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DAVID T. DAY, PH.D. . . . . Editor in Chief  
EDWARD W. PARKER . . . . . Managing Editor  
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\*Illustrated.

IN OUR issue for January 4 last special attention was called to the increase in size and capacity of furnaces, which has been such a marked feature in the development of the iron trade in recent years. This feature is brought out in a marked way in the new issue of the *Directory* of the American Iron and Steel Association. The changes there recorded cover a period of three years only, from 1898 to the end of 1901; yet we find that while the number of blast furnaces actually in existence has decreased, the estimated total capacity has increased 33 1-3 per cent, from 18,000,000 to 24,000,000 tons. The average yearly capacity of the furnaces using coal and coke has increased in the three years from 53,150 to 69,252 tons, or about 30 per cent; while that of the charcoal furnaces, which are necessarily of smaller size, has risen from 12,119 to 14,179 tons, or 17 per cent. The gain is a most notable one.

AN INTERESTING report has recently been made by a committee of the Reform Club of New York City on the valuation of the property of the Metropolitan Street Railway Company. The report shows that the company has bonds and stocks outstanding to the amount of about \$160,000,000 par value, the market value of which is about \$220,000,000. The physical value of the property is ascertained to be \$60,000,000 which leaves about \$160,000,000 as the value of the franchises possessed by the company for which it pays nothing. The net earnings of the company are found to be \$8,000,000 annually, nearly 4 per cent on the market value of its capital, 5 per cent on the par value, and over 13 per cent on the actual value of the property. The report states that if the water were squeezed out of its securities, the company could pay a dividend of 8 per cent on a capitalization of \$60,000,000 and charge 3 cent fares.

THE REPORT that a combination of European producers is being arranged to maintain prices of iron and steel as against American buyers, does not seem to be worth serious notice. It would be very difficult at any time to harmonize the British and German producers, and still harder to restrain furnace owners who saw a chance to cut down their unsold stocks. In addition to this, it must be remembered that the present demand for foreign iron and steel is only temporary. With the early opening of navigation and the freedom of the railroads from weather blockades, our own furnaces will have abundant supplies of material and will be able to meet all demands. Even if a combination should be formed "to make the Yankees pay up," it would probably be found by the time it could be put in working order that there were no Yankees in the market.

THE REPORT of the United Alkali Company of Great Britain for 1901 is once more disappointing, as no dividend is paid on the ordinary shares, which amount in the aggregate to nearly £3,000,000. Interest at the rate of 5 per cent on £2,700,000 debentures and dividends at the rate of 7 per cent on £3,000,000 preference shares have been paid, but that is all. The belief has now grown to an actual

certainty that the company was far too heavily capitalized at the start, but the mortgage holders and the preference shareholders are not likely to consent to any reduction of capital, so nothing can be done to reorganize the company. From the continued absence of dividends it might be at first sight imagined that the company is not a successful trading corporation or that it is badly managed. As a matter of fact the business is an excellent one and the amalgamation of a great number of different works has in this case been a real success, as the various products of the different works are mutually useful and the by-products are all used up. If it was not for the unfortunate over-capitalization the company would stand high among industrial concerns.

AN EARLY opening of navigation on the Lakes seems probable, some authorities predicting that vessels will get through as early as April 15, or some three weeks sooner than last year. Lake Superior, indeed, is reported nearly free from ice already. The question of rates on ore seems to be practically settled. The United States Steel Corporation has made contracts covering the transportation of a large quantity of ore on a basis of 75 cents from Duluth to Ohio ports, and other shippers, who have not covered their season's shipments yet, expect to be able to get the same rate. The shippers are aided in their contention for lower rates by the fact that navigation will be opened so early, which will permit all boats engaging in that trade to make two trips during April and therefore make it possible to move a very much larger amount of ore this year than otherwise would have been moved. It seems now entirely probable that the ore shipment for the coming season will be limited only by the ability of the Lake Erie docks to handle the material. It is altogether possible that the total season's movement will exceed 23,000,000 tons.

A MEETING of the coal shippers who do business in the Northwest over the lake route and who market Pittsburg and West Virginia coal in that territory was held in Cleveland last week and agreed upon prices. The list has been guarded very carefully, but it was said at the close of the meeting that all contracts will be taken this year at a 5 per cent increase over last year's prices. The West Virginia fields will deliver their lake coal to Cleveland and ports east at the same prices that obtained a year ago, but at ports west of Cleveland the Hocking producers will ask a slight increase. The selling agents started immediately after the meeting for the Northwest, and it is likely that most of them will be ready to make contracts for the season's movement within a few days. The docks at the head of the lakes are well cleaned up and there will be a need for coal immediately. In addition it is expected that the coal shipment this year will be extraordinarily heavy, probably in excess of the shipment during any one year in the history of the trade. Some preliminary discussion has been going on as to vessel coal rates on the lakes, but the general opinion seems to be that the rate obtained at the opening of navigation in 1901 will prevail this year, namely 35 cents to the head of the lakes and 50 cents to Milwaukee.

THE AVERAGE rate on iron ore moved from Lake Superior shipping points to the receiving ports on Lake Erie, during the season of 1901, is found by the *Cleveland Marine Review* to have been 79.9907 cents per ton. It may be a surprise to many to find that the average fell below 80 cents; but this is explained by the fact that the "wild" ore on which as high as \$1.25 was paid late in the season, was very much less in quantity than the contract ore carried at 80 cents or less. The *Marine Review's* averages are based on total shipments of 13,663,481 gross tons. For the nine years ending with 1901 the average rate has been as follows, in cents per gross ton.

1893	94.1	1896	97.7	1899	79.40
1894	78.9	1897	63.8	1900	120.70
1895	85.9	1898	59.0	1901	79.99

A rough average for the nine years is 84.39 cents. The sharp drop from 1900 to 1901 shows how the increase in Lake tonnage responded to the growing demand. It was in part also due to the changed conditions in the iron ore trade and the larger proportion of contract tonnage.



#### IMPROVEMENTS IN LAKE SUPERIOR ORE DRESSING PRACTICE.

The report of Capt. W. E. Parnall, superintendent of the Osceola Consolidated Copper Company, to his directors for the year 1901 contains valuable data as to the results in the ore dressing practice in the mills under his care and the effect of the recent improvements. The Osceola has two mills, the old and the new. The former has six heads of stamps; the latter seven, but it was not completed to its full capacity during 1901, only three heads having been in operation. (It was expected that the remaining four would be ready about February 15, 1902). The construction of the new mill was done in two stages; three stamps were first erected (completed November 6, 1899), and later an additional building with four stamps was put up (begun early in 1901, but not completed up to the date of the last report, February 4, 1902). It appears that the construction of the four new stamps will occupy about 12 months from the time of delivery of the material on the ground. The new mill with its full quota of seven stamps is estimated to have a capacity of 3,500 tons of rock per day, or 500 tons per stamp, and 1,000,000 tons per year for the usual running time, approximately 300 days. According to the reports of the directors of the company there were expended in the construction of the new mill the sums of \$98,529 in 1899, \$89,406 in 1900, and \$236,415 in 1901, a total of \$424,350. The final cost will be of course somewhat more than that.

When the new mill is completed it will handle all the ore that the mines produce and the old mill will be closed. The six stamps of the latter are crowded into a space barely sufficient to accommodate three heads together with the accessory washing machinery and other devices that have been proved to be necessary for economy in stamping and increased recovery of copper from the stamped ore. The Osceola management satisfied itself that the old Lake Superior practice of stamping in mortars with two screens of 3-16 inch mesh, and hanging up a head an average of two hours per 24 to clean out the large pieces of copper that could not pass through the screens, much of this copper being reduced to slime by abrasion, was capable of improvement. The stamps in the new mill have a circular mortar with a 5/8-inch screen all around it, giving a screening area 11.1 times larger than before; and instead of hanging up a stamp in order to clean out the mortar, a boy opens a valve in the

latter and thus permits the coarse copper to fall out ready for the smelter. In this way 20 per cent of the mineral is got directly. Hydraulic separators interposed between the stamps and the jigs take out 22 per cent more. Inasmuch as the mineral separated by those methods assays 93 to 96 per cent copper, about 56 per cent of the value of the ore is recovered without jigging, the jigs being relieved of the coarse copper that passes through the screens of the mortars and losses in dressing being reduced. The circular mortar is described and illustrated on another page.

Capt. Parnall does not enumerate all the labor and copper saving devices that have been introduced in the new mill, but he is apparently fully alive to their importance, stating that "in these times of close margin and low percentages of copper in the rock, it is imperative to watch the losses at the tail end of the mill." Three samples of the tailings are taken daily. In the old mill it was never possible to reduce the loss of mineral in the tailings below 0.25 to 0.27 per cent, an average of about 0.26 per cent, which would correspond to 0.187 per cent copper, the mineral being assumed to be 72 per cent fine; this result compares favorably, according to Capt. Parnall, with that attained by any of the old mills treating amygdaloid rock. In the new Osceola mill the average tenor of mineral in the tailings during 1901 was only 0.094 per cent, equivalent to about 0.065 per cent copper. There are no data in Capt. Parnall's report which would enable us to pursue this subject further. However, in referring to his report for 1899, in which year practically the entire quantity of rock was stamped in the old mill, it appears that the yield of mineral was 27 pounds per ton, which would indicate a recovery of about 0.972 unit of copper per ton of crude ore, assuming the mineral to have been 72 per cent fine. If the tailings carried away 0.187 unit, the original copper content of the ore would have been about 1.159 per cent and the saving in dressing a little less than 84 per cent. If with the same grade of ore the loss in the tailings were only 0.065 unit of copper, the saving would be a little more than 94 per cent, which would impress us as being phenomenally good work. It is, of course, assumed herein that the tailings samples represent all the value that leaves the mill and it would be interesting to know as to the method of taking them. It should be remarked, however, that the yield of mineral has decreased since 1899, the average having been 25.2 pounds in 1900 and only 23.7 in 1901, and the percentage of recovery would naturally vary more or less according to the grade of the ore.

The cost of dressing in the old mill in 1901 was 29.22 cents per ton of crude ore; in the new mill it was 22.1 cents. In this connection it is interesting to note that the cost of illumination and pumping water, the latter by means of the forty-million-gallon Nordberg pump, which was said to be the second largest in America when it was installed two years ago, came to 2 cents per ton of rock. Capt. Parnall computes that in stamping 687,094 tons of rock, which was the work done in 1901, a saving of 5 cents per ton amounts to \$34,354, while the increased recovery of copper which is to be expected from the new mill will amount to 1,642,154 pounds, or \$164,215 at 10 cents per pound, making a total gain of \$198,569 per annum. This corresponds to a little more than \$2 per share on the 96,150 shares which the company has issued, and if it is realized will reflect great credit upon the technical management of the company, especially in view of the comparatively moderate outlay of capital for which it will be secured. During the recent fat years the Osceola has been paying dividends of \$6 per share and during the previous lean years the distribution was only \$2 to \$3 per share.

#### IRON AND STEEL PRODUCTION IN GERMANY.

The corrected statement of pig iron production in Germany for the year 1901 is given by *Stahl und Eisen* as below, in metric tons:

	Tons.	Percent.
Foundry iron.....	1,512,107	19.4
Forge iron.....	1,356,794	17.4
Bessemer pig.....	464,036	6.0
Thomas (basic) pig.....	4,452,950	57.2
Total.....	7,785,887	100.0

The spiegeleisen made is not given separately, but—for some reason not apparent—is included in the forge iron. The total iron reported in 1900 was 8,520,540 tons, so that last year showed a decrease of 734,653 tons, or 8.6 per cent. Included in the returns for 1900 was 13,950 tons of scrap iron and cinder; the quantity for 1901 is not yet reported, but it is not an important proportion of the total.

There seems to be some need of improvement in the classification of pig iron at the German furnaces. Thus in the table above only 63.2 per cent of the total output is given as steel pig; but the report of steel production shows that some 80 per cent of the pig iron made was used in making steel. This must have included some of the pig iron given in the report under the foundry or forge grades.

The output for 1901 was the smallest reported since 1898. Moreover 1901 is the first year in the past ten in which the pig iron output has shown a decrease from that of the preceding year.

By districts, the largest producer last year was the Rhine District and Westphalia, which reported an output of 3,014,844 tons, or 38.7 per cent of the total. Luxemburg and Lorraine, including the Saar, made 2,896,748 tons, or 37.2 per cent. Silesia reported 762,843 tons, or 9.8 per cent; Siegerland and the Lahn, 634,712 tons, or 8.1 per cent; Hanover, 341,985 tons, or 4.4 per cent; Bavaria, 113,813 tons, or 1.5 per cent; tons, or 0.3 per cent. The highest proportion of basic iron was made in Luxemburg, from the minette ores of that region; while the Rhine District furnished about three-quarters of the bessemer pig.

The production of steel in Germany for the year 1901 is reported as follows, in metric tons:

	Acid.	Basic.	Total.	Per. ct.
Converter ingots.....	299,816	3,975,070	4,274,886	66.8
Open-hearth ingots.....	125,590	1,886,536	2,012,126	31.5
Direct castings.....	39,634	67,576	107,210	1.7
Totals.....	465,040	5,929,182	6,394,222	100.0
Totals, 1900.....	422,452	6,223,417	6,645,869	....

The total decrease in 1900, as compared with the previous year, was 251,647 tons, or 3.8 per cent. It will be noted that last year 92.7 per cent of the entire steel output was made by the basic process. The extent to which steel has superseded wrought iron in Germany is shown by the fact that over 80 per cent of the pig iron made last year was converted into steel.



#### MINING DIVIDENDS.

Unusually large dividends were paid by companies engaged in the mineral industry of the United States in the quarter ending March 31, last. This was especially true of the more important industrial combinations. A compilation by the *ENGINEERING AND MINING JOURNAL* of the dividends paid by 103 companies shows the total of \$47,487,881, which is a noticeable increase over the corresponding three months in 1901.

Foremost on the list are 20 petroleum and natural gas companies that reported \$20,423,598. Of this amount the Standard Oil Company contributed \$19,400,000, while 16 independent California and Texas oil wells yielded \$597,357.

Second place is held by 10 iron and steel com-



panies with \$15,649,629 to their credit. The bulk of this (\$14,012,283) was paid by the United States Steel Corporation, being a quarterly dividend of 1 per cent on the common stock, and  $1\frac{3}{4}$  per cent on the preferred.

The other industrials were 10 coal and coke companies with \$1,903,375, led by the Pittsburg rail and river combinations, and 6 chemical and mineral companies, with \$909,639, of which the Virginia-Carolina Chemical Company furnished \$519,844. In all the 46 industrial companies paid \$38,886,241, which is equal to nearly 82 per cent of the total reported.

In the list of metal mines 46 gold, silver and lead properties yielded \$4,163,232. Of this the American Smelting and Refining Company paid \$875,000 on its preferred stock; the Quincy Mine, of Utah, \$375,000, on a \$75,000 capital, and the Homestake Gold Mine in the Black Hills, South Dakota, \$315,000, being at the rate of 6 per cent annually on \$21,000,000 stock.

The copper companies in several instances have reduced their annual rate, owing to the lower selling price of the metal. Six companies reported \$3,692,160, and of this amount the Amalgamated, which controls properties in Montana, paid \$1,538,079, and Calumet & Hecla, of Michigan, \$1,000,000.

Two zinc concerns divided \$711,248, of which the New Jersey Zinc Company reported \$700,000. Three California quicksilver properties paid \$35,000. Thus 57 metal mines declared a total of \$8,601,640.

A number of new payers have been added to the list, while increased dividends have been declared by others whose profits have grown with the industrial expansion.

In addition to the above-mentioned dividends we report \$326,760 by 12 Mexican mines, led by the Penoles, of Mapimi (owned in Belgium), with \$164,438, equal to 50 per cent monthly on its capital. One Central American mine, worked by New York people, paid \$45,000. In Canada four British Columbia mines paid \$89,344, and in Nova Scotia 2 industrial companies paid \$120,000. In all these 19 foreign properties declared \$581,104 in dividends.



#### THE NEED OF AN AMERICAN LABORATORY OF ENGINEERING RESEARCH.

The foundation of the Carnegie Institution gives reason for the hope that a great impetus is about to be given to scientific research in the United States. Many and important as have been the scientific discoveries heretofore made in this country, from the time of Franklin to the present, it must be admitted that, in number at least, they do not compare with those of Europe. The reason does not lie in any lack of men with the quality of mind for the systematic investigation of the secrets of nature, but that such men have not had the proper opportunity. Many of them are professors in colleges, ready and willing to do research work, but who are compelled by lack of facilities, and still more by the necessity of earning their livelihood, to leave undone the work they would otherwise be glad to do. The splendid endowment of the Carnegie Institution makes it possible to bring the opportunity and the men together, with the happiest results.

We understand from published statements that it is the intention of the trustees of the Institution to go slowly in forming their ideas as to its place and scope, and that they will take counsel with many men interested in scientific investigation before forming definite plans. It seems proper at this time, therefore, to give expression to some thoughts upon the kind of work that one branch of the Institution might undertake, and to suggest that the trustees in forming their places will carefully consider the needs of engineering science for a laboratory especially devoted to research in the domain of engineering.

The whole world of science will of course present its claims. It would ill become any scientific man to antagonize the claims of any other, but the field for investigation is so vast that ten times ten million dollars would not be an endowment sufficient to provide for research in every department; hence the trustees will be compelled to favor some departments of investigation rather than others.

Upon what principle shall the selection of the subjects may first be considered; for instance, those branches of research which are already well provided for by the government or by special societies. Thus agriculture, entomology, forestry, fish culture, meteorology, astronomy, geology, and the standardization of measures of length and weight may be left to the government departments which now care for them. Exploration of ancient ruins in Assyria and Egypt may be left to the societies devoted to this subject.

All other proposed researches may be divided into two classes, first, the merely curious, and second, the useful or possibly useful. It is accepted that the result of a scientific research which at first appears only curious may years or centuries afterward become of transcendent importance; for example, the electrical discoveries which were only curious in the 17th and 18th centuries became useful in the 19th, and Faraday's and Henry's researches in the same field remained curious for several years before they became useful; but it will be noted that the curious discoveries which became useful were mostly in the domain of physical and not natural science. In a general way it may be said that every discovery in physical science is likely some day to become useful, while those in natural science may or may not become other than merely curious. The division of proposed researches into the two classes, curious and possibly or probably useful, therefore seems to be a legitimate one.

After a long list of proposed subjects for research have in this manner been excluded, or at least postponed, the next principle of selection would be that of preference, and the best ground of preference would appear to be that of the greatest possible immediate good to the human race. Of the subjects of research which are of the highest importance in this regard should be placed first of all those that offer the promise of conserving life and promoting the public health, and second those that pertain to the public material welfare. In the first class are included bacteriology, the means of preventing and curing disease, the purification of air and drinking water, surgery, and the prevention of accidents, especially from fire. In the second we would class all physical, chemical, and industrial science. Economic geology and mineralogy would be included in this class, and after them those subjects which tend chiefly toward intellectual advancement, such as history, economics, philology, pedagogy, etc.

Engineering, broadly defined as the science and art of utilizing the forces of nature for the benefit of man, is in part included in both of the first two of the above named classes. It has to do with the conservation of life and health when it is applied to the design and erection of safe structures, to heating and ventilation, to purification of drinking water, to fire protection, to sewage disposal, and to the safeguarding of life on railroads, on steam vessels and in mines. As for its relation to the material welfare of the race, it is the foundation of the wealth accumulated in the world during the past century and of our present domestic comfort. By means of the steam engine and other machinery it has revolutionized the arts of peace and war, and has given a new era to civilization. Moreover, engineering is not confined only to the material side of life; it is a strong factor in intellectual and social advancement. The education of the modern engineer requires such a severe preliminary and professional training that it has caused the establishment of scores of special schools, and has led to many changes in educational methods. The science of pedagogy, therefore, has as one of its important problems the education of the engineers of the future. Engineering, through the factory system, has given rise to and is solving numerous problems in sociology. Statistics, the economy of production and distribution, the combination of capital, the labor question, are all subjects of study by the engineer. The "captains of industry" are not cap-

italists, but engineers. The whole manufacturing industry, which now leads agriculture as a wealth producer in most of the great nations of the world, is founded on engineering.

Engineering is based upon experiment and research, much of it scientific, possibly more of it unscientific and haphazard. Its rules and formulae are some of them logical and accurate, others "rule-of-thumb" and approximate. Its "factors of safety" are largely factors of ignorance and guesswork. The engineer builds wonderful structures, but he wastes material, because he dares not, in ignorance of the proper factor of safety, economize it; or he builds a machine and it breaks down from unforeseen causes. In every design of a machine or other structure the engineer depends ultimately on research. For the strength and other qualities of his materials he relies on the data of some one's experiments; for the size of bearings on precedent or on printed rules, both of which are based on experiment; for the strength of columns he goes back to Hodgkinson, for coefficients of friction to Morin, for coefficients of radiation of heat to Peclet, and for properties of steam to Regnault and Fairbairn. The names just given show how ancient are the researches upon which the engineer of the present day necessarily depends, because there are no later researches to take their place.

Researches in different branches of engineering are constantly being made in different parts of the world, and the published descriptions of them are voluminous, but only a small fraction of the results are of permanent value. Most of the experiments made are on too small a scale, with imperfect apparatus and under undesirable conditions, and by experimenters who were prevented by other occupations from giving sufficient time to the work. Many of the published results are of little or no value, because they are imperfectly digested and edited.

In the year 1875 the need of researches on the strength of iron and steel was made so apparent to Congress that the "United States Board Appointed to Test Iron, Steel and Other Metals" was organized and money appropriated to build the 800,000-pound weight-testing machine at the Watertown arsenal for the use of the Board. While the machine was under construction some excellent research work was done, notably that on alloys of copper, tin and zinc, under the direction of Prof. Thurston, and that on wrought iron and chain cables by Commander (now Admiral) Beardslee, but before the machine was finished, the appropriation was exhausted and the Board ceased to exist. The machine was built at last and turned over the ordnance department of the army, which has made good use of it, but it has never been used for systematic research for which it was intended. The work projected by the Board in 1875 still remains to be done, and all the arguments then made in favor of the organization of the Board remain good to this day.

The field for engineering research is a vast one. To give only a glimpse of its extent we mention a few subjects in the branches of civil, mechanical and metallurgical engineering, saying nothing of electrical engineering, which is a vast field in itself.

1. Strength and other properties of materials, viz.: cast iron, steel of different kinds, especially the newer alloy steel; effect of heat treatment on steel; fatigue of metals; effect of repeated vibrations and shocks; cutting properties of tools; alloys of copper, aluminum, etc., cement and concrete, combinations of steel and concrete; abrasives; refractory materials; timber, its fireproofing and preservation from rot; properties of special shapes, such as springs, riveted joints, tubes, stayed and unstayed flat surfaces, etc.

2. Fuel; analyses and heating value of American coals; method of burning coal without smoke; methods of burning oil and fuel gas.

3. Steam boilers and superheaters; effect of circulation in boilers; treatment of feed water to remove scale forming materials and oil; methods of firing; methods of determining the temperature of furnaces and of analyzing the flue gases.

4. Steam engines, means of improving their efficiency; use of superheated steam.

5. Gas producers and gas engines.

6. Ventilation and heating; means of determining the purity of air in mines, in schools, etc., measurement of air supply; relative efficiency of different methods of ventilation; efficiency of radiators; fans

and blowers; transmission of heat and leakage of air through walls, windows, etc., measurement of air currents and air pressures.

7. Flow of water, steam, gas and air in pipes; resistance due to bends, valves and other obstructions.

8. Heat transmission through plates, tubes, etc.; effect of circulation of fluids; non-conducting coverings.

9. Steam; repetition of the work of Regnault, Fairbairn and others; determination of constants for superheated steam.

10. Water; weight of different temperatures; specific heat; measurement of flow from orifices, in streams, etc.; water-hammer in pipes; purification of drinking water.

11. Corrosion of metals; methods of preventing corrosion.

12. Friction and lubrication; determination of laws; identification and analyses of oils.

13. Transmission of power by gearing, ropes, belts, compressed air, water, electricity, etc.

14. Fireproofing of wood, paper, etc.

15. Engineering chemistry; comparison of accuracy and rapidity of analytical methods; standards of analyses for engineering materials of given physical properties.

16. Engineering apparatus; calibration of meters, indicators, dynamometers, etc.; testing machines, boilers, engines, tanks, pipes, furnaces, pyrometers, calorimeters, etc.

The investigations which may be made in the several subjects named above, and in many others which might be named, might all occupy a well equipped laboratory and a large corps of observers for many years. The next question is, how shall they be made?

Hitherto such researches have been made usually by single individuals, each choosing his own subject and devising his own methods, in different parts of the world, without collaboration with other workers in the same field, and often with imperfect facilities and insufficient time. There is surely a better method, which may be inaugurated by the Carnegie Institution. We would suggest the following plan of procedure:

First, appoint an advisory council of engineers to make a list of researches which ought to be undertaken, after receiving suggestions from engineers all over the world. This council might also present statements as to the relative importance of different proposed investigations, the scale upon which they should be undertaken, and the probable time, labor and money required for each. The management of the institution might then, by correspondence with the heads of engineering schools, discover that the men and the apparatus for some of the proposed investigations are already available in certain of these schools, and on satisfactory assurances that these investigations would there be made, might appropriate money for them. It would then, no doubt, be found that for many of the most desirable subjects of research there were no proper facilities, and no men of the right kind who could spend the time needed for research without neglecting their other duties. The need of a new laboratory of research in Washington would then be apparent.

The advantages of such a laboratory would be manifold. It would concentrate in one place all the equipment required for a great variety of purposes, where it would be well taken care of and be ready whenever needed. The greater part of the equipment could be in use practically all the time, for many researches could be progressing simultaneously. There would be a director of the laboratory with a trained staff of observers and computers, who would be constantly at work, not having their attention and time taken up by teaching students. The laboratory could afford room and use of apparatus under proper restrictions for investigations by post-graduate students and others interested in scientific research. It would contain a library of engineering research which would be accessible to those properly accredited. The work could be constantly under the supervision of

the trustees and the visiting members of the advisory council. The results of the researches would be properly edited and published, one of the managing staff being the editor. The laboratory, located in Washington, would be in contact with the Smithsonian Institution, the Bureau of Standards, the National Observatory, the Weather Bureau, the Geological Survey, and other scientific branches of the government, to their mutual benefit, and it would be within easy reach, for purposes of conference, of the scientific departments of the universities in Baltimore, Philadelphia, New York and other eastern cities.

The laboratory need not be an architectural monument in Pennsylvania avenue. It would be better to locate it in an unpretentious building in the suburbs, so that ground for future extensions might be cheaply obtained. A hundred thousand dollars for the building and an equal sum for the equipment would probably be sufficient for the first ten years.

The need of such an engineering research laboratory is apparent to all engineers, and we hope it will be established before long.

#### THE COAL FIELDS OF THE UNITED STATES.

The Third Part of the *Twenty-third Annual Report, 1900-1901*, of the United States Geological Survey, dealing with Coal, Oil and Cement, is now passing through the press. That portion of the volume relating to the coal-fields of the United States is the answer to many requests made to the Geological Survey for information concerning the coal supply of the country, and is based on geographic, geologic and trade relations. This report was prepared under the joint supervision of the Division of Mining and Mineral Resources and the Division of Economic Geological, Non-Metalliferous Deposits. The introductory part, by Dr. Charles Willard Hayes, geologist, discusses briefly the distribution, development, production and markets of the coal fields of the United States.

The total coal areas foot up some 80,397 square miles, exclusive of Alaska, and exclusive also of vast areas of lignite coal not strictly comparable with the higher grade anthracite and bituminous coals. Of this total area approximately 55 per cent is probably productive. The rank of States in production differs greatly from their rank in coal area. Thus Pennsylvania, ranking seventh in coal area, was easily first in production in 1900, with a little over 132,000,000 short tons out of a total production of about 241,000,000 tons. The same thing is true of the Northern Appalachian field as a whole, which, third in area, ranks first in tonnage and value of product, a result due to proximity to market, suitability of coal to fuel requirements, and relative quantity of workable coal per square mile of productive area. The anthracite field consists of several long, narrow basins in eastern Pennsylvania. Several small basins of Triassic rocks in the Piedmont region of Virginia and North Carolina, containing an aggregate of about 1,000 square miles, are coal bearing.

The Appalachian field, subdivided into northern and southern, extends from northern Pennsylvania 850 miles to central Alabama, embracing portions of nine states, and containing approximately 70,800 square miles, of which about 75 per cent contains workable coal. The Northern Interior field lies wholly within the State of Michigan, with an area of approximately 11,000 square miles. The Eastern Interior field, lying in Indiana, Illinois and Kentucky, has an area of 58,000 square miles. It is estimated that about 55 per cent of this area is productive. The Western Interior and Southwestern fields form a practically continuous belt of coal measure rocks, extending from northern Iowa southwestward 880 miles to central Texas, and embracing an area of 94,000 square miles. The Rocky Mountain fields extend from the Canadian border southeastward some 1,200 miles, with a maximum breadth of 500 miles, and aggregate 43,610 square miles. The San Carlos field, El Paso County, Texas, and the Eagle Pass field, extending from Uvalde County, Texas, 75 miles to the Rio Grande and across into Mexico,

properly belong to the Rocky Mountain field. The Pacific Coast coal-fields have a total area of about 1,000 square miles, with the most important deposits in Washington, a few deposits in extreme western Oregon and in central and southern California.

The lignite coal deposits which are not treated of in this series of papers, embrace about 50,000 square miles in Montana, the Dakotas and Wyoming; and then, in an area of about equal extent, they run in a narrow belt from the Georgia-Alabama line nearly to the Mississippi, and then west of the Mississippi in a broader belt from Little Rock southwestward through Arkansas, Louisiana and Texas.

The Appalachian field presents certain well-marked types of coal, which for particular purposes are regarded as standard. The coal of the Connellsville district of the Pittsburg bed is the standard for coking coal, as the Pocahontas coal of West Virginia is the standard for steam coal. The Northern Interior field, of Michigan, contains only bituminous coal, a fair steaming fuel. In the Eastern Interior field the largest part is a soft bituminous, fairly good steam coal; then there is the block coal in Indiana, and also numerous small areas of cannel coal, valuable for gas making and for domestic purposes in Kentucky. The coal of the Western Interior fields is fairly uniform in composition and makes a fair steaming fuel. In the Southwestern Interior field the coal varies from a soft bituminous in northern Texas to semi-anthracite in Arkansas. In the Rocky Mountain and Pacific fields the coal varies from lignite to anthracite. Owing to location and character of coal the northern Appalachian field controls the coal trade of the eastern States, sending its coal to the seaboard by the trunk-line railroads. It competes with the interior coal-fields to the west by way of the Great Lakes and the trunk-line railroads, and to the south by way of the Ohio River. The Southern Appalachian field supplies the South Atlantic and Gulf States as far west as the Mississippi, and Dr. Hayes thinks this field will in time support a large export trade to Central and South American ports, and, after the Isthmian canal is built, to Pacific Coast ports also. The markets for the coal of the Northern and Eastern Interior fields are chiefly within their own limits, and they are in more or less of competition with the Appalachian coal and with the natural gas of Ohio, Indiana and Kentucky. The Western Interior coal field supplies its own markets and those toward the north and west, where it must compete with the Rocky Mountain fields. The Southwestern Interior field has but little competition except from fuel oil in a large territory toward the south and west. Practically all the coal fuel used by the southern trans-continental railroads, as well as the Texas roads, comes from the north Texas and Indian Territory fields. Considering the entire region between the Appalachian coal field and the Rocky Mountain fields, there is observed a general movement of the coal westward, a tendency due chiefly to the higher grade of the eastern coals, but also in part to the generally lower westward railroad freights and to the ease of westward water transportation. The region west of the one-hundredth meridian, about half the area of the United States, Alaska excepted, contains less than 20 per cent of the coal fields. The development of the coal resources of Alaska is as yet in the experimental stage. Practically all the information at present available concerning these Alaskan coal fields is summarized by Mr. Alfred H. Brooks in his paper, which should form an invaluable aid in future prospecting and development.

**MANGANESE IN SOUTH RUSSIA.**—The manganese mines of South Russia are near Nicopol in the government of Ekaterinoslav. There are six concessions for manganese, owned by four concerns, the most important of which is the Nicopol-Mariopol Company. In 1900 there were 1,352 men employed, and the total rock taken out was 18,236,690 poods, from which there was obtained by concentration 5,177,066 poods (84,800 metric tons) of manganese ore, varying from 30 to 50 per cent manganese. The total for 1901 is estimated at 5,300,000 poods, or 86,814 metric tons.



### GEOLOGICAL SURVEY WORK IN TEXAS OIL FIELDS.

Congress has recently provided, by a joint resolution, for printing four thousand copies of Bulletin 184 of the Geological Survey entitled "Oil and Gas Fields of the Western Interior and Northern Texas Coal Measures, and of the Upper Cretaceous and Tertiary of the Western Gulf Coast," by George I. Adams. Of this number one thousand copies are for the use of the Senate, two thousand for the use of the House of Representatives, and one thousand for free distribution by the Survey.

It will be recalled that this bulletin was issued last fall, and almost immediately exhausted, owing to the active development taking place in the region dis-

### HARGREAVES-BIRD PROCESS FOR THE ELECTROLYTIC PRODUCTION OF SODA AND BLEACH.

BY EDWARD WALKER.

The Hargreaves-Bird process for the production of soda and bleach by the electrolysis of salt is now established on a commercial scale at Middlewich, Cheshire, England, and is already yielding satisfactory profits to the owner, the Electrolytic Alkali Company, Limited. It will be remembered that the process was originally experimented on at Farnworth, near Widnes. A description of the process and details of the cell was given in the *ENGINEERING AND MINING JOURNAL* May 21, 1898, and in the *Mineral Industry*, Vol. VI. Two years ago salt lands near Middlewich were acquired and an ex-

through to the cathode, but prevents the passage of chlorine or undecomposed salt. The efficiency of the diaphragm is of course the chief success of the process, though the arrangement of the anodes so that they are not attacked by the chlorine is also an important factor. The soda on passing through the diaphragms comes into contact with an atmosphere of steam and carbonic acid, and the resulting solution of carbonate of soda trickles out at the bottom. If no carbonic acid is present the solution consists of hydrated caustic soda. The chlorine is led away to lime chambers, where bleaching powder is made. The brine is being continuously pumped through the anode chamber from the well and back again, so that the strength of the solution is maintained at a constant level. Each cell is capable of decomposing 237 pounds of salt in 24 hours, producing 395 pounds of standard bleach, containing 37 per cent of chlorine and 578 pounds of soda crystals. The capacity of the cell for current is 2,500 amperes, though in practice the amount passing will vary from 2,300 to 2,500; while the pressure used varies from 3.7 to 3.9 volts. The electrical efficiency of the cell closely approximates the theoretical.

A general view of the works is shown in Fig. 1, and views of the cell house are given in Figs. 2 and 3. The 56 cells are arranged in four series of 14 each. The brine, steam and carbonic acid inlets and the exits for the spent brine, chlorine and soda solution, and the wires supplying the current, are all so disposed that any cell may be isolated at once for repairs without inconvenience. The life of each cell working without interruption night and day averages 100 days, and during that time no attention whatsoever is required. The soda solution from the various cells collects in reservoirs at the end of each set of 14 (see Fig. 3). From there it is drawn to a vacuum evaporator, where it is concentrated to a sufficient degree to solidify on cooling. It then passes to shallow cooling tanks, shown in Fig. 4. After solidifying it is broken out of the tanks, passed first through centrifugals to extract the moisture, then through breakers to reduce it to convenient sized crystals, and it is then packed direct into 200-pound bags ready for shipment. The chlorine is pumped to the lime chambers shown in Fig. 5. These cham-

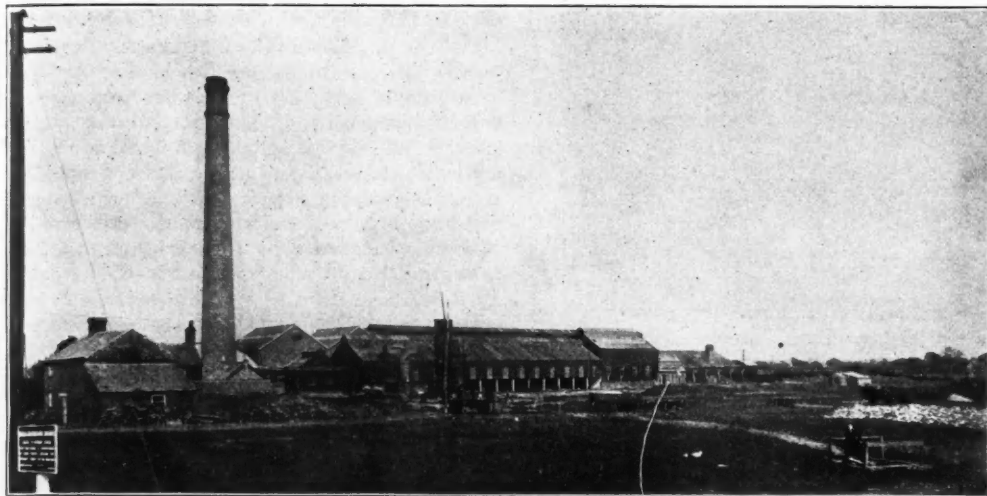


FIG. 1. GENERAL VIEW OF WORKS AT MIDDLEWICH.

cussed and demand for information regarding it on the part of investors and others. An abstract of the bulletin was given in the *ENGINEERING AND MINING JOURNAL* of January 18, 1902. The greater part of the bulletin is devoted to a discussion of the older oil and gas fields of Kansas and Indian Territory and the Corsicana field of Texas. Only a brief preliminary examination was made by Mr. Adams of the Beaumont field at a time less than six months after the bringing in of the Lucas gusher, when reliable information was extremely difficult to obtain. Mr. Adams' report, therefore, while as full as the facts obtainable at the time would warrant, was regarded as only preliminary, and the investigation of the field has been continued by the Geological Survey. The work has been done under the immediate supervision of Dr. C. W. Hayes, Geologist in charge of the Division of Non-Metallic Minerals, who has spent about two months in the field. Mr. William Kennedy, formerly of the Arkansas and Texas Geological Surveys, has been employed continuously in the field since May, 1901, and has collected a large mass of valuable data bearing on the stratigraphy and structure of the field and the statistics of production. Messrs. Hayes and Kennedy are now engaged in the preparation of a report on the Gulf coast oil field of Texas and Louisiana, which will be published by the Survey at an early date.

**MICA SPRINGS.**—The *American Machinist*, of recent date, says: "Mr. W. C. Leland, a machinist doing business at 469 Van Buren Street, Brooklyn, referring to our inquiry some time ago for a spring made of a substance which would not be affected by heat, sends us some pieces of mica arranged to act as a flat spring, and he says that a mica spring continues to act as a spring when exposed to very high temperatures. A specimen he sends us acts as a spring when held in a gas flame and continues to so act for a considerable time—at least as long as our patience has held out to test it. Of course, as many layers of mica may be superposed as is necessary to get the desired thickness and for experimental purposes at least, we would imagine that such a spring may be quite useful.

tensive plant erected. Production was commenced in April, 1901, and at the present time 56 cells are at work. A second set of 56 cells is being erected and will be in operation in April or May. Some illustrations of the works and the plant are given herewith, but before describing them it is best to give a short

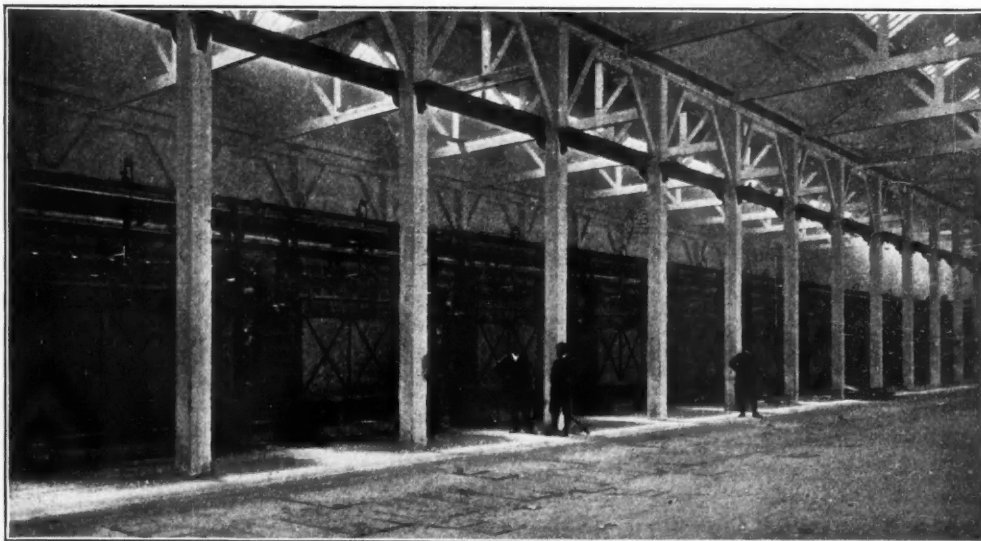


FIG. 2. INTERIOR OF CELL HOUSE, HARGREAVES-BIRD WORKS.

account of the principles of the process and to recapitulate some of the details which appeared in the issue of May 21, 1898.

The cells measure internally 5 feet by 10 feet by 1 foot. The cathodes consist of copper wire cloth, each 5 feet by 10 feet, giving a total area of 100 square feet. The anodes consist of pieces of gas carbon attached to frames between the cathodes. On the inner surfaces of the cathodes and in contact with them are diaphragms  $\frac{1}{4}$ -inch thick, composed of material the exact nature of which is not disclosed. It is a hard and non-porous material, composed of silicates, asbestos, etc. It is not in the nature of a filtering medium, but by osmosis allows the soda to pass

bers are arranged on staging so that the discharge direct to the packing barrels is considerably facilitated.

The present output per week is 70 to 80 tons of soda crystals and 50 to 55 tons of bleach. The entire output consists of these two products, as the market for them is the readiest. The demand is much greater than the supply, and the output of the 56 additional cells now in course of erection is already sold ahead. The soda crystals have the advantage of being practically pure, averaging over 99 per cent, the impurities consisting chiefly of moisture, with very small proportions of sodium sulphate and salt. The purity of the crystals produced by the ammonia-soda process is 98 per cent, and

of those produced by the Leblanc process not over 97 per cent. There are many makes of soda crystals sold in England that are grossly adulterated with sulphate of soda, presumably due to the salt-cake

The supply of carbonic acid for the cathode chambers is at present obtained from lime-kilns, and the lime produced is utilized in the bleach chambers. The company is favorably situated for the supply of lime

some likelihood also of gas engines being eventually employed as a source of power for the dynamos instead of steam engines, in which case the carbonic acid would be obtained from the exhaust and cleansed in the same scrubbers. The ultimate plan is as yet uncertain, though there seems no real reason for going further than the lime-kilns at present in use.

One of the difficulties that has had to be contended with is to obtain dynamos that are capable of generating large currents at low pressures. Several types by different makers have been tried, but there is still room for improvement in the design for this special purpose. Also the makers have not yet made dynamos which are capable of running continuously night and day. The difficulty is not, however, of any importance, and its removal depends entirely on the inclination of the makers to produce a dynamo suitable for the work for which it is required.

The company is also in a particularly favorable position in regard to the supply of brine. The estate on which the works are situated was bought at the ordinary price of land, before the previous owners had any idea that salt wells were to be sunk. The 73 acres cost £15,000, about one-fourth the price per acre that many properties of the salt union cost. The brine is tapped at a depth of 180 feet below the surface, and the extent of the rock salt at that depth is so great that the supply will last indefinitely.

The works of the company are also favorably situated for transportation facilities, being adjacent to the railway and to the canal, while the coal-fields are not far distant. The items of expenditure in the balance sheet consist chiefly of coal and wages, the



FIG. 3. CELL-HOUSE, HARGREAVES-BIRD WORKS

not being properly converted. The bleach produced by the Hargreaves-Bird process is of the highest quality. The chlorine contents as certified by independent analysts are always over 37½ per cent, and are often 38 per cent and 39 per cent. The bleach is a perfectly dry powder, which does not absorb moisture and become pasty, as there is no hydrochloric acid in the chlorine to produce chloride when brought into contact with the lime. In fact, the two products of the process are entirely satisfactory and are naturally in demand. The prices at which they are sold are based on the current market quotations, and no attempt is made either to underbid or to charge for higher quality.

The policy of the company has always been not to upset the market by suddenly increasing the supply nor to attempt to take trade away from other producers by underbidding. For this reason the production was limited at first, and the works will be gradually extended as the market broadens. During the ten and one-half months of working up to the end of February a profit of nearly £5,000 was made, and this in spite of various drawbacks incidental to

ready made and limestone for use in the carbonic acid supply. It was originally intended to use the

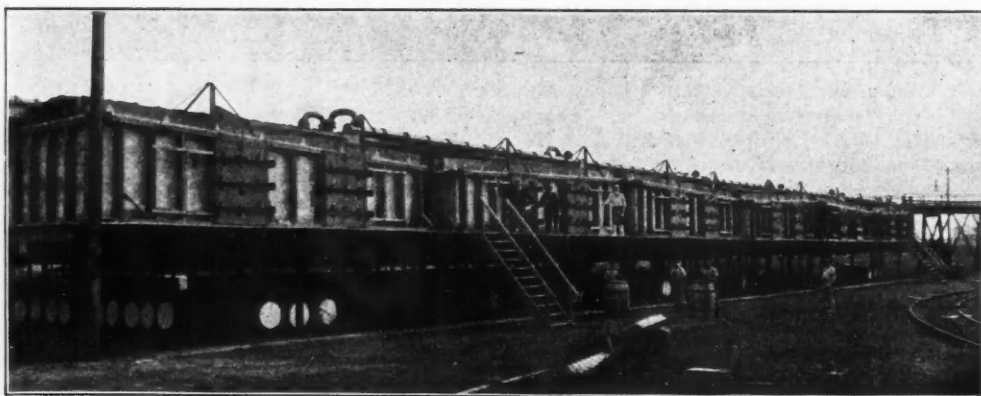


FIG. 5. BLEACH CHAMBERS, HARGREAVES-BIRD WORKS.

flue gases from the boiler furnaces as a source of supply, and experiments are now being made with

brine costing nothing, owing to the land having been bought so cheap, and the other items being very low. The wages bill also is much smaller than in most chemical works, as the greater part of the process is entirely automatic.

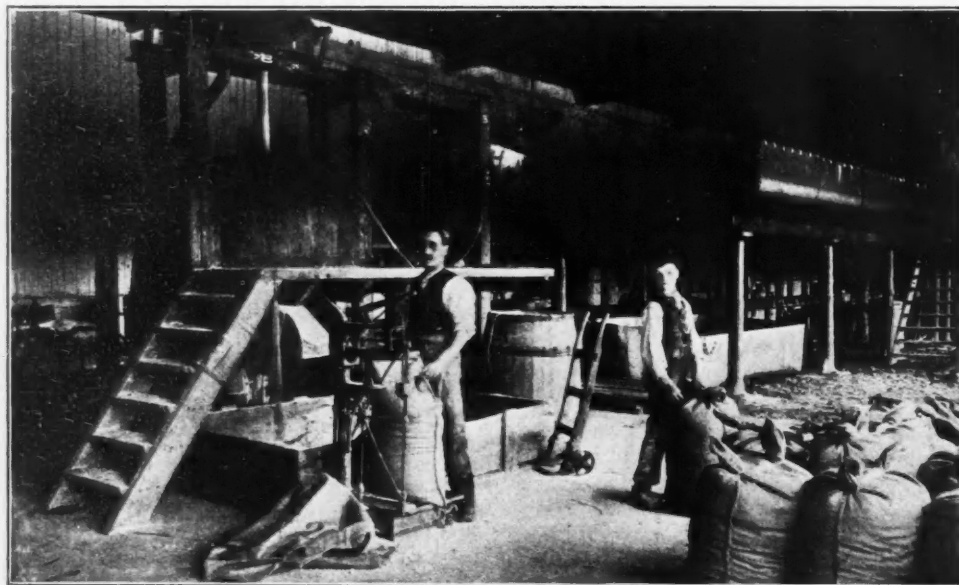


FIG. 4. CRYSTALLIZING TANKS AND CENTRIFUGAL FOR DRYING, HARGREAVES-BIRD WORKS.

the starting of new works and of the fact that all of the 56 cells were not working much more than three-quarters of the time.

mechanical stokers, which will produce the least amount of soot, and with scrubbers for removing the soot, sulphur, and carbon compounds. There is

#### AMERICAN EXPORT ORDERS.

The improvement in the industrial conditions abroad have given an encouraging impetus to our export trade. American manufactures are growing in favor in countries where British and German products have long been the standard of merit.

Judging from the many inquiries received by our manufacturers, and which have been reported to the *ENGINEERING AND MINING JOURNAL*, there is much promise for business in Japan and the Far East, and in South America and Mexico.

Many orders are being received from Germany, France, Great Britain and other European countries. A number of these orders, especially for iron and steel products, cannot be filled for some time, owing to the continued heavy domestic demand.

A feature in our export trade is the contracting for machinery and supplies for plants in Great Britain that will manufacture articles on the American plan. This novel step has been taken to compete more keenly with foreign manufacturers in their own territory. The saving in ocean freight rates will assist in lowering the price of the so-called American man-



ufactures. Electric machinery concerns are the leaders in this direction.

Among the more important orders received is one for machinery for the Maizura Arsenal, in Japan. This is understood to be the largest order yet placed by the Mikado's Government for American specialties. Trade in China is improving, but it will be some time before Americans regain what they have lost through the Boxer troubles. The Government has placed substantial orders for equipping its railway, and in other directions contracts have been booked for cast iron and steel pipe, etc.

In South Africa the revival of mining on the Witwatersrand has benefited our machinery manufacturers. Recently one steamer from New York carried \$30,000 worth of mining machinery to South Africa. A large quantity of steel pipe has also been ordered. The De Beers Consolidated Diamond Mines, Limited, at Kimberly, has placed further orders here, among them one for electric machinery. De Beers is an English company, but its management has shown preference for American machinery and supplies, judging from the number of important orders already sent here.

Australia and New Zealand have become active buyers in the American market, especially for electric traction machinery and supplies. We learn that efforts are being made by American manufacturers' agents in New South Wales to extend the use of steel for structural work especially in buildings. Already a contract has been taken for building the new Bank of Australasia in Sidney. In New South Wales there is also a good demand for American machine tools, and several substantial orders have been placed. Labor saving devices are coming more in use there. Recently an electrically operated traveling crane for handling coal at dock has been bought for shipment to Brisbane, Queensland. Machine tool manufacturers are establishing sales offices in the colonies, especially in New South Wales, which would indicate that the field is a promising one for their products.

In the Dutch East Indies more business is doing, a large order for conveying machinery having recently been placed here.

Russia shows a tendency to favor certain American manufactures. The Government, besides ordering armor-plate for its battleships, a quantity of which has been shipped recently, will be supplied with American electric equipment manufactured in Russia by a newly incorporated company.

Italy, which is a good buyer of our bituminous coal, has ordered an automatic railway to be used for handling coal in an electric plant in Milan. A quantity of steel pipe has also been purchased.

Of the other European countries, Holland has ordered a bridge tramway gravity system, while Spain and Germany want steel pipe and other heavy manufactures.

The investment of American capital in the mines and industrial enterprises of South America, the West Indies and Mexico is bringing business to our manufacturers. Heretofore the British and German manufacturers have had this field entirely to themselves. Of the orders recently taken by the Americans may be mentioned one for placer dredges for the gold-fields of Colombia, and one for 5,000,000 pounds copper wire for an electric road in Brazil. Pumping machinery has also been bought for sugar plantations in Porto Rico, in addition to other supplies for other West Indian islands.

The indications are that the foreign orders already placed will make the year 1902 rank with the best of our export years in the lines of manufactured products referred to in this article.

**PETROLEUM IN BURMA.**—*Indian Engineering* says: "The Rangoon Oil Company, which has been working at Yenangyat, Upper Burma, since the past two years, seems to have struck oil at last. In February they came upon a well which yields at present over 500 barrels daily.

### COAL AND COKE SHIPMENTS.

The heavy snowstorms in February have been followed by disastrous floods that demoralized railroad traffic for a time and suspended mining operations at certain anthracite collieries in Pennsylvania. With milder weather, however, the situation has improved, though there is still complaint of a short car supply.

In the first half of March the demand for fuel was so urgent owing to the curtailed shipments by producers, that substantial premiums for prompt deliveries were paid by consumers.

Railroad rates on coal shipped to the Great Lakes during the coming year will be practically the same as last, excepting that 2 cents more or 77 cents per ton will be asked from the Ohio mines.

Lake navigation will probably open much sooner than last season, as the ice at leading ports has been breaking for some time past.

Export trade is quiet, though the low ocean freight rates offering on forward charters favor new business.

**Anthracite.**—Production in February was curtailed by the floods, and shipments have suffered from poor railroad facilities. Consequently during that month the shipments were only 3,741,253 tons, as against 4,098,698 tons in February last year; showing a falling off of 357,445 tons. In the first two months this year the shipments totaled 8,279,391 tons, which is 1,002,969 tons less than the corresponding period in 1901. This decrease, however, will likely be made up with pleasant weather, active work at the collieries, and quicker dispatch on the railroads. The Pennsylvania Railroad Company shipped over its lines East of Pittsburg and Erie, from January 1 to March 22, a total of 948,954 short tons, a decrease of 119,257 tons, or about 11 per cent, as compared with last year.

**Bituminous.**—The main-line roads have suffered from bad washouts, but the damaged bridges and highways are gradually being repaired. Coal shipments are still less than the demand, causing anxiety in manufacturing industries. The Pennsylvania Railroad Company is hurrying shipments East of Pittsburg and Erie, and from January 1 to March 22 reported 5,099,348 short tons, against 4,851,450 tons last year; showing an increase of 247,898 tons. The shipments from the Pocahontas region from January 1 to March 1 aggregated 1,117,887 tons, being an increase of 103,281 tons as compared with the same period in 1901. Cumberland coal shipments over the Huntingdon & Broad Top Railroad are considerably less than last year, but an improvement is noted in Broad Top coal. From January 1 to March 29, the Cumberland shipments were 222,056 tons against 439,035 tons in the same time last year, and those from Broad Top, 227,801 tons, against 165,522 tons. Together the shipments aggregate 449,857 tons, against 604,557 tons last year; a falling off of 154,700 tons, or over 25 per cent in 1902.

The Chesapeake & Ohio Railroad reports an increased coal tonnage, having shipped in January 496,685 short tons, as against 458,732 tons in the same month last year. In the last six months of 1901 this road carried direct 2,047,423 tons New River coal, 671,292 tons Kanawha, and 66,871 tons Kentucky, making a total of 2,785,586 tons. In the same time of 1900, 2,546,133 tons were reported, showing an increase in 1901 of 239,453 tons, or nearly 9 per cent, chiefly in tidewater shipments. There were also received from connecting roads 19,572 tons, as compared with 37,513 tons in the last six months of 1900. It is noticeable that the movement of New River coal West has fallen off somewhat, but the decrease is more than made up by the heavier shipments of Kanawha and Kentucky coal.

In Ohio the movement of coal is increasing, as consumption is active in the West. The 7 roads reporting to the Ohio Coal Traffic Association in January show a total of 1,187,524 net tons, which compares with 1,045,088 tons in December; an increase of 142,436 tons. In the four months ending January 31, 1902, these roads, led by the Hocking

Valley, carried 4,503,358 tons. The Norfolk & Western Railway did a good business last year, shipping 5,905,173 tons, of which 2,509,485 tons, or 42.5 per cent, went to tidewater points. As compared with 1900 when the total shipments were 5,777,187 tons, there is an increase of 127,986 tons. The largest shipments in some time over the Baltimore & Ohio Road were made in January, amounting to 1,603,042 tons. In the 10 months ending January 31, 1902, the road carried 12,710,330 tons, which compares favorably with the same period in 1900. The shipments from the Beech Creek District over the New York Central Railroad in February were considerably less than the previous month, owing to the shortage in car supply. In February the tonnage was 325,717, making 819,766 tons for the first two months of this year.

**Coke.**—The activity in the iron and steel industry continues to make a large demand for furnace coke. Production in the Connellsville Region is over 215,000 tons weekly, but shipments, owing to the limited car supply, are less than 11,000 cars. Consequently prices for prompt shipment show a substantial advance. The Pennsylvania Railroad Company's lines East of Pittsburg and Erie report for the period from January 1 to March 22, a total of 1,976,576 short tons, as against 1,762,100 tons in the corresponding time last year; showing an increase of 214,476 tons or 12.2 per cent. The Beech Creek District sent over the New York Central Road in the two months ending February 28 a total of 27,535 short tons. The shipments originating on the Chesapeake & Ohio Road in the last six months of 1901 showed a marked improvement over 1900. In the last half of 1901 there were carried 185,248 tons New River coke, and 22,249 tons from the Kanawha District; a total of 227,497 net tons, compared with 167,910 tons in the same period of 1900, showing an increase of 59,587 tons, or over 35 per cent. There was also received from connecting roads 3,207 tons, against 5,257 tons in the six months ending December 31, 1900. There has been little change in the Norfolk & Western shipments in 1901, which amounted to 1,464,976 tons, as against 1,463,413 tons in 1900. Tidewater shipments fell off slightly in 1901, while the movement to other directions increased. The January movement over the Baltimore & Ohio road amounted to 332,448 tons, which is larger than December, and makes a total for 10 months of 3,476,254 tons.

### IRON AND STEEL EXPORTS AND IMPORTS.

Exports of iron and steel, including machinery, from the United States for the month of February were valued at \$7,358,296. For the two months ending February 28 the value was \$15,447,254, against \$17,569,770 for the corresponding period in 1901; showing a decrease of \$2,122,516, or 12.1 per cent, this year. The decrease is explained by the great activity of the iron trade here in all branches, and the depression abroad.

The chief items of exports in February were as follows, in long tons:

	1901.	1902.	Changes.
Pig iron .....	9,461	2,463	D. 6,998
Bar iron and steel .....	4,445	1,462	D. 2,983
Rails .....	23,723	6,202	D. 17,521
Sheets .....	3,982	589	D. 3,393
Structural steel .....	4,903	10,681	I. 5,778
Wire .....	5,269	7,417	I. 2,148
Nails .....	1,690	2,175	I. 485

Structural steel, wire and nails showed an increase; all other items considerable decreases.

The exports of iron ore for the two months were 316 tons only, against 842 tons last year.

Imports of iron and steel—including machinery—into the United States in the two months were valued at \$3,718,948, against \$2,790,916 for the corresponding period in 1901; an increase of \$928,032, or 33.2 per cent, this year. Among the items were 16,190 tons of pig iron, against 3,164 tons last year; and 7,549 tons of steel billets and ingots, against 1,145 tons last year.

Imports of iron ore into the United States for the two months were 137,027 tons, against 72,728 tons last year; showing an increase of 64,299 tons. These imports were chiefly from Cuba.

**THE NICKEL COMBINATION.**

The International Nickel Company, which was organized this week in New Jersey, is the result of the plans to consolidate and control the nickel production of the world, to which reference has been made in our columns heretofore. The plan was originated by Col. R. M. Thompson, president of the Orford Copper Company, and has been carried through chiefly by his efforts, though he has had recently the aid of Mr. Schwab, of the United States Steel Corporation, and Col. J. R. De La Mar.

The purchase of the stock of the Nickel Corporation, Limited, from its London owners was one of the steps toward the present consolidation. The case of that company, which owns valuable concessions in New Caledonia, has already been discussed in the JOURNAL.

The International Nickel Company will issue \$12,000,000 in common stock; \$12,000,000 in preferred stock carrying 6 per cent dividends, non-cumulative, and \$10,000,000 in 5 per cent bonds having 30 years to run. Of the authorized capital stock \$9,000,000 common and \$9,000,000 preferred will be issued at once to acquire the properties named below. The remaining stock will be reserved for future use.

The officers of the company are announced as follows: President, Ambrose Monnell, formerly assistant to the president of the Carnegie Steel Company; chairman of the board, Col. R. M. Thompson, of the Orford Copper Company; general counsel, Max Pam, of the United States Steel Corporation; treasurer, Stephen H. P. Bell; secretary, Joseph Claudet. The list of directors includes, besides those named above, E. C. Converse, of the United States Steel Corporation; Joseph Wharton, of Philadelphia; Dr. Leslie D. Ward, Archibald W. Maconochie, Col. J. R. De La Mar; Millard Hunsiker, of London.

The properties in which the new company will own a controlling interest—if not the whole—are those of the Canadian Copper Company in Canada and the United States; the Orford Copper Company, with extensive reduction works at Bayonne, N. J.; the Anglo-American Iron Company and the Vermillion Manufacturing Company in Canada; the American Nickel Works of Joseph Wharton in Camden, N. J.; the Nickel Corporation, Limited, and the Société Minière Caledonienne in New Caledonia.

The Société Le Nickel, with its extensive properties in New Caledonia and its reduction works in France, is not included in the combination. It is intimated, however, that the International Nickel Company has already a full understanding with the French company. It is believed that a community-of-interest plan has been arranged which will regulate production, prices and a division of the markets.

The nickel companies not in the combine include the Mond Nickel Company, which has good properties in the Sudbury District in Canada, and refining works in England; the Mond process, however, has not yet proved itself to be as great a success as its projectors expected, and its actual output has not been large. The same may be said of the Lake Superior Power Company, under the direction of Mr. F. H. Clergue, which has properties in the Sudbury District and proposes to refine nickel at the Sault Ste. Marie works. The Nickel-Copper Company of Ontario, which was organized to work mines at Sudbury and to refine the metal by the Frasch process, is doing nothing at present. In Germany the firm of Basse & Selve produces some nickel from Norway and New Caledonia ores and occasionally from Canadian matte, and there are one or two other refineries in Germany. The new International Company and the Société Le Nickel, however, will control by far the greater part of the world's production of nickel. The International Company will also have a considerable output of copper from its Canadian ores. We may add that there are believed to be some valuable nickel areas in the Sudbury District in Ontario which have not yet been taken up and are open to lease or location.

The extended use of nickel in steel making explains the interest in the new company which is evi-

dently taken by the United States Steel Corporation; though there is no official connection between the two companies.

**HOW TO INCREASE COAL SALES IN AUSTRIA.**

CONSULAR REPORT.

During the year 1901, there were imported at Trieste about 300,000 tons of coal, 20 per cent of which came from the United States. With the exception of one shipload, all the United States coal was imported by the Austrian Lloyd Steamship Company for its own use. This company is said to be so well pleased with the result of its experiment of substituting American for British coal that it has contracted for 100,000 tons of American coal, to be delivered during 1902.

The praises of American coal sounded by the Lloyd's engineers induced a Trieste coal dealer to place with a New York firm an order for 3,000 tons of prime steam coal. When the coal arrived it was found to contain so large a percentage of screenings as to render it unsalable as standard steam coal, and the purchaser refused to accept it. The coal was finally disposed of at a considerable discount, but not until it had been offered to, and inspected by, nearly every other dealer in the city. The local representatives of the British coal interests unduly descanted on this incident, and it can not be denied that the reputation of American coal suffered a serious setback.

That we have coal equal to the best British grades few dealers doubt; but many Austrians would regard it as a very risky experiment to buy in the United States "sight unseen" a shipload of coal and pay cash for it. In fact, the large majority of our exporters of coal are not yet well enough known abroad to demand from foreign buyers more confidence than they are willing to extend to them. British coal is sent on consignment. Nearly every British exporter doing business in Austria has a large depot at Trieste in charge of a native agent, and it is probably safe to say that the most experienced coal men of that city are thus linked to British interests.

A standard grade of American steam coal was recently offered in Trieste for February or March delivery at a price 3s. (73 cents) below the quotations of Welsh coal and found no taker; while in Italy and France the same coals have for the past year been sold side by side at practically equal prices. Were an American coal depot established in Trieste, from 200,000 to 300,000 tons of first-class American steam coal could annually be sold in southern Austria.

There is also a demand for good gas coal; and with wood selling at from \$6 to \$10 a ton and an inferior grade of gas coke at \$11 a ton, it ought not to be difficult to create a demand for anthracite coal. But such is the conservatism of the Austrian dealer that he will not buy abroad a commodity which, for more than half a century, has been brought to his very door, even if he can effect a large saving by doing so. He does not like to reckon with unknown quantities in his business transactions, and he seems willing to pay whatever it may cost to have business made easy or safe for him.

**THE UNITED STATES STEEL CORPORATION'S FIRST YEAR.**

The directors of the United States Steel Corporation, at a meeting held April 1, ratified the plan of the Finance Committee for a new issue of bonds, to retire part of the preferred stock and to provide additional capital. Details of the bond issue were withheld, but a special meeting of the stockholders was called for May 19 to act on the proposition.

Under the conversion plan it is proposed to retire preferred stock to the amount of \$200,000,000 upon which dividends are paid at the rate of 7 per cent per annum and issue bonds to a total of \$250,000,000, with interest fixed at 5 per cent.

The company's first fiscal year ended March 31, and at the meeting a statement for the year was

given out, the earnings for March being estimated. The net earnings by months were as follows:

April, 1901	\$7,356,744
May, 1901	9,612,349
June, 1901	9,394,747
July, 1901	9,580,151
August, 1901	9,810,880
September, 1901	9,272,812
October, 1901	12,205,774
November, 1901	9,795,841
December, 1901	7,758,298
January, 1902	8,901,016
February, 1902	7,678,583
March, 1902, (estimated)	9,700,000

Total net earnings.....\$111,067,195

The above net earnings were arrived at after deducting, each month, the cost of ordinary repairs, renewals and maintenance of plants, and interest on bonds and fixed charges of the subsidiary companies. The disposition made of the earnings was as follows:

Net earnings, as above	\$111,067,195
Sinking funds	\$3,059,913
Depreciation and reserve funds	12,339,782
Interest on bonds	15,200,000
Total charges	\$30,599,695
Balance, surplus	\$80,467,500
Dividends paid	56,017,783
Undivided earnings	\$24,449,717

The dividends paid included \$35,682,832, or 7 per cent, on preferred stock; \$20,309,601, or 4 per cent, on common stock; and \$25,350 on outstanding stocks of subsidiary companies. The balance is applicable to reserve fund, improvements or working capital.

It is stated by the chairman of the board that the extra \$50,000,000 of bonds above the \$200,000,000 to be used for retirement of preferred stock will give the corporation a working capital of about \$106,000,000 to be used in any way that the directors might deem best. The legal advisers of the corporation laid special stress on the point that no preferred stock would be retired without the consent of the holder. This, they said, would remove any impression that the retirement of the preferred stock for new bonds would be compulsory.

It is further stated that many of the plants in the steel corporation were built with the view of competing with others now embraced in the same group. It has developed at the meetings which are held from time to time by the presidents of the various subsidiary companies that changes could be made in the various plants which would result in harmonizing the whole in such a way as to effect economies estimated to result in a saving under normal conditions of \$15,000,000 a year. In order to effect these changes it is said that it is necessary to expend between \$25,000,000 and \$30,000,000. As it was considered unwise to impair the present working capital of \$15,000,000 by such expenditure the present plan was proposed. It is proposed to take \$1,000,000 of the yearly saving in interest charges and create a sinking fund for the retirement of this second mortgage.

**AN INDIAN MINING SCHOOL.**—The Indian Government is considering the question of the establishment of a school of mines in India. The reason of this action is the difficulty of securing competent mining engineers for that country.

**GERMAN IRON PRODUCTION.**—The pig iron output of the German furnaces in February is reported by the Association of German Iron and Steel Makers at 597,334 metric tons, or 59,354 tons less than in January. The production for the two months ending February 28 was as follows, in metric tons:

	1901.	1902.	Changes.
Foundry iron	254,895	267,887	I. 12,992
Forge iron	258,323	204,053	D. 54,270
Bessemer pig	76,463	65,271	D. 11,191
Thomas (basic) pig	729,739	716,811	D. 12,928
Totals	1,319,420	1,254,022	D. 65,398

The total decrease was 5 per cent. The increase in foundry iron was probably more apparent than real, as the grading of that class of pig seems to be rather wide, and some foundry iron is used in steel making.



**LEAD AND ZINC DEPOSITS OF THE OZARK REGION.**

In response to a demand for information concerning the lead and zinc ores of the Ozark Region the United States Geological Survey has issued a preliminary report, which is a part of the *Twenty-second Annual Report*. The economic work for the report was done by H. F. Bain, under the supervision of C. R. Van Hise. The areal geology is by George I. Adams, under the direction of Bailey Willis. The report is now ready for distribution, and may be obtained by operators in the field by applying to representatives and senators or to the United States Geological Survey.

While the report nominally considers the whole region, and the deductions which it contains are applicable to the various districts, it was found impracticable to study them all in a satisfactory manner in the limited time available for field work. Ac-

Missouri. In a general way the Mississippi and Missouri rivers bound it on the north and east, and Spring, the Grand and the Arkansas rivers approximately limit it on the west and south. The southern part of the Ozark Region is occupied by the Boston Mountains, which are a dissected highland in which the rocks are carboniferous sandstones and shales. The northern part of the region is the Ozark Plateau. This is the portion in which the lead and zinc deposits are situated. Throughout most of its extent it is a simple, rolling plain, and in the more rugged parts the broken character is evidently the result of erosion by streams which have dissected a generally even surface. The simple structure; the prevalence of unaltered sedimentary rocks; the entire absence of volcanic agencies, and the limited occurrence of crystalline rocks place the country in contrast with mining regions in general.

The eastern division of the Ozark Plateau is the

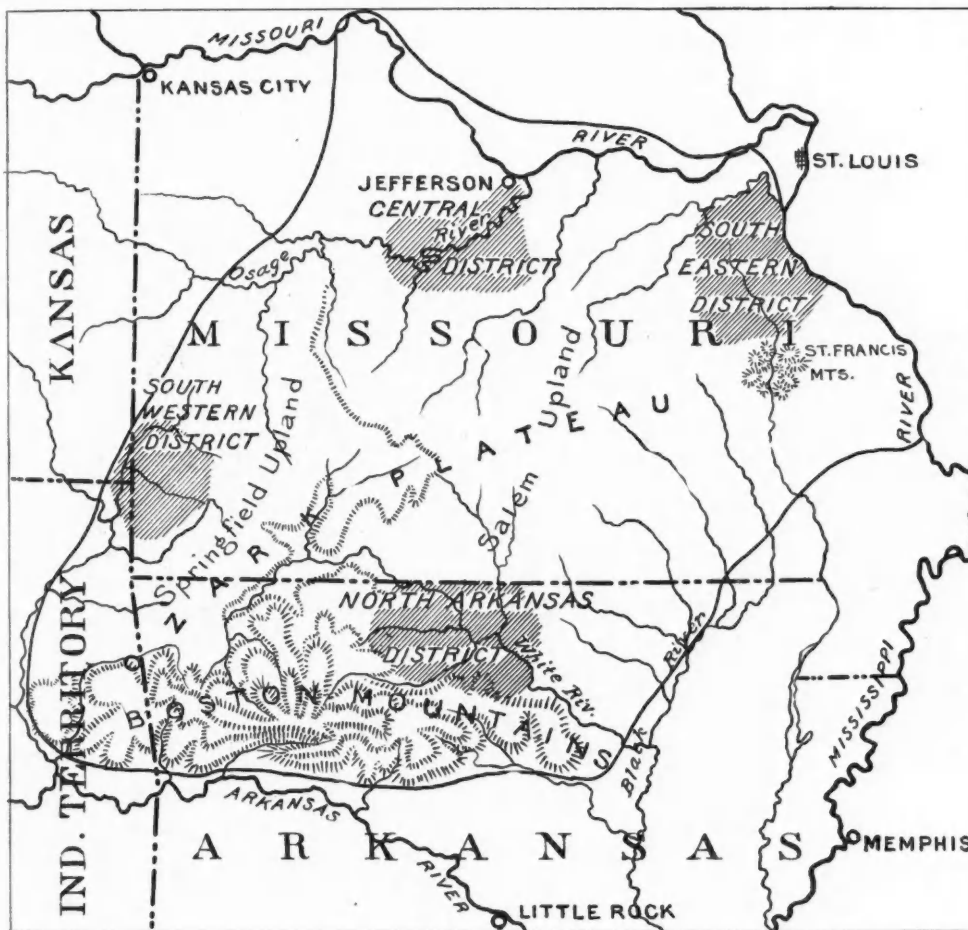
great irregular runs of rich ores. This district is situated within the area of the Mississippian limestones. In the other three districts the ores occur in the Cambro-Silurian series. The Southeastern Missouri District produces essentially lead, and is best known through its disseminated ores. The Central Missouri District, which is not fully prospected, is characterized thus far by small ore bodies of both lead and zinc. The northern Arkansas District, which is now being developed, shows a variety of rich ores.

*Theories of Ore Deposition.*—Previous to this report many geologists and engineers have studied the region, or certain of its districts. The most important contributions were made by Arthur Winslow in reports of the Missouri Geological Survey, Volumes VI. and VII., published in 1894, and the *Report of the Arkansas State Survey for 1892*, by J. C. Branner, published in 1900. This later report appeared during the progress of the investigation by the United States Survey. Aside from the State reports, the most significant publication is an article by W. P. Jenney in *Transactions of American Institute of Mining Engineers*, Volume XXII., 1894. The papers by Winslow and Jenney, which have been published for some time, have provoked discussion and helped greatly to a right understanding of the genesis of the ores. The interpretations given by them are sharply antagonistic. Jenney emphasizes the importance of ascending waters, while Winslow insists on the great importance of descending waters. The present report takes the ground that both were to a considerable degree correct, but that each over-emphasizes certain phases of the processes of ore deposition.

*Genesis of the Ores.*—The following is a brief account of the origin of ore-bodies as explained in the report. The close association of the ores with underground circulation indicates that the metals have been derived from the rocks which the waters have traversed. The chemical reactions which have taken place in the course of the segregation of the ores are those which specially characterize dilute solution. The richer ore bodies accordingly indicate the activity of a greater amount of water. The important circulation of the region is through the limestones of the Cambro-Silurian and Mississippian series. Large quantity analyses of these rocks and of others of the region show the presence of minute but important amounts of lead and zinc. There is reason to believe that the water might have taken the metals from them. As originally precipitated the metals were thoroughly disseminated. It has been the work of the underground waters to gather and concentrate them. This process has probably been repeated many times in many horizons, and at different depths. The ore bodies are the net result of a long series of concentrations.

The general chemical processes which have taken place may be outlined as the oxidation of the sulphides to sulphates; the transportation of the sulphates in solution, and the precipitation of the sulphides at favorable localities. The localization of the ore bodies was dependent upon the presence of suitable conditions for deposition, such as the presence of fissures which would allow a mingling of solutions; the presence of impervious shales, which would limit the circulation of solutions, and the occurrence of organic matter which would serve as a reducing agent. Since the formation of the ore bodies by what may be called first concentration, they have been extensively altered and repeatedly reconcentrated. This secondary enrichment has been an important factor in producing the richer deposits.

The region shows a close association of the ores with courses followed by the underground circulation, there being an increase in quantity of the ore with proximity to trunk channels. The occurrence of the ores along zones of brecciation is explainable on the ground that the water there moved with greater facility. The largest ore-bodies are found either in open ground or in re-cemented ground where breccias and other phenomena occur, showing clearly that circulation at some time has been free.



SKETCH MAP OF THE OZARK REGION.  
(Adapted from United States Geological Survey Report.)

cordingly investigations were directed more particularly to the southwestern or Missouri-Kansas district, because it is the one of greatest economic importance. The other districts, however, were visited and studied in a general way.

The ores of the Ozark Region are of great commercial importance, and well worthy of attention. The output of zinc from the southwestern district alone is approximately 90 per cent of that mined in the United States, or 20 per cent of the production of the world, and the lead from it constitutes 22 per cent of the output of this country, or 7 per cent of the world's production. While the other districts do not foot up such grand totals they are rich, and constitute important factors in the mineral wealth of the region.

*Definition of the Ozark Region.*—Broadly defined, the Ozark Region embraces the southern half of the State of Missouri, a very small corner of southeastern Kansas, the northeastern corner of Indian Territory, and the northern part of Arkansas. On its borders are the cities of St. Louis, Jefferson, Marshall, Sedalia and Joplin in Missouri; Galena in Kansas; Wagoner in Indian Territory; Fort Smith and Bartlesville in Arkansas, and Poplar Bluff in

Salem Upland. The rocks of this division are the Cambro-Silurian series, with the exception of the St. Francis Mountains, which are a group of granitic peaks, and which are not of importance with respect to the lead and zinc. The western part of the Ozark Plateau is the Springfield Upland, in which the country rock is the Mississippian or Lower Carboniferous limestone.

*Ore-bearing Formations and Mining Districts of the Region.*—Geologically considered, the deposits of the region fall in two classes, which correspond to the eastern and western divisions of the Plateau. They are those of the Cambro-Silurian dolomites and magnesian limestones, and those of the carboniferous limestones and cherts. Such a classification takes into account the association, genesis and form of the ore bodies. It also has an economic importance in its bearing on the extent and probable duration and depth of the deposits. Four mining districts are generally recognized in the region. The most important commercially is the Southwestern Missouriian, or Missouri-Kansas, District, of which Joplin is the best known city. It is essentially a zinc producing district, although an important amount of lead is also mined. It is characterized by

*Conditions of Circulation which Produced the First and Second Concentrations.*—For the discussion of the ore deposits of the region as a whole, the geological section has been generalized so as to emphasize the nature of the formations with respect to their relation to circulating waters. The series of rocks as discussed, are Cambro-Silurian limestones and sandstones, Devono-Carboniferous shales, Lower Carboniferous or Mississippian limestones, and undifferentiated Carboniferous shales and sandstones. The Devono-Carboniferous shales and the undifferentiated Carboniferous shales are regarded as impervious or limiting members. Of these two the Devono-Carboniferous, occupying an intermediate position between the Cambro-Silurian and the Mississippian series, was of particular importance in relation to the deeper circulation, since, where it was present and not displaced by faulting, it was an effective barrier to the ascending solutions. In the absence of this shale or where considerable displacements occur, it is probable that the Mississippian limestones received ore-bearing solutions from the underlying Cambro-Silurian formations.

For the ores in the Cambro-Silurian it is held that the first concentration was effected by the deep circulation which took place below the Devono-Car-

duced by mechanical and chemical segregation in connection with denudation.

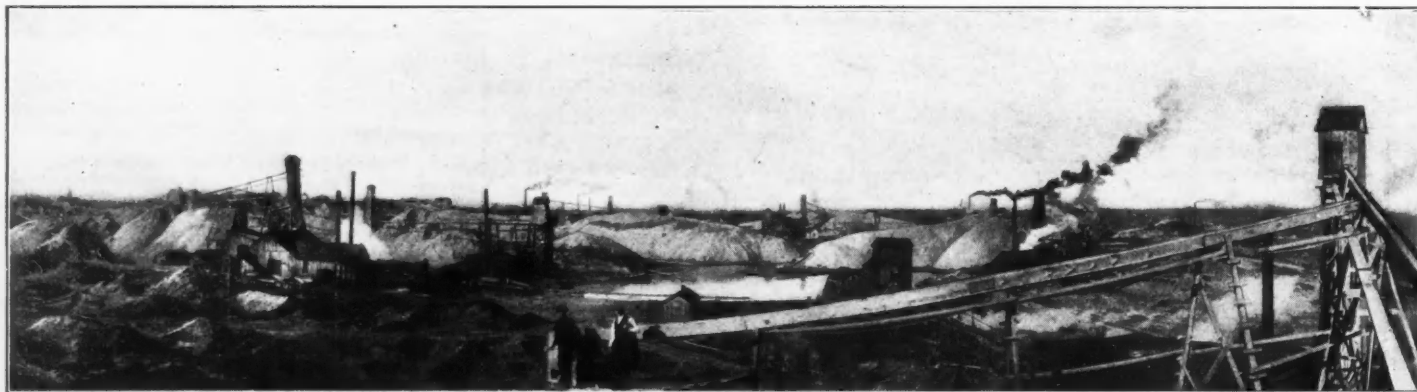
*Classes of Mines and Depth of Ore Bodies.*—At the close of the report some statements are made which may prove of value in prospecting and following out the ore bodies. It is recognized that no improvement can be made on the ancient rule of following the ore-body, but when this is not possible or easy, certain phenomena associated with the ore are significant in determining the proper line of prospecting. In the Southwestern District the ore-bodies belong to the class of ores which have been concentrated first by ascending waters, and secondly, have been modified and re-concentrated by descending waters. So far as the concentration is a result of downward moving waters it is unfavorable to permanent enrichment and extent with depth. Descending waters are normally oxidizing waters, but in the Joplin Region the constant pressure from below limits their penetration, and the wide presence of reducing agents obscures their action. In the typical instances of the action of descending waters the ground is soft and open from the surface down. Galena is, in such mines, the first ore encountered. Normally it is in rich pockets associated perhaps with zinc silicate or carbonate, and with red clay. Below

## THE PRODUCTION OF ZINC ORE IN THE UNITED STATES.

BY WALTER RENTON INGALLS.

Zinc ore, like lead ore, is frequently carried for reduction to metal a long distance from the mines which produce it and the statistics of spelter output do not, therefore, indicate where the ore originated. Most of the European countries publish statistics of the production of zinc ore within their limits, which, although leaving us without data as to the metallic contents of the ore, afford valuable information as to the condition of the zinc industry at its bases. In the United States, on the other hand, statisticians have made no general attempt to study the question of zinc ore production except in census years and by occasional spasmodic investigations. However, there are fortunately the publications of various State geological surveys and some reliable non-official compilations which enable nearly all of the domestic production of zinc to be traced to its original sources.

In 1900 the Joplin District of Missouri and Kansas produced 242,330 tons of ore; New Jersey, 221,053; Colorado, 77,984; Wisconsin, about 15,000; Iowa, 2,000; and Tennessee, 3,968. In addition to these supplies there were small quantities from Arkansas,



VIEW OF MINES AT ORONOGO IN THE SOUTHWEST MISSOURI DISTRICT.

boniferous shales. At this time the disseminated ores were deposited. The reducing and precipitating agents were in this case the organic matter of the limestone and especially the shales. When erosion removed the Devono-Carboniferous shales a secondary concentration by descending waters began. At this time disseminated ores were taken into solution and concentrated. The resultant ore bodies occur in crevices and breccias. It is in this concentration that the synclines through their influence upon the circulation became the seats of rich deposits as has been pointed out by Branner.

In the area of the Mississippian limestones there have likewise been two concentrations. The upper limiting member was there the Coal-Measure shales; the lower limiting member was the Devono-Carboniferous shale when it was present and not displaced. It has been shown that in some portions of the region the circulation from the Cambro-Silurian might have passed upward into the Mississippian limestones. Accordingly Bain has considered this series as having been the source of the ores found in the Mississippian limestones. The secondary concentration of these deposits has occurred since the removal of the overlying Coal-Measure shales. In the district there are two classes of mines corresponding to these two concentrations. In the mines in which the first concentration was the important factor the sulphides are found and the water channels are clean and the minerals lining them untarnished. Where the secondary concentration has occurred the mines are muddy, clayey and sticky. The evidence of the action of descending waters is very plain in certain mines which start in places that are practically sink holes. It was phenomena of this kind which led Winslow to believe that all the ore bodies were pro-

duced by mechanical and chemical segregation in connection with denudation. the galena, and usually where the red clay gives way to drab or black selvage, zinc carbonates or silicates are replaced by blende, and usually at the same place the underground water level is encountered. The blende then becomes dominant and the galena subordinate. Such an ore-body usually is a product of sulphide enrichment. It may be expected to persist in depth to the limit of the action of the surface waters only.

Wherever, because of a protecting cover or from other cause, the ore-bodies have not suffered the action of descending waters the ores of the first concentration occur, and they may be expected to retain their character and richness to their final limit in depth. They yield more steadily but rarely as well as do the ores of the upper ground. This fact has been recognized by the miners and generalized in the statement that hard-ground mines are normally less rich, but more productive than soft-ground mines.

It is only in instances where the two circulations have operated that the full vertical sequence is found, namely, surface ore resulting from oxidized enrichment, enriched sulphides, and ores of first concentration.

Concerning the report it may be said that it is based upon the fundamental conception that the ore deposits are the result of the circulation of underground waters. In this respect Mr. Bain accords with the ideas of Van Hise in his method of presentation. The report is largely theoretical, yet it contains descriptions of many important mines and the characteristic ores and their mode of occurrence. The illustrations and maps are valuable and interesting, particularly the folding map on the scale of 10 miles to 1 inch, which shows the geology and mining localities of the entire region.

New Mexico and Virginia. Virginia produces normally about 15,000 tons of ore per annum, but recently the principal mines of that State have been producing but little, pending the introduction of an improved method of mining. The zinc ore product of the several States varies greatly in richness and in character.

Of the production of the Joplin District a small part is zinc silicate, which is mined at Granby and Aurora, chiefly at the latter place; the remainder is concentrated blende, which is mined at Joplin, Webb, Carterville, Oronogo, and adjacent towns in Missouri, and in the vicinity of Galena, Kan., the district having its commercial, if not its geographical, center at Joplin. Approximately 75 per cent of the total output is mined in Missouri. The silicate is shipped just as it is dug, save for the sorting out of worthless rock by hand, and assays 40 to 45 per cent zinc, fetching usually about \$10 to \$15 per ton f. o. b. cars. The blende of the district is entirely a concentrated product and represents the output of a vastly greater quantity of crude ore. No one knows just how much crude ore is mined and milled in the district, nor what is its average grade and average yield of mineral. The average yield is probably in the neighborhood of 5 per cent of mineral, and on that assumption the crude ore product of the district during the last three years must have averaged about 5,000,000 tons per annum; the average tenor of mineral in the crude ore was probably about 6.4 per cent blende, equivalent to 4.3 per cent metallic zinc, since it is unlikely that the general milling practice of the district recovers more than 70 per cent of the mineral contained in the crude ore. The concentrated product is made to contain about 60 per cent zinc, which is considered the standard of



the district; the average of the entire output is probably a little below that figure, although a good deal of ore containing from 62 to 63 per cent zinc is turned out and occasionally some as high as 64.5 per cent zinc, which of course is almost pure blende. Even in the case of 60 per cent ore, of which the best is likely to contain 1 per cent iron and 0.5 per cent lead, there is only about 8 per cent of quartzose or earthy gangue in its composition.

The high tenor in zinc of the Joplin ore and its comparative freedom from iron and lead render it an unusually docile material for smelting. Its value varies according to the price of spelter and the temporary requirements of the smelters. When spelter is quoted at 4 cents per pound at St. Louis, standard ore generally commands about \$25 per ton at Joplin. On that basis, an ore yielding 5 per cent mineral would be worth only \$1.25 per ton in its crude state. However, there is obtained besides the zinc a certain quantity of galena concentrate, which helps out materially. During the three years 1898, 1899 and 1900, the galena product of the district averaged a little more than 10 per cent of the

large scale to obtain as good results as the smaller miners. Nearly all of them have therefore reverted to the old policy of the fee owners of leasing the land at a royalty upon its product. Under that system the expenses of the eastern companies appear to be about 20 per cent of their income and the profit to them depends of course upon what the land cost them. He would be a venturesome engineer who would now attempt to introduce any fancied improvement in the Joplin District, not because the practice there is by any means perfect, but because it is the concrete result of the experience of many men extending over many years, which has evolved a system peculiarly suited to the local conditions. For the same reason further improvements, of which no doubt there will be many, will be likely to originate in the Joplin District rather than outside of it.

Heretofore most of the western spelter has been derived from the Joplin District; in fact, practically all of it, save a comparatively small quantity from Wisconsin and Colorado ore, but now the new mines of northern Arkansas are expected shortly

a few years ago, when the introduction of improved methods of milling enabled a closer separation of the minerals to be made. Since then a large quantity of this class of ore has been treated at Leadville, yielding a galena-pyrite concentrate, which finds a more or less ready market with the silver-lead smelters, and a ferruginous blende which has been sold largely to European zinc smelters and to a less extent to Kansas smelters. The export trade has been made possible by favorable freight rates, ore being carried from Leadville, by way of Galveston, to Swansea or Antwerp for about \$9.50 per short ton. The miners receive comparatively little for the material, \$5 to \$7 per ton being the usual price, but as it is purely a by-product and the value of the remainder of the ore is increased by its clean removal, the miners can well afford to sell it even at so low a price.

According to Hon. H. A. Lee, Commissioner of Mines for Colorado, the production of zinc ore in that State in 1900 was 77,984 tons, averaging 42 per cent zinc, of which about 30,000 tons were exported. The remainder includes doubtless the ore which was used for the manufacture of zinc-lead pigment at Cañon City, Colo., and some that may have gone to Mineral Point, Wis., for the manufacture of zinc white, because the spelter producers of the United States did not use so much as that. In 1901 the production of the Leadville mills was 23,261 tons. The Leadville product averages approximately 45 per cent zinc, 6 per cent lead and 10 per cent iron. Besides the Leadville product there are also shipments of zinc ore from Silver Plume, Montezuma, Creede, and elsewhere in Colorado. Kansas smelters have received ore from Creede which has assayed as high as 59 per cent zinc, containing 3.75 to 5 per cent lead and only about 2 per cent iron. However, as a general thing the Colorado blende is high in iron, not merely because of pyrites mechanically intermixed with it, but especially because the blende itself contains chemically combined iron, which of course cannot be removed by any method of mechanical concentration. It is nevertheless a material which the zinc smelters can afford to buy at a suitable price and mix with pure ore in such proportion as to make a charge which can be distilled advantageously.

The fact that the Colorado blende contains combined iron makes it susceptible to the intense magnetic influence of the Wetherill machines and enables it to be separated from the intermixed galena and pyrite, which are both absolutely non-magnetic. Experiments have demonstrated that this is a process which will be commercially successful, and the Colorado Zinc Ore Company and the New Jersey Zinc Company are now erecting magnetic-separating plants at Denver and Cañon City, respectively. The indications point toward the production of ore with about the same percentage of iron as that which the present concentrating mills are furnishing, but several units higher in zinc and lower in lead. In connection with the treatment of these Colorado ores it is interesting to note that the Midland Smelting Company is taking them to Bruce, Kan., smelting them there without admixture of other ores in Sadtler retorts, and selling the silver and lead-bearing residuum to lead smelters with successful results, it is reliably stated. All of this is a vast improvement from only 15 years ago, when the concentration of the Leadville sulphides was first undertaken at the Colonel Sellers mill, and the Denver Zinc Company attempted direct distillation of the roasted tailings with disastrous results.

Both the Joplin and the Wisconsin districts have problems of their own in connection with ferruginous ores, but in each case it is due to intermixed pyrite and marcasite rather than to iron chemically combined with the blende, although in that respect the Wisconsin blende is less pure than the Joplin mineral. When the blende is non-ferruginous, magnetic separation of the raw minerals is impossible, but after a preliminary roasting the ferric oxide can be removed, a process which has already been applied on a working scale by the Empire Zinc Com-



CAVE IN AT AURORA PLANT, ORONOGO, MO.

total zinc ore; of course the proportion varies in different mines. The galena concentrate is sometimes as rich as 80 per cent lead, but the standard of the district is considered to be 77 per cent lead. Out of the price received for his ore, the miner has to pay a royalty to the land owner of 10 to 20 per cent on the zinc ore; on the lead ore the royalty is higher, ranging up to 33 1-3 per cent. After deducting the cost of mining and milling there is not left much of a margin to pay the cost of dead work, reimburse the original investment for opening and equipping the mine, which may amount to \$10,000 or \$15,000, and yield a profit. That there is any profit at all in the business is due of course to the low costs at which mining and milling are performed; the former is favored by the nature of the ore deposits and the latter by the free-separating character of the ore, but the success in concentrating is due in no small degree to the ingenuity of the Joplin millmen in developing a simple, yet comparatively efficient, method of treatment. It would be hazardous to venture any figures for the average cost of mining and milling, but large quantities of ore have been mined for 60 cents a ton and milled for 30 cents, the milling cost for certain months falling as low as 20 cents. Run-of-mine coal costs \$1.40 to \$1.60 per ton, and labor \$2.00 to \$2.25 per day. Ore yielding 4 per cent of mineral can be worked profitably under favorable circumstances, and of course the higher the yield the greater the profit. An interesting feature of recent experience has been the failure of companies undertaking operations on a

to come into the market. The Arkansas mines are not really new, but their exploitation has not yet been undertaken except in a desultory manner because of their remoteness from railway communication. That drawback will soon be removed, inasmuch as railways are now building into the district, although they are understood not to be going there specially for its development, which, if they were, would indicate that its mineral resources were known to be very important. On the contrary, reports are still conflicting as to the value of the Arkansas zinc mines. In a paper presented at the Mexican meeting of the American Institute of Mining Engineers, however, Dr. John C. Branner, now of Stanford University and formerly State Geologist of Arkansas, stated that "there is no longer any doubt about the existence in that region of large bodies of zinc ore," and moreover, that the ore is remarkably pure.

Another competition threatening to the Joplin District is the zinc ore of Colorado, which State has very large zinc resources in the great deposits of mixed sulphides at Leadville and Kokomo. Those deposits are of phenomenal magnitude and are capable of cheap extraction, notwithstanding the relatively high cost of labor and mining supplies in Colorado. The ore is a silver-bearing mixture of galena, pyrite and blende, with very little gangue. As early as 1886 it was milled for recovery of its lead content and such silver as was carried by the galena, the blende being accumulated in the tailings heaps. The process was only indifferently successful until

pany at Joplin. Heretofore the Wetherill machine has been the only one on the market designed for the separation of feebly magnetic minerals, but now two new types, the Cleveland-Knowles and the Waring, both Joplin inventions, are being exploited, and it is hoped with their aid to improve the inferior ore produced in Joplin which does not now find a ready market at remunerative prices. Wisconsin also offers a good field for the application of such systems, since there is found in that State a good deal of blende intermixed with marcasite, which has not yet been treated with much success, although several elaborate attempts have been made. The Wisconsin mines are still worked on the whole in a crude and unenterprising manner. The district is rather extensive in area, and is considered by many to possess greater possibilities than it has ever been made to show.

In the eastern part of the United States the most important source of zinc ore is the mines of Stirling Hill and Franklin Furnace, in the northern part of New Jersey. The mines near Friedensville, Pa., were once famous producers, but have been idle since 1882; there has been talk recently of reopening them. All of these are owned by the New Jersey Zinc Company. The New Jersey mines are unique as to the character of their ore, and in point of magnitude rank among the great ore deposits of the world. The ore as mined assays about 25 per cent zinc, and as the production in 1900 was 221,053 tons, practically all of which was obtained from only one of the two great mines, its zinc tenor was more than one-third as much as that of the entire Joplin output, to obtain which approximately 5,000,000 tons of crude ore had to be mined and milled. Moreover, the iron and manganese contents of the New Jersey ore are valuable for the manufacture of spiegeleisen after the zinc has been extracted. The New Jersey ore as raised from the mines is already rich mineral; before submitting it to reduction, however, it is separated into its component parts, namely, franklinite, willemite and worthless gangue, the last being comparatively small in quantity. This separation used to be effected by ordinary mechanical dressing, but the Wetherill magnetic process was found to be a great improvement and is now employed for the treatment of all the ore, leaving little to be desired as to technical and commercial results. There is produced a willemite product, assaying about 50 per cent zinc, 2.5 per cent iron and 4 per cent manganese, which is partly exported to German smelters and partly reduced at the South Bethlehem and Palmerton works of the New Jersey Zinc Company, and a franklinite product, which is employed for the direct manufacture of zinc white, the manganiferous residuum of the ore being subsequently smelted to spiegeleisen. Under the enterprising management of the New Jersey Zinc Company the production and sale of its zinc white has been largely increased during the last two or three years, and an important export trade in that product established. The willemite concentrate is highly prized because of the purity of the spelter which can be made from it.

The production of high grade spelter is also a specialty of the Bertha Zinc and Mineral Company, which operates the most important zinc mines of Virginia. Those mines are situated in the southwestern portion of the State, not far from Pulaski, at which point the company's smelting works are located. The ore is calamine, which is concentrated to a tenor of about 40 per cent zinc before smelting. The metal that is produced from it is famous for its purity, and sells at an important premium for purposes for which ordinary spelter is unsuitable. The Bertha mines are extensive and are unique, as the zinc ore is overlaid by a thick deposit of ferruginous clay from which a large quantity of iron ore is recoverable by washing. The proximity of the mines to good coal supplies enables both zinc and iron smelting to be easily conducted.

The zinc-bearing belt, which begins in Virginia, appears to extend into northeastern Tennessee, but with respect to the mining possibilities of the latter State there is still much uncertainty. There used to be zinc smelting works at Clinton, near Knox-

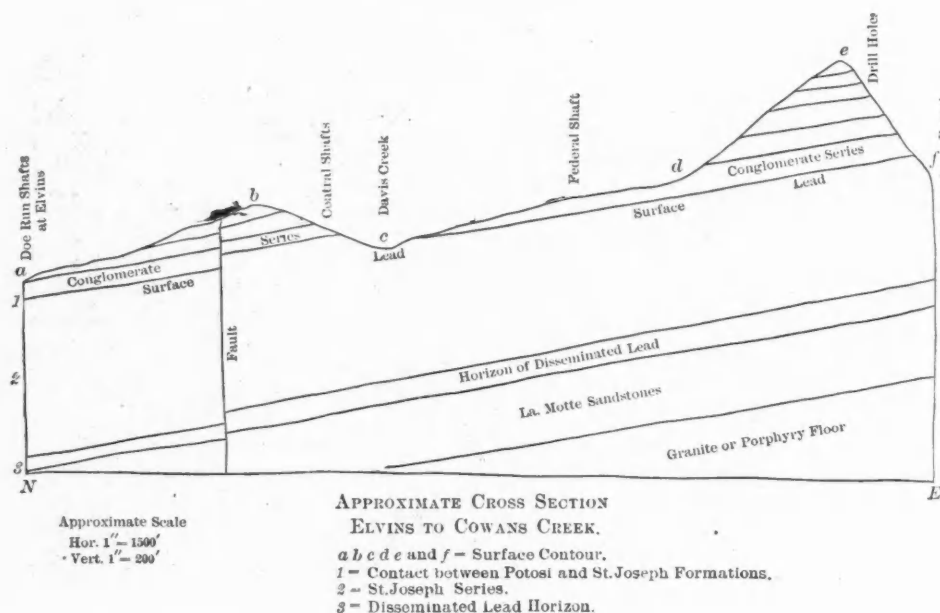
ville, but the mines which supplied it were abandoned as unprofitable nearly 10 years ago, and the plant is now a wreck. Some of the most promising mines of Tennessee are so remote from railway connection that their exploitation under present conditions would hardly be profitable; as to others, which lie along the line of the Southern Railway for a considerable distance east of Knoxville, there is doubt as to the yield of mineral that can be obtained. The latter zone contains numerous surface deposits of calamine beneath which the country rock (dolomite) is mineralized with intersecting veinlets of blende. At Mossy Creek, at least, the mineralization is extensive, but the percentage of blende obtainable per cubic yard of rock that would have to be broken would be very small. Barytes is associated with the blende, and because of the difficulty of effecting a separation of that mineral by jigging, a concentrate assaying more than 50 per cent zinc can hardly be made. The blende is, however, exceptionally free from metallic impurities and yields a remarkably high grade of spelter. The present small production of zinc ore in Tennessee is chiefly blende, which probably averages between 40 and 50 per cent zinc.

## THE DISSEMINATED LEAD ORES OF SOUTHEAST MISSOURI.

BY FRANK L. NASON.

In submitting the following paper on the occurrence of the disseminated lead ores of Southeast Missouri, I wish, at the outset, to disclaim any intention of finality on the question of the origin of these unique deposits. Professional work for some of the large mining companies of St. Francois County during the greater part of 1901 has brought some very interesting and, possibly, valuable facts to my attention.

There are certain facts with regard to the occurrences of lead ores in this section which are either not generally known, or, if known, sufficient weight has not been given to this knowledge in the discussion of the genesis of these ores. The ores are locally known as surface lead and disseminated lead. The surface lead has been known and exploited for years; only quite recently have disseminated ores been known and worked. Surface lead ores occur in large, coarsely crystalline masses or clusters of crystals. They are found in seams and channels, embedded in surface clays or embedded in clays filling



LEAD ORES IN SOUTHEAST MISSOURI.

It is shipped mostly to smelters in Indiana. Such calamine as is produced in Tennessee goes partly to Indiana and partly to Virginia for smelting.

The production of spelter in the United States in 1900 was 123,231 tons, of which 114,961 was western spelter. This was less than in 1899 and more than in 1898, the output in 1900 having been almost exactly equal to the average of the three years. There was a large increase in the production of spelter in the United States in 1901. Statistics of the spelter production do not fully represent the magnitude of the American zinc industry, because they do not take into account the zinc tenor of the oxide made directly from ore. In Europe, on the other hand, the supply of zinc oxide, save what is imported from the United States, is furnished by burning spelter, which appears in the statistics of metal produced in those countries. The output of zinc oxide in the United States in 1900 was 47,150 tons, corresponding approximately to 37,720 tons of spelter. The total production of zinc in the form of metal and oxide was therefore approximately 161,000 tons, or only a few thousand tons less than the output of Germany, which occupies first place among the zinc-producing countries of the world. The German spelter is, however, derived partly from imported ore, an important part of which is contributed by the United States, while the American production is entirely made from domestic ore.

seams and channels. They are found attached to, but never penetrating, the limestones with which they are associated. On the other hand, the disseminated ores occur in fine grained crystalline masses, in layers or beds parallel to the limestones and slates with which they are associated (in this case frequently occurring as nearly solid galena) or penetrating and filling with fine crystalline grains certain strata of limestone associated with the slates. The surface ores fill horizontal bedding planes, seams and channels, diminishing in richness from above downwards, rarely reaching 100 feet below the surface (as at present exposed by erosion), occurring generally from 200 to 400 feet above the underlying La Motte sandstones. The disseminated ores never appear on the surface, are rarely more than 50 feet above the sandstones, and often lie in immediate contact with them or even penetrate them to a considerable depth. The disseminated ores are almost invariably associated with thin bedded limestones interstratified with black or dark colored chloritic clay slates; the surface ores invariably in connection with heavy bedded limestones. In addition to the above differences, which might be explained as purely accidental, there is another characteristic which indicates, if it does not prove, a different origin both as to source and time.

Disseminated ores within a few days after being mined and exposed begin to tarnish, taking on an



iridescent blue color, which deepens to a dark Prussian blue. The enclosing rock changes, *pari passu* through varying shades of brown. This change is wholly absent from surface ores and rocks. These ores usually have a dull gray, corroded appearance, and when the crystals are bright, when first removed, or with bright luster on fractured surfaces, this luster changes to a dull, earthy gray, probably due to oxidizing from a sulphide to a sulphate or carbonate. In the absence of chemical analysis, the tarnish on disseminated ores is assumed to be due to carbonate of iron, in a small proportion, which is certainly present in the limestones, and probably in the disseminated lead as well.

It may be added that in fault planes and zones of crushed rock in mines of disseminated lead, galena occurs, frequently in large quantities, having all the differential qualities, as to crystallization, freedom from tarnish, etc., which characterize the surface lead. It occurs in such a manner as to leave no question in one's mind that it is of more recent origin than the disseminated lead with which it occurs. This point is intensified by the fact that while faulting often throws the layers of disseminated lead as far as 40 feet vertically, disseminated lead does not occur in the fault planes. When lead does occur it occurs as crystals and crystalline masses, with crystals of white or amber calcite or crystalline masses of calcite, but this lead never takes the tarnish of the disseminated ores.

The productive area of disseminated lead ores, as at present known, is confined to a belt practically beginning with Bonne Terre and ending in a southeast line at Mine La Motte in Madison County. I do not wish to be understood as affirming that this line limits the field of disseminated ores, and that the great producing mines are at present thus limited. The economic areas may, and probably do, transcend these bounds.

Another point is as follows. The producing mines of this belt have, without exception, had their origin in connection with surface lead. So obvious is this fact that, until quite recently, there has been a deep rooted prejudice against territory that has never produced surface lead. Recent explorations with diamond drills have shown that disseminated lead, in paying quantities, exists under ground that has never produced any surface mineral. The belt in which known deposits of disseminated lead occurs is about 25 miles in length, and on an average about 5 miles in width. On the other hand, the territory in Southeast Missouri, which has produced large amounts of surface lead, covers, roughly, an area of 1,400 square miles.

It must not be assumed that the belt of disseminated ores now known is worked along its entire length. From Mine La Motte to Elvins, a distance of 20 miles, no mines are operated. From Elvins to Bonne Terre there is almost a continuous chain of operated mines. Moreover, between these two points (Elvins and Mine La Motte) no surface lead has ever been produced, at least in any quantity.

Dropping the above point for a time, let us consider the disposition of occurrences of surface lead from Elvins and vicinity to Bonne Terre and Mine La Motte.

The rocks of this belt have a general but very slight dip to the southwest. The country is hilly, the higher points, as determined by barometer, are from 150 to 350 feet above the datum level of Big and Flat rivers. The hills in general are due neither to monoclinical or anticlinal folds, but, so far as is now known, to erosion entirely. Both Big and Flat rivers have flood plains a mile or more in width, thus cutting through the overlying rocks. Into these rivers, from either side, flow smaller tributary streams which have cut more or less deeply into the long divides, breaking them up into more or less hill-like domes. The gulches formed by these streams are usually dry, during the summer months at least, and are almost wholly denuded of soil, leaving the nearly horizontally bedded rocks exposed. As the summits of these hills and divides are approached the mantle of residuary clay becomes thicker, and on the summits of many of the hills

this clay, filled with blocks of drusy, cherty quartz, is often 50 to 100 feet thick. The limestones underlying this clay mantle and capping the hills are more or less cherty, having cavities lined with druses of quartz, locally known as mineral blossom. In many places these same limestones have their jointing and bedding planes covered with this same quartz. The quartz is not all crystalline, much of it having concentric bands of agate and chalcedony. Going down the hills, the limestones, still conformable, become less and less cherty, until a point is reached where they disappear altogether. Incidentally, it may be well to state that the thickness of the cherty limestones appears to be variable. In other words, reckoning from above, in some places the chert will appear 200 feet or more below the summit of a hill and in another near-by place, not more than 100 feet. This fact, as well as other observed phenomena, has led the writer to the opinion that the cherts have had a superficial origin, secondary in fact, having been

vins and Bonne Terre the major part of the rock outcrops belongs to the St. Joseph formation, while from Elvins southward to Mine La Motte the rocks are either the conglomerate series, as exposed in draws and gulches; or, if, on the summits of the less deeply scored divides, the chert bearing Potosi limestones. After reaching an elevation of 50 feet above Elvins, the writer does not know of a single outcrop either of the St. Joseph limestones or of the conglomerate series, west of the line of hills west of Farmington and as far south as Mine La Motte.

As has been previously stated no lead ore has ever been found on these uplands. From Elvins down Flat River, a little below the mouth of Davis Creek, up Davis Creek for about one mile and across the lands of the Central Lead Company, the St. Joseph limestones are more or less exposed by erosion. From, and including, the valley of Flat River, to Desloge, Mo., the St. Joseph limestones are almost continuously exposed, save where tongues of the conglomerate series, reaching out from beneath the hills surrounding this basin, intrude upon the St. Joseph outcrops for a short distance. Beginning at Big River and near Desloge, for a long distance above and below, the river has cut down to and into the St. Joseph series. Going up from the Big River, the same conglomerate series with its beds of slates reaches out from beneath hills and divides, all of which are capped by the cherty Potosi limestones and their mantles of cherty clay.

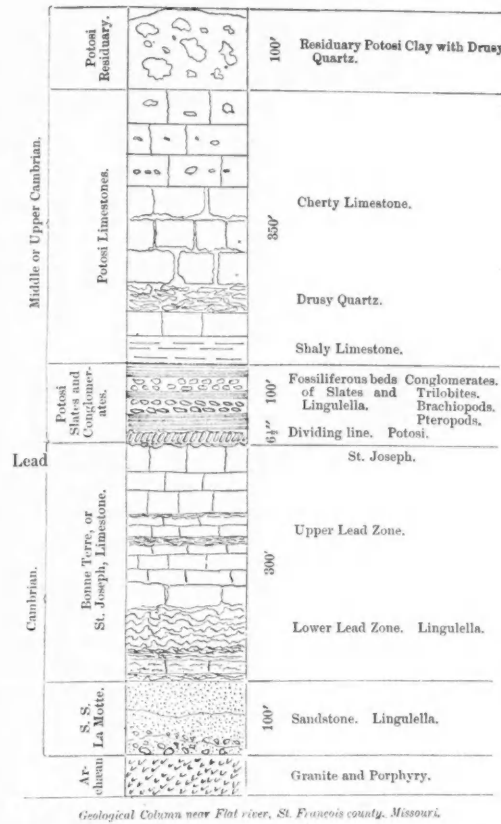
As stated, in Southeast Missouri, surface lead is confined to outcrops of the St. Joseph limestone and bounded by the outcrops of the conglomerate series, consisting of limestone conglomerates interbedded with layers of strata of clay slate.

Recapitulating briefly, there is a decided physical difference between surface and disseminated lead; there is, apparently, a slight chemical difference; both are confined to areas of the St. Joseph limestones and, finally, the working mines of disseminated lead of to-day have been primarily discovered through occurrences of surface lead. The conclusion has been that no disseminated ore bodies would be discovered outside the limits of surface lead. The above conclusion has, to a certain extent, been confirmed by Winslow (see *Transactions American Institute Mining Engineers*, Volume XXII, Page 634; *Missouri Geological Survey*, Volumes VI and VII, "Lead and Zinc Ores;" *Bulletin No. 132*, United States Geological Survey, pages 28 to 30 inclusive). While Mr. Winslow does not come out strongly in favor of leaching and lateral segregation, his feeling is unmistakably in favor of this view. In the *Transactions American Institute Mining Engineers*, the writer practically coincided with him in this belief as against fissure or vein origin advocated by W. P. Jenney (*Transactions*, Pages 83, 171 and 642).

At the time the above papers were written it was supposed to be true, as Winslow stated, that no line of demarcation existed between the lead bearing St. Joseph and the (in this locality) barren Potosi. The discovery of the heavy bedded conglomerates and slate series puts the question upon an entirely new basis, both economic and scientific.

Heavy beds of soft clay slates present an impenetrable barrier to either upward or downward circulating waters. This barrier is now known to exist between the St. Joseph and Potosi limestones. As proved by outcrops it covers the territory from Bonne Terre to Doe Run, north and south, and from two miles west of Irondale to the hills just west of Farmington. Including areas of the St. Joseph limestone in the above it covers 182 square miles. The writer has not visited Mine La Motte since this series was discovered. If the series of slates outcrops there, as it probably does, the area affected will be at least 325 square miles.

The assumption of Winslow is not wholly disposed of by the existence of this barrier unless it can be proved that no deposits of either surface or disseminated ores lie beneath the slates: for it might be assumed that the waters leaching the lead from the Potosi could follow down to the slates, follow along to where erosion had carried the slates away, thus allowing the mineralized solution to pass down



GEOLOGICAL COLUMN NEAR FLAT RIVER, MO.

leached from overlying beds of sandstone which have now almost completely disappeared.

Previous to 1901 a rough division of the rocks lying above the La Motte sandstones had been made. The chert-free limestones, bearing in their lower strata the disseminated lead, and in their upper the surface lead, have been called St. Joseph or Bonne Terre: the cherty limestone above, the Potosi, the only distinction being the occurrence or non-occurrence of chert. If the limestones were cherty they were called Potosi, otherwise St. Joseph or Bonne Terre. If the writer is correct in his assumption that the chert is secondary in its origin, then the above distinction is arbitrary and worthless. It does not follow, however, that no distinction exists. The rocks of the St. Joseph formation were supposed to pass upwards and to grade insensibly into the Potosi with no geological break. Apparently this gradation had never been questioned until the spring of 1901, when the writer discovered a series of limestone conglomerates outcropping in the bed of Flat River near Elvins, Mo. These conglomerates are interstratified with beds of clay slate from 2 to 3 feet to upwards of 20 feet in thickness. The alternating beds of conglomerate and slates form a series of upwards of 100 feet thick.

Returning to the point dropped during this somewhat long but necessary digression. Between El-

into the St. Joseph limestones and be deposited where they are now found. On the other hand, if either or both ores should be found beneath the slates, Jenney's theory would be all but impregnably established.

As a matter of fact, the shafts of the Doe Run Lead Company at Elvins and Central, Mo., all start above the conglomerate and slate veins. The ore bodies which they are working compare favorably in size and richness with other ore bodies in the valley. Of the two shafts of the Derby Lead Company, both start considerably above the conglomerate series, go down through the slates and one is already in ore.

At two shafts with which the writer is well acquainted, immediately under the slates was a layer or flat channel from which a large quantity of surface lead was taken. In another place a quarry started in the side of a hill and in the St. Joseph limestone yielded considerable surface lead. As the quarry was carried into the hill the St. Joseph limestone ran under the conglomerate series. Above the contact between the conglomerate series and the lower St. Joseph limestones no trace of lead is seen.

Moreover, the writer has seen cores from several drill holes put down more than two miles distant from any outcrop of the St. Joseph limestones, and these cores showed disseminated lead in workable quantities.

It would seem to follow, therefore, that the origin of the disseminated lead cannot be ascribed to the leaching of the overlying Potosi rocks. While the only other theory may not have been completely established, the more recent studies seem to point almost unmistakably in the direction of the theory advocated by Jenny.

Whatever the bearing of the above facts on the scientific question as to the origin of the deposits, there can be no question from the economic standpoint. Deposits of disseminated ores do exist beneath the chert hills of the Potosi rocks.

If the theory of lateral secretion, or leaching from the decomposition of overlying limestones obtains, the lead fields of Southeast Missouri are decidedly limited in extent. If the theory of fissure or vein origin be established, it will be difficult to outline the areas of workable lead. This much is certain, however, the area will be increased from hundreds to one or more thousand square miles.

Leaving out the question as to the reliability of the guide hitherto used—surface lead, which does not exist in the greater area—another question arises, is there anything that will take its place?

Drilling by diamond drills is uncertain and unsatisfactory at best, but it is the only means of not only testing a pay deposit, but of determining whether any lead at all exists.

Even where surface lead is found, there is no certainty that a pay deposit of disseminated lead underlies it. In other words, in known productive districts of disseminated lead, workable ore bodies are only a small per cent of the total of a given area. It is probable that not more than 10 per cent of the ground is workable. It follows, therefore, that if there are any means of eliminating the 90 per cent, or any part of it, from the expense of drilling an enormous saving in first cost will be offered.

**IRON AND STEEL EXPORTS OF GREAT BRITAIN.**—Exports of iron and steel—including machinery—from Great Britain for the two months ending February 28 are valued by the Board of Trade returns as below:

	1901.	1902.	Changes.
Iron and Steel .....	£3,939,141	£3,846,127	D. £ 93,014
Machinery .....	2,750,261	2,633,941	D. 116,320
New ships.....	798,605	1,126,978	I. 328,373
Totals.....	£7,488,007	£7,607,046	I. £ 119,039

The value of mining machinery, included above, was £80,918 this year, against £85,975 in 1901. Exports of pig iron to the United States this year were 9,842 tons.

### PALMERTON PLANT OF THE NEW JERSEY ZINC COMPANY (OF PENNSYLVANIA.)

By GEORGE C. STONE.

These works, located in the Lehigh Valley, on the line of the Lehigh Canal and of the Central Railroad of New Jersey, about nine miles east of Mauch Chunk, are on the edge of the anthracite coal fields, and have excellent facilities for cheap fuel, labor and transportation. The property consists of a comparatively narrow strip of land from 200 to 1,000 feet wide, and about 1½ miles long. The company controls, in addition, several hundred acres of land adjacent, or in the immediate vicinity, and on a portion of this the town of Palmerton has been laid out. The ground on which the works are located slopes gradually from northwest to southeast, affording excellent drainage.

The works are traversed throughout by railroad tracks of standard and of narrow gauge, the standard gauge connecting with the Central Railroad of New Jersey tracks. The railroad company delivers to the tracks of the zinc company and the zinc company does its own switching. The connection with the railroad, which is at the west end of the property, provides for the delivery of loaded cars on one set of tracks, and the removal of empty cars from another. Storehouses, cooper shops, pig iron yard, blast furnace supply room and foundry are all served by their network of tracks.

A second system delivers coal, ore and limestone to the blast furnaces and zinc oxide plant, the cars either passing over an all-steel 100-ton track scale or by a turnout which avoids the scale. Thence connection is made to a main trestle, which is double tracked and rises to a height of about 30 feet. Its length is about 3,000 feet, the first 1,000 feet being taken up by an ascending grade of 2 per cent, with the assistance of the natural slope of the ground. The space under the trestle is occupied by bins, each 20 feet high and 25 feet wide, accessible from cross galleries having chutes for the delivery of coal and ore into wheelbarrows. The space below the chutes can also be filled for a reserve supply.

To the south of the trestle is a storage yard 100 feet wide and 2,000 feet long, which will hold about 60,000 tons of ore and a like tonnage of coal. This is served by a Brown traveling bridge, which takes material from trestle bins and delivers it to any part of the yard, or vice versa. With the increase in size of the works more of these bridges will be installed.

To the east of the furnace room is the power plant, the south side of the boiler house acting as a retaining wall for the coal dumped from the trestle. The coal is drawn through openings in the wall and discharged directly in front of the boilers. To the east of the boiler house the double tracked trestle widens out to three tracks, and enters the blast furnace stock house, which is about 120 feet long at the present time. It will be extended as more furnaces are added.

The zinc oxide plant is immediately east of the railroad yard and north of the trestle. The furnace room, 50 feet wide and 1,260 feet long, contains 288 open-hearth furnaces, built back to back in blocks of 12. Each block is a complete, independent unit. To the north are the blower houses, one for each two blocks, and each containing two blowers with direct-connected motors. North of these are the settling towers and fan rooms. Each of the latter contains 8 exhaust fans of special design, each with its own motor. Farther north are the bag rooms—4 in all—for the collection of zinc oxide. The bag rooms have a combined floor area of nearly 2 acres, and contain over 27 miles of bags, if placed end to end, and with a total surface of 19½ acres. The bag rooms form 3 sides of a rectangle, the oxide packing room occupying the fourth side. The packing room is 62 feet wide by 143 long, and four stories high. Floors 1 and 4 are for storage of the unpacked oxide, an electric elevator lifting it from the ground floor to the top of the building. From here it is fed through chutes by its own gravity to bolting machines on the third floor, thence to packing machines on the sec-

ond. Bags are sewed and cleaned on the third floor.

The barrels manufactured in the cooperage department travel on skids over covered bridges to the space between the packing machines, where they are trimmed and are placed ready for filling. The oxide when packed is delivered on platforms at the end of the building and thence travels to the storehouses ready for delivery. Three of these have been erected, and a fourth provided for. The combined floor area will be 63,000 square feet, and the storage capacity about 9,000,000 pounds of oxide.

The cooperage building stands north of the packing room, and between the storehouses. It is 82x160 feet, the lower floor being used for stock storage and drying rooms. The cooperage department proper, where the barrels are made, extends the entire length of the building. The finished barrels are elevated, stored, and rolled over inclined bridges to the packing room. Automatic sprinklers provide safety from fire.

The furnace room is built entirely of iron and steel, the working floor being 10 feet above ground, affording space for hoppers, which discharge the refuse material from the furnaces into steel cars. Thence it is moved by locomotives to the blast furnaces. The ore used is mainly a combination of zinc, iron and manganese, and after the extraction of the zinc the residues are used for the manufacture of spiegel-eisen.

The fan rooms and blower houses in the oxide department have brick walls and steel truss roofs. To the east of the group of buildings comprising the oxide department are the offices, laboratories, store or supply rooms and shops. Offices and laboratory are connected by a covered passage. The former contains the accounting department, the rooms for superintendent and assistants, the directors' room, and large vaults for storage. The laboratory apart from the main working room contains offices for the chemists for special work, such as testing and sampling. It also contains supplies and a separate department for experimental work. Indirect steam radiation heats the buildings, which are well ventilated.

The shops are arranged in a semi-circle, with the office in the center, and are connected by narrow gauge tracks with each other and with the general system. A small fireproof building serves for oil storage. The general supply building is adjacent, and next to this the foundry. The molding floor of the latter is 36 by 154 feet, with core room, ovens, motor room, etc. A 3-ton electric bridge crane travels above the entire molding floor, and surface track connection is had throughout.

Southeast of the foundry is the pattern storage room, entirely fireproof, next the carpenter shop, then the machine shop and sheet iron workers' department. All these buildings have complete outfits of power tools, and each building has its own electric motor. All are steam-heated and equipped with automatic sprinklers.

The building for locomotives stands to the east, and the main blacksmith shop somewhat to the south. The latter, a building erected of concrete, with steel truss roof, contains four forges, motor, fan, drill, and power hammer. Three other blacksmith shops, each with two forges, are built on other portions of the property. All of the power is supplied from a central power plant, which stands well in the center of the present works.

The engine room is 64 by 270 feet, the basement floor being level with the ground. There are thus no pits or dark corners. A 40-ton traveling crane spans the entire building, and a standard gauge track runs into it. The crane can remove heavy machinery directly from the cars. The main engine room floor is 10 feet above the ground floor; the walls of white enameled brick at the base and red brick above. The roof is slate on 3-in. plank, carried by steel trusses. Two 800-horse-power engines with direct-connected 250-volt 600-kilowatt direct-current generators have already been installed. Next to these is room for another of the same kind of engine. The two now in place are horizontal cross-compound Corliss, built by the Dickson Manufacturing Company of Scranton. The generators were built by the Crocker-Wheeler



Company. Two 150-kilowatt Crocker-Wheeler generators, direct-connected to Payne horizontal tandem compound engines, supplied power until the main power plant was started, and these are now kept as a reserve.

Then follow in succession condensers and pumps for exhaust steam and water supply to the works and to the town of Palmerton.

There is space in the engine room for three blowing engines, only one of which has so far been installed. It is a horizontal cross-compound corliss, with 26-in. and 46-in. steam cylinders, 54-in. air cylinders, all 48-in. stroke, and was built by the Southwark Foundry and Machine Works, of Philadelphia. Each engine has a Goubert heater between low pressure cylinder and exhaust main. The feed water after passing these travels through an auxiliary heater, which absorbs the exhaust from all the pumps.

A clock tower serves for the assembling of all the cables, and their distribution through the building and to all parts of the works. There is also a telephone switchboard room, and there are telephones in most of the buildings of the works, by which connection is made with the hotel, railroad station, superintendents' houses, etc., in the town.

The boiler house, south of the engine room, is 56 feet wide, and will eventually be 320 feet long. It now contains 16 return tubular boilers, each 6 feet in diameter and 20 feet long, equipped with Wilkinson automatic stokers, and arranged also to be fired with the waste gases from the blast furnaces. When all of the blast furnaces are in operation the gas will probably supply all of the steam that is needed. The type of boiler used was adopted because it is deemed best adapted for burning the zinc-contaminated gas produced in the blast furnaces.

East of the power plant the first blast furnace is now in process of erection. Room has been provided for three more. The furnace stack is 60 feet high, the bosh 14 feet in diameter; a Brown automatic charging device and hoist will be used. Elaborate dust catchers or upright flues are provided in separate sets, one to be cleaned while the other is in use. South of the furnace are five 32-pipe Cooper hot-blast ovens, one being a spare. Then follows the stock house containing 18 round steel tanks, placed on concrete walls. Over these run 3 lines of standard gauge track on a steel trestle connecting with the wooden trestle above referred to. Narrow gauge tracks run in 4 lines on the surface for carrying the stock to the hoists. The tanks are for the storage of fuel and limestone. The ore or residuum is brought directly from the hoppers in the oxide-furnace room to the hoists.

The spelter or zinc metal plant is located farther east, and consists at present of but 2 large regenerative gas furnaces of different types, the intention being to add more when needed. The present spelter furnaces are erected in a brick building with steel truss roof 66 feet wide by 240 feet long. The main or working floor is 14 feet above the ground, the regenerators being placed beneath this floor and above the ground. The refuse material can thus be dropped into hoppers below the floor and removed in steel cars. North of the spelter furnace building are 11 Taylor gas producers in a steel building 43 feet wide by 91 feet long. These supply gas for the spelter furnaces and retort kilns. There are also brick kilns, clay sheds and an extensive pottery. The latter is equipped with clay-crushing machinery, pug mills and hydraulic presses. It contains the retort drying room, and is of ample capacity for a number of additional spelter furnaces.

Next follows a boiler plant containing two 250-horse-power Babcock & Wilcox boilers for steam supply to gas producers and drying rooms. This boiler room is 54 by 60 feet, and has space for two more boilers of like capacity. Adjoining is the engine room, 50 by 75 feet. This is not now used, all the power being supplied from the central plant.

South of the spelter plant are the lithopone and experimental acid plants. The lithopone plant has a present capacity of 5 tons daily and room sufficient

for doubling that capacity. The experimental acid plant will be used for testing the Schroeder contact method for making sulphuric acid on all kinds of ores, the patents for this process in this country having been acquired by the company. The lithopone plant will absorb the major portion of the acid manufactured.

The plans of the company contemplate enlargement and the erection of buildings and other improvements sufficient for a total capacity of some 60,000 net tons of zinc oxide yearly, 72,000 gross tons of spiegeleisen and 30,000 net tons of spelter or metallic zinc. There is also in process of erection a sheet zinc rolling mill to be located at some distance from the zinc-oxide and spelter plants.

The water supply is obtained from the Palmer Water Company, which also supplies the town of Palmerton. The water is carried through 30-in. pipes from the Pohopoco Creek, at Parryville, 3½ miles. The water is unusually pure; the creek runs through a slate formation, and the water contains only two grains to the gallon of total solids.

From the engine room the water is pumped into mains, which supply the entire works both for manufacturing and fire protection, and is pumped also into the stand pipe of the town. The latter is 20 inches in diameter, and 80 inches high, and stands on a hill about 90 feet above the works and the town.

Palmerton is situated in the valley of the Quashicola just over the hill and to the east of the works. It is connected with the latter by the company's own railroad, on which the workmen, who live in the town, are taken to and from the plant. The town, besides an ample supply of the excellent water aforesaid, has good roads, sidewalks, a complete sewerage system, and is lighted by electricity generated at the works. There are already some 200 houses for workmen, superintendents, etc.; more are in process of erection; three hotels and a number of stores have been built. As the works increase, so must the town grow, and other manufacturing industries are now contemplated, so as to diversify employment and find profitable use for all classes of labor.

COAL IN NEBRASKA.

By A. W. CLAPP.

Excitement has been caused recently by the report of a find of a good vein of coal in the vicinity of Jamestown, Nebraska.

About twenty years ago a small amount was found in this district, and it was thought by many that in time a workable vein would be discovered. A short time after this a 4-inch seam was struck near the surface, a short distance from the first find; underneath was found the usual coarse gravel, which was plainly of a more recent geological formation than that in which coal is usually found, and after going down 50 or 60 feet the coal-mining project was abandoned.

In 1897, J. H. Tank, while digging a well, 2 miles north of the first find, struck a small seam of a better quality at a depth of 200 feet. Above this was a layer of a shaley slate and a similar formation below. Water was found and nothing more was done about the coal.

Last month H. H. Brown, while putting down a well 2 miles east of the previous find, struck a seam at a depth of 125 feet; at a depth of 140 feet other small seams were found, apparently of a good quality, but not of sufficient size to pay to mine.

The present find on the farm belonging to E. Re-mele, is about 3 miles northwest of the first find of 20 years ago.

The seam is said to be 10 feet thick. It lies below a black slate rock and the borings from a drill indicate that its upper line is clearly defined.

The drill at present is down below the coal and in a hard rock clay. A 2-in. tubular well auger is used, so that the borings are pretty fine when they reach the surface, the largest pieces being about the size of a walnut. Other holes will be sunk in the vicinity to find out the probable limits and trend of the seam.

MANUFACTURE OF SULPHURIC ACID BY CONTACT PROCESS.

In the *Berichte der Deutscher Chemischen Gesellschaft*, xxxiv, xvii, 4069 to 4115, was a paper by R. Knietsch on this subject, which will be of importance to all chemists who are interested in it. The great development that the catalytic manufacture of sulphuric acid has already attained in Europe is manifested by the fact that the Badischen Anilin und Soda Fabrik alone produced 116,000 metric tons in 1900, against 89,600 in 1899 and only 39,000 in 1894. In the United States the process has already been undertaken by various acid makers, but so great progress has not yet been attained as in Europe. The theory of the process and the various methods of its application were described in *The Mineral Industry* for 1898 and subsequent volumes.

Phillips' application to the formation of sulphuric anhydride of the catalytic action of platinum, which was first observed by Humphry Davy in 1817, dates back to 1831. Not much progress was made, however, until very recently and the development of the present commercially successful methods was due to theoretical considerations, rather than to any practical results previously obtained. Experiments made with pure sulphurous anhydride and air showed that the practically complete conversion of SO<sub>2</sub> to SO<sub>3</sub> occurred, which proved also to be the case with the gas obtained by burning pyrite, but although the conditions of the laboratory experiments were exactly duplicated it was found that the activity of the contact substance gradually diminished to zero. Investigation showed that certain impurities in the gas, especially arsenic, exerted a deleterious action on the platinum, very small quantities being sufficient to destroy completely the catalytic activity of the metal. The purification of the gas proved to be one of the most difficult problems in the development of the process; it can be effected only by intimate and thorough agitation of the gas with water or sulphuric acid, which must be continued until optical as well as chemical purity is reached.

The proper regulation of the temperature was found to be another essential feature. Inasmuch as the oxidation of sulphurous anhydride to sulphuric is endothermic, evolving 22,600 calories, and furthermore since sulphuric anhydride is dissociated at a temperature between 900° and 1,000° C., it was seen that once the reaction was started extraneous cooling instead of heating was necessary. At a temperature below 200° C., however, there is no reaction. The maximum effect is manifested at about 450° C. It is important, therefore, for rapidity to use a contact substance possessing its greatest activity at about 450° C. According to Herr Knietsch, the only known contact substance which fulfils that condition is platinum.

The packing of the asbestos is a matter of great importance; it must not be so loose that the gases can pass through without contact, nor so dense as to cause an improper resistance to the passage of the gases. The asbestos is best packed in layers on perforated plates, strung on an iron rod, kept apart by projections; in this way all the tubes of the apparatus can be similarly and evenly packed.

The best absorption medium for the SO<sub>3</sub> gas has been found to be acid containing 97 to 98 per cent H<sub>2</sub>SO<sub>4</sub>; this is better than either water or acid of any other strength. A single absorption vessel is sufficient for even a very rapid stream of gas, if the strength of the absorbing medium be kept constant by the regular inflow of water and outflow of the sulphuric acid that is formed.

IRON ORE IMPORTS INTO GREAT BRITAIN.—Imports of iron into Great Britain for the two months ending February 28 were, in long tons:

	1901.	1902.	Changes.
Spain .....	818,555	791,239	D. 27,316
Other countries.....	155,593	117,701	D. 37,892
Totals.....	974,148	908,940	D. 65,208

The other countries included Sweden, Norway, Algeria, Greece and Newfoundland.

**THE UNITED STATES MINERAL EXPORT TRADE IN JANUARY.**

The part which the mineral industry plays in the foreign trade of the United States is shown in our table below, which exhibits a total value of \$22,345,520 for 57 mineral products and their manufactures exported in January. This is equal to 18 per cent of the total exports from this country during the month. These mineral exports include many articles sent to countries where, heretofore, British and German manufacturers have held exclusive territory.

In comparing the exports in January with those of last year a decrease of \$478,110 is observed. This was due chiefly to the smaller export movement in iron and steel, which in turn was caused by the extraordinary home demand. Part of this decrease was also due to the lower market value of various important products, notably copper.

*U. S. Exports of Domestic Mineral Products and Manufactures in January, 1901 and 1902.*

Articles.	1901.		1902.		Changes, 1902.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Aluminum .....	.....	\$17,173	.....	\$3,611	..... D.	\$13,562
Brass .....	.....	135,436	.....	123,839	..... D.	11,597
Bricks, Building and Fire.....	.....	41,414	.....	27,391	..... D.	14,023
Cement, bbls.....	23,344	50,637	26,234	40,073	..... D.	10,564
Acids .....	.....	19,776	.....	27,441	I.	7,665
Ashes, not and pearl, lbs.....	101,170	4,876	132,288	6,494	I.	1,618
Copper sulphate, lbs.....	4,570,435	224,246	3,100,360	114,548	D.	109,700
Lime, acetate of, lbs.....	5,612,242	101,159	3,772,856	57,458	D.	43,701
Coal, Anthracite, tons.....	194,759	877,350	103,242	482,511	D.	394,839
Coal, Bituminous, tons.....	417,003	955,036	402,225	1,030,640	D.	75,604
Coke, tons.....	34,299	136,494	32,609	129,555	D.	6,990
Copper ore, tons.....	492	55,251	3,513	343,440	I.	288,189
Copper Ingots, bars, etc., lbs.....	22,270,030	3,645,776	32,085,041	3,837,671	I.	191,895
Phosphate Rock, tons.....	43,761	326,839	34,910	278,747	D.	48,092
Gunpowder and Explosives.....	.....	88,718	.....	176,017	I.	87,299
Iron Ore, tons.....	440	1,165	20	122	D.	1,043
Pig iron, tons.....	20,606	299,958	7,233	120,682	D.	179,276
Bar iron, lbs.....	9,170,291	142,020	4,981,299	98,197	D.	52,823
Bar and Rod Steel, lbs.....	20,116,545	306,585	3,943,182	97,005	D.	209,580
Iron and steel billets, etc., tons.....	14,124	349,374	276	8,411	D.	340,963
Iron and Steel Hoops, etc.....	495,832	10,468	949,881	20,054	I.	9,586
Iron and steel scrap, lbs.....	995	14,721	636	9,319	D.	5,402
Rails, iron, tons.....	260	6,265	132	2,125	D.	4,140
Rails, steel, tons.....	25,336	740,794	14,386	376,959	D.	364,199
Sheets, iron, lbs.....	2,789,356	79,951	778,854	23,805	D.	56,146
Sheets, Steel, lbs.....	8,915,359	114,798	1,380,255	30,875	D.	83,923
Tin plates, etc., lbs.....	73,501	3,174	316,486	10,454	I.	7,280
Structural Iron and Steel, tons.....	5,516	325,238	4,972	263,580	D.	61,358
Wire, Iron and Steel, lbs.....	14,196,200	362,534	16,184,374	363,624	I.	1,988,174
Builders' Hardware.....	.....	684,051	.....	820,727	I.	1,000
Nails, cut, lbs.....	3,301,687	77,494	1,703,868	32,886	D.	136,676
Nails, wire, lbs.....	3,792,101	89,266	3,416,805	64,698	D.	44,608
Nails, all other and tacks, lbs.....	324,963	20,623	343,740	20,090	I.	24,568
Machinery, Electrical.....	.....	467,686	.....	409,476	D.	58,210
Machinery, Metal working.....	.....	259,027	.....	306,943	I.	47,916
Machinery, Pumping and Pumps.....	.....	166,227	.....	228,426	I.	62,199
Steam Engines and parts.....	.....	839,983	.....	341,981	D.	498,002
All other manufactures of iron and steel.....	.....	4,250,315	.....	4,447,571	I.	197,256
Lead, pigs, bars and old, lbs.....	1,134,909	51,308	8,862	553	D.	50,755
Lead manufactures.....	.....	23,047	.....	37,718	I.	14,671
Lime, bbls.....	2,150	2,616	2,659	3,575	I.	959
Roofing slate.....	.....	83,218	.....	70,724	D.	12,494
Marble and stone.....	.....	61,428	.....	58,773	D.	2,655
Nickel, lbs.....	539,143	136,667	397,283	108,365	D.	28,302
Mineral Oil, Crude, gals.....	10,504,293	498,039	11,343,195	507,538	I.	9,499
Naphthas, gals.....	2,928,451	254,893	795,475	50,923	D.	203,970
Illuminating oil, gals.....	63,327,757	3,986,019	74,161,985	4,579,970	I.	593,951
Lubricating and paraffin oil, gals.....	5,866,442	856,842	6,190,487	852,745	I.	4,077
Residuum, bbls.....	96,125	224,192	60,774	73,628	D.	150,564
Zinc oxide, lbs.....	589,863	26,303	605,151	29,473	I.	3,170
Other pigments and colors.....	.....	156,900	.....	125,681	D.	31,219
Quicksilver, lbs.....	54,728	30,193	54,205	33,241	D.	3,048
Salt, lbs.....	826,622	3,387	1,121,708	5,007	I.	1,620
Tin manufactures.....	.....	37,437	.....	49,511	I.	12,074
Zinc ore, tons.....	3,061	91,315	2,645	77,610	D.	13,705
Zinc, pigs, sheets, etc., lbs.....	112,103	4,978	820,348	36,582	I.	31,604
Zinc manufactures.....	.....	2,950	.....	4,511	I.	1,561
Total value.....	.....	\$22,823,630	.....	\$22,345,520	D.	\$478,110

The exports of iron and steel were valued at \$8,089,080, or 36 per cent of the total mineral products exported. This shows a falling off of \$1,527,637, or about 16 per cent, from January last year, owing as stated, to the great activity in our home trade. The heaviest decrease was in pig iron, steel billets, and steel rails for which the domestic demand now exceeds production. In fact, large purchases in Germany and Great Britain have been made by United States manufacturers. Machinery shipments were made chiefly to the United Kingdom, where extensive manufacturing plants are being constructed on the American plan.

Mineral oils show a satisfactory export demand, especially from Great Britain and Continental Europe. In the far East, Japan is the most important consumer.

Exports of fine copper show an increase of over 30 per cent in quantity as compared with January last year. Owing to the cut in market prices here, the average invoice value on exports has fallen from 16.37 cents per pound in January, 1901, to 11.96 cents this year. This caused a drop in value on the copper exports in January this year of over \$1,400,000, which could probably be swelled were it possible

to calculate exports on exact selling prices. One result of these lower prices has been increased speculative buying in Great Britain, whose imports have grown from 3,117,878 lbs. in January, 1901, to 20,366,587 lbs. this year. Germany has also bought more, but the increase is comparatively small, while France and some other European countries show a marked falling off. France alone records having purchased only 2,928,380 lbs., against 5,465,633 lbs. last year.

Copper ore shipments amounting to 3,513 tons were reported in January this year. Great Britain took 2,268 tons and Mexico the balance. The trade in copper sulphate is curtailed by less demand from Italy and several other important European countries, that last year took the bulk of our exports. Greece, however, is becoming a large buyer of our product. It has heretofore been supplied chiefly by Great Britain.

Comparatively little domestic lead was exported, as the home demand is sufficient and good prices are obtainable. Consequently our export trade is chiefly in Mexican and other lead refined here in bond.

Spelter exports to Europe have increased. Zinc ore, however, shows a slight falling off, but as the Belgian smelters have contracts with us, they are importing to satisfy their current wants.

Coal and coke exports are somewhat less than last year, owing partly to the interference with production and transportation by heavy weather. Of the coal there were sent to British North America, 99,670 tons anthracite and 205,973 tons bituminous, both showing a marked falling off from last year. European trade continues insignificant. Mexico and Cuba have both purchased good quantities of bituminous coal, and took much of the coke that was exported. At present low ocean freight rates our exporters may get an advantage in European markets, and with milder weather and better railroad transportation from producing centers there is a likelihood of an increased trade.

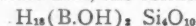
The superphosphate manufacturers in Europe received less phosphate rock in January, because

shippers held for higher prices. Consequently the exports fell off about 20 per cent in quantity as compared with January, 1901. Expectations are, however, that shipments will improve.

**COMPOSITION OF TOURMALINE.**

By GEORGE F. KUNZ.

The composition of no other precious stone has received so much attention from eminent chemists as has that diversified colored mineral, tourmaline. Exhaustive papers on the subject have been contributed by a long list of investigators. Among these are Riggs, Clarke, Rammalsberg, Tschermak and Foote. Prof. S. L. Penfield, during the past year, has followed up his and Prof. Foote's former paper on the composition of tourmaline, replying to criticisms and differing views put forth by Prof. Clarke of Washington, and Dr. Tschermak of Vienna, and reaffirming his previous determination in a very satisfactory manner. He shows that the formula proposed by both Professors Clarke and Tschermak, involving as they do, extreme elaborateness, and combinations of molecules that would require thousands of atoms, can only be made to serve by a process more mathematical than chemical. He reaffirms, for a general tourmaline acid, the formula,



in which the hydrogen is replaced by alumina, and the remainder by various metallic atoms; and the several varieties are determined by the kind and proportions of these latter elements, and the general character of the tourmalines as a species-group by the "mass-effect" of the molecule otherwise, as a whole. This view, he feels, affords an explanation of the constitution of tourmaline that is both well grounded and comprehensible, while the views that he criticises do not, and the methods of their application are such as could be used mathematically to furnish formulæ for almost any substance ever subjected to analysis.

*Tourmalinated Quartz.*—The beautiful mineral rutile in quartz, variously called saganite, Venus' hairstone, and, by the French, fiesche d'amour (love arrows), has been found in a number of localities in the United States, Switzerland, New Zealand, Madagascar, and Brazil, the crystals being all shades of red, yellow and brown, generally, with metallic luster, almost invariably in transparent quartz or rock crystal. This has always been one of the most interesting of the included minerals. During the past year, however, a remarkable discovery has been made of tourmalinated quartz, and several interesting finds have been made, namely, in Jefferson County, Mont.; Mesa Grande, Cal., and Haddam Neck, Conn. The Mesa Grande tourmaline crystals, like those of Haddam Neck, Connecticut, are often found penetrating crystals of quartz, but a very striking and curious occurrence of true inclusion of tourmaline in quartz crystals has been found in Montana, at a locality some 22 miles southeast of Butte, and 16 miles from Silver Star, in Jefferson County. In a ledge, or perhaps a dike, of coarse pegmatite, on the edge of the Butte granite area, occur very large perfect crystals of orthoclase, small mica scales, black tourmalines, and quartz crystals, colorless, smoky, and amethystine. Of these last, the two former are full of tourmaline inclusions, while the amethyst is free from them. Some of the smoky crystals are 3 feet in length and 8 inches in diameter, more or less filled with acicular tourmaline. So dense is this filling that in some cases the quartz appears black. But the amethysts, whether entirely separate, or upon and among the other crystals, or even forming terminations to them, contain no tourmaline at all. Sometimes the prismatic part of a crystal is black from the inclusions, and the pyramids are transparent purple amethyst. The tourmalines vary from delicate needles up to 5½ millimeters diameter, and penetrate the quartz in every direction; but sometimes they are zonally arranged, producing remarkable "phantoms," very elegant when cut transversely and polished.



**NEW YORK EXPORTS IN FEBRUARY.**

As compared with the preceding month February shows a falling off of \$396,429 in the exports of mineral products and manufactures from New York. This decrease, which was due to the shorter month, was marked by smaller shipments of such leading articles as mineral oils, machinery (other than metal working), and certain iron and steel manufactures. But as compared with February, 1901, there has been a marked improvement in copper, iron and steel wire and nails, and some other articles.

Any notable growth in the exports of iron and steel products is not expected until the producers are better able to satisfy the large home demand. With additional furnace capacity, however, producers are gradually getting into shape to fill all orders. Manufacturers are exporting odd lots of material in order not to lose all hold on foreign trade.

The total value of the exports of iron and steel and their manufactures in February was \$3,332,314, compared with \$3,458,416 in January; showing a decrease of \$126,102, chiefly in machinery. England and Australia were heaviest purchasers with smaller lots to Norway and Sweden, Japan, the Philippines, Turkey, South Africa and South America. Japan's purchases were principally machinery and structural material. A little business in steel bars and sheets was also done with Korea. South Africa is buying more mining machinery as the mines in the Witwatersrand are preparing for increased operations.

Mineral oils show a falling off of 11,738,189 gals. as compared with the January exports. Illuminating oil heads the list. No crude oil was exported.

Anthracite coal exports were smaller than January, but bituminous shows an increase of 1,825 tons. The soft coal went chiefly to Italy, and the anthracite to the West Indies, Canada and elsewhere.

**RECENT DECISIONS AFFECTING THE MINING INDUSTRY.**

SPECIALLY REPORTED.

**LIABILITY FOR DIRECTION OF FOREMAN IN MINING OPERATIONS.**—Where a miner was ordered by his foreman to make excavations at a place where the miner thought the overhanging rock looked "a little suspicious," but the foreman assured him it was safe, there was no such obvious danger as to create an assumption of risk on the part of the miner, in spite of the fact that the work was under the foreman's supervision. The excavations were preparatory to placing of supporting timbers by other workmen, so he was not engaged in making a dangerous place safer.

In an action for personal injuries alleged to have been caused by the defective condition of the mine, questions to expert witnesses as to whether the decayed state of a sill would render extra timbers necessary, to make it reasonably safe for a man to work at the place where the accident occurred is not objectionable as calling for conclusions as to the safety of existing conditions, but it is admissible to show the proper mode of construction.—*Faulkner v. Mammoth Mining Company* (66 *Pacific Reporter*, 799); Supreme Court of Utah.

**TRANSFER OF MINING PROPERTY BY LOCATORS TO COMPANY.**—Where the locators of mining claims surrendered possession to a corporation pursuant to articles of incorporation reciting the transfer of such locations in consideration of paid-up shares of stock, and the corporation improved the property, but there was no further written evidence of conveyance, a law declaring that no estate in realty can be granted otherwise than by operation of law or subscribed instrument in writing, would not prevent the corporation from acquiring title, but accepting value for and allowing improvements upon the claims constituted an estopped passing title by "operation of law." Such defect in the transfer cannot be set up by a stranger to impeach the passing of the title. Failure to file affidavit of making of improvements and performing the necessary labor on mining claims does not render such claims open to relocation.—*Murray Hill Mining and Milling Company v. Havenor* (66 *Pacific Reporter*, 763); Supreme Court of Utah.

**RIGHT TO INJUNCTION PENDING APPEAL.**—Where in an action to restrain parties from removing ore from a certain vein on a motion for an injunction pendente lite—pending litigation, it is shown that in a prior action between the parties judgment is entered that those sought to be enjoined are the owners of the vein and ore, the court may consider such judgment in determining the motion, though the time for an appeal has not elapsed, and the party seeking the injunction intends to appeal from such judgment. A court in refusing such injunction on the ground of the existing judgment does not pass upon the merits of the questions to be decided on appeal—*Boston and Montana Consolidated Copper and Silver Mining Company v. Montana Ore Purchasing Company*. (66 *Pacific Reporter*, 752); Supreme Court of Montana.

**RATIFICATION OF ACT OF SUPERINTENDENT OF MINING COMPANY.**—A creditor of a mining company sought to have its president execute a bill of sale for certain machinery purchased from others. The president refused, but referred the creditor to the superintendent of the company who executed such bill, signing it as manager of the company. The directors, with the exception of the president, resided in another state, and the president had the general management of its affairs within the state. The creditor testified that he had informed the president that the bill had been executed, and that the president knew the character of the transaction, but did not want it known that he was cognizant of the transaction, and that he was in the immediate vicinity when the creditor took possession of the property. The parties who had sold the machinery sued and attached it as the property of the

*New York Mineral and Metal Exports in 1902.*

Articles.	February.		January-February.	
	Quantity.	Value.	Quantity.	Value.
Acids .....		\$24,549		\$39,456
Ashes, Pot and Pearl, lbs.....	23,384	1,144	122,000	5,638
Asbestos .....		4,887		16,253
Aluminum .....		5,459		7,634
Cement, bbls.....	7,754	10,462	21,223	29,109
Bricks, fire and building.....		2,825		7,777
Coal, Anthracite, tons.....	1,066	4,575	2,421	11,188
Coal, Bituminous, tons.....	5,834	19,195	9,743	31,561
Coke, tons.....	11	110	27	271
Copper ore, tons.....	1,212	129,786	3,480	361,017
Copper ingots, etc., lbs.....	22,134,245	2,702,197	38,352,336	4,673,925
Copper Manufactures.....		64,831		112,475
Copper sulphate, lbs.....	4,352	179,404	5,916,756	241,864
Explosives .....		68,876		147,189
Iron, pig, tons.....	550	10,299	1,305	24,899
Iron, scrap, tons.....	178	3,133	196	3,525
Iron and steel bars, rods, lbs.....	744,175	20,531	1,916,069	55,194
Iron and steel sheets, lbs.....	373,872	8,844	715,865	18,925
Iron hoops, bands, lbs.....	138,210	3,131	654,450	14,257
Iron and steel wire, lbs.....	12,095,364	265,648	24,363,957	530,875
Iron and steel manufactures.....		263,646		596,371
Iron, structural, lbs.....	1,839	118,297	3,173	211,527
Iron and steel nails, etc., lbs.....	4,530,008	95,537	8,294,754	173,111
Steel rails, tons.....	4,849	136,039	5,174	179,495
Tin plates, lbs.....	10,786	920	20,622	1,766
Machinery, electrical.....		465,999		540,997
Machinery, metal working.....		309,930		585,742
Machinery, not specified.....		630,663		1,566,238
Electrical appliances.....		201,796		578,776
Pumps .....		109,483		290,858
Engines .....		368,510		497,991
Boilers .....		73,782		165,681
Pipes and fittings.....		255,126		563,502
Lead, pigs, etc., lbs.....	833	36	5,435	376
Lead manufactures.....		9,909		18,001
Mineral oils, gals.....	37,161,656	2,799,881	86,061,501	6,284,828
Nickel, lbs.....	279,787	89,170	677,070	197,535
Lime, acetate, lbs.....	4,771,842	72,815	8,140,127	123,862
Phosphate rock, tons.....	173	1,500	1,173	12,630
Marble .....				39,832
Roofing slate.....		22,954		53,597
Paints .....		54,343		128,574
Salt, lbs.....	44,009	530	92,248	1,050
Tin manufactures.....		11,740		34,207
Zinc ore, tons.....	1,713	51,000	3,771	111,000
Zinc, pigs, etc., lbs.....	226,582	9,293	897,731	39,231
Zinc manufactures.....		499		1,170
Zinc oxide, lbs.....	398,344	15,750	968,635	43,815
Zinc dross.....		10,533		31,768
Total value.....		\$9,500,567		\$19,397,667

The exports of copper are improving in quantity, but the value has depreciated considerably since the fall in prices in the domestic market. In fact, the average invoice value for fine copper in the first two months this year is a little over 12c. per lb. while last year it was over 16½c. On 38,352,336 lbs. exported this year this drop of about 4½c. means a decrease in value of \$1,725,855. Even this figure is only approximate, as it is understood the metal has been sold at less than the invoice value. Germany, Holland, England and France were the leading buyers, all showing increased imports in February. The copper ore shipped went chiefly to Great Britain for smelting.

Spelter and zinc ore exports were somewhat less than January, owing partly to the better prices ruling at home. England and Austria took most of the spelter, while the ore went to Holland. Business in zinc oxide was also less than January. England, Italy and Austria are the principal buyers. The zinc dross went to England and Holland.

Nickel exports are nearly 30 per cent less than January. Of the February shipments England received 89,600 lbs., Belgium, 55,772 lbs., Holland, 44,815 lbs., and Baltic Russia, 44,800 lbs.

**EXTENSION OF LEADVILLE DISTRICT.**

BY OUR SPECIAL CORRESPONDENT.

In a pamphlet entitled, "Hints to Prospectors," and issued several years since by the Colorado & Southern Railway, the attention of prospectors was called to the mountain peninsula lying between the South Park and the Arkansas Valley. Especially was it predicted that silver-lead ores might be looked for with confidence in the neighborhood of Weston Pass and at points on both slopes to as far south as Buena Vista and Trout Creek.

Developments made some time ago demonstrated the existence of a silver-lead vein in the Dolomite Mine at the head of Trout Creek, in the South Park and opposite Newitt Station. More recent work, south of Leadville, in the neighborhood of Weston Pass, shows an extension of the old Leadville formations southward, while new work on the east side of the range between Mosquito and Weston passes continues to give promising returns. The exploration of this same range toward the south is likely to result in still further favorable results, and the coming summer gives promise of greatly increasing the boundary of the old Leadville District from Tennessee Park, on the northwest, to Weston Pass and beyond on the southeast.

company. The court held that the evidence of ratification of the bill of sale by the company was sufficient to go to the jury, together with the bill of sale. Independent of such ratification the bill of sale was void, and not voidable, and the sellers had the right to raise the question of its validity. The jury had the right to determine whether the bill had been in fact ratified.—*Trent v. Sherlock* (66 *Pacific Reporter*, 700); Supreme Court of Montana.

**PROTEST AGAINST ISSUE OF PATENT BY ADVERSE CLAIMANT.**—An action was brought against one who was the owner of two mining claims. The lines of the junior claim crossed the senior claim; the discovery monument of both claims being at the intersection of the veins in each, about 10 feet apart, and the discovery point of the junior claim being at the same blow-out where the discovery was made in the senior; and both discoveries were made upon the same mineral, and within the lines of the senior claim. The party bringing the action, after the location of the others' claims, located a third claim which crossed them both. The first party had never abandoned either of his claims. It was held that in a conflict between the second and third location, the third must prevail, since the same discovery point cannot be used for the location of two mining claims, and a location posted upon a discovery made within the limits of another and existing and valid location is void.—*Reynolds v. Pascoe* (66 *Pacific Reporter*, 1064); Supreme Court of Utah.

#### ABSTRACTS OF OFFICIAL REPORTS.

##### *National Salt Company.*

This company's report covers the year ending December 31, 1901. The balance sheet shows \$5,758,250 common stock and \$3,758,250 preferred stock; in addition to which there are 12,417½ shares of preferred and 12,417½ shares of common stock deposited with the American Trust Company, of Cleveland, O., pending certain litigation with the United Salt Company.

The accounts for the year show profit from New York Department, \$290,581; profit from subsidiary companies, \$28,052; dividends, etc., \$156,465; total, \$475,098. Deductions are, for loss on Michigan Department, \$275,738; New York office, \$160,445; total, \$436,183, leaving a surplus for the year of \$38,915. The surplus from the previous year was \$837,459, making a total of \$876,374. Deductions from this were: Amount credited for profit in 1900, but not received, \$155,314; bonds of subsidiary companies paid, \$40,000; dividends paid, \$651,172; total, \$846,486, leaving a balance of \$29,888 at the close of the year.

The president's report says, in substance: "A number of the former directors resigned during November and December last, and new men were put in their places. On January 8 the undersigned was made president. The company's financial situation was found to be very unsatisfactory, and the J. Dobson Good Audit Company was therefore appointed to ascertain its exact financial condition; the result of this examination is presented herewith. It will appear clearly to the stockholders that the company had no surplus and no money which it could distribute by way of a dividend in February last, and that it cannot be stated, now, when the company will have earnings sufficient to allow it to declare a dividend.

"It is assumed that the stockholders are familiar with the history of the transactions between this company and the United Salt Company, of Cleveland, Ohio. It appears clearly that the National Salt Company never received any benefit from that executory agreement; on the contrary, if that agreement is enforceable, this corporation would be found to be under obligations to the extent of the sum of \$686,547, for which, apparently, it could receive no return. This amount which the company would be called upon to pay, if the agreement with the United

Salt Company is found to be legal and enforceable, would add that sum to the amount of its conceded indebtedness.

"It is impossible to state the actual value of the assets of this company. Its plants were mostly purchased and paid for in the stock of the company and have heretofore been reported to represent the amount equal to the par value of the stock used in their purchase. So, for practical purposes, the only useful statement that can now be made is one showing the actual, undisputed debts and the amount of assets that may be regarded as quick assets. The value of plants will depend very much on the success of the business as conducted hereafter; their value in case of liquidation can only be a matter of speculation at the present time.

"Many bad contracts have heretofore been made by the company which are a burden and produce a loss; the expense incurred in the administration of the affairs of the company for the last year has been very large. The existing debts were created before the present officers came into power; the latter have proceeded to do what they could in the way of diminishing expenses and operating with economy."

##### *Franklin Mining Company, Michigan.*

This company's report covers the year ending December 31, 1901. The financial statement shows receipts as follows: Cash and copper on hand, January 1, \$32,909; copper sold, \$494,436; silver sold, \$700; stock sold, 20,000 shares, \$300,000; total, \$828,045. The payments were, at mine, \$546,788; smelting, freight, taxes, etc., \$51,510; loans paid, \$214,500; total, \$812,798, leaving a balance of \$15,247 on December 31. The assets at the close of the year were: Cash, \$15,247; copper and accounts receivable, \$96,070; mine supplies, \$71,533; total, \$182,850. The accounts and bills payable amounted to \$116,940, leaving a balance of assets amounting to \$65,910.

The copper produced was 3,757,419 pounds. The copper sold was 2,961,169 pounds, leaving 796,250 pounds on hand at the close of the year. The average price obtained for copper was 16.7 cents per pound.

The directors report: "It will be seen that the old Franklin still holds out well, and promises to do so for several years to come, at an average of from 9,000 to 10,000 tons per month of fairly good stamping material from the old openings.

"At the Franklin Junior the work on the Pewabic or amygdaloid lode has been suspended, it being deemed best to stop openings there and confine ourselves to taking rock from the Peninsula (conglomerate) lode on that property.

"In November, 1901, the product of rock from the conglomerate lode was 17,756 tons; in December, 18,003; in January, 1902, 17,856, which, with nearly 10,000 tons per month from old Franklin, equals per day for the three stamps over 1,100 tons (average), and this, too, using only one skip at conglomerate. At the conglomerate lode, by using both, we could easily add 10,000 tons of rock for the mill per month.

"The Junior amygdaloid has not come up to our expectations so far, but we have hopes that later on, by cross-cutting from the bottom of the openings on the conglomerate, we may find that it will prove valuable enough to work. At present we are fully supplied with rock which will pay to work from other sources.

"The cost in opening the two mines at the Junior has been large, but with the stoppage of expense on the amygdaloid our cost will be materially reduced, and copper produced for a much less price than heretofore. With the construction account nearly finished, we see no reason why the prospects with a fair price for copper are not very good indeed for the future."

##### *Gloss-Sheffield Steel and Iron Company.*

This company owns an extensive property in Alabama, including blast furnaces, coke ovens, iron ore and coal mines. Its report is for the year ending

November 30, 1901. The company has \$6,700,000 preferred stock, \$7,500,000 common stock and \$4,000,000 bonds.

The income account shows receipts as follows: Profits on pig iron, after deducting depreciation, \$311,407; profit on coal, less 3 cents per ton mined for depreciation, \$151,445; profit on coke, \$59,382; North Alabama Furnace Company, \$17,556; ore and dolomite sales, \$35,597; royalties, rents, stores, etc., \$153,733; total, \$729,120. General expenses and taxes were \$62,677; bond interest, \$203,812; making a total of \$266,489 and leaving a surplus of \$462,631. The surplus from the preceding year was \$546,099, making a total of \$1,008,730. The dividends paid were 7 per cent on preferred stock, amounting to \$469,000, and leaving a surplus of \$539,730 at the close of the year.

The production report for the year is as follows:

	1900.	1901.	Changes.
Pig iron made.....	210,268	218,857	I. 8,589
Brown ore mined.....	129,502	234,661	I. 105,159
Red ore mined.....	243,125	227,789	D. 15,336
Dolomite flux.....	118,087	101,349	D. 16,738
Coal mined.....	1,053,524	1,042,298	D. 11,226
Coke made.....	367,989	339,199	D. 28,790

The average price realized for pig iron last year was \$10.51 per ton, against \$13.78 in 1900.

Extensive repairs were made to seven of the company's blast furnaces. In the new coal mines in Walker County work was delayed on account of the failure to complete the railroad to the mines. The development work at the iron ore mines was kept well ahead.

The president's report says: "The outputs of pig-iron, coal, coke, red ore and dolomite were very materially reduced, due for the most part to the fact that during the summer months, when there was little demand for domestic coal and coke, three of the Birmingham District furnaces were out of blast at one time for a brief period and two of them for quite a prolonged period. This also had the effect of increasing in a marked degree the cost of producing raw materials. The output of coal and coke has also been greatly reduced by the almost continuous car shortage which has prevailed during a large portion of the year. It is proper to add that at the date of this report the output of iron has been increased until it is now at the rate of over 300,000 tons per annum, with five furnaces in blast, with two additional furnaces to be blown in within sixty days.

"In order to produce a sufficient amount of raw materials to supply all of our furnaces and to have a reserve and surplus for emergencies, the following betterments are essential, both from an economic standpoint and in order to guarantee operations in face of bad weather, railway disasters, strikes or other contingencies: Flat Top Mine Development, including prison, washers, coke ovens, houses to accommodate coke organization, etc. Brown Ore; developing mines, washers, houses, etc., to supply Birmingham District furnaces. Further contemplated developments at Russellville to fully supply Sheffield District and, in part, Birmingham District furnaces. Limestone; to purchase and develop quarry, including, houses, etc., to supply the Sheffield District furnaces with limestone. To develop Whitney quarry, including houses, etc., to supply the Birmingham District furnaces with limestone.

"Dolomite as a flux should be abandoned and carbonate of calcium or mountain limestone substituted. The Whitney quarry, the property of this company, situated on the Alabama Great Southern Railroad, can be developed at a cost of \$75,000. A very high grade of cement, for which there is sale, can be and is manufactured in this district from lime slag, and this cement is of such superior quality that natural cements made at Louisville and Fort Scott, which are used almost exclusively, cannot compete with it and would be driven from the Southern market if enough could be made to supply the demand.

"In addition to the improvements outlined above, which are required to make this company independ-



ent in the matter of raw materials, the following additions are required for account of the furnaces: Birmingham District Furnaces—City furnaces, 3 blowing engines; North Birmingham, 1 blowing engine; North Birmingham, 3 stoves for No. 3 furnace. Sheffield District Furnaces—Philadelphia furnace, 500 horse-power of boilers; Philadelphia furnace, 1 blowing engine; Lady Ensley furnace, 1 blowing engine; Hattie Ensley furnace, 1 blowing engine. Storage capacity at Birmingham and Sheffield District furnaces to be materially increased.

"The prospect is most encouraging. At this writing the results of the first quarter are known and are 63 per cent greater than the corresponding period of 1901. Sales have been made covering the production of the second and third quarters of the present fiscal year at prices which reasonably insure earnings for \$1,200,000 over and above bond interest and other fixed charges for the year ending November 30, 1902."

*Great Boulder Perseverance Mining Company, Western Australia.*

From the report of this company, which owns a mine in the Hannan's District of Western Australia, it appears that the output of gold for 1901 was valued at £487,000 and the profit divisible was £163,000 after ample provision had been made for depreciation and development account. A large balance of £90,000 was brought forward from the previous year, so that the amount available for dividend is £257,000. It has been deemed best, however, to pay the whole of the cost of plant—some £160,000—out of profits, so that only £87,500 is distributed as dividend, being at the rate of 50 per cent. From the engineer's report it seems likely that the profits for the next three years will be as great as those in 1901, as there is enough ore blocked out to yield such results. The future life of the mine also promises well, as all the development work is encouraging.

#### 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.

*Southern Rhodesia; Information for Intending Settlers.* London, England; published by the British South Africa Company. Pages, 64; illustrated.

*Plane Surveying.* By Prof. Paul C. Nugent. First Edition, 1902. New York; John Wiley & Sons, London; Chapman & Hall, Limited. Pages, 584; illustrated. Price, \$3.50.

*Electric Power Transmission. A Practical Treatise for Practical Men.* Third Edition; Revised and Enlarged. By Louis Bell, Ph. D. New York; the *Electrical World and Engineer.* Pages, 632; illustrated. Price, \$3.

*Mining Laws of the Bodie Mining District, California.* Compiled from the Original Records, with Addenda. By O. F. Hakes. Bodie, Cal.; printed at Bodie Miner-Index office. Pages, 44.

*The Ore Deposits of the Rico Mountains, Colorado.* Extract from the *Twenty-second Annual Report of the United States Geological Survey.* By Frederick Leslie Ransome. Washington, Government Printing Office. Pages, 168; with maps and illustrations.

*First Report of the Geological Survey of Natal and Zululand.* By William Anderson, Government Geologist. Pietermaritzburg, Natal; Government Printer. Pages, 140; with maps and plates.

*Annals of South Africa.* No. 7. London, England; published by *South Africa.* Pamphlet, 32 pages.

*Nova Scotia. Report of the Department of Mines, 1901.* Edwin Gilpin, Jr., Inspector of Mines. Halifax, N. S.; Public Printers. Pages, 120.

*South Australia. Statistical Register, 1900.* Compiled from Official Records. Adelaide, S. A.; Government Printer. Pages, 288.

*The Foreign Commerce and Navigation of the*

*United States for the Year Ending June 30, 1901. Volume 1.* Prepared by the Bureau of Statistics of the Treasury Department; O. P. Austin, Chief of Bureau. Washington; Government Printing Office. Pages, 1,420.

*Report on the Iron Ore Deposits along the Kingston & Pembroke Railway in Eastern Ontario.* Prepared for the Geological Survey of Canada by Elfric Drew Ingall, M.E. Ottawa, Canada; Public Printer. Pages, 92; with maps and illustrations. Price, 25 cents.

*Preliminary Report on the Roads and Road-building Materials of Georgia.* Being *Bulletin No. 8* of the Geological Survey of Georgia. By S. W. McCallie, Assistant State Geologist. Atlanta, Ga.; State Printer. Pages, 264; illustrated.

*Coltivazione delle Miniere.* By Prof. Sollman Bertolio. Milan, Italy; Ulrico Hoepli. Pages, 284; illustrated. Price (in New York), 90 cents.

*Deep-Level Mines of the Rand and Their Future Development.* By G. A. Denny. London, England; Crosby Lockwood & Son. Pages, 170; illustrated. Price (in New York), \$8.75.

#### BOOKS REVIEWED.

*Electrical Engineering Testing.* By G. D. Aspinall Parr. London; Chapman & Hall, Limited. Philadelphia; the J. B. Lippincott Company. Pages, 484; illustrated. Price, \$3.50.

This work is intended, according to the writer, to form a systematic course of instruction in the extensive field of testing connected with electrical engineering. It embodies most of the experimental work that is usually done in colleges and technical schools and includes also tests of heavy electrical machinery. As far as possible, the tests have been made complete and descriptive, including an introduction giving the general features of the test and description of the apparatus necessary, the method of carrying out the actual test, tabular forms indicating the best way of recording the results of the tests and finally the inference to be drawn from the tests.

The different chapters cover the tests of ordinary electrical machinery in the first place, following it by methods of measuring resistances and insulations and by tests of dynamos and finally tests of cables and wires. An appendix contains the algebraic solutions of a number of the formulas ordinarily used and also descriptions of apparatus. A number of tables which are useful in obtaining results are also given. While the book is written from the standpoint of English practice chiefly, there is a great deal in it that will be useful to students and engineers everywhere.

*Aide-Memoire du Mineur et du Prospecteur.* By Paul F. Chalou. New edition, enlarged and entirely rewritten. Paris, France; Ch. Beranger. Pages, 412.

The first edition of this little volume appeared some six or seven years ago. The appearance of a new edition evidently indicates that the work has met the appreciation it deserves. The author understands what too many compilers of hand books apparently do not realize; that is the great amount of useful information that can be given in the form of well chosen and well arranged tables. Information can thus be presented so that the essential facts are apprehended at a glance, and this is what the practical man wants. The scope of this unpretentious little volume is broad, the mass of material winnowed by the author must have been great, yet the book contains the grains of fact arranged in orderly fashion. Though written from a French viewpoint the work is of far more than average value to any one desiring details about the subjects it summarizes. It contains chapters on geological formations, rocks, the principal minerals and metals of economical importance and an excellent summary of the preliminary work to be done in opening mines, with hints on estimating the quantity of ore

in sight. Then the author considers prospecting by drilling, takes up the methods of breaking down rock by hand or power drills and explosives, the running of drifts and levels, mine timbering, sinking, ventilation, lighting, drainage, surface and underground transportation, hoisting, different methods of stoping or opening ground, the use of compressed air and electricity, mine surveying, and gives a good summary of the French mining law. The book also contains some interesting and valuable tables and a glossary of mining terms in French, English and Spanish. Like most French works, it has an excellent index.

Though the book is written with reference to French practice, it will be found of value as a hand-book by many American mining engineers. It is carefully revised containing frequent references to articles and books that have been published as recently as 1901. Numerous mathematical formulas are given, but we notice none that call for more than a knowledge of algebra and trigonometry. The work comes nearer being the standard for a miner's handbook than any we have yet seen.

*A Practical Treatise on Mine Surveying.* By Arnold Lupton. New York, London and Bombay: Longmans, Green & Co. Pages, 416; illustrated. Price, \$5.00.

This is a comprehensive work, primarily intended, the author states, for an elementary text book. It contains chapters on the measurement of distances, descriptions of surveying instruments and of instruments for plotting surveys; surface and underground surveying; leveling; methods of connecting surface and underground surveys; calculation of mineral tonnages, surveying bore holes; prospecting by the magnetic needle, etc. An appendix contains specimen examination papers of various school boards and some mathematical tables.

The book has some good points, and is doubtless well adapted to its purpose, an elementary text book for students at such institutions as the Yorkshire College or the City and Guilds Institute of London. It is clearly written, the diagrams and cuts are well chosen, and there is some matter not often found in treatises on surveying, such as an excellent discussion of the methods of surveying bore holes. On the whole, however, the book, well adapted though it be for its intended purpose, is not likely to meet the needs of students in the United States. It is essentially an English work, and the instruments described and methods recommended are in some cases not such as are standard with us; in fact, would not be permitted in a mine where standards are high. Any one familiar with the work done in the Pennsylvania anthracite mines or in many metal mines in the West will feel the undue prominence given to the miner's dial and surveyor's chain. The mining transit and steel tape are not too good for our mining engineers and surveyors. Again, the work, for a text book of mine surveying, hardly says enough about the very important subject of connecting surface and underground surveys, neither is enough said about surveying difficult ground, narrow and irregular slopes or raises, or old and partly closed workings.

A chapter on geometry, trigonometry and logarithms seems out of place to any one familiar with the thorough drill in mathematics required of engineering students in our technical schools. A text book of surveying is scarcely the place for such instruction. The author discusses various methods of keeping a note book at some length, and has considerable to say about plotting results. He does not take up the matter of surveying methods, the make-up of surveying parties and the duties of each man as fully. It is true that different mining companies have different systems in this respect, yet fuller suggestions of the best methods might be given.

To summarize, the book contains much information of value to students and surveyors, but being written for English students, the book is not suited for American practice. It is comprehensive, yet at the same time almost too elementary. For the needs of American students there are better works in type.

*Field Book of Practical Mineralogy; How to Examine and Report on Mines.* By G. W. Miller. Denver, Colo.; Publishers Press Room Company, 1901. Pages, 190; illustrated. Price, \$1.50.

This little volume, the author states, is intended for mining engineers, prospectors, mineralogists and mining men. The work is divided in four parts. Part 1 treats briefly of ore deposits, giving theories of vein formation and some directions on reporting on mines. Part 2 gives assay methods for gold, silver, lead and copper ores, methods for laboratory tests of gold and silver ores by cyanide, chlorination, amalgamation; and a list of blowpipe tests. Part 3 is devoted wholly to descriptive mineralogy and contains analytical tables for the determination of minerals. So long as the prospector is a factor in the development of the world's mineral resources, so long no doubt will there be books written to aid him in his search. In all probability the great majority of these books will be found more or less unsatisfactory, in fact, it may be doubted whether a really first class prospectors' handbook has yet been written. Most attempts either cover too much ground, omitting practical information for prospectors and prospecting outfits and giving information of value chiefly to the mining engineer. Other attempts deal chiefly with mineralogy and give a small part of the total information that a prospector may need. To this class Mr. Miller's book belongs and in its limited field is hardly satisfactory. The remarks on ore deposits, for instance, might well be omitted, while, those on faults might give considerable more detail. The directions on sampling, testing and estimating ore in sight, if given at all, should be much more full. The remarks on assaying and laboratory tests, while accurate enough, are hardly to be commended. The author, for instance gives only the cyanide method for the wet assay of copper ores, and says nothing of the iodide method, which at least is as good for the complex copper ores found in many districts in the West.

The strength of the book lies in the lists of qualitative tests of minerals, comprising 27 pages, and in Part 3 on determinative mineralogy. The qualitative tests are well summarized, and as they give both wet and dry tests are of value to anyone having the necessary chemical outfit. The various minerals mentioned in the analytical tables are grouped according to the element of chief importance; as gold minerals, silver minerals, lead minerals, tin minerals, aluminum minerals, calcium minerals, etc. This method of grouping offers certain advantages, but is open to the objection that in complex sulphides, arsenides and antimonides, the usefulness of such a table is dependent on a knowledge of chemical composition that can be gained only by assay or quite elaborate tests. For ready determination of rocks in the field a system based on physical characteristics and simple blowpipe tests is to be preferred. In fact, we think that Mr. Miller's tables would be useful rather to the assayer than to the prospector. At the end of the book is a glossary of mining terms which is of some value, but no more satisfactory than the great majority of such glossaries. The book is clearly printed, substantially bound and of convenient size, but it is hardly a work that the prospector needs most, though it may prove of value as a reference handbook for a mine assayer.

*Power and Power Transmissions.* By E. W. Kerr. New York; John Wiley & Sons, 1902. Pages, 356; illustrated. Price, \$2.

The author, who is assistant professor of mechanical engineering at a Texas college, states that the matter contained in this book is largely that given by him in the form of lectures to students of the elementary principles of engineering, hence, he does not and could not presume to present much that is new but rather a collection of such principles and information as will direct the beginner along the proper course of study. Since the book is thus confessedly elementary and does not deal at all with the higher mathematics, it cannot be criticized for not

going much into theories. From a practical view point the work is of decided merit. It omits some matter which may be well presented even to elementary students and some of the statements made are hardly accurate, but the book is clearly written, the cuts and diagrams are well chosen and easily understood. The work is divided into three parts. Part 1 discusses machinery and mechanics, Part 2 deals with steam boilers and engines and Part 3 is about pumps, gas engines, water-power, compressed air and hot-air engines. At the end of some of the chapters the author gives problems for the student to work out. Answers to these problems are usually not given.

As to some specific criticisms, it may be said that some of the author's statements about pulleys are scarcely of general application, and the diagrams do not illustrate the case of a body being hauled along the ground. We note no mention of chain gearing, though rope drives are discussed.

A discussion of the various classes of boilers in Part 2 is reasonably full, mention being made of ordinary return tubular type of Cornish, Scotch and locomotive boilers and of water-tube boilers, including the Babcock & Wilcox, Sterling and Heine. The matter of firing is discussed and various fuels are mentioned, though little is said of mechanical stokers and more might have been said about forced and induced draft, a subject of increasing importance. Among automatic cut-off engines mention is made of the Green, Corliss and Brown engines, while of high speed engines are mentioned the Buckeye, Porter-Allen and Ball & Wood. Indicators and the proper methods of making indicator diagrams are discussed at some length, though more detail might have been given about the use of the pantograph. A chapter on condensers speaks of the jet and surface types and says something about the use of cooling towers. In discussing boiler feed the author has something to say about feed-water heaters and economizers, but fails to give reasons for the working of that apparently paradoxical device, the injector. A chapter on valve gear takes up the Stevenson link, the Allen, Myer and Giddings valves, the Armington & Simms piston valve and Green and Corliss valve gear. A discussion of the construction of valve diagrams is sufficiently clear, as is a brief summary of rotary engines and steam turbines. In a chapter on pumps the author discusses simple and compound power and steam pumps, the hydraulic accumulator, deep well pumps and the airlift, but makes no mention of pumps with mechanically operated valves. In speaking of gas engines the author mentions the Otto and the Day types, and speaks of gas engine regulation and igniters. Under water-power the author discusses briefly water wheels, outward and inward flow turbines, and impulse wheels, and gives information about the flow of water through orifices and the measurement of streams. Under compressed air, mention is made of air compressors, rock drills and the laws governing the compression of air and the influence of temperature on pressure. Tables on the properties of steam, its flow of compressed air through pipes, and the velocity of water, conclude the book. The work as previously stated does not pretend to be exhaustive. An acquaintance with trigonometry is the highest mathematical knowledge required of any one using it. Yet the author in the plain has shown excellent judgment in selecting his material and the book can be commended to any seeking an elementary knowledge of the subjects discussed.

*New Zealand Official Year Book 1901.* Compiled by E. J. Von Dadelzen, Registrar General. Wellington, New Zealand; Government Printer. Pages, 640; illustrated.

This is the tenth number of the yearly publication issued by the colony of New Zealand and contains chiefly in tabular form a great mass of statistics in relation to the various interests of the colony. These statistics include population, lands, agriculture, mining, commerce, finances, education, etc.

The accompanying text is brief, giving only in condensed form such information as is necessary to explain the statistics. The volume has evidently been compiled with a great deal of care and covers the interests of the colony as far as possible to do within the limits of such a volume.

#### 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 required. Letters should be addressed to the MANAGING EDITOR. We do not hold ourselves responsible for the opinions expressed by correspondents.

#### *A Uniform Monetary Standard.*

SIR: I would like to call your attention again to a possible and very desirable reform which was proposed in your columns several years ago, but has probably been lost sight of in the pressure of other matters. It seems to come up now naturally in view of the proposed action on the metric system.

I refer to the adoption of a uniform coin standard by all the leading commercial nations. It is not meant by such a proposal that any nation should give up its own coinage or the values, names and divisions of its money. But it would be possible by compromises and adjustments so slight that they need not affect values anywhere to make a standard that could be recognized practically all over the world. Thus, as you pointed out at the time, our own five-dollar piece, the British pound sterling, the German twenty-mark piece, the twenty-five franc piece of France and the Latin Monetary Union, the Russian ten-ruble piece and the Japanese ten-yen piece could be made of uniform value by changes in weight less than the allowances now made for wear before a coin is declared "light," and therefore put out of currency.

Of the great convenience and saving to be secured by such a change, no traveler and no merchant having foreign accounts needs to be told. It would be a powerful agent also in promoting intercourse among nations. Of course a good deal of negotiation would be required to bring about the change, but I believe the obstacles can be surmounted. The greatest one, of course, would be the opposition of bankers, who derive much profit from the existing differences in coin values.

As an engineer who has had dealings in various parts of the world, I would like to call attention once more to this question, and I hope others will take it up.

A. C.

Yokohama, Japan, Feb. 10, 1902.

#### 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.)

*American Cement.*—Will you kindly give in your JOURNAL, the following information: 1. The cement production in the United States, 1900-1901.

2. The exports of portland cement, 1900-1901. a. The quantity. b. To what countries and in quantity to each.

3. The imports of portland cement, 1900-1901. a. The quantity. b. From what countries and in what quantity.

4. Some of the largest constructions built entirely of American cement.

5. The relative value of foreign and United States cements as regards their quality.—Cement.

*Answer.*—Your questions cover entirely too much ground to be answered in this column fully. Briefly, the United States produced in 1900 a total of 20,486,274 barrels (of 300 pounds each) of cement,



9,177,222 barrels being natural hydraulic and 11,309,052 barrels portland cement. The imports were 3,182,245 barrels, chiefly from Germany, Belgium and Great Britain. The exports were 186,586 barrels, chiefly to the West Indies and South America. The figures for 1901 are not complete, but the production did not vary much from those for 1900. Imports in 1901 were 1,252,436 barrels, and exports 373,934 barrels.

American cement has been used in nearly all of the large buildings recently erected. Its universal use is shown by the rapid decrease in imports. Engineers now accept standard brands of American cement as better than any but the very highest quality of imported cement, and fully equal to those.

For detailed information, we can refer you to the article on cement in the *Mineral Industry* Volume IX (price \$5); Cummings' *American Cement*. (\$2); Jameson's *Cement* (\$2); Spalding's *Hydraulic Cement* (\$2).

**Sadtler Zinc Retorts.**—Is the Sadtler zinc retort patented? What is its composition and its form? Is it made under the same conditions as the ordinary zinc retort? Where is it made and used?—A. F.

**Answer.**—The Sadtler retort is patented. Its composition and method of manufacture are given in the following extract from the *Mineral Industry*. Volume IX:

"Benjamin Sadtler, of Denver, Colo., has patented a zinc retort which consists of the ordinary cylindrical vessel of refractory material, provided with a basic lining about 0.125 inch in thickness. As basic material, magnesia, chromite, corundum, or titaniferous iron ore, may be used; no special claim is made to any particular substance. This lining is prepared by application of a solution of sodium silicate to the interior of the retort, after which the refractory material pulverized to pass a 20-mesh sieve, or about that size, and free from fine dust, is introduced, and by rotation of the retort in a suitable framework is made to adhere to the inner walls as an even coating. When the retort is burned in the ordinary manner the sodium silicate sinters with the clay of the retort on the one hand and the coating of the refractory material on the other and produces a firm and dense lining, which is claimed to resist the corrosive influence of high percentages of iron, manganese, etc., which would be fatal to distillation in an ordinary clay retort."

The Sadtler patents are controlled by the Midland Smelting Company, of Denver, Colo. That company operates a smelter at Bruce, Kansas, for purposes of demonstration.

**Market for Manganiferous Iron Ore.**—Is there a market for ore of the following composition: Iron, 45.84 per cent; phosphorus, 0.0219; silica, 6.50; manganese, 6.94 per cent?—C. D. W.

**Answer.**—Your ore is not high enough in manganese to be in demand as a manganese ore. It is a manganiferous iron ore of rather low grade, and would not meet a demand large enough to support high freight charges. Whether it is salable at all depends chiefly upon its location and the distance to furnaces which would use such an ore.

**Concentrating Low-grade Gold Ores.**—Please tell me if there is any practical means, and if so, the best, to effect a rough concentration, after coarse crushing, of a low grade quartz ore carrying its value largely associated with limonite, black sand and a very low or small per cent of iron sulphurets, in all perhaps 2 per cent. I should like to concentrate three into one, discarding the dead material and treating the remainder as should appear necessary. If it is practicable to make such a separation, please state the steps, the machinery used and who has made it a success.—C. F. H.

**Answer.**—Such a separation as you refer to is practicable. Some form of jig would be required. There are a number of these on the market, differing little in efficiency.

We do not, however, know any plants where such a method of treatment of the kind of ore you describe is in use. The general method of treating such ores is fine crushing and amalgamation, the tailings being run over some form of concentrator—vanners or tables—and the sulphurets saved in that way for any form of treatment that may seem best.

**Iron and Copper Sulphides.**—Will you please answer through your correspondence column the following: 1. Do iron sulphides cap copper sulphides? 2. What are the probabilities when a 5-foot quartz ledge of pay gold values is at a depth of 30 feet, is replaced by talc that assays \$2 in gold in a granite and diorite formation. The ledge keeps its width to 110 feet. 3. Is andesite considered a favorable formation for copper?—W. B. M.

**Answer.**—1. Iron sulphides are frequently found as a cap to copper sulphides. Such an occurrence is the "iron hat" of the old German miners, and is familiar to most mining engineers.

2. It is impossible to give any opinion on probabilities without proper examination of the property. An opinion based upon general considerations would not be worth anything.

3. Andesite is not considered an especially favorable formation for copper.

We advise you to read some elementary economic geology—such as Stretch's *Prospecting, Locating and Valuing Mines*.

#### STEARIC WAX MINERS' CANDLES.

It is claimed that the original candle was made by the primitive man by poking his finger into the ground, placing a strip of porous fiber or pith in the hole and filling the hole with fat melted by the sun. When the fat cooled he would dig out his candle. Of course, this candle smoked like a chimney and emitted an odor strong enough to nauseate a sailor, but it was a candle nevertheless.

Later on candles were made by fastening several strings to a stick at intervals of about 2 inches and dipping or drawing the strings through melted tallow. The strings were then withdrawn and the fat that adhered to them hardened by contact with the air. With each dipping a new layer would form on the strings until a candle was made. Another method was by the use of metal moulds, and many can recall the time when the good housewife would save all the kidney fat for candle-making.

A comparison of these plain tallow candles with the stearic wax miners' candle of the present day shows the great strides made in this line of manufacture in recent years. A miner's candle must not smoke or give forth any odor; should it bend or have a certain greasy feeling it is condemned instantly. The flame must be bright and steady and burn evenly. It should not melt nor become soft under the heat often encountered in deep mines; indeed a miner's candle of to-day is a marvel of mechanical and chemical skill.

E. Schneider & Co., of Chicago, manufacturers of stearic wax miners' candles, state that their mining candles give light without odor or smoke, are made of material so hard that it cannot bend and will not melt under 140° F., and that the light will withstand a strong draft of air, while the wick does not glow when blown out.

In the manufacture of these candles, after the glycerine is extracted from the tallow, fatty acids (oleic and stearic) remain combined with lime which must be eliminated before the acids can be separated in what is known to the trade as "red oil" (oleic acid) and "stearic wax" (stearic acid). To accomplish this the fatty acids in combination with the lime are run into vats, where the emission is treated with oil of vitriol which precipitates the lime. It is then necessary to get rid of the vitriol by pressing. Bags of the residue are placed in layers in a hydraulic press with press plates between each layer and immense pressure applied. A certain amount of oleic acid or "red oil" oozes out of the bags. The bags are next placed in a hot press and subjected to a still greater pressure with the addi-

tion of heat. This liberates all of the oleic acid leaving a thin cake of stearic acid. The oleic acid or "red oil" is run into barrels after having gone through a filter press. If used for candles, it will bend or melt when subjected to but slight heat, thereby allowing the candle to gutter. Candles made of it sell at a less price, but are unfit for use in mines, and it has been proven that in the end they are more expensive than those made of stearic acid.

#### OTTUMWA BOX CAR LOADERS FOR DOCK WORK.

The Ottumwa Box Car Loader Company reports that it is extending the use of box-car loaders and has taken up the matter of loading box-cars at docks as well as at the mines.

The Northwestern Fuel Company is having one of these dock loaders built for its No. 1 dock at West Superior. This will be one of the most complete and best arranged docks on the Lakes. This Ottumwa portable dock loader will, it is believed, enable the company to greatly increase the capacity of the dock.

The loader is made to travel the entire length of the docks, and load from any one of the pockets. The boiler, loader, propelling arrangement, is all located on a car, and it is so arranged that the car can be moved quickly from one pocket to another.

#### LALLIE'S UNIVERSAL TRANSIT COMPASS

Lallie's patent universal transit compass, illustrated herewith, is a compact, practical instrument, simple in design, and easily manipulated. The manufacturer claims that it has a far wider range of use in stopes and all underground work than the more expensive transits. It is asserted that with its use "location surveys" of mining claims can be



LALLIE'S UNIVERSAL TRANSIT COMPASS.

performed quickly, and the engineer is not hampered with a heavy instrument. The instrument is provided with a graduated circle figured to quadrants, and with its double vernier, all horizontal and vertical angles are read to single minutes. A variation plate and levels are provided. A neat, round extension tripod, with aluminum head and clamps, supports the instrument, and when set up at any point, any horizontal angle can be deflected and any angle of elevation or depression can be read to single minutes, independent of the needle.

**LONG DISTANCE POWER TRANSMISSION IN ITALY.**—The use of high pressures for long-distance transmission of electric energy is increasing on the Continent of Europe. An order has recently been placed for the machinery of a 13,000 horse-power plant to be erected on the Cellina River in Northern Italy, the energy to be supplied, at a tension of 36,000 volts, to Venice, Udine, Pordenone and other towns. Current in this installation will be transmitted over distances up to 56 miles. The current will be three-phase, and will be generated at a comparatively low tension of a few thousand volts, and raised to the transmission voltage by means of stationary transformers.

**THE USE OF MECHANICAL STOKERS.**

A list of recent installations of Roney mechanical stokers, which has just been compiled by Westinghouse, Church, Kerr & Co., goes far toward substantiating their claim that this apparatus forms a part of the equipment of most of the modern steam plants in which a high standard of engineering has been adopted, and in which the selection of apparatus is governed by merit. The list starts with the four large organizations upon which New York City depends for its lighting and transportation service, namely, New York Edison Company, Metropolitan Railway Company, Third Avenue Railway Company (now controlled by the Metropolitan), and the Manhattan Railway Company. These plants aggregate 128,500 h. p. boiler capacity, fitted with Roney mechanical stokers. Lighting, street railway, and industrial concerns throughout the country swell the aggregate to a round half-million horse power. The list is thoroughly representative of power-using industries, and includes central station and isolated electric lighting plants, street railway power houses,

**SALES OF FAMOUS OIL FILTERS.**

The Liberty Manufacturing Company, Pittsburg, report the following recent sales of the well-known Famous Oil Filter and Refiner:

New York Club Building, New York City; Onondaga Lake Railway Company, Syracuse, N. Y.; L. M. Rumsey Manufacturing Company, St. Louis, Mo.; Berliner & Son, New York City; Southern Elevator, East St. Louis, Ill.; The Grand Leader, St. Louis, Mo.; Iron River Light & Power Company, Iron River, Wis.; The Arcade Building, East St. Louis, Ill.; Ashburn Mining Company, Folsom, Cal.; City of North Vernon, Water and Light Department, North Vernon, Ind.; Commercial Building, St. Louis, Mo.; Cannonsburg Electric Light, Heat & Power Company, Cannonsburg, Pa.; Colorado Ice & Cold Storage Company, Kansas City, Kan.; Pitcher Lead Company, Joplin, Mo.; Peper Tobacco Company, St. Louis, Mo.; Firth Carpet Company, Firth Cliffe, N. Y.; John Shroeder Lumber Company, Milwaukee, Wis.; Armour & Co., Sioux City, Iowa; Messrs. George I. Roberts & Bros., New York.

ing of known width. The width of this opening bears a known and definite relation to the circumference of the circle described by the spout; thus a known portion or sample is caught and conducted by the tube through the casing into any convenient receptacle placed outside of the sampler and under the outer end of this tube.

The operation of the machine is simple, absolutely automatic and requires no attention. One of these samplers has been in constant and successful operation for the past two years in a well known plant near Butte, Montana.

Five sizes of this machine are now being manufactured and carried in stock, varying in capacity from 25 to 600 gallons per minute. Other sizes can be made if desired. The standard machine is designed to cut out a sample exactly 1-2000 part of the entire amount of water and material flowing through the sampler. When required for use in cyanide or chemical work every part can be made of the material best adapted to meet requirements.

This sampler was invented by Mr. Owen Byrnes, Marysville, Mont. The American Engineering

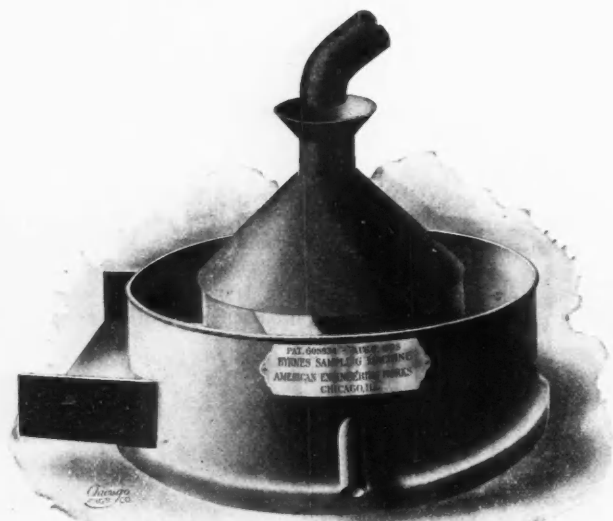


FIG. 1.

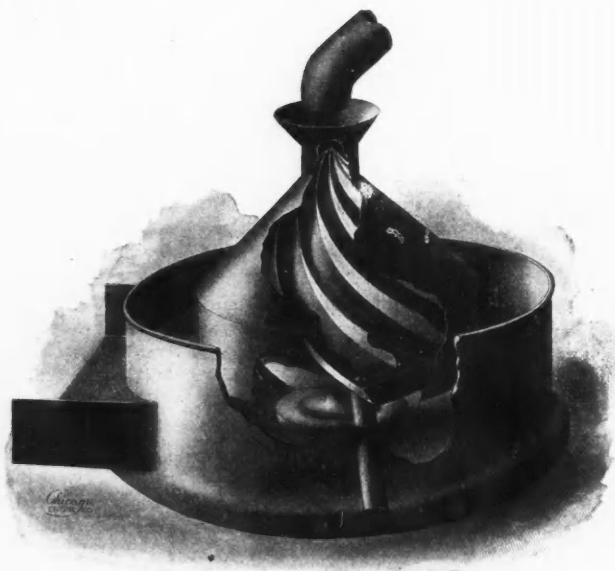


FIG. 2.

BYRNES' AUTOMATIC PULP SAMPLING MACHINE.

steam railroad shops and terminal stations, refineries, chemical works, cotton, woolen and silk mills, mining, smelting and refining plants, paper and flour mills and large manufacturing companies of every description. Probably the strongest recommendation for the Roney stoker aside from the general recognition it has enjoyed is in its adoption by the government engineers for public works, particularly in the large power plants of the Navy Department. Brooklyn, Boston, Washington and Portsmouth Navy Yards have all adopted this type of stoker, and the United States Naval Proving Ground at Indian Head, Md., has duplicated its original order, making a total of 600 h. p. boiler capacity. This duplication of orders is another feature that shows the favor in which this apparatus is held. The United Railways and Electric Company of Baltimore has placed eight orders since the original equipment was installed; the Pennsylvania Railroad Company has placed seven, and the American Locomotive Works three, while the Lackawanna Iron and Steel Company, the Republic Iron and Steel Company, the Aetna Iron and Steel Company, and the Carnegie Steel Company have added to their equipments of Roney stokers every time they have enlarged their steam plants. The reputation of this apparatus has brought orders from other countries, the most notable among recent installations being one in South Africa for 500 h. p. boiler capacity and one in Mexico of similar size. Shipments of Roney stokers to England during the last year show a growing appreciation of the special features of this apparatus.

**BYRNES' AUTOMATIC PULP-SAMPLING MACHINE.**

Every practical mill-man knows that the prevalent practice of a cup or dipperful of material every half hour or hour, whether taken by machine or hand, is an inaccurate method of sampling ores. The sampling machine represented by the accompanying cuts should be located in the system of launders or pipes in a mill so as to take the entire flow from the stamps or crushing machinery, or the entire flow of concentrates or tailings from tables, vanners, etc. From this entire flow an absolutely average and definitely known part or sample can be taken. Fig. 1 is an outside view of the machine and Fig. 2 shows the internal construction.

Material is received in the hopper of the sampler on the apex of an inside cone, the space between the inner and outer cones being divided into 10 equal spiral chambers. It is evident that when the material flows through these spiral chambers a rotary motion will be developed. Nine of the spiral chambers discharge directly into the fixed casing forming the base of the sampler and through the free outlet of the casing can be led wherever desired. One of the spiral chambers is entirely closed and extends through the outer cone, terminating in a spout or chute which is open on the bottom. This spout or chute also discharges into the casing forming the base of the sampler, but at every rotation of the double cone the spout passes over and discharges a certain amount of the material being sampled into a tube provided with a slotted open-

Works of Chicago are the sole licensees under the Byrnes patent and will be pleased to furnish full information and quote prices to anyone requiring this apparatus.

**THE PARNALL-KRAUSE STAMP MILL MORTAR.**

The accompanying illustrations show a new pattern of mortar for stamp mills recently patented by William E. Parnall, Sr., and Charles H. Krause. These mortars are intended for use with the heavy steam stamp used for crushing copper bearing rock in the Lake Superior region. These mills are provided with single stamps, housings or casings enclosing the space around the stamps and above the mortars and constituting a permanent frame work for carrying the roof of the mortar and for holding the screens or grates in place. The housing, or mortar, has from two to four openings, arranged on opposite sides of the stamp and mortar, and these are provided with straight, flat or plane screens, which are usually inclined outward toward the top and are located at some distance from the stamp and the cavity of the mortar. It will be apparent that only a small part of such plane screens can be perpendicular to the splash, which radiates from all sides of the stamp, and that pieces of free metal small enough to pass straight through holes in that part of the screen which is perpendicular to the splash cannot pass obliquely through holes of the same size in other parts of the screen, but will be



thrown back into the mortar and subjected again to the powerful blows of the stamp.

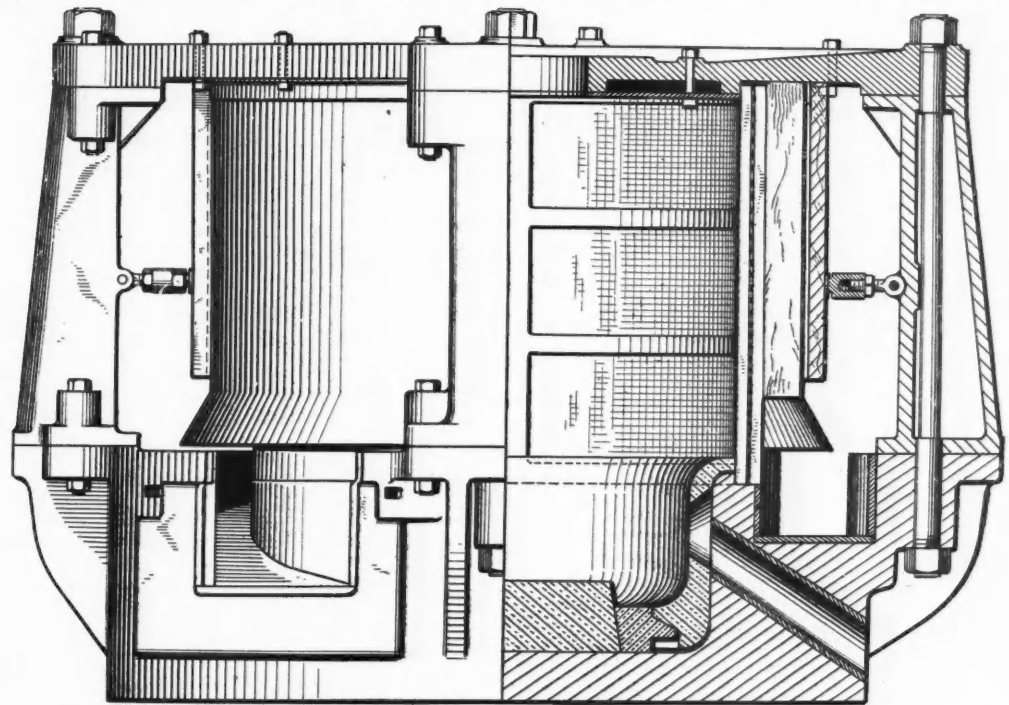
This repeated action of the stamp upon free pieces of copper is undesirable for several reasons: It reduces the capacity of the mill and correspondingly increases the cost of crushing a given quantity of rock; it increases the losses in fine material, or slimes, which are produced by the repeated pounding of the free metal, and the longer the copper is retained in the mortar the greater will be the percentage of iron mixed with it from the constant wear and abrasion of the stamp, liners and parts of the mortar which are exposed to the cutting and abrading action of the hard crushed rock. The permanent frame work forms a considerable part of the enclosure around the stamp and mortar, reduces to that extent the screening area, and, consequently, the discharging capacity of such mills, and must be protected by linings which are exposed to the powerful splash of sharp pulp or sand from the heavy stamp and consequently are subjected to rapid abrasion and wear and must be frequently renewed, thus entailing constant care, trouble and expense.

It follows, therefore, that in the stamp mills having plane screens or grates arranged in the permanent casings which form a considerable part of the enclosure around the mortar, their capacity to crush the rock and free the metal is much greater than their capacity to discharge or get rid of the freed metal. The total output of these mills is thus materially reduced, loss in fine slimes is largely increased, and the quality and value of the metal impaired.

In this improved mortar, by the construction and arrangement of the parts, it is claimed, that the grates are more advantageously and effectively disposed, and their effective area for the discharge of the pulp or sand and free metal is increased to a maximum, while the area of the permanent parts of

fine material in slimes is reduced, the quality of the metal obtained is improved and the time, trouble and expense required to renew linings and parts exposed to abrasion are to a great extent avoided. The mortar and stamp being completely surrounded by

taken by the Parnall-Krause Machinery Agency, of which Mr. Charles H. Krause, of Houghton, Mich., is manager. Some of the devices covered by these patents are already in use in Lake Superior mills, having been manufactured at the Nordberg Works,



HALF SECTIONAL ELEVATION, PARNALL-KRAUSE MORTAR.

the grates and splash-pan, which can be easily removed in sections, either partially or wholly, are more easily accessible for inspection and repair than

in Milwaukee, and at the works of the Portage Lake Foundry and Machine Company, at Ripley.

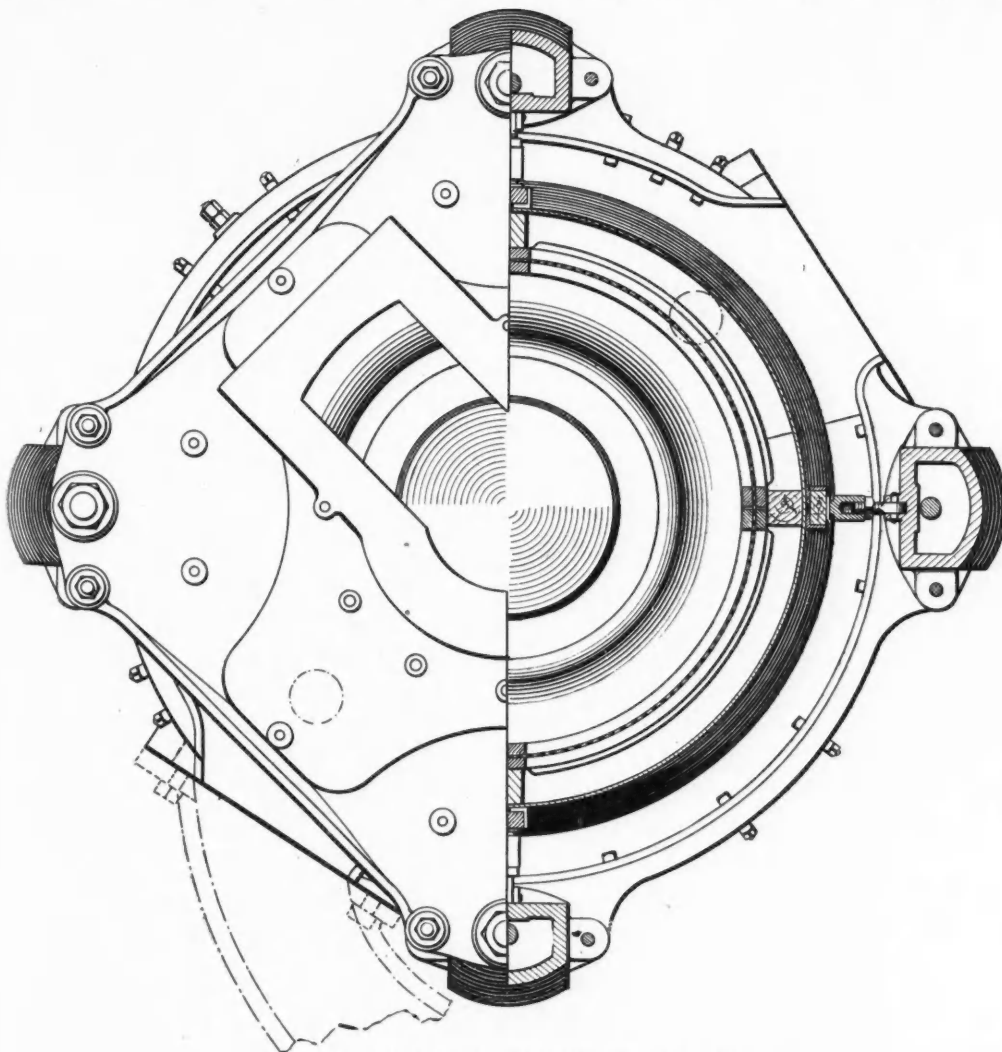
**CROCKER-WHEELER COMPANY EQUIPMENT IN THE U. S. MINT.**

The month of March has brought to the above company orders for 11 more motors to be added to its already large equipment in the new Philadelphia Mint. This brings the total number furnished to 120, besides four generators aggregating 625 kilowatts. Nearly the entire installation is of Crocker-Wheeler manufacture and the plant is most interesting in the completeness of the distribution of power by electricity. In fact, the metal is electrically treated from the time it enters the building until it leaves it. The electric current refines it, the rough ingot is topped, rolled, cut and weighed all in motor-driven machines; an acid bath then leaves it ready for the coining machines, which are a unique application of a small motor driving a large fly-wheel of sufficient momentum to insure a heavy pressure at the instant of stamping. The whole plant demonstrates the extent to which electric operation may be successfully carried.

**THE KENNICOTT WATER SOFTENER.**

Good water is always desirable for the economical operation of any steam plant and in most chemical and mechanical operations. Water the softness of which closely approaches rain water, regardless of the lime or other incrusting salts contained in the original source of supply is claimed to be secured by means of the Kennicott water softener. This apparatus, manufactured by the Kennicott Water Softener Company, Chicago, is operated upon the idea that water should be purified outside the boiler; since after the scale-forming material enters the boiler it cannot be removed except by emptying the boiler. The introduction of anything into the boiler which causes the precipitation of lime, magnesia, or other scale-forming material, can only add to the material already there; while if proper materials are used in the water outside of the boiler and the precipitated matter collected and removed by suitable means before the water enters the boiler the desired result is obtained and the boilers are kept free from scale.

The softener consists of a steel settling tank surmounted by smaller tanks or boxes in which the precipitating reagents are placed from time to time.



HALF SECTIONAL PLAN, PARNALL-KRAUSE MORTAR.

the mill exposed to the abrading and destructive effect of the splash is reduced to a minimum; hence the capacity of the mill is greatly increased, loss of

when they are partially inclosed on the sides by a permanent casing or housing.

The manufacture of these mortars has been under-

An overshot water wheel turned by the water to be purified as it flows into the machine furnishes the small amount of power required. The chemicals required are no secret, and are purchased in open market by users of the apparatus.

The cost of materials for softening water is said to be from ½ cent to 8 cents per 1,000 gallons of water treated, averaging about 2 cents. At this price for purification, this apparatus should bring into use many deep wells abandoned for city water which frequently costs from 8 to 10 cents per 1,000 gallons.

Water is treated either cold or hot, heat not being necessary to the operation in this process. The Kennicott Company makes proposals for the installation of its softeners only after making a chemical analysis and special tests upon the water to be used. A corps of chemists is kept for this purpose, the laboratory being especially equipped entirely for water analysis.

The company's method of marking samples of water is as follows: An intending purchaser is supplied with a sample inquiry blank whereon he may answer questions relative to the size of the plant and the duty which will be required of the softener. A tag envelope is also supplied, this envelope being addressed to Kennicott Water Softener Company. The inquiry sheet is enclosed in the tag envelope and the tag envelope is used to mark the demijohn containing the sample of water. Thus the data in regard to the sample of water are directly attached to the sample, and the danger of error is avoided.

The apparatus is also adapted for the treatment of acid and mine waters and is said to completely neutralize any free acid. It is also adapted for the removal of material other than incrusting salts. The company is prepared to undertake the investigation and removal of any material from water and is able to place at the disposal of intending purchasers of its machinery the services of expert chemists who have made water their specialty for many years.

#### AN OIL SAVER.

The injudicious use of ordinary oil cans provides opportunities for great wastefulness of lubricating oils. The device herewith illustrated in two different forms for economically applying oil to working parts, is reputed to have had its origin in an operating department of pronounced wastefulness, and originally provided for the oiling of mine car wheels, but the benefits derived extended its use to the operating departments of mining and other machinery and general manufacturing institutions wherever lubricants are required. A saving of 50 per cent in both labor and also oil is alleged to have followed its adoption



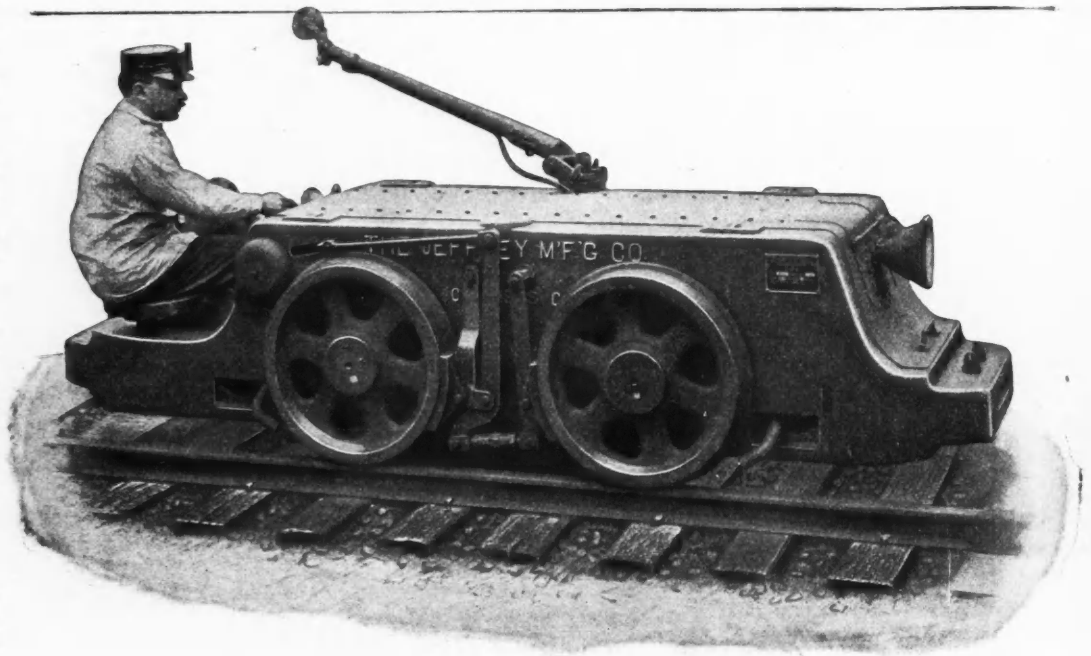
TORMAY IMPROVED OIL SAVER.

in some of the larger coal mining properties. Like other innovations, the earlier productions are said to have been deficient in construction. The Ironsides improved Tormay patent oiler, illustrated herewith, is said to be the outcome of all past experience, from which former weaknesses have been eliminated, while improvements suggested by experience have been incorporated. It is now described as an article

of superior design, workmanship and durability. The oiler consists of a central working barrel, containing a plunger and surrounded by an oil reservoir. Openings in the working barrel, sealed or unsealed, according to position of plunger, communicate with the oil reservoir. The adjustability of the stroke of plunger governs the quantity of oil for each operation. When not in use its contents are not only preserved from leakage, but also protected from dust and other impurities. The oiler is made by the Ironsides Company, Columbus, Ohio.

#### JEFFREY ELECTRIC LOCOMOTIVES.

The accompanying illustration shows a four-ton Jeffrey electric locomotive of the single or gondola type in which the seat for the motoneer is located at one end of the locomotive. It is equipped with two motors of 10 h. p. each. They are of the enclosed multipolar railway type. Each axle is driven by one of



JEFFREY SINGLE-END, GONDOLA-TYPE MINE LOCOMOTIVE.

the motors through single reduction gearing. The gears are of steel with machine-cut teeth. This locomotive develops a draw-bar pull of 1,000 pounds, at a speed of 6 to 8 miles per hour. Upon a level track and clean dry rails it will haul a train load of 33 tons gross made up of mine cars having well lubricated loose wheels. With a reduction of friction losses in the train, the locomotive will haul proportionately greater loads. All controlling mechanism is arranged so that the motoneer does not have to leave his seat to operate any portion of it.

The Jeffrey electric controller is of substantial construction, thoroughly insulated where necessary, and inclosed so as to protect the contacts and wearing parts from dirt and moisture. The controller is arranged so that the motors may be reversed only when the current is shut off. A separate switch is provided so that the motors may be started and run either in series or parallel, thus enabling the motoneer to use the current economically in starting, but at the same time giving him opportunity to start heavy loads with motors in parallel when a long distance from the power house, where the line of voltage is liable to be low. This feature is particularly valuable in mine work, where it is not considered necessary to run heavy copper circuits, or where the rails are not carefully bonded for the return circuit. Resistance coils of ample capacity and having large radiating surface are provided for starting the locomotive and for running at slow speed when desired.

The brakes are operated by a screw and hand wheel, which renders the mechanism self-locking in any position the motoneer desires to leave it.

Pressure upon the several brake shoes is equalized by a system of levers so that the braking effect is equally distributed upon the wheels, and all the wheels wear equally.

The headlights shown in the illustration are of the oil type, but electric headlights of either the incandescent or arc-lamp pattern may be used upon the locomotive. The trolley pole is placed at one side of the locomotive, thus bringing the trolley wire outside of the rails so that the danger of electric shock to men or animals within the mine is eliminated. The locomotive is arranged so that the trolley pole may be placed upon either side to suit the arrangement of mine wiring.

The four-ton locomotive shown in the illustration is built to any gauge, from 18 inches up. The minimum height above rail is 29 inches, and the length over all, excluding bumpers, is 9 feet 3 inches. The wheels are 24 inches in diameter and the wheel base is 36 inches. The locomotive is manufactured

by the Jeffrey Manufacturing Company, Columbus, Ohio.

#### PATENTS RELATING TO MINING AND METALLURGY

##### UNITED STATES.

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

Week ending March 18, 1902.

- 695,483. MACHINE FOR MOLDING ARTIFICIAL STONE.—Noyes F. Palmer, Brooklyn, N. Y. The combination of a mold-box, with an inclosed core, a perforated false bottom embracing the core, means for raising the false bottom, means for lowering the core, and means for simultaneously operating the false-bottom-raising means and the core-lowering means.
- 695,490. WIRE-DRAWING MACHINE.—Marcellus Reid, Providence, R. I., assignor to Charles De Hart Brower, trustee, New York, N. Y. A friction wire-drawing drum, a friction-band encircling the periphery of said friction-drum adapted to grip said drum and a lever and cam attached to the friction-band.
- 695,567. MACHINE FOR STAMPING COAL.—Rudolf Kuhn, Bruck, Germany. In a coal-stamper, the combination of a carriage, with a vertically-movable slide carried thereby, a drop-plunger, means for removably connecting said plunger to the slide, means for releasing the plunger from the slide, and means for propelling the carriage by the movement of the plunger.
- 695,590. BRICK AND KILN FURNACE.—Frank E. Swift, Washington, Iowa. A furnace having combustion-chambers provided at the front with doors or openings, a coking-chamber also provided at the front with a door or opening, a coking-table in said chamber, discharge-openings in the rear of the furnace communicating with the coking and

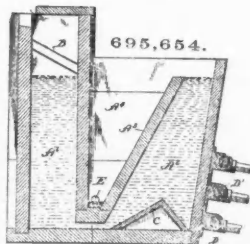


combustion chambers, an air-heating chamber, flues connecting said chamber with the discharge-openings, a flue for conducting air to the air-heating chamber, and flues for conducting the heated air from the air-heating chamber to the combustion-chambers.

695,592. **HOISTING AND CONVEYING APPARATUS.**—George E. Titcomb, Cleveland, Ohio, assignor of one-half to the McMyer Manufacturing Company, Cleveland, Ohio, a partnership. A bucket having a rotatable driving member adapted by its rotation to close the bucket, combined with a cable depending in a bight and adapted to rotate said mechanism and also adapted to play idly through the bucket when one ply of the cables moves up and the other down at the same rate.

695,604. **FURNACE-CHARGING APPARATUS.**—Benjamin A. Franklin, Philadelphia, Pa. In a furnace-charger, the combination with two independent carriages, of a frame having at one end a horizontal and a vertical pivotal connection with one of said carriages, and having at the other end a similar connection with the other carriage, and a charging-bar, longitudinally movable in said frame.

695,632. **COMPRESSED-AIR WATER-ELEVATOR.**—Greenlee D. Buchanan, Jacksonville, Fla. A device comprising two separate water-chambers, each having a valved water-inlet at its bottom and a valved air-vent at its top, an air-supply pipe connected with each of the chambers, a rotary valve carried by each of the said pipes and provided each with a crank-arm, a walking-beam, a link carried by each of the ends of the walking-beam and connected to the said crank-arms, a rod connecting with each crank and with the air-vent valve, a shift-rod in each of the chambers, a water-holding cup carried by each of the shift-rods, a connection between each shift-rod and the cranks of the rotary valve, and valved discharge-pipes having their lower ends disposed adjacent to the lower ends of the said chamber.



695,635. **PROCESS OF MAKING METAL TUBES.**—Elisha Emerson, Providence, R. I. A process for making tubes and cylinders by electrodeposition, the same consisting in forming a thin sheet of metal by electrodeposition on a metal cathode, removing the sheet, forming the sheet into a tube or cylinder by uniting the edges, placing the tube or cylinder on a support in an electrolytic vat and depositing metal until the required thickness of metal is secured.

695,654. **ORE-PULP DISTRIBUTER.**—Frederick W. Sherman, Park City, Utah, assignor to the Gates Iron Works, Chicago, Ill., a corporation of Illinois. A receptacle provided with a pressure-chamber and a sizing-chamber connected together by means of a narrow channel at the lower portion thereof, and discharge-valve mechanism in the sizing-chamber to draw off the classified product.

695,659. **COUPLING FOR WELL-DRILLING TOOLS.**—William D. Snyder, Rives, Ohio. A locking device for well-drilling tools, comprising a bolt, a ratchet mounted for sliding movement thereon and carrying a pin projecting beyond the bolt, and a rotatable ratchet adapted to be turned into engagement with the slidable ratchet and having an opening through which the said pin projects.

695,667. **PROCESS OF PRODUCING EXPLOSIVES.**—Joseph Bonnet, Paris, France. A process of producing an explosive compound consisting in dissolving a nitro derivative in free fatty acid and then adding a suitable substance to support combustion.

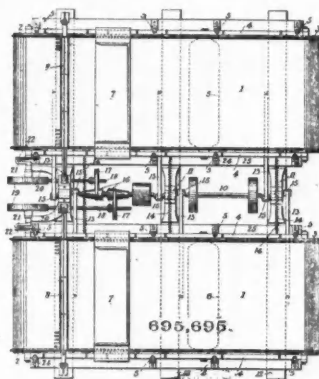
695,670. **PROCESS OF MANUFACTURING IRON AND IRON ALLOYS.**—Francis C. Crean, Montreal, Canada. In making iron or iron alloy by mixing iron particles and molten metal, feeding one of the ingredients first to the bottom of a vessel containing the other ingredient and then changing the point of feeding.

695,678. **FIREPROOFED WOOD AND METHOD OF MAKING SAME.**—Joseph L. Ferrell, Philadelphia, Pa. A product, characterized by capacity to resist flame, and consisting of wood impregnated with aluminum sulphate, substantially as set forth.

695,679. **FIREPROOFING COMPOUND AND METHOD OF MAKING SAME.**—Joseph L. Ferrell, Philadelphia, Pa. A fireproofing compound, consisting of an aqueous solution of aluminum sulphate mixed with another chemical capable of obviating the discoloring effect of the sulphate.

695,693. **ORE OR GRAIN SACK.**—William R. Morris, Cripple Creek, Colo. A bag or sack provided on its outside and at or near the mouth of the bag proper with a reinforcing portion extending entirely around the same, an extension or flap above the mouth of the bag proper, and a plurality of two-part fastening means applied at intervals on the reinforcing portion, the two members of each fastener being on opposite sides of the bag, the extension or flap being designed to be formed into a tight roll, and when thus formed to have its ends project beyond the sides

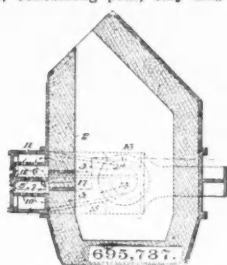
of the bag to form handholds, and also to permit the fastening means to be secured over the same so as to completely close the sack, and a part of the reinforcing portion to be brought over the roll.



695,695. **ORE-CONCENTRATING MACHINE.**—Walter McDermott and Francis E. Elmore, London, assignors to the Frue Vanning Machine Company, Detroit, Mich., a corporation of Michigan. The combination with two belts and frames for supporting same and means for causing said belts to travel, of a common operating-shaft, connecting-rods carried by the frames, cranks carried by the shaft and acting on the connecting-rods for moving both frames in opposite directions, connecting-rods engaging with the cranks without caps whereby a thrusting motion only is imparted to them, springs connected to said frames for producing a reverse movement of same, whereby an even motion without jar is obtained, two cone-pulleys on the shaft, a driving-roller for each belt and means connecting each cone-pulley with a roller so that the two belts while driven from the shaft may be independently regulated with reference to the speed of the latter.

695,716. **APPARATUS FOR PERFORATING BLOOMS.**—John Fritz, Bethlehem, Pa. An apparatus comprising a punch and a mold provided interiorly with projections adapted to engage an expanding ingot or bloom as it is expanded by the punch and to forge projections thereon and to hold it against the longitudinal force of the punch and maintain it from crushing without the side walls of the mold intimately engaging it.

695,730. **COMPOSITION OF MATTER.**—Frank Jones and Charles L. Pennell, Massillon, Ohio. A composition of matter to be used as a core for casting pipes and other tubular articles, containing peat, clay and soda-ash.



695,737. **CONVERTER.**—John S. Klein, Oil City, Pa. A side-blowing converter, having at an intermediate part of its height a surrounding supporting-hand provided with trunnions, said converter being provided with a substantially continuous blast-slot extending across one side intermediate of its height, continuous lining-plates for the slot, spacers to hold the plates apart, and a wind-box covering the slot.

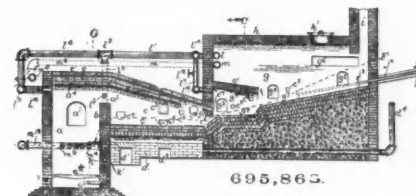
695,745. **DRILL FOR DEEP WELLS.**—John W. Livermore, Berkeley, Cal. A drill-tool comprising an open base-ring, having a rabbeted edge, a diametrical web extending across and also below said ring, and formed at the bottom into two arc-shaped cutters connected by a diametrical cutter, a solid neck projecting upwardly from the base-ring and hinged valves for opening and closing said ring; all in combination with a casing fitted to said rabbeted edge, a drill-rod having a screw connection to said neck, a threaded section on the drill-rod adjacent to the upper end of the casing, and means for securing the upper end of the casing to said threaded section.

695,762. **PROCESS OF PURIFYING ALUMINOUS ORES.**—Dmitry A. Peniakoff, Brussels, Belgium. In the treatment of ferro-aluminous ores, such as bauxites, a process which consists in converting the iron compounds therein into sulphides and then extracting the iron sulphide thus formed with an acid capable of attacking the iron sulphide.

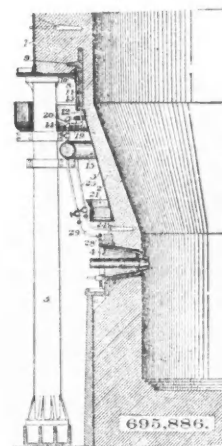
695,790. **COAL-WASHER AND ORE-CONCENTRATOR.**—Alonzo C. Campbell, Asheville, N. C. A machine provided with a pan, and means for oscillating the pan and imparting a percussive action to the same, said pan having a true bottom and a false bottom, a chamber being between the bottoms and increasing in depth toward the discharge end and in the direction in which the percussion takes place, said false bottom consisting of spaced riffles having perforated pockets at the forward ends.

695,858. **MINE-GATE.**—Newton K. Bowman, North Lawrence, Ohio. In combination with a gate, a lock therefor upon each side, a trip at each side of the gate a distance

therefrom, and connecting means between the trips and the gate, including bars mounted for longitudinal movement in opposite directions, the parts being combined, whereby the actuation of a trip upon one side of the gate by the approach of a car effects an opening of the gate and sets the lock upon the opposite or far side of the gate to hold the latter open, and whereby operation of the remote trip effects a release of the lock and permits the gate to close.



695,868. **REVERBERATORY SMELTING-FURNACE.**—Frederick Nevergold, Portland, Oregon. The combination of a fire-chamber, a smelting-chamber and an intermediate concentrating-chamber; a bridge-wall between the fire-chamber and the concentrating-chamber; a reverberating roof over both the last mentioned chambers; a wall between the concentrating and smelting chambers having an upper passage-way, or flue, and a lower passage-way for the fluid smelted material; and an auxiliary fire-chamber under the concentrating-chamber.



695,886. **BLAST-FURNACE.**—Charles I. Rader, Youngstown, Ohio, assignor of one-half to William H. Hassinger. A blast-furnace having a mantle, vertical water-cooled plates in its walls at the level of the mantle, a jacket surrounding the plates, means for cooling the plates, a bosh-jacket surrounding the furnace-bosh, and means for cooling the said bosh-jacket.

GREAT BRITAIN.

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

Week Ending February 27, 1902.

- 2,750 of 1901. **WATER GAS-MAKING.**—J. C. H. Kramers and J. G. Aarts, Breda, Holland. Improvement in furnaces for making water gas.
- 3,666 of 1901. **COLLIERY TUB-BRAKE.**—R. Wilkinson, J. King and C. Hanks, Leeds. Improved automatic brake mechanism for colliery tubs.
- 3,894 of 1901. **SHARPENING ROCK DRILLS.**—G. J. Glossop, Leeds. Machines for making and sharpening three-winged rock drills.
- 5,764 of 1901. **ELECTRODEPOSITION OF ZINC.**—L. Mond, London. In the electrodeposition of zinc, the use of revolving cathodes in contact with each other so as to prevent the spongy formation.
- 6,829 of 1901. **SULPHURIC ACID MAKING.**—Badische Anilin and Soda Fabrik, Ludwigshafen-on-Rhein, Germany. Manufacture of sulphuric acid constantly maintained at a strength of 97-99 per cent.
- 7,542 of 1901. **COAL BREAKER.**—P. Alriq, Paris, France. A plant for breaking, sorting and packing coal.
- 11,337 of 1901. **WHITE LEAD MAKING.**—F. J. Corbett, Melbourne, Victoria. Manufacture of white lead by treating litharge in a solvent liquid with a carbonic acid.
- 14,266 of 1901. **NON-CORRODING ALLOY.**—J. S. Wolfe and T. J. Geiger, Catsauqua, Pa., U. S. A. A copper alloy containing tin and iron, to be used as a substitute for toughest steels, and having the property of not corroding.
- 22,233 of 1901. **HARDENING STEEL.**—C. Davis, Washington, U. S. A. Hardening steels by means of a series of electric arcs acting directly on the surfaces.
- 25,671 of 1901. **HARDENING STEEL.**—C. Davis, Washington, U. S. A. Methods of hardening tool steels by chilling at very high temperatures.
- 26,595 of 1901. **AMALGAMATOR.**—W. F. Bedell, Kaslo, B. C. An amalgamating pan for use in connection with gold gravels.

## PERSONALS.

Mr. Homer P. Ritter, of the United States Geodetic Survey, is in San Francisco, Cal.

Senator Thomas Kearns, who is interested in the Silver King Mine, in Utah, is visiting New York City.

Mr. Victor M. Clement has returned to Salt Lake, Utah, from Mexico after inspecting his properties there.

Mr. P. L. Shuman, of the California Spiral Pipe Company, of San Francisco, Cal., has been in New York City.

Mr. Henry M. Crowther, of Salt Lake, Utah, has gone to Nevada to report on mining properties for New York parties.

Mr. Carl Hendrick, the well-known metallurgist, has returned to Salisbury, N. C., from a professional trip to Arizona.

Mr. C. W. Kempton has recently returned to New York City from a professional trip to Chile and Colombia, South America.

Mr. Bertram Hunt, cyanide expert of San Francisco, Cal., has returned to that city from San Bernardino County, Cal.

Mr. A. H. Gracey, managing director of the Imperial Development Company, of British Columbia, has been visiting mines in California.

Mr. R. W. MacFarland, a mining engineer of Ymir, B. C., has gone to Singapore, Straits Settlement, to prospect gold fields in Siam.

Capt. Josiah Hall, mine inspector of Houghton County, Mich., recently made an extended tour of the southwestern mining district.

Mr. W. Pollard has resigned as foreman of the South Eureka Mine at Sutter Creek, Cal., to accept a position at Coolgardie, West Australia.

Mr. Walter Wyman, a Chicago coal mine owner, recently visited the Lake Superior copper district in quest of pre-historic copper relics.

Mr. Charles Briggs, of Calumet, Mich., president of the Calumet & Arizona Mining Company, is sojourning at Pasadena, Cal., for his health.

Mr. J. H. Pratt, professor of geology and mineralogy in the University of North Carolina, has been examining mines in Washoe County, Nev.

Mr. James H. Henley, formerly superintendent of the Ibox Mine, Leadville, Colo., is now superintendent of the Elkton Mine, Cripple Creek, Colo.

Messrs. J. W. Schofield and George B. Nichols, Liverpool, Eng., of the Serra Steamship Line, were visitors to the Birmingham District last week.

Capt. J. C. Lewis, of Rock Lake, Ont., superintendent of the Rock Lake Copper Company, recently visited the Michigan copper district on business.

Mr. Stephen Goulshammarrow, an oil expert of international reputation, is in San Francisco, Cal., to gather oil statistics for the Russian Government.

Capt. James Chynoweth, superintendent of the Tri-mountain and Centennial copper mines, recently returned to Calumet, Mich., from Milwaukee, Wis.

Mr. D. R. Oliver, president of the Zubiata Mining Company, La Colorada, Sonora, Mex., is in San Francisco, Cal., to attend the company's annual meeting.

Capt. W. Murdock Wiley, manager of the Union Copper Mines at Gold Hill, N. C., was in New York City on March 29 to attend a meeting of his company.

Mr. G. L. Hedges has resigned as general manager of the Wauconda Mine at Wauconda, Wash., on account of ill health and Mr. J. B. Rossman is temporarily in charge.

Mr. Gordon R. Campbell, secretary and counsel of the Calumet & Arizona Mining Company, recently returned to Calumet, Mich., from a visit to the mines at Bisbee, Ariz.

Mr. F. Saxton, of Bodie, Cal., has been summoned by cable to resume the duties of his former position with the Transvaal Mining Company, which employed him before the war.

Mr. Robert F. Carr, vice president and general manager of the Dearborn Drug and Chemical Works, of New York and Chicago, is on his way to San Francisco via Los Angeles.

Mr. Samuel G. Moffitt has resigned the superintendency of the open-hearth plant of the National Steel Company at Sharon, Pa., to accept a similar position with the LaBelle Iron Works, Steubenville, O.

Mr. Joseph Panterow, general foreman of the blacksmith and other shops of the Westinghouse Electric and Manufacturing Company, at East Pittsburg, Pa., has been appointed to a similar position in the British Westinghouse plant at Manchester, Eng.

Mr. David Baker has been appointed successor to Mr. A. J. Moxham as general manager of the plant of the Dominion Steel and Iron Company, of Sydney, N. S. Mr. Moxham recently tendered his resignation as manager but retained his official connection with the company.

Mr. Fred H. Dakin, mining engineer of San Francisco, Cal., has been retained by a Boston, Mass., syndicate to explore the old river beds of Upper California for gold. The work for the present will be confined to Butte and Plumas counties, a virgin field for this class of mining.

Mr. William Braden, late of the engineering staff of the Boston & Montana Consolidated Copper and Silver Mining Company, at Butte, Mont., and formerly with the Montana Mining Company at Marysville, Mont., has established an office as consulting mining engineer at 32 Broadway, New York City.

Col. Gilbert J. Root, of San Francisco, Cal., is building a large barge in Humboldt County, Cal., for the purpose of working auriferous sands in the spit dividing the Big Lagoon from the ocean. He will use the Johnson process, which is the property of the Rose Gold Reclamation Company, of San Francisco.

Mr. J. L. Brass, manager of the Virginia Iron, Coal and Coke Company, Bristol, Va., has resigned to take effect on April 1. Mr. W. R. Wills has resigned as treasurer of the same company and will be succeeded by Mr. John W. Core, at present traveling auditor. Mr. D. Davies, auditor, has been appointed to succeed Mr. Brass as manager. Mr. W. B. Bowles will succeed Mr. Davies as auditor.

Mr. F. G. Coggin, Jr., of Torch Lake, Mich., has been appointed superintendent of the Champion Mill to take effect May 1. He is in reality made superintendent of the Copper Range Consolidated Mills. Mr. Coggin served his apprenticeship with the Calumet & Hecla as a machinist. Later he graduated from the Massachusetts Institute of Technology. In 1894 he became superintendent of the Atlantic Mill.

Mr. E. E. Loomis, who for some years has been superintendent of the mining department of the Delaware, Lackawanna & Western Railroad Company, has been appointed general manager of the mining and sales department. He has been succeeded as superintendent of the coal department by Mr. Reese A. Phillips, for several years superintendent of the Scranton district. The position of assistant superintendent of the coal department has also been created, and Mr. C. E. Tobey, Mr. Loomis's chief clerk, has been appointed thereto.

President E. O. Hopkins, of the Sloss-Sheffield Steel and Iron Company, the second largest iron producing company in the South, will tender his resignation soon. He was re-elected but a week or two before the announcement was made. Mr. Gentry Hillman, furnace manager for the company, has tendered his resignation, effective May 1. The statement is also made that Mr. J. J. Gray, Jr., superintendent of the Sloss-Sheffield Company's properties in Florence and Sheffield, Ala., is considering his resignation, he having become interested in the furnace at Rockdale, Tenn., along the Louisville & Nashville Railroad. It is further stated that other resignations in this company will follow that of the president. While nothing positive is announced, it is generally believed that Mr. J. C. Mabin, one of the stockholders and directors in the company, will succeed Mr. Hopkins in the presidency.

## OBITUARY.

David Mahanay, president of the Quicksilver Mining Company, is dead. He was born in New York City 77 years ago. During his earlier years he was interested in the drug business but for the past 33 years he had been at the head of the Quicksilver Mining Company. He leaves a son and a daughter.

Augustus Boardman Coit died in the Murray Hill Hotel, New York City, March 28 from a stroke of paralysis. He was 71 years old. Mr. Coit was born in New York City. In early life he went to Buffalo and then to St. Louis, where he acquired heavy mining interests, being at one time the principal stockholder in the Consolidated Utah Copper Company. Mr. Coit returned to New York City 15 years ago, at the time announcing his retirement from active business. He retained a membership in the New York Produce Exchange.

Capt. John Little for 15 years night superintendent of the Edgar Thomson Mills of the Carnegie Steel Company, died at his home in Braddock, Pa., recently. Captain Little was born in Freeport 61 years ago. When a boy he went to Johnstown to work in the mill. At the breaking out of the civil war he enlisted as a private in the Fifty-fourth Pennsylvania Infantry and at the close he was captain of his company. From 1866 to 1874 he was head roller of the Cambria Iron Works. In the latter year he came to Braddock with the late Captain W. R. Jones, and for 10 years was head roller at the Edgar Thomson Works. In 1884 he was made night superintendent of the rolling mills, and later of the entire plant. He was obliged to resign 3 years ago on account of ill health. He leaves a widow and 6 children.

Captain James Mitchell, an old resident of Bessemer, Mich., and a pioneer of the Gogebic iron range, died in Bessemer recently of chronic stomach trouble,

with which he had been afflicted for many years. Captain Mitchell went to the Gogebic range from the Marquette range in 1884 and was one of those who mined the first ore taken out on the Gogebic range at the Old Colby Mine. He had been employed at the mines near Negaunee, Mich., where he lived for a number of years, and had charge of several explorations in that vicinity. Of late years he had been employed at the mines near Bessemer, his last work being done at the Tilden Mine last summer. About 6 months ago he became too ill to work any longer and had been confined to his bed the most of the time since that until his death. Captain Mitchell was born in England about 55 years ago and came to this country when a young man.

## SOCIETIES AND TECHNICAL SCHOOLS.

ENGINEERS' CLUB OF ST. LOUIS.—At the meeting on March 19, 36 members and 9 visitors were present. Messrs. Henry Rustin and Robert E. Einstein were elected to membership. The president introduced Mr. R. D. O. Johnson, who addressed the club on the subject "Lead Mining in Southeastern Missouri." Mr. Johnson described the geological formations in which the various deposits were found; the various forms of deposits, and their distribution. The several schemes of mining were described. The paper was discussed by Messrs. Wheeler and Bilharz.

COLORADO MINE OWNERS' ASSOCIATION.—Preliminary steps in organizing this association were taken in Denver on March 27 at a meeting of about 40 mine owners at Brown's Palace Hotel. Arthur Winslow, of Kansas City, manager of the Liberty Bell Mine at Telluride, Colo., presided. A committee of 10 was appointed to arrange for a future meeting.

The objects of the association are to be fostering the welfare of the mine operators of the state and protecting and developing the industry in all its branches. The constitution provides that the membership shall consist of individuals or companies actively operating metalliferous mines in the state.

It is rumored that the association will endeavor to secure better treatment from the smelters, to get more consideration from the railroads that haul ores, and to make a decided stand against the miners' union.

## INDUSTRIAL NOTES.

The Pacific Tank Company, of San Francisco, Cal., has shipped a 300-ton experimental cyanide plant to Providence, R. I.

The Miles-Bement-Pond Company, manufacturer of machine tools, has moved its Pittsburg, Pa., offices into the Frick Building.

The Krogh Manufacturing Company, of San Francisco, Cal., is now installed in its new offices and salesrooms at 519 Market street.

The Brown Gas Engine Company, of Columbus, O., and the Cochran Company, of Lorain, O., have joined hands and hereafter the Brown gas engine will be built at Lorain.

The Webster Manufacturing Company, of Chicago, Ill., is reported to have secured a contract for some \$20,000 worth of power transmission equipment from the Sun Portland Cement Company, of Owen Sound, Ontario, Canada.

The Arthur Fritsch Foundry and Machine Company of St. Louis, Mo., reports that it is busy in both its machine and foundry departments. The bulk of the orders at present are for crushers and other mining machinery.

The Westinghouse Electric and Manufacturing Company is to erect at Scranton, Pa., a plant for electrical purposes which will cost \$1,400,000. The plant will occupy part of the site of the Lackawanna steel mills that were torn down and removed to Buffalo.

The Williams Patent Crusher and Pulverizer Company, of St. Louis, Mo., is shipping crushers and pulverizers to almost all parts of the world. Among those recently shipped were crushers and pulverizers for Japan, Canada and points in South America.

The Allis-Chalmers Company for installation in the Third Avenue power house of the Brooklyn Rapid Transit Company, has ordered 35,000 h. p. feed water heaters of the Wainwright type of Charles H. Paine, of New York. The heaters will be built by the Taunton Locomotive Manufacturing Company, of Taunton, Mass.

The Portland Smelting & Refining Corporation, Limited, of Portland, Ore., has been incorporated by O. M. Rosendale, Frank Sedgast, A. Castle Sanford and Ernest Barton. The capital stock is placed at \$300,000. The objects of the corporation are to erect a smelting and refining plant in Portland and engage in a general smelting, refining and mining business.

Col. Ira A. Shaler, sub-contractor for the building of a portion of the New York rapid transit subway, has placed an order with A. H. Funke, of 101-103 Duane street, New York City, for 20 additional No. 9 Baldwin acetylene mine lamps. Col. Shaler states



that these lamps are giving perfect satisfaction and are the best light for his purpose that he has been able to obtain.

The Lacey-Buek Company, with a capital stock of \$500,000, has been organized in Chattanooga, Tenn., to develop mineral lands in North Georgia, Alabama and Tennessee and to operate the Trussville, Ala., furnace. The following directors have been named: Dr. John Dooley, F. V. Berry, C. E. Buek and James D. Lacey. The Trussville furnace has been in operation several weeks.

The New York & Rosendale Cement Company, owned by S. D. Coykendall, has sold out to the Consolidated Rosendale Cement Company, recently incorporated with a capital of \$1,500,000. The Consolidated already owned the F. O. Norton, the Lawrence, the Lawrenceville, and the Newark & Rosendale companies. The Consolidated is controlled by Wm. N. Beach and James B. Paulding.

Jean F. Webb, of Denver, Colo., patentee of a pneumatic cyanide process, has sold a half interest therein to the Colorado Iron Works Company, of Denver, Colo. To exploit the process a new company will be organized, capital stock \$500,000. John W. Nesmith, president Colorado Iron Works Company, will be president, and Jean F. Webb, Jr., secretary. It is announced that the company will erect plants to use this process, giving a special guarantee.

Caldwell Bradshaw and T. M. Bradley, majority stockholders in the Southern Cement Company, whose plant is located at North Birmingham and has a capacity of 800 barrels of cement every 24 hours, have sold all interests to Daniel Pierson, A. C. Courter and Harold R. Senon, of Newark, N. J., and a new company has been formed with Mr. Pierson as president and Mr. Senon as secretary and general manager. The plant will be placed in full operation.

The Howells Mining Drill Company, of Plymouth, Pa., states that it is putting out a safety match to which it has given the name of the Black Diamond Safety Squib. It consists of a hollow tube of paper sealed at one end. From the sealed end extends about 2 ins. of closely rolled paper covered with sulphur. In preparing a blast the tube is filled with powder and a match is applied to the sulphur-covered paper, avoiding the danger of premature explosions.

The West Virginia Bridge and Construction Company, formed by Pittsburgh and Wheeling interests, to locate works near Wheeling, W. Va., has elected the following officers: Edward Hazlett, president; George A. Laughlin, vice-president; G. E. Wincher, secretary and treasurer; and J. H. Bartlett, general manager. The plant is to cost about \$500,000, and will be enlarged later. Mr. Bartlett, the general manager, was formerly connected with the Keystone Bridge Company and the Columbia Bridge Company.

As a result of friction in the National Salt Company's management some important changes have been made in the officials. N. S. Beardslee, of Scranton, Pa., is now president; Joy Morton, of Chicago, vice-president; N. B. Fuller, of Scranton, secretary and treasurer; F. W. Ralyea, of Scranton, assistant treasurer, and W. B. Putney, Jr., of New York, assistant secretary. The board of directors contains the names of only N. S. Beardslee, Joy Morton and W. S. Eddy of the old board.

The Ticonderoga Graphite Company, of Ticonderoga, N. Y., has bought a crushing plant, consisting of Gates crushers and accessories from the Allis-Chalmers Company. The company is in the market for a 100 h. p. engine and a small quantity of shafting, hangers, piping, pumps, etc., for its new plant and is erecting a mill to separate graphite from rock. Most of the product will be used for lubricants, the remainder for stove polish stock, foundry facings, etc. W. W. Jeffers is secretary and treasurer.

Kendrick & Roberts, Incorporated, of Philadelphia, Pa., have secured a contract to erect the buildings for part of the new steel plant of the Lackawanna Iron and Steel Company, at Buffalo, N. Y. The contract amounts to approximately \$200,000. The buildings are a bessemer steel works, 4 stories high, measuring 667 by 101 ft.; a blower house, one story high, measuring 85 by 47 ft.; a blower engine and pump house, one story, 325 by 82 ft., and a pump house, one story of heavy ornamental brick, 250 by 68 ft.

The Colorado Iron Works, of Denver, Colo., during the past few days has received the following orders: 36-in. hexagonal copper furnace for the Consolidated Mining and Smelting Company, of Cerrillos, N. Mex.; 2 sets 10 in. by 20 in. Blake crushers; 2 sets 40 in. by 16 in. rolls; 1 set 27 in. by 14 in. rolls, all for the Ohio & Colorado Smelting and Refining Company; 1 5-stamp 850-lb. mill, for the Salt Lake Hardware Company, of Salt Lake City; 125 tons cast-iron U pipes for hot blast stoves for the United States Mining Company, of Salt Lake City.

The American Potteries Company includes the Ford China Company, Ford City, Pa.; the Union Potteries Company, of East Liverpool, O.; Wick China Company, of Kittanning; New Cumberland Pottery Com-

pany, of New Cumberland, W. Va.; Falston Pottery Company, of Falston, Pa.; Trenton Pottery Company, of Trenton, N. J., and the Seibring Pottery Company, of Seibring, O. The trust will have a capital of \$13,000,000. A Moreland, former secretary of the Carnegie Steel Company, Limited, is prominently identified with the new combine.

The American Car and Foundry Company, it is said, intends to build a new steel car plant at Berwick, Pa., that will be practically a duplicate of the plant recently completed at Detroit. All machine tools will be electrically driven. The main car erecting and car press shop will be 730 ft. long and 185 ft. wide. The plant will have a capacity at the outset of about 20 steel cars per day. The contract for the buildings has been awarded to the American Bridge Company and Westinghouse, Church, Kerr & Company will attend to the engineering details. The company's eastern offices are at 25 Broad street, New York.

The Pressed Steel Car Company, of Pittsburgh, Pa., states that the company's output of pressed steel cars up to March 27, 1902, aggregated over 60,000 finished cars, or sufficient to make a solid train 360 miles long. The cars built by the company have made great changes in methods of freight transportation, being much lighter in proportion to the carrying capacity than the old style wooden cars in use prior to 1897. The works of the company are pushed to their fullest extent, delivering over 100 finished cars per day, in addition to a large number of trucks, bolsters, center plates and other pressed steel specialties for wooden and steel cars.

The Green Engineering Company, Chicago, reports a number of sales this year of its traveling link-chain grates, among the orders taken being: American Tin Plate Company, 6,000 h. p.; Union Steel Company, 6,000 h. p.; American Steel Foundry Company, St. Louis, Mo.; Crane Company, Chicago, Ill.; Armour & Company, Kansas City, Mo., East St. Louis, Mo., and Chicago, Ill.; Danville (Ill.) Street Railway and Light Company, Ballard & Ballard Company, Louisville, Ky.; Emery, Bird, Thayer Company, Kansas City, and the Norwood Water Works. The company states that the number of orders and inquiries received certainly proves that the best concerns consider this grate possessed of qualities that are worth careful investigation before placing orders.

The Juniata Tube Company, of Lewiston, Pa., has been incorporated with \$800,000 capital, of which half is preferred and half common stock. A site for the plant has been secured at Burnham, Pa., about 4 miles from Lewiston, near the plant of the Logan Iron & Steel Company. The officers of the company are: E. H. Weeks, Philadelphia, president; J. I. Quigley, Lewiston, vice-president; H. J. Fosnot, Lewiston, secretary and treasurer; directors, E. H. Weeks, William Maguire, Alexander L. Francois, A. J. Rote, Gardiner W. Kimble, Edgar G. Webb, J. I. Quigley, H. J. Fosnot, J. M. Goodhart and Wm. F. Eckbert, Jr.; executive committee, E. H. Weeks, Wm. F. Eckbert, Jr., and H. J. Fosnot. The main office will be in Lewiston, the factory at Burnham and the foreign office in Philadelphia.

The Westinghouse Machine Company, of East Pittsburgh, Pa., has taken a contract from Julian Kennedy, of Pittsburgh, for the erection of 6 engines at the blast furnaces of the Toledo Furnace Company, of Toledo, O., and the South Chicago Furnace Company, of South Chicago. They will cost \$175,000. Three engines will be built for each furnace and they will be so arranged that they can be run as compound or single engines. Each set will comprise 2 high-pressure and a low-pressure engine, the latter being used as an auxiliary. When it is in use the high-pressure engine will receive steam at boiler pressure and exhaust into the receiver from which the low-pressure engine will be supplied. When the low-pressure engine is in use as a simple engine it will receive steam from the boiler through a reducing valve. Each high-pressure engine will have a steam cylinder 50 in. in diameter, fitted with Corliss valve gear. The low-pressure steam cylinder will be 96 in. in diameter and similarly equipped. The air cylinder in all engines will be 96 in. in diameter and the stroke will be 66 ins. The engines will make 60 revolutions per minute. The air cylinders will be equipped with the Kennedy piston inlet and outlet valve. The engines will be of a special type, with the blowing cylinder immediately above a heavy bed plate. On top of the blowing cylinder will be a heavy housing and guide box and on top of the guide box will be the steam cylinder. Each engine will weigh 600,000 lbs., and will have 2 flywheels 20 ft. in diameter, each weighing 65,000 lbs.

#### TRADE CATALOGUES.

The series of illustrated circulars printed on heavy paper and intended for filing in an ordinary filing case, issued by the American Engineering Works, of Chicago, Ill., is intended to cover all the products of that firm. Some recent issues include descriptions of

standard ore cars, special ore cars, ladle cars and gable bottom cars.

W. R. Ostrander & Co., of New York City, issue the 13th edition of their catalogue of telephone and telegraph instruments, general electric supplies and speaking tube hardware. The catalogue contains illustrated price lists of a great variety of material, has a good index and will be found valuable as a reference book to any one likely to require electric light material, telegraph and telephone supplies, electric bells, speaking tubes, etc.

Catalogue No. 19, of the Penberthy Injector Company, of Detroit, Mich., is a pamphlet of 68 pages, containing price lists and a large amount of descriptive matter about the company's injectors, water gauges, oil and grease cups, etc. Two new specialties of the company, for which great merit is claimed, are a low and high water alarm, a purely mechanical device, the operative part of which is within the boiler, and a force-feed lubricator of simple construction that is stated to give a positive feed when attached to any moving part of an engine and to be capable of extremely fine regulation.

Stilwell heaters for heating and purifying feedwater for boilers are described in a 71-page pamphlet published by the Stilwell-Bierce & Smith-Vaile Company, of Dayton, Ohio. The pamphlet calls attention to the waste of fuel and the damage to boilers from the use of impure feedwater and calls attention to the merits of the Stilwell system of treating hard water. The exhaust steam passes through the feedwater as it falls in thin sheets, quickly heating the water to boiling and thus precipitating any lime carbonate in solution. Testimonial letters are given from a large number of industrial concerns.

Catalogue No. 2, for 1902, published by the Keystone Driller Company, of Beaver Falls, Pa., describes the Keystone mineral prospecting machines for exploring oil, coal, lead, zinc and iron lands, gold placer mines and making soundings for bridge piers, foundations, etc. The pamphlet discusses the relative merits of percussion and core drills for prospecting and calls attention to some excellent work done by Keystone machines in various sections of this country. The important parts of the machines are described and directions are given for the proper care and management of the drills in the field.

A little pamphlet entitled "Mechanical Arithmetic," issued by the Felt & Tarrant Manufacturing Company, of Chicago, Ill., describes the "Comptometer," an adding and calculating machine operated by keys after the manner of a typewriter. This machine was awarded a gold medal by the Franklin Institute as a meritorious invention and, the company claims, can be adapted to all classes of commercial and scientific computation. The pamphlet calls attention to the utility of the invention and its application to commercial work. A long list of users, including the United States Government and many great industrial concerns, is given. This is claimed to be the only machine that adds by the simple touching of keys and nothing more.

Baldwin acetylene lamps for mine use are described in an attractive 32-page pamphlet sent out by the manufacturer, A. H. Funke, of New York City. The pamphlet points out the advantages of acetylene as an illuminant as compared with oil and candles in the smaller quantity of oxygen removed from the air and the smaller amount of carbon dioxide given off. The lamps are made in several sizes. Size No. 7, suitable for individual miners, is stated to give as much as 2 oil lamps or 6 candles and to cost but 3c. for 8-hours' burning. The No. 8 lamp, stated to give rather more light than a 16-candle-power electric light, is intended for drill work, mucking or use at loading stations, and is said to cost 6c. for 8-hours' burning. The manufacturer states that the lamps are now in use at upwards of 100 mines.

Steel plate fans, full or three-quarter housed, are described in catalogue No. 134, a pamphlet of 66 pages, issued by the American Blower Company, of Detroit, Mich. These fans are designed for heating, ventilating and drying plants, forced and induced draft apparatus, etc. The company states that it has been manufacturing fans of the steel-plate type for many years, that its product is designed on scientific principles, and that the material and workmanship are of the highest grade. The fans are regularly built, in sizes from 30 to 180 in. in diameter, and may be driven by belt or by direct connection to a steam engine or electric motor. The company also manufactures steel-plate fan wheels of the Guibal type for mine purposes in sizes ranging from 14 ft. up. A number of tables on the capacity of fans at varying revolutions and pressures, and on the properties of air and steam add to the value of the pamphlet.

A neatly printed and illustrated pamphlet of 64 pages on crushing and grinding machinery is issued by the Sturtevant Mill Company, of Boston, Mass. The crushers described are of the jaw and the rotary types. The company claims for its roll jaw crushers

that they will not clog in reducing the hardest rock from the lump to corn sizes,  $\frac{1}{2}$  to  $\frac{3}{4}$  in., in one operation without screens. The crushers are built in a number of sizes, from a 2 in. by 4 in., for laboratory work, to a 6 in. by 24 in., having a capacity of 6 to 8 tons broken to  $\frac{1}{2}$  in. per hour. The company states that it is preparing to build very large roll jaw crushers of Jupiter steel with a capacity satisfactory to largest producers. The rotary crushers described in the pamphlet are recommended for materials of moderate hardness, as gypsum, talc, soapstone, phosphate rock, chalk, limestone, coal, etc. In regard to the centrifugal rolls described, the company points out the advantages of their small diameter and the saving in wear from their peculiar construction. Other devices described in the pamphlet are inclined shaking screens, also emery mills for fine grinding.

#### GENERAL MINING NEWS.

##### ALABAMA.

###### BIBB COUNTY.

(From Our Special Correspondent.)

**Galloway Coal and Coke Company.**—This company is now shipping 100 tons of coal a day from its new mines at Garnsey, and expects to increase the output soon.

**Lchigh Coal Company.**—Work is progressing steadily at the new mines being opened by this company. Shipments will be begun during the coming summer.

###### BLOUNT COUNTY.

(From Our Special Correspondent.)

The work on the Long Branch Railroad, built by the Louisville & Nashville Company to reach coal properties, has been started. Dunn & Lallande, of Birmingham, the contractors, have subleased part of the work and will make every effort to finish the job as quickly as possible.

###### JEFFERSON COUNTY.

(From Our Special Correspondent.)

**Davis Coal and Coke Company.**—A contract will be soon given for the construction of a branch of  $\frac{1}{2}$  miles of track from the Birmingham Mineral Railroad to reach the property being developed by this company, which was recently organized with capital stock of \$125,000. President W. E. Leake, whose headquarters are in Birmingham, reports that the opening of the mines will be started at once.

###### TUSKALOOSA COUNTY.

(From Our Special Correspondent.)

**Davis Creek Coal Company.**—Work on this company's new mines is making good progress. Shipments of coal will be begun inside of 90 days.

###### WALKER COUNTY.

(From Our Special Correspondent.)

**Globe Coal Company.**—This company is opening three new mines at Flat Top Mountain and will be ready to ship coal as soon as the branch of the Southern Railway from Littleton to Flat Top is completed.

##### ARIZONA.

###### GILA COUNTY.

**Old Dominion Copper, Mining and Smelting Company.**—The shareholders of this company have revolted against the A. S. Bigelow management, and at the annual meeting in Jersey City on April 2 dismissed the old board of directors and elected a new one. The campaign against the old management was begun by Towle & Fitzgerald, bankers of Boston, several months ago. Discontent has been enhanced by the announcement that the company had lost \$73,000 in 1901, and had sold its 10,200,000 lbs. of copper produced in 1901 at 12½c. Compared to the previous year, the company was \$106,000 worse off, having carried over a considerable stock of copper from 1900, and thrown it on the market with the output of the current year. At the meeting the malcontents, represented by Towle & Fitzgerald, had proxies for over 100,000 shares. Proxies for about 8,000 shares were held by N. L. Amster, a mining engineer familiar with the property, and the Bigelow management, represented by W. L. S. Chrimes, had proxies for about 20,000 shares, the total capitalization of the company being 150,000 shares of a par value of \$25 each. The directors supported by the majority stockholders were Charles F. Smith, Joseph P. Herrick, Charles G. Lund, Edward F. Newton, J. Waldo Smith, Lewis D. Brandeis, and George Napier Towle. They received the vote of 107,500 shares.

Out of the 150,000 shares there were 133,498 represented at the meeting, of which the old management had only 22,000.

###### MOHAVE COUNTY.

(From Our Special Correspondent.)

**Gold Road.**—Henry Hunrath and Fred Jungi have cut a vein 10 ft. wide said to assay \$65 gold, with streaks assaying as high as \$250 a ton.

**Hardy Camp.**—About 25 men are at work on gold claims in San Francisco District.

**Leeland-Mitchell.**—This property, near Boundary Cone, under bond and lease to Col. Thos. Ewing, has become a regular shipper of gold ores. The south drift is reported in 450 ft., in good ore, while good ore is reported in the drift on the opposite side of the mountain.

**Treadwell Group.**—These mines in San Francisco District, under the management of O. F. Kuencer, of Kingman, are having much work done. A contract has been let to sink 100 ft. on the Pioneer and a 22-h.p. engine is completed over the Treadwell shaft. The company has also let a contract to run a 100-ft. tunnel on the Irwin.

**Vulcan Smelting and Refining Company.**—This company, of San Francisco, Cal., has completed preliminary measures for erecting a 50-ton smelter at the terminus of the Arizona & Utah Railroad, near Chloride.

##### CALIFORNIA.

###### AMADOR COUNTY.

(From Our Special Correspondent.)

**Bunker Hill.**—In this mine at Amador City, C. K. Downs, of Sutter Creek, superintendent, milling ore has been struck at the 1,400-ft. level. Ore has also been found in a drift on the 800. Local investors have put about \$120,000 into this property.

**Mitchell.**—At this mine, at Pine Grove, Superintendent Hyner has bought 20 more stamps, giving the mill 30 in all.

###### CALAVERAS COUNTY.

(From Our Special Correspondent.)

**Angels.**—At this mine, at Angels, Thomas H. Fullen, superintendent, the mill is to be enlarged by adding the 20 stamps purchased from the California-Ophir Company. The mine will then have 60 stamps.

**Beatrice.**—The new 100-h. p. compressor is now in place at this mine, near Murphys.

**Black Oak.**—This mine, near Angels, is to be reopened by a company represented by J. J. Meyers, of San Francisco. The property has not been worked for some years.

**Central Hill.**—William M. Nuner and D. A. Nuner, of San Andreas; have purchased this mine near that town and have men at work. They have 125 acres of ground.

**Gold Hill.**—A rich shoot of ore has been found in this mine, near Angels, C. Wolff, superintendent.

**Junction.**—Williams, Roberts & Co. are sinking a shaft to bedrock on this placer claim near Douglas Flat.

**Melones Mining Company.**—This company now as a post office at the mines, called Melones. The 60-stamp mill is completed and is running. When the 4 miles of flume were completed and the water wheel installed, sufficient power was generated to give 760 h. p. with 6,700 cu. ft. flow of water per minute. The foundations are prepared to receive an additional 60 stamps during this year. The office of this company is at 53 State street, Boston, Mass. The office of the general manager, William C. Ralston, is at 331 Pine street, San Francisco. The company owns 18 claims: Royal, Summit, Squirrel Gulch, Tuolumne, Stanley, Bowers, Reserve, Enterprise, Keystone, Stanislaus, Mineral Mountain, Bell, Donald C., Last Chance, including the Melones, a famous mine and at one time a large producer.

**Sultana.**—At this mine, at Angels, Charles H. Morgan, manager, the foundation for the air compressor is completed and the machinery will be put in at once. The shaft is now down 300 ft. and will be sunk to 1,000. This company, which has already invested \$75,000, is working the old Bovee claim.

###### INYO COUNTY.

(From Our Special Correspondent.)

**Mineral Ranch.**—This mine, 4 miles from Ballarat, C. Anthony, superintendent, is to build a tramway for hauling out ore.

**Radcliff.**—This company, at Ballarat, W. W. Goodwin, manager, is again at work with 15 stamps dropping.

**St. George Group.**—This group of claims, near Modoc, has been purchased by Spokane, Wash., and Los Angeles men, through H. L. Percy, of Los Angeles, and will be reopened. The claims have not been worked for over 30 years.

###### LOS ANGELES COUNTY.

(From Our Special Correspondent.)

**Big Horn.**—A Los Angeles corporation, known as the Lowell & California Mining Company, F. C. Fenner, superintendent, is opening the Big Horn quartz mine on the eastern slope of North Bald Mountain, at the headwaters of the San Gabriel River. The ledges in that vicinity are supposed to have been the source of the placer gold found in the San Gabriel.

##### MADERA COUNTY.

(From Our Special Correspondent.)

**Gambetta.**—The unwatering of this mine, at Grub Gulch, is expected to be finished shortly, when development work will start.

**Res.**—Charles M. Ward and J. M. Day are working ore from this mine, at Grub Gulch, in a 2-stamp mill. They have bonded 4 adjoining claims on which work is to begin shortly.

##### MARIPOSA COUNTY.

(From Our Special Correspondent.)

**Garibaldi.**—At this mine, at Kinsley, S. R. Porter superintendent, work is actively prosecuted.

**Virginia.**—Arrangements are being made to start up this mine, near Coulterville.

**Washington Group.**—This group, near Hornitos, owned by James F. Peck, will be worked by a company soon.

**White Rock.**—This copper mine shipped some ore to the smelters last year. C. C. Burrell, of Ellsworth, Me., one of the owners, is having Thomas Price & Son, of San Francisco, prepare plans for a smelter at the mine. E. L. Foster is superintendent.

##### MONTEREY COUNTY.

(From Our Special Correspondent.)

**Stone Canyon Coal Company.**—This company, at Bradley, Frank Horswill, superintendent, has been shipping coal from its deposit for some time. Other deposits at Slack Canyon nearby are also to be developed. A tramway 22 miles long may be built from the mines to Bradley, the nearest railway point.

##### NEVADA COUNTY.

(From Our Special Correspondent.)

**Crystal Lakes.**—The recent storms wrecked the buildings of the mill recently erected at Meadow Lake.

**Ethel.**—This mine, near Washington, is being developed by E. C. Grissell and A. Olson.

**Champion.**—A most important transfer is that of the Providence Mine to the Champion Hill Mining Company. It gives the Champion ownership to about 3 miles along the lode. The company now owns the Champion, Providence, Merrifield, Wyoming, Nevada City, Spanish and Ural mines. E. R. Abadie is superintendent. The Providence, which was located in 1858, is supposed to have yielded altogether about \$6,000,000, including 147 acres of land and has been worked to nearly 2,000 ft. Drifts will be run under the creek to connect the two mines. The mines are at Nevada City and the company's offices are in the Crocker Building, San Francisco.

**Gaston Ridge Mining Company.**—This company, at Gaston, has purchased 4 claims from Dana Harmon, the former superintendent.

**Gold Bank.**—It is expected that this mine, near Magbert, owned by Charles Belden, of Grass Valley, will be operated by a company represented by H. J. Griffin.

**Gold Ridge.**—Richard Phelan has sold these mines between Graniteville and Meadow Lake to a San Francisco company represented by M. M. Baruh.

**Gold Tunnel.**—A contract has been let to move the Reward Mine machinery to this property, at Nevada City, Ed. Lawrence, superintendent.

**Iowa.**—This mine, near Graniteville, is to be opened by a company which John Eddie, superintendent of the Pennsylvania Mine, is organizing.

**Murchie.**—This old mine is being reopened under the superintendency of J. C. Campbell. The mine is at Nevada City.

**New Mohawk.**—This new Sacramento company is about to start work on a group of claims near Graniteville, with William McLean, of Graniteville, as superintendent. A number of men will be put on.

##### PLACER COUNTY.

(From Our Special Correspondent.)

**Channel Found Mining Company.**—Application has been made to the California Debris Commission for a license to mine this property, near Lincoln, by the hydraulic process.

**Inskip.**—The Anti-Debris Association has secured an injunction against this hydraulic mine at Gold Run, E. A. Moody superintendent, and the mine has stopped work. The association charges that tailings delivered into Rattlesnake Ravine ultimately raise the bed of Bear River, causing the water of Feather River to back up. The association has also instituted suits against some other hydraulic mines.

**Lost Emigrant.**—This mine, near Donner, F. L. Heath, of Colfax, manager, shipped some ore to the smelters lately and a small mill will be built the coming spring.

**Puschek.**—The mill at this mine, 4 miles from Colfax, has started again.

**Rawhide Consolidated Gold Mining Company.**—At this mine, near Towle, continues prospecting and is erecting a 10-stamp mill. John T. Patrick is superintendent.



## PLUMAS COUNTY.

(From Our Special Correspondent.)

**Cub and Star.**—These two quartz mines on the north fork of the American river, at Butte Valley, were worked some years by Rickard and McMullen and sold by them recently to T. J. Lamoureux, of Oakland, Cal., who organized the Golden Peak Mining Company to work the mines. There has lately been put up a 3-stamp mill, rock breaker, 2 Johnston concentrators, etc. The mill is run by water power and the ore now milled is paying well.

**Sunnyside.**—This mine, at Butte Valley, owned by the Plumas Gold Mining Company, of Boston, Mass., is being operated under lease by the Clear Creek Mining and Leasing Company, of Boston; Harry S. Adams and E. G. Thomas are the managers. The gravel is being extracted by drifting and 18 men are engaged in development.

**Taylor and Hull.**—J. H. Longnecker has applied to the California Debris Commission for permission to work these mines near Genesee by the hydraulic process.

## RIVERSIDE COUNTY.

(From Our Special Correspondent.)

**Cannon Group.**—This group, in the Providence Mountains, recently purchased by E. Frank Campbell, has been examined by A. T. Stewart, of Los Angeles. As the ore carries considerable sulphurets a mill with concentrators will be erected.

**Desert Queen.**—This mine, near Banning, at one time a large producer, but idle for a long period, has started again.

**Red Cloud.**—This mine, near Salton, E. H. Gould superintendent, is ready for work on a large scale. S. P. Creasinger, of Los Angeles, is president of the company and W. L. Elder secretary.

**Silver Wave.**—On this property, in Old Womans Mountains, D. Jackson, representing A. P. Morrison, of New York, has, since taking the bond, spent \$12,000 in development work and claims to have found an ore body which will pay handsomely.

## SACRAMENTO COUNTY.

(From Our Special Correspondent.)

**Blue Ravine.**—At this drift mine, near Folsom, machine drills have been put in.

**Gray Wing.**—At this mine, near Folsom, Mr. McCormick, formerly of the Hidden Treasure Mine, has succeeded James Wing as superintendent.

**White Wings.**—This company has bonded the Perazzo ranch near Folsom where a new mine is to be opened. The company expects to find the same rich gravel channel found in the Gray Wing and Blue Ravine mines. W. I. Hupp, for 30 years a hydraulic miner at Weaverville, is the principal in the company and Walter Van Matre is to be in charge.

## SAN DIEGO COUNTY.

(From Our Special Correspondent.)

**California King.**—The excavation for the 1,000-ton reduction works at this company's mines at Pichacho, is completed, and 5 large boilers are in place.

**Golden Cross.**—A company capitalized at \$2,750,000 has been organized in London to purchase this mine, at Hedges. While the mine is a large producer it is in debt and its affairs are managed by a receiver. It has the largest quartz mill in California. The ore is low grade, but in large bodies.

**Pichacho District.**—The dry-washer men in this district, numbering about 50, got out over \$25,000 last year.

**Stonewall.**—This quartz mine at Cuyamaca, 8 miles from Julian, which was at one time a very heavy gold producer, has been sold to New York men by the San Francisco National Bank, which held a mortgage upon it. The mine was located in 1870, was worked some years by A. P. Frary, but became the property of the owners of the Cuyamaca grant. It was afterward purchased and developed by the late Governor Waterman. Since his death it has laid idle for 9 years.

## SAN LUIS OBISPO COUNTY.

(From Our Special Correspondent.)

**Madrone.**—For this mine, near Cayucos, a 10-pipe retort has been shipped from Los Angeles by Winfield Mayhall, superintendent.

**Oceanic.**—At this quicksilver mine, near Cambria, a landslide has closed the air-shaft. Repairs are in progress. Storms also caved in the main tunnel at the Klau quicksilver mine.

## SHASTA COUNTY.

(From Our Special Correspondent.)

**Balaklala.**—After several months' idleness, this mine, near Kennett, W. W. Adams manager, has started. Twenty men are employed.

**Mount Shasta Gold Mines, Limited.**—The new mill, near Shasta, has started. F. E. Ware is general manager, A. S. Gabbs, superintendent, and H. A. Ladd, 407 Douglas Building, Los Angeles, is secretary. A large

pumping plant to bring water from Clear Creek is to be established.

**Tamarack.**—This location, near Winthrop, owned by Gaylord Allen, T. Elixon, James Drennon and W. Schweitzer, is being prospected by 2 tunnels. A 15-ft. ledge has been cut.

**Texas.**—This mine, near Whitehouse, is having an air compressor and pipe line put in. Compressed air replaces electricity for running drills. The tunnel has been driven 800 ft.

## SIERRA COUNTY.

(From Our Special Correspondent.)

**Wide Awake Gold Mining Company.**—After 17 months work on the bedrock tunnel an upraise of 45 ft. has cut a good body of auriferous gravel. The channel is about 6 ft. deep. The mine is near Downieville and is owned by an Oakland company, with F. H. Wheelan, of San Francisco, as president; J. L. Field, of Alameda, secretary, and W. H. Rouse, of Oakland, superintendent.

## SISKIYOU COUNTY.

(From Our Special Correspondent.)

**Clark Placer.**—This claim, near Yreka, has been bonded by Martin, Hawkins & Co. to Colorado men, who will shortly reopen it. The mine has been idle and in litigation several years.

**Consolidation.**—H. J. Barton, of Oak Bar, is making arrangements for a consolidation of interests along Beaver Creek and the Klamath from below Honolulu down to Oak Bar. The intent is to build a 10-mile ditch to carry 5,000 in. of water and use it on the mines under one management. New York and San Francisco men are investigating.

**Evening Star and Central.**—These old mines, near Rollin, are being reopened by a San Francisco company under the superintendence of Ben F. Daggett, of the Black Bear Mine. The main tunnel is being driven south in the hope of encountering the Evening Star ore body 400 ft. below the present workings. This will require from 250 to 300 ft. of driving on the vein.

**Greenhorn.**—At this gravel mine, near Yreka, prospecting is to start at a new place. The mine was at one time a large producer.

**Jillson.**—This mine, at Hornbrook, has 10 men blocking out ore and getting ready to stope. They have enough to keep the 10-stamp mill busy some months.

**Minneatta B.**—At this mine, near Nolton, the lessees, White & Martin, are hydraulicking very good gravel.

**Salmon River Company.**—The hydraulic mines of this company, both at Sawyers Bar and Summerville, are in full operation, with plenty of water.

**Tyrer & Co.**—These men are running their mill on good ore at Klamathon and have a force at work in the mine.

**Wild Cat.**—This claim of F. Beoudry, at Callahans, is one of the most extensive hydraulic operations in the county.

## TRINITY COUNTY.

(From Our Special Correspondent.)

**Fairview.**—A company of which Joseph H. Porter is representative has decided to take this mine at Minersville, which it bonded 6 months ago for \$60,000. A wagon road is now being built from the top of Trinity Mountain to the mine.

## TUOLUMNE COUNTY.

(From Our Special Correspondent.)

**Badger.**—At this mine, near Jamestown, a force of men have been set at work under Superintendent George E. Stayton.

**Dead Horse.**—This mine, at Carters, belonging to the Consolidated Eureka Company, has developed a very rich shoot of ore. It is the deepest mine on the east belt of the Mother Lode.

**Gold Ridge.**—Arrangements are being made for a 10-stamp mill on this property, at Chinese Camp. William Jones is president of the company and Drenzy A. Jones, secretary.

**Jumper Gold Syndicate of California, Limited.**—In the mines of this company, at Stent, P. George Gow, general manager, an exceedingly rich pocket has been uncovered in the vein of free milling ore. The mine, one of the largest regular producers of the State, belongs to an English and Scotch company.

**Lost Fox.**—Superintendent Ingalls, of this mine, at Carters, has let a contract for 20 stamps. Lumber is being hauled.

**Platt and Gilson.**—The shaft at this mine, at Sulbyville, is being cleaned out preparatory to an examination with a view to purchase by a Colorado company.

**Republican.**—It is stated that 10 stamps are to be added to the mill of this mine at Jacksonville. T. McGovern, of Sonora, is general manager, and B. Deleray, superintendent. The 10 stamps in place are crushing high-grade ore.

**Tarantula.**—This mine, near Stent, owned by C. C. Drescher, has been bonded to Los Angeles men.

## VENTURA COUNTY.

(From Our Special Correspondent.)

**Mica Mines.**—A road is being built to the Mica mines on Piru Creek by the English company, which purchased the claims from the Barton Bros. There are six claims on the property. A mill and machinery are to be hauled in over the new road, and most of the mica will be ground for the market.

## COLORADO.

## BOULDER COUNTY.

**Boulder Oil Wells.**—The Bradford Oil Company, a Rocky Ford organization, is preparing to sink at least 3,500 ft. if necessary. The Arnold well is being cleaned out preparatory to replacing the tubing and the pump. The Alamo is down 2,000 ft. Pending the arrival of the heavier cable at the King well, no drilling will be done. The Phenomenal is down 152 ft. The Boulder-Valmont derrick is near Boulder Creek, a short distance west of Valmont. At the Monarch the derrick and engine house are up. At the Sale-Boulder all of the machinery has been installed. The Boulder Basin is down 1,450 ft. deep. The Cleveland has lost its tools at a depth of about 1,400 ft. The Maxwell Oil Company has its engine in place and its derrick up. The tank car for the McKenzie well has not yet reached Boulder and the stationary tanks are about full. The Richmond-Boulder Oil Company, just organized by Dr. E. N. Cook, H. G. Brunson and J. H. Parker, has an option on George R. Williamson's ranch east of Boulder. The rig irons for the Eagle Land, Gas and Oil Company have arrived.

## CHAFFEE COUNTY.

(From Our Special Correspondent.)

**Salida Smelter.**—About 50 men are now at work and the foundations for most of the buildings are finished. There are 6 furnaces under construction, 4 for lead and 2 for pyritic ores. A stack 150 ft. high will be erected on the mesa 50 ft. above the furnaces. It will be connected with them by a flue 22 ft. wide and 120 ft. long. About 1,250,000 brick will be used in constructing the entire plant. Each furnace will have a capacity of 300 in 24 hours, and it is expected that the average capacity of the entire plant will be from 1,000 to 1,200 tons daily. Timothy Goodwin is manager of the Ohio & Colorado Company that is erecting the plant.

**Silver Tip Gold Mining Company.**—James Montgomery, of Florence, and E. Beeler, of Turret, are arranging for active work on this company's property. A modern plant of machinery will be installed under the management of E. Beeler.

**Tasmania.**—Robert Taggart, superintendent of this company, at Winfield, is at work on the Last Dollar vein.

**Twin Lakes Placers.**—N. A. Loggin, the new manager of this property, expects to begin operations on Cache Creek, near Granite, at an early date.

## CLEAR CREEK COUNTY.

(From Our Special Correspondent.)

**Albro.**—It is stated that a consolidation of most of the mines and tunnel on Albro Mountain, at Dumont, is under way, after which machinery will be installed at the Clear Creek and Gilpin tunnel, now driven into the mountain for 725 ft. J. H. Hoban, Idaho Springs, is superintendent.

**Buckeye Tunnel and Mining Company.**—It is said that a new plant of machinery will be bought for this undertaking. Omar Shepard, of Georgetown, is in charge. A tunnel is to be driven into Democrat Mountain. The company has just been incorporated.

**Chamberlain-Dillingham Ore Company.**—This is a consolidation of 3 different ore-buying concerns, with plants located in Idaho Springs, Georgetown, Black Hawk, Breckenridge and Denver. The 3 companies consolidated are: W. J. Chamberlain & Co., State Ore Sampling Company, and the Denver Smelting and Mining Company. The incorporators are: W. J. Chamberlain, F. Dillingham, Robert James, C. K. Wolfe and W. O. Manson. The State Ore plants were bought outright and will be dismantled. Headquarters will be maintained in the Boston Block, Denver. One sampler will be operated in each place, this being the desire of the American Smelting and Refining Company. It will be necessary to equip several of the samplers with new machinery to handle the increased tonnage. The older mills will be dismantled and probably moved to other localities, where samplers may be installed. The capitalization is \$1,000,000, half of which will be used in conducting the ore-purchasing business.

**Monarch Mining, Milling, Tunnel and Power Company.**—In the cross-cut tunnel, at about 1,400 ft., the Syndicate vein is reported cut and to show a wide streak of mill ore. At the surface it was 30 ft. wide and ran \$7 a ton. The territory for 4,000 ft. beyond

belongs to the tunnel company, which also owns the Freeland Mine, a big producer years ago. It will be cut by the tunnel at a depth of almost 3,000 ft. G. E. McClelland, of Idaho Springs, is manager.

**Tropic Mining Company.**—In the cross-cut tunnel of this company, 975 ft. in, the Tropic vein has been cut, showing 2 streaks of smelting ore; 12 in. will run over \$100 per ton. R. B. Morton, Idaho Springs, is manager.

**Wisconsin.**—A pool of Georgetown men, with which J. J. White is connected, has opened 3 ft. of high-grade ore, the first class running 500 ozs. silver and the second class 135 ozs. The stope is 900 ft. in from the mouth of a drift.

#### GILPIN COUNTY.

(From Our Special Correspondent.)

**Mining Transfers.**—Sadie P. Coltrin to Joseph Heinze, to the Helen Gold Mining and Tunnel Company, the Black Canon tunnel and tunnel site, Enterprise District; F. D. Carper to M. E. Hiatt, the Eureka mill site, Enterprise District; C. L. Harker to John Smith, the Fairfield, North Fairfield and South Fairfield lodes, Russell District; G. R. Tonn to A. Bayer, ¼ interest in Gold Lode Claim, Quartz Valley District.

**Carr Mine & Colorado Company, Limited.**—Connections have been made between the lower levels so that sinking, which has been delayed for several months, may be resumed. The shaft, now 750 ft., will be sunk to 1,000 ft. with Leyner air drills. The daily production on company account of 35 tons is treated at the mill, being hauled by an aerial tramway, ¾ mile. The ore is fair grade and the smelting product is the same. The company is working 55 men, besides 20 leasers, and with the past developments will be in better shape than ever. English parties are the owners and S. Hoskin, Central City, is manager.

**Cook.**—Leasers shipped some iron from their lease on the 600-ft. level which brought values of 14 oz. gold per ton. Arrangements are being made for sinking the shaft 300 ft. deeper to connect with the Fisk and Gregory workings, or it may be found advisable to upraise. L. H. Stockbridge, Central City, is manager.

**Delmonico Mining Company.**—The shaft is 600 ft. deep and will go to 1,200 ft. The company is thinking of installing electric drills. It has offices in the Boston Block, Denver Colo.

**Mammoth Gold Mining Company.**—The air compressor formerly on the Waterbury adit has been installed in the main building of the Mammoth mine and sinking has started. The shaft, now 700 ft. deep, will be sunk at least 100, and possibly 300, ft. W. H. Paul, Central City, is manager.

**Sampling Works Consolidation.**—The State ore sampling works at Black Hawk, in this county, has been absorbed by the Chamberlain Sampling Company, along with the sampling works of the same company, and other sampling works owned by other parties in the Clear Creek and Boulder counties. It is claimed this is a move of the American Smelting and Refining Company and causes some talk among the mining men of this county. A meeting will be held during the coming week to discuss the advisability of erecting a public sampling works. It is understood, too, that the Carpenter Smelter at Golden will pay assay values on all ores from this county, as well as a fixed price of \$3.50 per ton for tailings, some of which in the past the shippers could not get a bid on, which at that rate would pay to ship. In fact, there promises to be some excitement in the shape of treatment prices for ores this summer unless present signs count for little.

**Wilkesbarre Gold Mining Company.**—An order has been placed for a Weber gasoline hoist of 12 h. p. and the shaft building will be enlarged. Pennsylvanians are interested and E. C. Sherman, Central City, is superintendent.

#### HINSDALE COUNTY.

(From Our Special Correspondent.)

**Tobasco.**—O. Pierce, manager of this mine, near Lake City, has placed an order for a tramway to be over 8,000 ft. in length, to deliver the ore from the mine to the mill.

#### LAKE COUNTY—LEADVILLE.

(From Our Special Correspondent.)

**Mining Development at Leadville.**—The first quarter of the new year shows a very satisfactory condition of affairs. The total tonnage is in the neighborhood of 175,000 tons of all classes of ore, the larger part of this being low and fair grade iron ore. The sulphide producer could have easily produced 100,000 tons additional from the Ibex, Resurrection, New Monarch, A. M. W., Small Hopes, Nayr and other lead sulphide propositions. The present daily output is about 1,750 tons and comes largely from the Home combination, Caribou, Phoenix, Moyer, Yak, Ibex, Penn, Midas and leases on Carbonate and Fryer Hills. Among the most important new work under way is that of the Keystone Mining Company on the old

Rex group; the new shafts on the 150 acres controlled by the Big Evans Mining Company; the sinking of the new shaft on the 150 acres of the Homer placer; the sinking of 5 drill holes below the 1,300-ft. level on the Pyrenees claim by the Rialto Company; the sinking of a new 500-ft. shaft on the Star of the West combination; the new shaft on the Valley, Forest Rose and Dispute combination being put down by the New Valley Leasing Company, controlled by Springfield, Mass., people; a new shaft by the Hap Hazard Gold Mining Company, on its combination in Lake Park, and a large amount of new work in Sugar Loaf, Two Bit Gulch and other outside localities.

**Leadville Mineral Rights.**—The city of Leadville has just filed another suit to protect its mineral rights underlying the streets and alleys. The new suit is against the Weldon Mining Company. The city claims \$423,000 for ore taken out to date from its part of the territory.

**A. M. W. Combination.**—But little ore is being shipped, while the sulphide bodies are all lying idle. Meantime Manager Nicholson is carrying ahead important development and prospecting work. The pumps are handling 1,000 gals. of water per minute.

**A. Y. & Minnie Leasing Company.**—This company includes S. D. Nicholson, manager, Julius Rodman and E. L. Newhouse. They have the new lease on the A. Y. and Minnie Mine, and are erecting a new concentrating mill to be largely on the style of the A. M. W. Mill, and to cost \$25,000. It will have a capacity of 125 tons a day and employ the latest methods.

**Benton Mining Company.**—On the Park lease 7 ft. of good iron has been opened from the new strike in virgin ground.

**California Gulch Mining Company.**—It is not likely that work will be resumed on this downtown new shaft at present. Only \$4,000 could be raised from the sale of stock, and this was not deemed sufficient.

**Chippewa Leasing Company.**—This gold belt property is outputting 15 tons a day of silicious ore which averages nearly 2 ozs. gold.

**Diamond Gold Mines Company.**—The new shaft is down 1,025 ft. and pumps are being put in before drifting or sinking deeper. Philadelphia men are interested who hope to tap the Resurrection ore shoot.

**Dinero Leasing Company.**—Thirty men are at work. Shipments are sufficient to carry ahead the exploration work. Occasional pockets of very rich ore are encountered.

**Dunkin Mining Company.**—Lessees are working Nos. 2 and 3 shafts and producing 25 tons a day of iron ore, 45 per cent excess, and about 10 tons a day from silicious ore carrying 20 ozs. silver.

**Homestake Mining and Leasing Company.**—Bad weather has curtailed shipments, but not development, and the regular tonnage is being hoisted and stored. The vein, which has opened nicely, averages 5 tons a day of ore carrying 100 oz. silver, 15 to 20 per cent lead and a slight assay of gold to the ton.

**May Queen.**—Lewis & Co., new lessees, have sunk a new shaft 125 ft. and are drifting at that depth in fine-looking contact matter.

**Morning and Evening Stars Consolidated Mining Company.**—All work is done by lessees. The manager of the company is E. Z. Dickerman. Most of the work is in the Morning Star territory, on the Upper Waterloo lessees; in the Carleton shaft 200 tons a month are being mined at the 115-ft. level; in the Ladder shaft operations are conducted at the 165-ft. and 400-ft. levels, and 500 tons a month of fair grade ore shipped; at the Porter No. 3 shaft new development is under way at 127 ft., but no shipments being made; 150 tons a month are coming from the Nevis shaft and 300 tons of iron a month from the Jones. On the Evening Star combination the Upper, the New and the No. 5 shafts are worked by Lessee Clanton, who is shipping 300 tons a month of fair-grade iron ore.

**New Leadville Gold Mining and Milling Company.**—This company is working the Gilt Edge and Helen claims on Rock Hill, and also has 90 acres of territory in the Tennessee Pass section. Drill holes are being sunk on both propositions.

**New Leadville Home Mining Company.**—The annual meeting is now in session, April 5. The reports will show an immense amount of work accomplished and a heavy tonnage ranging from 250 to 350 tons a day. Most of the work has been done through Penrose territory, although the Bon Air and Starr shafts have also been shipping. No dividend has been paid this year, but as it was announced in January that dividends would be quarterly, some action will probably be taken at this session.

**Northern Mining Company.**—Pelcher & Pierson, who have the lease on the Northern Mine, are shipping 25 tons of fair grade iron daily from the 550-ft. level. New work is under way at the 575-ft. level.

**Printer Boy Gold Mining Company.**—In the district court the suits begun last week by Mr. Childs, the former manager, were all dismissed and the com-

pany is pushing work at the 525-ft. level. In cutting the station a number of good sulphide streaks have been encountered. As soon as the machinery is in place the old workings will be drained and the shaft sunk deeper. The shaft is now 725 ft. deep and may go 300 ft. deeper.

**Resurrection Gold Mining Company.**—No sulphides are shipped, but a more favorable market is awaited. The company can ship 400 tons daily of such ore. It is handling 100 tons a day of good oxidized ore from No. 2 shaft.

**Rialto Leasing and Mining Company.**—From below the 1,240-ft. level the diamond drill is reported meeting with encouraging conditions. It is searching for the extension of the Greenback iron sulphide shoot, the largest in the Leadville district. Boston men are heavily interested with Denver people in this combination.

**Sierra Nevada.**—Reynolds & Hanifen, of Leadville, are at the head of this lease worked through the Yak tunnel, and are producing 40 tons daily of zinc ore carrying 30 per cent zinc and 10 per cent lead and a few ozs. silver with a trace of gold. Arrangements are being made to increase the tonnage, which goes to the Colorado Zinc Works at Denver.

**Small Hopes.**—The Sessult, Kernes and Forest City claims of this company are worked under lease. The output of oxidized argentiferous iron is 20 tons daily. Shipments will be increased. The large lead-iron sulphide dump of the Emmet claim has also been sold to lessees and they are shipping. Lessees are also shipping 450 tons a month from the Emmet claim of fair grade oxidized iron.

**Two Bit Gulch Mining Company.**—A new vertical shaft down 80 ft. on the main workings is following a 10-in. streak of very rich ore. The intention is to sink 300 ft. and then drift to the old incline. The company has 42 acres of ground, nearly all of which is virgin territory.

**Valentine Mining Company.**—About two-thirds of the old stockholders have agreed to take stock in the new company if the proposition made by the Leadville Power & Water Company that all holders of the old stock shall take half of their present holdings in new stock at 10 cts. a share, is accepted; otherwise the old stock will be entirely lost.

**Valley Leasing and Mining Company.**—The new shaft is down 80 ft. and appears to be in a carbonate contact. The company is an eastern concern and will work the Valley, Forest Rose and Dispute claims near the New Monarch group.

**Yak Mining, Milling and Tunnel Company.**—Shipments average 3,000 tons a month of low grade sulphides and zinc ores.

#### MINERAL COUNTY.

**Last Chance.**—The troubles of this mine at Creede and of the New York & Chance Mine, which began in 1894, have been adjusted. In 1890 the Del Monte Company claimed the mine, alleging apex rights. The case was carried into the United States courts, where last winter a compromise was proposed, and this has been approved. The Last Chance is given the ownership of the mines, the Del Monte to have a lease for 20 years. There is a shaft 1,500 ft. deep, with levels at every 100 ft. The ore carries silver, mixed with lead and gold as depth is gained.

(From Our Special Correspondent.)

**American Sulphur Refining Company.**—A controversy regarding the ownership of extensive sulphur deposits 10 miles west of Creede has been settled in favor of this company. The dispute arose over the ownership of the land. This having been decided to rest in the State, the board of land commissioners has executed a lease to the company.

#### SAGUACHE COUNTY.

**Blanco Mutual.**—This company at Sand Creek has a 5-stamp mill completed and is making a test run.

**Cripple Creek-Idaho Company.**—Superintendent Whitney, of this company at Liberty, has about 40 men at work, about 20 in the mine and the rest building roads, getting out timbers and preparing to put up a mill.

**Independent.**—The shaft is now down about 250 ft. and it is thought that it can be sunk at least 75 ft. a month. The ore found in the winze is of a smelting grade and it is not likely that the big mill will be started up for some time. Charles B. Wise of Crestone is manager.

**San Isabel.**—At this property above Crestone, a small force is cutting out a station for the new steam hoist. The force is to be increased, and 500 ft. of sinking done as soon as the hoist is in place.

#### SUMMIT COUNTY.

(From Our Special Correspondent.)

**Puzzle.**—This mine, at Breckenridge, has a long record as a producer. The old mill is being overhauled and put in order for the season's work.



## TELLER COUNTY—CRIPPLE CREEK.

(From Our Special Correspondent.)

**Central Consolidated Company.**—Considerable adverse criticism has been raised by the directors of this company taking the stock off the exchange. Other criticisms of the directorate have been made. The company owns property on Raven and Bull Hills.

**El Paso Gold Mining Company.**—This property is shipping heavily and is said to be taking out some very rich ore. Considerable development work is under way. This property is the banner one on Beacon Hill, and comprises the original El Paso Company's claims; the Orizaba Nos. 1 and 2, Fanny B. claim of the old Fanny B. Company, the Lonaconing, Old Hickory and Columbus of the Kimberly Company; Columbia No. 1 claim of the Cripple Creek Columbia Company, and the Little May and Australia claims. William Bainbridge, of Cripple Creek, is general manager.

**Jennie Sample Consolidated Gold Mining Company.**—This company was formed recently by the consolidation of the Gould properties, the Constantine property, the Gettysburg claim of the Jack Pot Company and the Minnehaha claim of the Monarch Company. The Gould property consists of the Jennie Sample, Rhinoceros, Nil Desperandum, Sitting Bull Nos. 1 and 2 and Kitty Lane claims, situated on Raven Hill, adjoining the Elkton and Dr. Jack-Pot properties. The consolidation has also purchased the Grace and Special claims from the Grace Gold Mining Company.

**Portland Gold Mining Company.**—This company has reduced its working force, about a third of the men being laid off, it is said for economical reasons. In about 2 months a new mill will be built, which will enable the company to handle its milling ore much more cheaply. Most of the men laid off were engaged in breaking down ore. It is understood that none of the men engaged in development were laid off. The new mill is situated near Colorado City and will soon be completed. R. A. Trevarthan, of Victor, is in charge of the mine.

**Princess Alice Consolidated Gold Mining Company.**—The directors met recently and elected the following officers: President, E. C. Larkin; vice-president, Charlotte Williams; secretary and treasurer, Anna Douglass. H. H. Barbee is general manager. The company owns, among its other holdings, the Lafayette and Ruby claims, on Bull Hill, between the Lucky Gus and Last Dollar. The Lafayette and Ruby are now under lease to R. P. Russell.

**Stratton's Independence, Limited.**—It is understood that the regular quarterly dividend of this company, amounting to \$122,000 has been paid for the quarter ending February 6. The company has now paid a total of \$3,914,857. It is understood that the property is shipping about 250 tons of ore per day. John Hays Hammond, consulting engineer, has been in the district, and it is understood that his cable to the home office in London indicates disappointment as to the ore of the lowest levels. The fact that the mine is producing considerable ore and that the regular dividend has been paid, coupled with the unfavorable report of Mr. Hammond, makes mining men at a loss to know the true state of affairs in regard to the mine. H. A. Shipman is in charge.

## IDAHO.

**Mineral Production.**—The report of Martin M. Jones, State mine inspector, describes mines in various counties of the state, and gives considerable space to Idaho County and Thunder Mountain. It contains tables showing the production of the various minerals for 1901, showing that of 3 of the principal metals, gold, silver and lead, Idaho produced a value of \$9,213,199 as follows: Gold, fine, 110,228 ozs., value, \$2,280,423; silver, 3,305,154 ozs., valued at \$4,264,162; lead, 65,967,000 lbs., valued at \$1,638,680.

## BINGHAM COUNTY.

(From Our Special Correspondent.)

**Colorado Gold Mining Company.**—This company has just added a car-load of new machinery to its bucket elevator dredge on the Snake River at Blackfoot and expects to have the plant in running order within 2 weeks.

**Stevens.**—This group of placer claims, near Blackfoot, was recently bonded to a Detroit company. The successful dredging of the Snake River fine gold on a large scale by the Sweetser-Burroughs Company, at Minidoka, is attracting a good deal of attention and favorably located bars of great extent are in demand.

## CASSIA COUNTY.

(From Our Special Correspondent.)

**Sweetser-Burroughs.**—This suction dredge, situated on the Snake River, 30 miles west of Minidoka, has been in operation 3 weeks. The chain bucket elevator dredge, belonging to the same company and situated 20 miles east of Minidoka, was started March 20. The two plants are handling 4,500 cu. yds. of gravel a day at a cost of a trifle under 5c. per cu. yd.

## LEMHI COUNTY.

(From Our Special Correspondent.)

**Bohannon Bar Hydraulic Mining Company.**—This company, at Bohannon Creek, has put on a force of 10 men, and is making preparations for the usual season's run. The full force amounts to 30 men.

**Leesburgh Gold Mining Company.**—This company, whose property consists of a large hydraulic plant at California Bar, has put on the usual spring force cleaning out ditches, setting pipe and sluices preparatory to the season's run, which commences about May 1.

**Pacific Dredge Company.**—This company has been rebuilding the large dredge at Moose Creek, which was destroyed by a boiler explosion last fall. All the machinery is now on the ground and is being rapidly put in place. The company expects to have the plant ready to run within 30 days. The company is also making preparations to work the lower portion of its ground with hydraulic apparatus.

**Ulysses.**—This mine, at Indian Creek, has been sold to a company of Houghton, Mich., men for \$75,000. The new company is now in possession and has started up the 5-stamp mill. This will be kept in operation pending further development of the mine and the erection of a larger plant to be run by water-power.

## SHOSHONE COUNTY.

**Gold Standard Mining Company.**—This company owning 160 acres of placer ground along Pony Creek, near Delta, has started 2 giants washing away sand in search of bedrock gravel. The property has been equipped for bedrock mining with flumes, steel pipe lines, giants, etc. The company was organized four months ago. Frank Houle is manager.

**Reindeer Mining Company.**—The tunnel is driven 360 ft, most the distance along the ledge. This is a new copper property, located 3½ miles southeast of Mullan. A. M. Strode of Mullan, is president of the company.

**Roy Mining Company.**—A. H. Hill is manager of this company that owns ground near the head of Beaver Creek, about 2 miles north of Sunset Peak. The lower tunnel is to be extended along the ledge.

## ILLINOIS.

**Coal Miners' Wages.**—The miners and operators of the Peoria and Canton sub-districts have reached an agreement for the year beginning April 1. The wages to be paid day labor run from \$1.80 to \$2.10, and the question of machines was referred to a committee. Mine carpenters will receive \$2.25 per day, and all miners are required to observe the clause prohibiting forked coal. All coal is to be weighed instead of being measured, as heretofore. This agreement will bind the miners at Coal Valley, Sherrard, Wanlock and Gilchrist.

## INDIANA.

(From Our Special Correspondent.)

**Plymouth Block Coal Company.**—This company, of Terre Haute, has been incorporated. The capital stock is \$25,000. The incorporators are J. Smith Talley, W. E. Eppert, H. B. Talley, R. W. Rippetto and T. B. Stephenson. The company proposes to open mines and construct plants in Vigo, Park and Clay counties. The home office will be in Terre Haute.

## CLAY COUNTY.

(From Our Special Correspondent.)

The scale committee of block coal miners and operators met in joint conference on March 29, but was unable to draft a scale agreeable to both sides. The operators offer the miners the scale they desired, about the same as last year, except that the powder clause is not included.

## GRANT COUNTY.

(From Our Special Correspondent.)

**Oil Explorations.**—The number of wells drilled in March was 16 more than in February, and the daily increase of production is 700 bbls. April begins with 198 wells drilling, and derricks up for 83 more. The 225 completed wells in this district produced 3,510 barrels of oil during March.

## VERMILLION COUNTY.

(From Our Special Correspondent.)

**Torrey Coal Company.**—This company, of which A. S. Bogle, is president, has abandoned the Geneva Mine, one of the oldest mines in this district. The machinery, animals, etc., are being shipped to Glendora, a new mining camp 3 miles north of Sullivan, where the company has secured 1,800 acres of coal land.

## VIGO COUNTY.

(From Our Special Correspondent.)

**Mine Operators and Miners' Convention.**—After four weeks of conference the Indiana miners and operators signed a wage scale contract for the year beginning April 1. The miners held out for a weekly pay day and for the privilege of buying powder where they pleased, but secured neither request. However,

the price of powder was fixed at \$1.75 a keg. The men gained a clause fixing a minimum thickness of vein for which price of mining agreed on at the interstate conference—80c. a ton—is to apply. This is 3 ft. 3 in. in old mines and 3 ft. 6 in. in new openings, for less thickness 88c. Hoisting engineers are to work 8 instead of 10 hours for a day.

## IOWA.

**Coal Miners and Operators Convention.**—In accordance with an understanding reached at Des Moines last week, the joint conference of miners and operators ratified an agreement. The miners were defeated in their main contention, securing neither an increase in the day wage scale nor the employment of shot firers by the operators. The only concession by the latter was the employment of shot examiners.

## KENTUCKY.

## LIVINGSTON COUNTY.

**Pittsburg Fluorspar, Mining and Manufacturing Company.**—This company has its general office at 124 Second avenue, Pittsburg, Pa., and a branch office at Smithland. The company has 4 developed mines near Smithland, Ky. Transportation is reached by a tramway able to handle 100 tons of fluorspar per day. The mines are equipped with machinery for drilling, hoisting, etc., and have a mill for grinding the spar, and cooper shops for making barrels for the ground spar. The company also has extensive holdings of lands at Golconda, Ill., upon which it has mines producing lead, kaolin and red oxide of iron. The company intends to work a much larger force the coming season to take care of its rapidly increasing business, and expects to bring the production up to 200 tons daily.

## WEBSTER COUNTY.

**Wheatcroft Coal and Coke Company.**—This company, at Wheatcroft, has sunk and completed a new shaft, the present output of which is about 300 tons daily. The vein averages 6¼ ft. in thickness. Irving H. Wheatcroft is president of the company. He is also president of the Wheatcroft & Western Railroad.

## MICHIGAN.

**Coal Miners' Wages.**—The United Mine Workers of Michigan were called out for a general strike, beginning April 1, on account of the failure of the operators and miners to adopt a wage scale and adjust differences during their recent meeting at Saginaw. The call affects twenty-one unions throughout Michigan, with a membership of 2,300. The old scale of wages expired March 31.

## COPPER—HOUGHTON COUNTY.

(From Our Special Correspondent.)

**Calumet & Hecla.**—This company is installing electric pumps in No. 7 shaft, Hecla branch, at the 12th, 24th, 26th, 36th, and 48th levels. Electrical pumps are in use in other parts of the mine and giving satisfaction. With the additional pumps in commission the water of the entire mine will be handled without the aid of the bailers at the Red Jacket shaft.

**Centennial.**—The work of installing a Nordberg hoist in the engine house at A shaft is progressing well, under the direction of C. V. Reed.

**Champion.**—The new mill is enclosed with the exception of the rock bins. The foundation for the rock bins is being built, the rock coming from the mine. A large force of carpenters is busy on the interior wood-work.

**Copper Range Consolidated.**—F. C. Goggin, Jr., has been appointed superintendent of stamp mills for this company and will have charge of the Baltic and Champion mills in addition to the mill of the Atlantic Mining Company.

**Lake Superior Smelting Company.**—The first shipment of sulphide ore from the Superior Mine, in Algoma District, Ontario, has been received at the Dollar-Bay smelters. Several shipments from the Rock Lake District, near Georgian Bay, have also been received.

**Old Colony.**—A new shaft has been started on a lode encountered with the diamond drill 4,500 ft. east of the Kearsarge lode. At the shaft started last fall drifts have been run 100 ft. east and west and a standard shaft will be opened.

**Pewabic.**—The litigation over this property, which has been dragging through the courts for 18 years, has ended in the United States Court at Grand Rapids, Mich. The decree allows Thomas H. Mason, of New York, \$57,782; Receiver Peter White, of Marquette, Mich., \$35,000 for services rendered, and Dickinson, Warren & Warren, \$11,188 for services as attorneys. The \$100,000 remaining in the hands of the court will be distributed to the creditors and stockholders. The Pewabic was purchased from the original company about 1884 by Thomas F. Mason for \$710,000 and by him sold to the Quincy Mining Company for \$1,000,000. It is now a part of the Quincy Mine.

**Quincy.**—The output of mass and barrel copper is large, several car-loads being shipped to the smelters weekly. No. 6 shaft is again in commission and ship-

ping to the mill. As soon as fitted with a Parnall-Krause mortar the idle head at the mill will resume stamping.

**Trimountain.**—The foundation for the engine house at No. 1 shaft is under way. At No. 3 shaft the foundation for a combined engine, boiler and compressor house is building. The machinery for an electric lighting plant has arrived at the mine and will be installed at once.

**Winona.**—Work at this property is still confined to diamond drill operations on section 28.

#### COPPER—KEWEENAW COUNTY.

(From Our Special Correspondent.)

**Mohawk.**—Several consignments of machinery for the mine and mill have arrived; 2 hoisting engines, made by the Nordberg Manufacturing Company, of Milwaukee, Wis., are at the mine. The drums weigh 10 tons each.

**Phoenix.**—The excavation for the foundations for the one-head mill to be erected this summer are completed and Contractor James Kinefick will start work on the foundation walls.

#### COPPER—ONTONAGON COUNTY.

(From Our Special Correspondent.)

**Mass.**—The second head at the mill is running a day shift only. The mine output of rock averages 700 tons per day.

#### MINNESOTA.

(From Our Special Correspondent.)

The Steward Iron Company has been organized in the offices of J. L. Washburn, attorney, for the men behind the concern. It will control a valuable lease on the western Mesabi. The Elizabeth Iron Company has been organized in the office of J. G. Williams, attorney for the men behind it, who are P. L. Kimberley and local parties having a state lease near Hibbing. Its capital is \$500,000. The Edmund Iron Company has been organized by E. J. Longyear, G. G. Hartley and W. H. Burris, to handle a property near Hibbing.

Vessels are at docks at Duluth and Two Harbors to load ore, and all the masters of the Pittsburg Steamship Company's ships at Duluth are waiting orders to move. A few mines are shipping to dock, though the movement will not be large for 2 weeks. Minnesota ore harbors are free from ice. At Ashland the situation is different, as ice is still rather solid. At Marquette and Presque Isle there is open water, but no boats are yet due.

#### IRON—MESABI RANGE.

(From Our Special Correspondent.)

**Champion Mining Company.**—This company, which has taken over the property of the old Champion Iron Company, under a reorganization, is leasing 3 forties south of the Mountain Iron Mine at 15c. royalty and 100,000 tons minimum. D. E. Woodbridge and H. R. Spencer are president and secretary of the company.

**Fay Exploration Company.**—This company is opening 2 mines near Hibbing on lands belonging to Laura A. Day, and finding a good mine on one of them, from which it will be able to ship at least 50,000 tons this year. The company has a shaft in ore.

**Jordan.**—At the new mine stripping with one shovel will start about May 1. The mine will ship some ore this year.

**Minnesota Iron Company.**—At this company's Burt Mine, at Hibbing, the stripping contractors, Winston & Dear, are getting to work. They will use 2 steam shovels, 12-hour shift, and the waste dirt will be dumped in the caved ground of the Sellers Mine, also belonging to the Minnesota Company. A trestle 1,000 ft. long connects the stripping with the caved ground. A total of 800,000 cu. yds. are included in the contract. A shaft is down to bottom, 150 ft., and mining has started.

**Stevens.**—The work of opening this mine in section 26, T. 59, R. 15, bought by the Oliver Iron Mining Company about 2 years ago, will start at once. There is a very large deposit of ore here, of excellent physical character, hard and dense, running about 60 to 61 per cent iron and low in phosphorus. A minimum output of 100,000 tons is required on the property, and the royalty is 15c. a ton. The mine comprises 9 forties, most of them in the north half of the section. It will be a steam shovel proposition, and stripping is to start at once. A large amount of ditching and draining was done last year, and the ground is in excellent shape for rapid and heavy work. The mine will ship by the Duluth & Iron Range road.

**Union.**—This mine, the property of the Republic Iron and Steel Company, and of the American Steel Hoop Company, has started shipping to dock, and will continue steadily. It is expected to ship 50,000 tons to each company this year. The Franklin, adjoining, will also probably ship 100,000 tons. Both mines have a considerable stockpile, and the Union is remarkably well opened underground. This will be its second year.

#### MISSOURI.

**Murlin Coal Mining Company.**—This company's miners have struck. The walk-out affects about 800 miners in the following counties: Macon, 400; Randolph, 250; Ray, 200.

The cause is the recent discharge of a miner in Randolph County for some minor offense. The executive officers of the union and the management of the coal company could not agree as to who was at fault in the matter.

#### JASPER COUNTY.

(From Our Special Correspondent.)

**Joplin Ore Market.**—The past week has been the most active for years in the Joplin District. Zinc ore opened very strong, yet closed at an advance of \$3.50 per ton over the opening price. Much ore has been contracted ahead at this price, and will occasion no surprise if zinc ore advanced still further. Several large producers around Joplin pooled their production in the hands of Bud M. Robinson, one of the leading producers at Chitwood, a camp 2 miles west of Joplin. The Illinois Zinc Company paid \$37.50 per ton for the ore controlled by him.

The lead ore market remains unchanged with the price \$21.75 per 1,000 lbs. The local smelters secured the greater portion of the production.

During the corresponding week of last year zinc ore's top price was \$27.50 per ton, and lead ore brought \$23 per 1,000 lbs.

Following is the turn-in by camps of the Joplin District for the week ending March 29:

	Zinc lbs.	Lead lbs.	Values.
Joplin	3,334,680	822,120	\$74,571
Cartersville	2,114,750	472,130	19,900
Galena-Empire	1,072,510	157,970	18,451
Aurora	875,400	28,710	10,263
Webb City	439,180	54,460	7,334
Zincite	461,620	27,900	8,224
Carthage	206,970	.....	5,063
Carl Junction	317,490	3,290	4,834
Oronog	275,010	.....	4,481
Duenweg	381,180	51,560	6,839
Spurgeon	62,230	81,460	2,333
Central City	131,080	1,450	1,802
Neck City	100,300	.....	1,641
Stotts City	136,330	.....	2,181
Sherwood	83,670	.....	1,255
Granby	199,000	42,000	2,729
Roaring Springs	94,180	.....	1,177
Peoria	.....	46,410	928
Totals	10,551,240	1,708,000	\$197,043
Total 13 weeks	133,713,190	16,137,280	\$2,182,329

Zinc value for week, \$159,980; lead, \$37,063; zinc value, 13 weeks, \$1,834,820; lead, \$347,509.

#### MONTANA.

##### BEAVERHEAD COUNTY.

(From Our Special Correspondent.)

**Ajax.**—This property, in the upper Big Hole basin, owned by A. J. Noyes, of Dillon, is to have a mill. Mr. Noyes has purchased the rock crusher, Huntington mill and other machinery formerly in use at the Old Faithful in the Elkhorn District. The mill was not suitable for the ore in the Old Faithful.

**Golden Era.**—Tom Flanders, who with associates holds the bond on this Argenta property, has repaired the machinery preparatory to unwatering the mine. A good body of ore is known to be exposed below water level, opened by the old St. Louis company, which owns the property, and worked it some 12 years ago.

**Indian Queen.**—This property, on Birch Creek, 6 miles from Apex Station on the Oregon Short Line, is being re-equipped with machinery. A New York syndicate held a bond on the property last year, but failing to secure an extension, surrendered the option, and removed the machinery. It is claimed that a new option has been given to Boston people. The ore is copper. Some high grade ore has been produced.

##### CASCADE COUNTY.

(From Our Special Correspondent.)

**Big Seven Mining Company.**—A stockholders' meeting, held at Neihart for the election of officers, resulted in the election of D. L. S. Barker as president and treasurer; vice-president, J. C. Armstrong; secretary, J. C. E. Barker. These officers, with J. T. Armington and Jane Barker, are trustees.

##### FLATHEAD COUNTY.

(From Our Special Correspondent.)

**Kintla Lake Oil Company.**—The machinery for the first well, including a sawmill, is on the ground. Drilling will begin as soon as lumber for derrick and other purposes is ready. A. L. Jaqueth, of Kalispell, has charge of operations; he is sending 10 men to the field to start work. The difficulty so far has been to secure suitable casing for the well.

##### JEFFERSON COUNTY.

(From Our Special Correspondent.)

**Manganese Ore.**—Ira Myers, of Great Falls, and others convey to United States Senator Paris Gibson and J. J. Hill, of St. Paul, 7 claims at the head of Clancy Creek for a consideration of \$17,000. It is rumored that Great Northern Railway interests will develop this property for manganese ore.

#### MADISON COUNTY.

(From Our Special Correspondent.)

**Biesinger & Beck Mining Company.**—This company, incorporated under the laws of Utah, is developing its property by a cross-cut tunnel, now in about 435 ft. Ore cut is about 5 ft. between walls. A streak of ore on the foot-wall side has produced some very rich specimens of stephanite and native silver. The main tunnel will be driven ahead with the expectation of reaching what is considered the main ledge in the next 50 ft. Some stoping has been done on the first ledge cut, 94 tons of ore shipped from per ton. The shipping ore is the footwall streak, balper ton. The shipping ore is the footwall streak, balance of vein being a silver-lead concentrating ore. The company owns 4 claims in the group. The capital stock is 400,000 shares of a par value of 25c. Thomas Biesinger is president and manager. The company intends to build a concentrator in the near future. The postoffice address is Puller Springs, 7 miles from the property.

**Copper Queen Mining Company.**—Judgments obtained against this company at Twin Bridges resulted in the sale of the personal property by the sheriff to satisfy the judgments. Two engines that cost \$700 each sold for \$250 to C. S. Lentz, president of the Big Show Mining Company.

**Mayflower Consolidated Mining Company.**—The consolidation of the Mayflower with other properties adjoining into the present company has been effected. The incorporators are Alex J. Johnson, A. H. Wethey and Thomas M. Hodgins, of Butte. Senator W. A. Clark owns 45,325 shares of the stock of the company, which has a capital of \$120,000. The Mayflower has produced ore some years.

#### MISSOULA COUNTY.

(From Our Special Correspondent.)

**House Group.**—This group of claims near Clinton, which has been under development for the past 18 months by eastern people under a bond, has closed down. The showing, it is stated, would not justify the expenditure of any more money. The hopes of developing a paying copper property were disappointing.

#### SILVER BOW COUNTY.

**Nipper Consolidated.**—Judge Clancy has made a decision allowing this company, of New York, to appear as defendant in a suit brought by the Anaconda Company for a sale and partition of the Parnell lode claim. The action had been brought against the Nipper Consolidated Copper Company of New Jersey, which defaulted in the suit, but it was represented that the New Jersey company has been succeeded by the New York corporation.

(From Our Special Correspondent.)

The hoisting engineers of the Anaconda, Parrot and Washoe mines struck April 1 for an increase of wages from \$4 to \$5 a day, but the engineers' union does not favor the strike. President Scallon, of the Anaconda Company, had an agreement with labor unions when the 8-hour day was granted that there would be no further demands of labor for 2 years, and when the demand for an increase was made by the engineers the demand was promptly refused. The Boston & Montana and Butte & Boston engineers refused to go out. About 28 engineers are on strike, but as the mines closed 3,000 miners are affected.

The State Supreme Court has made an order granting F. Augustus Heinze permission to file supplemental briefs in the certiorari proceedings having to do with the order of Judge Clancy granting Heinze the right of survey of the Anaconda Mine to ascertain if, as he claims, the Anaconda Company is extracting ores from the vein which Heinze claims has its apex in the Fairmount claim.

**Anaconda.**—A cave-in occurred April 1, extending from the 1,300 level up 10 floors. One miner was killed. The cave-in fortunately occurred just at change of shifts or the loss of life would have been great. The damage is considerable.

**Boston & Montana Consolidated Copper and Silver Mining Company.**—The case of Franklin Farrel et al. vs. this company, now pending in the United States Court, has been transferred from Butte to Helena, and will be heard in April. It is a suit based on alleged unlawful use of certain inventions for bessermizing copper from matte. The rights to the invention for the United States are claimed by Farrel, who bought the French invention from Pierre Mauhes, of Lyons, France.

#### TETON COUNTY.

(From Our Special Correspondent.)

**Big Blackfoot Mining Company.**—This is a new organization to operate in the ceded portion of the Blackfoot Indian Reservation, known as Swift Current District. The principal place of business is Great Falls. The incorporators and trustees are A. W. Mahon, J. C. Ulrich, F. M. Friburg, T. F. Richardson and George H. Stanton, of Great Falls. The capital stock is 100,000 shares of \$1 each.



NEVADA.

ELKO COUNTY.

(From Our Special Correspondent.)

**Eclipse Gold Mining Company.**—This company, of Ogden, Utah, is capitalized at \$200,000 in \$1 shares. Officers are: J. F. Snedaker, president; S. H. Hobson, vice-president; Jesse J. Driver, secretary and treasurer. The company owns the Eclipse claim in Tuscarora District.

NORTH CAROLINA.

FRANKLIN COUNTY.

**Chateaugay Iron and Ore Company.**—The J. & J. Rogers Company, of Ausable Forks, has sold to this company the Palmer Hill mines at Black Brook. Recently the Chateaugay Company purchased the Arnold mines at Ferrona. Both mines contain large quantities of ore. The Palmer Hill mines have been idle about 10 years.

NORTH CAROLINA.

ASHE COUNTY.

(From Our Special Correspondent.)

**Ore Knob.**—This copper mine is worked by the Garrettsou Furnace Company. In the main shaft, some 700 ft. deep, a good body of 5 per cent ore is being exposed. This mine was worked with profit when copper was 8 and 9c., at which time it belonged to a Baltimore company, who paid some \$210,000 in dividends.

CABARRUS COUNTY.

(From Our Special Correspondent.)

**Gupauro Mining Company.**—This company, organized by Chicago men, with \$500,000 capital, is working a property about 4 miles southwest of Gold Hill. Several gold-copper veins are opened, showing high-grade ore, although the shaft is down but 20 ft. The main vein is 4 ft. wide and is turning out ore beyond the expectations of the owners. R. D. Curd, of Salisbury, is managing director.

DAVIDSON COUNTY.

(From Our Special Correspondent.)

**Emmons.**—At Cid, about 10 miles southwest of Thomasville, is worked by the Hercules Mining Company, composed of New York men. W. A. Anderson is president; Robert D. Nuese, treasurer. The shaft is down 440 ft. on a large and well-defined belt of copper ore, which at times carries high gold values. Samuel Brown, formerly of New York, is superintendent.

ROWAN COUNTY.

(From Our Special Correspondent.)

**Rowan.**—This gold and copper mine, under the management of R. D. Curd, of Salisbury, is mining ore with a view to sell to the Union Smelter when it blows in.

**Union Copper.**—This mine, under the management of Capt. W. Murdock Wiley, has curtailed expenditures and are making all necessary repairs with a view to blowing in the smelter. They have accumulated a lot of ore and concentrates, and continue to do so. About 100 hands are employed.

STANLEY COUNTY.

(From Our Special Correspondent.)

**Whitney Reduction Company.**—This company has let a contract for the building of a railroad from New London to the site of the first development plant on the Yadkin River; \$75,000 is said to be the consideration, and the road is to be completed by June 1. The contractors, W. J. Oliver & Company, of New London, have several gangs of mules and men on the work. Over this road will be conveyed the material for the construction of the large dam and canal, and also the ore from the company's mines to the milling plant near the dam. Col. E. B. C. Hambley, the manager, has just returned from Pittsburgh, Pa., where he has made a contract for the railroad iron.

OHIO.

MONROE COUNTY.

**International Coal Company.**—This company, of Woodsfield, has been organized to develop 25,000 acres of coal land in the well-known Capitina Creek District, carrying a 6-ft. vein. A new line of railroad is talked of.

STARK COUNTY.

**Massillon Coal Mining Company.**—This combine, which has control of all the Massillon district mines, announced recently that 5 of its mines would shut down April 1. About 700 men are employed in these mines. The shut down is in order to concentrate work at certain mines.

OREGON.

BAKER COUNTY.

**Galconda.**—This mine, in the Cracker Creek District, 7 miles west of Sumpter, is reported sold by

John G. and John T. English, of Danville, Ill., to Pemberton, Ore., men for a large sum.

**Nelson.**—This placer mine, which Baker City purchased last fall, with a water right, of Fred S. Lack, has been leased to Mose Carpenter for 8 months. The placer mine was thrown in with the water when the city purchased the Auburn ditch.

JOSEPHINE COUNTY.

**Oak Flat.**—These hydraulic mines, in Illinois District, are reported bought of Cope, Horn and Cornell, by Pool Bros. & Reynolds, of Denver, Colo. The mines comprise 1,200 acres of placer grounds, in the fork of the Illinois and Briggs Creeks. The banks lie at an average depth of 60 ft., and carry coarse and fine gold. The mine is well equipped with hydraulic plant. Two giants, under a pressure of 400 ft., are operated, deriving their water from a 20-mile ditch, from Soldier Creek. This ditch alone cost \$35,000. A new and large ditch is to be constructed to tap the headwaters of Briggs Creek, which, by the aid of a 5-acre reservoir, will afford a steady run during every month in the year.

MALHEUR COUNTY.

(From Our Special Correspondent.)

**Morning Star.**—This group is situated on the summit of Pedro Mountain, between Baker and Malheur counties. It consists of 3 full claims, carrying 3 ledges in the slate formation. The ground is not yet patented. The Morning Star claim has open cuts for 800 ft., showing the pay shoot, 2 shafts and a cross-tunnel 180 ft., cutting the ledge at about 65 to 75 ft. deep. The ledge is 5 ft. wide and the pay streak from 1 ft. to 3 ft. wide.

**Puget Sound.**—This is an easterly extension of the Morning Star claim and practically no work has been done on it. There is an open cut some 5 ft. by 8 ft. by 15 ft. long, from which some 3 tons of ore has been taken and milled.

**Sunday Hill.**—This group, next the Eagle Head, is owned by the Coats Brothers, of San Bernardino, Cal. Ore has been taken out for two years past. At present 5 men are extending the 3d level on the ledge. A tunnel is to be run 800 ft. This mine and the Eagle Head are about 1/4 of a mile from Coats' stamp mill.

PENNSYLVANIA.

ANTHRACITE COAL.

**Lehigh Valley Coal Company.**—This company's statement for February and the three months of the fiscal year from December 1 to February 28 is as follows:

	February.	Three Months.
Earnings .....	\$2,000,148	\$6,041,840
Expenses .....	1,975,358	6,018,511
Net earnings .....	\$24,790	\$23,329

For the three months there was an increase of \$344,514 in earnings, and an increase of \$280,897 in expenses; the net earnings this year comparing with a deficit of \$40,287 in 1901.

**Philadelphia & Reading Coal and Iron Company.**—This company makes the following statement for February and the eight months of the fiscal year from July 1 to February 28:

	February.	Eight Months.
Earnings .....	\$2,193,319	\$20,156,618
Expenses .....	2,059,243	18,377,527
Net .....	\$134,076	\$1,779,091

For the eight months there were increases of \$1,070,257 in earnings; of \$794,265 in expenses; and of \$275,992 in net earnings.

BITUMINOUS COAL.

Joseph Wharton, owning blast furnaces at Port Oram, N. J., has purchased 250 acres of land and the mining rights to coal under 2,650 acres near Graceton, in Indiana County. About \$150,000 was paid for the property and privileges. Mr. Wharton has arranged to build on the tract 126 coke ovens and to make other improvements, which will bring his total investment up to nearly \$500,000. With the completion of his third furnace at Port Oram, now under construction, which will have a daily capacity of 450 tons, the 2 now in blast producing together 600 tons, Mr. Wharton, who is 76 years old, will be the largest individual iron master in the country.

**Miners' Wages.**—The operators and miners of District No. 2 agreed on a wage scale at Altoona March 27, deciding to continue the present scale. The principal features of the scale are as follows: All coal mined by pick to be paid for at the rate of 60c. a gross ton, "five-ninths of the price of pick mining plus and one-half cent for machine mining," a continuation of the general 20 per cent. advance on all other labor connected with the mining of coal, and a check off, which means that check weighmen are placed on all tipples and their wages collected from the miners by the operators.

**Elia Coal Company.**—This company, of Pittsburgh, which recently acquired the plants of the Pittsburgh

& Baltimore Coal Company, at Irwin, is making extensive improvements. The tiple is being remodeled to enable 2,000 tons to be loaded daily, and new houses are being erected.

**Jamison Coal & Coke Company.**—This company of Greensburg has increased its indebtedness from \$775,000 to \$1,525,000 and issued 750 5 per cent bonds of \$1,000 each. The mortgage secures coal lands in Hempfield and Salem townships. The company recently began the erection of its third plant.

**Rochester & Pittsburg Coal and Iron Company.**—This company's miners struck on April 1. About 4,000 miners are involved. Only pumpers and track layers are to keep at work to protect the mines. If General Manager L. W. Robinson attempts to evict the strikers from their homes, many of which are owned by the company, the pumpers and tracklayers will also be called out, and the mines allowed to flood.

The strike is ordered because General Manager Robinson refused to sign the agreement of the miners and operators' conference at Altoona. Mr. Robertson asserts that the Altoona convention would not concede to his company the same conditions of labor as to the other operators present in regard to thick and thin seams. He asserts that his company proposed to pay the same scale of wages for mining their thick seams as other operators paid in thin seams of coal, but insisted it was unfair to discriminate against his company in not granting the same rights as the Altoona conference agreed to with all other operators as to handling cars.

**Whitsett.**—This mine of the Pittsburg Coal Company, 16 miles west of Connellsville, on the Pittsburg, McKeesport & Youghiogeny Railroad, is reported on fire. The fire started from a hot bearing at the mine fan and reached the airshaft.

SLATE.

A large school slate factory will be built by the National School Slate Company at Slatington. Three hundred people will be employed, and the plant will have a daily capacity of 40,000 slates.

The Pennsylvania court recently dismissed the application of the Bangor & Portland Railroad Company, controlled by the Delaware, Lackawanna & Western Railroad Company, for an injunction against the American Bangor Slate Company, the Lehigh & New England Railroad Company and the Genuine Bangor Slate Company. The American Bangor Slate Company made an agreement with the former management of the Bangor & Portland Railroad, in return for an advance of \$15,000, that all its slate would be shipped over that road. When the slate company began shipping over the Lehigh & New England road the Bangor & Portland people brought suit, with the intention of holding the American Bangor Company to the agreement. The decision is of far-reaching importance, as many other slate shippers in the Pen Argyl Region have a similar agreement.

**American Slate Company.**—At the annual meeting this Bangor company elected W. J. Turner, president; R. H. Rushton, vice president; W. W. Catchings, treasurer; John F. Hoffmeister, secretary; Cotton Amy, general manager, and Charles S. Ford, assistant manager. Business during 1901 was very good, permitting a dividend of 2 1/2 per cent to be paid on the capital stock.

SOUTH DAKOTA.

CUSTER COUNTY.

(From Our Special Correspondent.)

**Black Hills Porcelain Clay and Marble Company.**—Directors have been elected for the ensuing year as follows: B. R. Noble, Wesley Schlichter, of Yale, Mich.; L. P. Woodbury, John A. Tolman, R. L. Boyer, of Chicago, Ill.; F. H. Wellington, of Detroit, Mich.; L. Hicklaen, E. J. Miller, Columbus, O.; H. P. Cook, Cincinnati, O.; Joseph Seep, Oil City, Pa. L. P. Woodbury continues as general manager and Charles Nason as superintendent.

**Willow Creek Mining Company.**—At the annual meeting at Custer directors were elected as follows: M. Burg, D. P. Moore, E. T. Bedell, P. P. Schindel, J. J. Gehlen, H. J. Linden, of Lemars, Ia., and I. M. Donaldson, Thos. Love and W. E. Benedict, of Custer. D. P. Moore, of Lemars, was elected president; D. N. Hoffman, of Lemars, secretary, and E. A. Dalton, treasurer.

LAWRENCE COUNTY.

(From Our Special Correspondent.)

**Golden Reward.**—The crushing machinery of the new cyanide mill has started and the vats are being filled.

**Grizzly Gulch Ground Bonded.**—George M. Nix, of Lead; Otto P. Th. Grantz, of Deadwood, and H. J. Mayham, of Denver, Colo., have taken a bond on 700 acres immediately south of the Homestake. The original owners are James Cusick, Frank Abt, and others. The consideration is close to \$1,000,000, the bond running one year. A 2-compartment shaft is started.

**Horseshoe Mining Company.**—The cyanide plant has started for an experimental run. It has been fitted up in the chlorination mill of the company at Pluma. Anson Highy is general manager.

**Richmond.**—C. B. Harris is working the mine under lease, taking out silver-lead ore for shipment. The ore will be loaded at Galena, when the new Burlington extension is in use. The Richmond belongs to Henry Earl, of New York.

**Rossiter Cyanide Plant.**—John Lundberg and J. V. N. Dorr are running 50 tons of ore through the mill daily, the ore coming from the Buxton and Big Bonanza claims at Terry, also under lease. The Rossiter plant in Deadwood was the first cyanide mill erected in the Black Hills.

**Spanish R.**—Connors Brothers, of Spearfish, owners, have taken out the diamond drill and are going to sink the shaft deeper.

#### PENNINGTON COUNTY.

(From Our Special Correspondent.)

**Benedict Group.**—The Chilian mill, that was formerly in use on Smith Gulch by H. D. Dibble and others, has been purchased by the Black Hills Copper Company, purchaser of this group, and is being set up. A steam hoist has been obtained of the Harney Peak Tin Mining Company at Hill City. J. B. Taylor is superintendent of the company at Rochford.

**Castle Creek Company.**—Part of the ground has been surveyed for patent. Surveys have also been run for the permanent development work. Free gold ore has been found in several places and a small stamp mill is soon to arrive.

**Cochran Mining Company.**—The shaft is 100 ft. deep and a drift has been run 100 ft. south on the ledge. A cross-cut is being run from the face of the drift. A steam hoist has been ordered.

**Elizabeth Mining Company.**—The Bismarck shaft when the present work is completed will be 500 ft. deep. The 40-stamp mill is running again.

**Fairview Group.**—This property has been surveyed for patent. It belongs to J. T. Harrington and Harry Gregg, of Spearfish.

**Gregory Mining Company.**—A vein of sulphide ore is reported in a drift from the bottom of the shaft.

**Holy Terror-Keystone Consolidated Mining Company.**—At the annual meeting it was decided to move the head office from Milwaukee, Wis., to Deadwood. Three Black Hills men were elected on the board of directors—R. B. Hughes, J. W. Fowler and H. S. Vincent, of Deadwood. The two remaining members of the board will be elected after the removal of the head office, April 15. R. B. Hughes was elected president to succeed John S. George, of Milwaukee. F. J. Kipp, of Milwaukee, was elected vice president and will act as president temporarily. George M. Marling, treasurer, and Adolph Siegel, secretary, of Milwaukee, will hold their offices until after the change. The company is running 20 stamps of the Keystone Mill on ore from the 700-ft. level of the Holy Terror Mine. The shaft is 1,200 ft. deep, but there has been no mining below the 9th level. A drift is being driven north on the 700-ft. level to intersect the Keystone vein in about 400 ft. further. An appropriation has been made for a large amount of dead work in the Keystone Mine this year.

**Lost Jim Group.**—George B. Best, of Wisconsin, has purchased the property in the interest of eastern men, making the first payment on the purchase price of \$12,000. He is receiving machinery at Rochford for development.

**Lulu Mining Company.**—A pocket of free-milling ore was recently encountered in the drift from the bottom of the 100-ft. shaft.

#### TENNESSEE.

##### RHEA COUNTY.

**Dayton Coal and Iron Company.**—Twenty-two miners were killed by an explosion on April 1 in the Nelson Mine of this company, at Dayton. The dust in the mine became ignited and caused a terrific explosion. W. T. Head, brother of Superintendent James Head, was fatally injured. There were 75 men in the mine when the explosion occurred. Many of those who got out alive were badly injured.

Owing to the gas in the mine the men were required to use safety lamps. It has been the rule of the company for the miners to place their fuses, ready to be lighted for blasts, just before quitting work each day, by workmen known as "firemen," who go through the mine after all the miners are out. The two "firemen" who are supposed to have caused the explosion lit the fuses before all the miners could get out. It is supposed that one of the shots was defective. The flame from the blast ignited the gas, which in turn ignited the dry coal dust. The explosion that followed wrecked the shed at the mine entrance. Three men were killed while standing outside the mine and two seriously and one fatally injured.

#### UTAH.

(From Our Special Correspondent.)

**Salt Lake Ore and Bullion Settlements.**—The ore settlements for the week ending March 29, and the bank settlements are as follows: Bullion, \$63,800; ore, \$159,300; gold bars, \$10,800; auro-cyanides, \$1,900.

##### BEAVER COUNTY.

(From Our Special Correspondent.)

**O. K.**—It is said that several hundred tons of bornite will be shipped soon to the smelters at Salt Lake. All of this ore is said to come from the 200. Workings on the 300 level are said to show the same shoot.

##### JUAB COUNTY.

(From Our Special Correspondent.)

**Tintic Shipments.**—The following cars were marketed during the week ending March 29: South Swansea, 30 cars ore; Grand Central, 6 cars ore; Uncle Sam, 5 cars ore; Richmond-Anaconda, 1 car ore; Swansea, 7 cars ore; May Day, 2 cars concentrates; Mammoth, 6 cars ore; Bullion-Beck, 5 cars ore; Yankee Consolidated, 7 cars ore; Star Consolidated, 2 cars ore; Lower Mammoth, 4 cars ore; Ajax, 2 cars ore; Gemini, 11 cars ore; Eagle & Blue Bell, 3 cars ore; Tesora, 3 cars ore.

**Tesora.**—The mine is closed down, it is said, and only a few men are working on the upper levels. Owing to water the lower levels have been abandoned for the present.

**Utah-Galena.**—It is said that connection will soon be made between these 2 properties at the 800-ft. level for ventilation. It is estimated there is but 400 ft. to run.

##### SALT LAKE COUNTY.

(From Our Special Correspondent.)

**Bingham Shipments.**—The following shipments were made for the week ending March 29: Ben Butler, 1 car ore; Storey, 1 car ore; Columbia, 2 cars ore; Burning Moscow, 1 car ore.

**Highland Boy.**—The usual weekly shipment of 3 cars of copper bullion was sent to the refineries during the week ending March 29.

**Last Chance.**—The Blind Bill claim, on the north, has been added to the possessions of this company. The reported price is \$2,000.

**New State.**—Omaha, Neb. men are furnishing the funds to open this property and have ordered a compressor. The property has been worked in the past. The tunnel, now in 400 ft., is to be pushed to the vein.

##### SUMMIT COUNTY.

**Daly-West-Quincy Consolidation.**—According to Salt Lake papers the Daly-West, one of Utah's great ore producers, and the Quincy, a small but rich mine working parts of the same veins as are opened in the Daly-West, will consolidate, avoiding a long litigation over apex rights. It is stated that the deal is formally closed, with the exception of having the transaction ratified by the shareholders of the Daly-West. It is also stated that the Daly-West will issue 30,000 shares of stock to pay for the Quincy, making its total capitalization 180,000 shares. The Quincy is capitalized at \$75,000, in 50c. shares, but has issued only 125,000 of its 150,000 shares; the exchange will be thus at the ratio of a little less than 4 for 1. The stockholders of the Quincy are given as Col. Wm. M. Ferry, W. W. Armstrong, D. C. McLaughlin Estate, Edward P. Ferry Estate, James Farrell, Francis Smith, F. A. Nims, David Keith, Henry Newell, E. F. Holmes, M. C. Harrington, Walter Scott, and Richard Williams.

Since January, 1901, Quincy shareholders have received \$1,100,000 in dividends, including the March dividend. The company has paid monthly. The first strike was made in December, 1900, and the approximate gross receipts are close to \$1,250,000. It is said the ore has netted the company an average of \$50 per ton. On this basis the mine, which has been explored to 400 ft., has produced in little more than 16 months 25,000 tons of ore. The company employs 150 to 200 men.

(From Our Special Correspondent.)

**Park City Shipments.**—The shipments for the week ending March 29, are: Ontario, 1,464,110 lbs.; Daly-West, 1,813,890 lbs.; Quincy, 418,000 lbs.; Anchor, 213,550 lbs.; Silver King 1,479,990 lbs.; total, 5,389,990 lbs.

**California.**—At a special meeting of the shareholders at Park City it was decided to move the head offices to Salt Lake. A finance committee was appointed to negotiate a sale of the property or to increase the loan to \$10,000 to secure funds to open the mine.

##### TOOELE COUNTY.

(From Our Special Correspondent.)

**Stockton Shipments.**—For the week ending March 29 the Ophir Hill shipped 18 cars of concentrates.

**Stockton.**—J. J. Trenam is reported as saying that a 2-ft. vein of galena and carbonates has been cut in the upraise from the 200-ft. level, and a 12-in. vein of carbonates north of the first strike in a cross-cut.

#### VIRGINIA.

##### DICKINSON COUNTY.

**Sandy Ridge Coal Company.**—This company has been organized to mine coal with C. A. Holt, president; Isaac Witz, vice-president; F. T. Holt, secretary and treasurer, and they and J. L. Witz are directors. Staunton is to be the home office, and the capital stock \$300,000.

##### WEST VIRGINIA.

**Junior Coal Company.**—This company, controlled by John T. Davis, son of ex-Senator Henry G. Davis, president of the West Virginia Central Railroad, has purchased the Roaring Creek & Charleston and the Roaring Creek & Bellington railroads, embracing 25 miles of track and nearly 8,000 acres of coal land. The price paid is said to be \$1,000,000.

#### FOREIGN MINING NEWS.

##### AFRICA.

###### NATAL.

The coal production of the colony in January was 51,517 tons, against 40,557 tons in January, 1901. There were 2,108 tons of coal exported and 22,215 tons sold to steamers in the port of Durban. There were employed at the mines 171 white men, 1,678 negroes and 1,489 East Indians; a total of 3,338 men.

###### RHODESIA.

The gold output for February is reported at 13,204 oz. crude, an increase of 967 oz. over February, 1901. For the two months ending February 28 the total was 29,159 oz. crude, against 23,024 oz. for the corresponding period in 1901; an increase of 6,135 oz. The total this year was equal to 25,952 oz. fine gold, or \$536,428.

##### TRANSVAAL.

(From Our Special Correspondent.)

**Windsor Gold Mining Company, Limited.**—At the special meeting held recently the provisional agreement entered into by the directors for the amalgamation with the Eton Gold Mining Company, Limited, was confirmed. A new company, to be called the Windsor Gold Mines, Limited, is in process of formation; its issued capital will be £376,858, divided into 376,858 shares of £1 each, of which 175,000 will be issued to this company. The necessary resolutions were passed placing the company in voluntary liquidation and authorizing the transfer of the company's assets and property and the receipt of the purchase consideration. Of the 175,000 shares above referred to, 15,000 will be set aside to meet certain liabilities, leaving 160,000 available for distribution to the shareholders. Any surplus resulting from the sale of the 15,000 shares will be accounted for in due course by the liquidators.

##### AUSTRALIA.

###### QUEENSLAND.

**Mount Morgan Gold Mining Company.**—This company reports for February a total of 15,763 tons of ore treated by chlorination. The yield was 10,506 oz. gold, an average of 0.67 oz. to the ton.

###### CANADA.

##### BRITISH COLUMBIA—BOUNDARY DISTRICT.

**Greenwood Smelter.**—The second furnace will be ready for blowing in within a few days.

**Montreal & Boston Copper Company.**—At the annual meeting in Montreal directors and officers were re-elected. President Melville's report stated that operations during the year, ending January 31, show an increase in revenue of \$2,164. The cash in hand and surplus account shows a credit of \$267,326. Since the date of this statement the company has acquired ownership to a smelter upon favorable terms, with a capacity of 400 tons per day, which will be increased to 1,200 tons per day.

**Old Ironsides.**—The new timber shaft is in daily use. It will probably be a month before the new hoist for the No. 2 shaft is received. It is being made by the Jenckes Machine Company, of Sherbrooke, Quebec.

**Rambler-Cariboo.**—The workings on the 800-ft. level have cut the vein, where the ore encountered was 4½ ft. wide and the samples are said to average 250 ozs. of silver per ton. The mine is shipping steadily. The ore is hauled to McGuigan on the Kaslo & Slocan Railroad. The concentrating plant will be started within a few weeks, when the spring thaws furnish water.

##### BRITISH COLUMBIA—EAST KOOTENAY DISTRICT.

**Sullivan Smelter.**—This plant is being constructed at Marysville. H. McKenzie is in charge of work. It is stated that the plant will be completed as soon as possible.

##### BRITISH COLUMBIA—LARDEAU DISTRICT.

**Northwestern Development Syndicate.**—H. G. Brock, formerly of Rat Portage, has been in Seattle, Wash., to contract for stamp mills and mining machinery. Ten stamps will be installed.



BRITISH COLUMBIA—ROSSLAND DISTRICT.

**Rossland Ore Output.**—According to the Rossland Miner the output of ore for the week ending March 22 and for the year to date is as follows:

Mine.	Week.	Year.
Le Roi.	5,500	55,853
Le Roi No. 2.	1,300	12,750
Cascade	30	300
Bonanza	90	900
Velet	25	250
Centre Star	1,050	1,740
Rossland Great Western	700	700
War Eagle	60	60
Total	8,610	71,743

**Center Star.**—The mine is shipping 4 30-ton cars daily. The management of the mine is still devoting attention principally to the development of the deep workings, and good progress is being made in the shaft and the drifts at the 700-ft. level.

**Le Roi.**—The development work in the main shaft and on the 1,050-ft. level is proceeding steadily.

**Le No. 2.**—The mine is preparing to increase its daily output. The new ore body on the 700-ft. level is being opened up steadily, and ore is being taken for shipment in considerable quantities.

**War Eagle.**—Interest centres about the diamond drilling on the 800-ft. level. The mine is again in the shipping list.

BRITISH COLUMBIA—SLOCAN DISTRICT.

**Slocan Ore Shipments.**—The total amount of ore shipped from the Slocan and Slocan City mining divisions for the year 1901 was, approximately, 30,000 tons, says the New Denver Ledger. Since January 1 to March 15, 1902, the shipments have been as follows:

	Week.	Total.
Payne	235	235
Ivanhoe	255	255
Sunset	40	460
Reco	40	202
American Boy	20	225
Arlington	20	771
Hewett	551	551
Bosum	20	460
Last Chance	40	110
Wonderful	20	20
Enterprise	40	180
Monitor	287	287
Queen Bees	81	81
Silver Glance	35	35
Whitewater	1,195	1,195
Ottawa	7	7
Nepawa	20	60
Hartney	20	20
Marion	58	58
May	5	5
Paystreak	5	5
Surprise	20	20
Total tons.	240	5,262

**Arlington.**—This mine, at Erie, has 75 men at work, and more will be put on as soon as the roads are in better shape for shipping.

**Copper Farm.**—At Craigtown, 6 miles from Erie, George Green, of Rossland, is running a cross-cut tunnel upon this property. Machinery has lately been installed.

**Gordon.**—At this mine, about 12 miles from Erie close to the Spokane Falls & Northern Railway, a small force is cross-cutting to the lead.

**Ymir.**—After tunnelling 2,150 ft. at this mine, at Ymir, the main ledge has been encountered at a depth of 1,000 ft. Four tunnels have been run, the lowest at a depth of 600 ft. Most of the stoping has been done on the second and third levels. A shaft has been carried 50 ft. below the 4th tunnel, or a depth of 650 ft., so there now remains an upraise of 350 ft. to connect the present low workings. The mine is fitted with an 80-stamp mill. The greater part of the values is saved on the plates. The concentrates run over the vanners and will be passed through the cyanide plant.

MEXICO.

CHIHUAHUA.

**Calera.**—This mine, a concentrating proposition near Minaca, is now in control of the Chihuahua Exploration Company, recently formed by New York men, of which J. W. Phillips, formerly manager of the Helena Mining Company's general properties, at Cusihuiriachic, is general manager. Less than a month before the acquisition of the property by the Chihuahua Exploration Company an option was secured for 30 days by J. C. Brooks, formerly of Cusihuiriachic. The property contains 25 pertenencias and Mr. Brooks secured it for a reported price of \$55,000 silver.

(From Our Special Correspondent.)

**Parral, Iguana and Santa Rosalia.**—This group at Parral, and the Juaraz Nos. 1 and 2 in another group, were recently bought by Wm. V. Pettit and Wendler & Blanckensel. The properties are all located within the city limits of Parral.

SOUTH AMERICA.

BRITISH GUIANA.

The gold reported for the month of February, on which royalty was paid, was 5,348 oz., against 6,287 oz. in February, 1901; showing a decrease of 939 oz.

MINING STOCKS.

(Complete quotations will be found on pages 507 and 508 of stocks dealt in at):

New York.	Mexico.	San Francisco.
Boston.	London.	Salt Lake City.
Philadelphia.	Paris.	Spokane.
Colo. Springs.	Toronto.	St. Louis.

New York. April 4.

Interest was lacking in the copper group after the Good Friday holiday, owing to the absence of any sensational rumors. Amalgamated was heavy, fluctuating between \$62½ and \$66, trading being mostly professional. Anaconda was dealt in on a small scale under \$30 per share. Quotations on this stock on 'Change are now made on the per cent system, and not on the dollar-per-share basis. Thus prices this week were given as 113¼@119 per cent on the par value of \$25. This is the method used by the New York Stock Exchange in quoting on its other securities, which usually have a par value of \$100. The curb coppers were featureless.

In the Colorado gold stocks business has been narrow, and prices for the Cripple Creeks are weak. A sale of Portland is reported at \$2.55. Elkton Consolidated, in sympathy with the Western market, has tumbled to 90c., the lowest price in some time. There seems to be extra pressure on this stock, although it is on a dividend basis, and has just made a quarterly payment of \$100,000, or 4c. per share. Isabella, after touching 27c., was turned down at 25c. Small Hopes, one of the more important Leadville silver stocks, was stationary at the recession to 50c.

Ontario Silver, of Utah, has recovered, selling up to \$9, though most of the trading was done around \$8¼. Alice, of Montana, is firm at 55c., though buyers are not active.

Sales of Quicksilver common, of California, are noted at \$3¼@\$3½, but nothing is doing in the preferred shares. Brunswick gold rose from 9 to 15c., closing around 13c., trading being chiefly among brokers to create interest in the stock.

The Comstocks draw little attention, and whenever they gain a few cents in price there is always sure to be a reaction soon after. Consolidated California and Virginia rose to \$1.35 and then dropped to \$1.25, while Ophir brought \$1.05; Mexican, 50c; Belcher, 28c., and Hale & Norcross, 27c. Assessments are being collected by Ophir, Mexican and Belcher.

There was an auction sale of \$10,000 6 per cent gold bonds, due 1917, \$500 each, of the Rio Tinto Copper Mining Company, of New Jersey at \$10½.

Boston. April 2.

(From Our Special Correspondent.)

Enthusied by reports of a better state of affairs in the metal trade, brokers took hold of copper shares and marked special stocks up at a rapid pace. Copper Range Consolidated seemed to lead in the honors, advancing \$7 to \$54.50. Old Dominion responded to the victory of the Towle-Fitzgerald crowd at the annual meeting in Jersey City by moving up \$3.75 to \$23.25. Bingham also responded to the prevailing feeling and advanced \$4 to \$29.

Daly-West recorded a phenomenal rise of \$14 to \$42. This was due to the acquisition of the Quincy mine, thus preventing lawsuits which would have meant both time and money. Centennial was depressed to \$19.50, but easily recovered to \$22. The annual meeting disclosed nothing as to change in ownership of the stock, as the directors were re-elected. The annual report showed \$179,644 cash on hand December 31. Total receipts were \$524,139, and expenses \$344,495. The company got 16½ cents for its copper up to the break in December, but, the management claims, this was not due to foresight on their part, as their copper is always sold as fast as produced. President Fay thinks that Centennial now has the making of a mine, thanks to the Kearsarge lode. New York is said to have been a buyer of this stock of late.

Dominion Coal touched \$130 during the week, which is its record. Dominion Iron and Steel recorded an \$8 advance to \$51.50. It is reported that there has been some buying of the latter by United States Steel people.

Tamarack mining continues under pressure, selling at from \$175 to \$180. An unfavorable report is expected to appear this month.

Isle Royale dropped to \$15 after the issue of the annual report, but recovered a part of the loss. Osceola has been quiet at \$60@61. A splurge was made in American Zinc and Smelting, resulting in an advance of \$13.50, but it soon subsided.

The report that Calumet & Hecla has withdrawn from the copper market under 14c. is credited, but the query is put, who cares as long as there is a plentiful supply at 12¼?

Colorado Springs. March 27.

(From Our Special Correspondent.)

Interest in the Cripple Creek stock markets was centered sharply in Stratton's Independence to-day by the report of John Hays Hammond, consulting

engineer for that company. The expert has just completed a cursory examination of the big Battle Mountain property, and cabled the result to the London offices yesterday evening. He stated that the development work, which has been going forward in the lower horizons of the mine, between 900 and 1,400 ft., has not proved satisfactory. Considerable criticism has been bestowed upon Mr. Hammond in local mining circles for what is termed "speaking without knowledge;" but the adverse comments come in the main from uninformed newspaper writers and mining men who have no definite means of knowing what the true condition of the property is. Until more information is at hand the word of a man who has been in the mine must be taken in preference to one who has not, in spite of the fact that Coloradoans in general do not consider Mr. Hammond a friend of Cripple Creek. The mine is shipping on an average of 250 tons of \$20 to \$30 ore a day. The shares are not quoted locally, and the effect of Mr. Hammond's adverse report cannot be measured from this end.

Elkton was a disappointment to buyers this week. On the 21st these shares sold strong at \$1.19 and \$1.20 a share. Tuesday evening the directors held a consultation with the new superintendent, and the following day the shares broke violently, selling from \$1.17 to \$1.14½. The week closes with the stock in good demand, at \$1.13@1.14 a share. No explanation for the break can be obtained. A week ago Doctor-Jack Pot was in high favor, due to the report that the rich Doctor-Chief ore shoot had been encountered in the north drift of the 700-ft. level. It developed during the week, however, that bad air is interfering with the running of the drift, and an upraise is being made to connect these workings with the level above. The stock broke from 49 to 47 last Friday, but recovered to 48 during the week, selling fractionally lower to-day.

Portland has attracted considerable attention this week on account of the trouble between the company and the so-called Smelter Trust over treatment charges. President Burns threatened to close down the mine, alleging that excessive charges are being exacted. The truth of the matter appears to be that the smelter is merely making the Portland pay the usual "short-time" treatment rates, as the company's contracts expired last January in view of the near completion of the new 300-ton Coronation mill at Colorado City, which will handle the company's product after June 1. It is not believed, however,

DIVIDENDS.

Name of Company.	Date.	Latest Dividend		Total to Date.
		Per Share.	Total.	
†Am. Sm. & Ref. pf.	Apr. 8	1.75	875,000	7,141,553
*Bald Butte, Mont.	Apr. 10	.06	15,000	1,177,148
†Boston & Colo. Sm.	Apr. 1	.75	11,250	382,600
†Central Coal & Coke, com.	Apr. 15	1.00	15,000	90,000
†Central Coal & Coke, pf.	Apr. 15	1.25	18,750	656,250
*Central Lead, Mo.	Apr. 15	.50	5,000	285,000
Colo. Fuel & Iron com.	Apr. 15	1.75	402,500	1,642,500
*Cob. Mercur, Utah	Apr. 7	.03	30,000	240,000
*Daly West, Utah	Apr. 10	.40	60,000	1,487,500
†Doe Run Lead, Mo.	Apr. 15	1.50	15,000	507,072
†Dominion I. & S., pf.	Apr. 7	3.50	175,000	350,000
*Empire State Ida.	Apr. 15	.05	25,277	1,359,448
Houston Oil, pf., Tex.	Mar. 15	3.00	225,000	225,000
†Iowa, Colo.	Apr. 15	.01	16,967	236,835
*La Fortuna, Ariz.	Apr. 9	.05	12,500	1,138,500
†Mong. River C. & C. pf.	Apr. 15	1.75	347,165	1,735,825
Nova Scotia Steel, com.	Apr. 1	4.00	123,600	123,600
Nova Scotia Steel, pf.	Apr. 1	2.00	20,600	61,800
†Penn. Salt	Apr. 15	3.00	150,000	13,000,000
†Phila. Gas, com.	Apr. 21	1.50	221,282	2,028,393
*Rocco-Homestake, Nev.	Apr. 10	.01½	4,500	72,000
*Silver King, Utah	Apr. 10	.66½	100,000	5,150,000
Sta. Maria de Guad., Mex.	Apr. 10	4.35	10,875	325,625
†United Zinc pf.	Apr. 15	.50	7,490	75,057
†Va-Car. Chem., pf.	Apr. 15	2.00	240,000	5,580,000
†Westmoreland Coal.	Apr. 15	1.50	375,000	7,125,000

\*Monthly. †Quarterly. ‡Semi-annual.

ASSESSMENTS.

Name of Company.	Loca-tion.	No. Delinq.	Sale.	Amt.
April Fool	Utah	Mar. 24	Apr. 12	.05
Belcher	Nev.	Apr. 4	Apr. 29	.05
Ben Butler	Cal.	Mar. 31	Apr. 19	.05
Canton Placer	Cal.	Apr. 23	Apr. 19	.01
Chollar	Nev.	Apr. 23	May 14	.05
Crown Point	Nev.	Apr. 9	Apr. 14	.05
Eureka Con. Drift	Cal.	Mar. 31	Apr. 31	.00½
Int'l Copper	Utah	Apr. 5	Apr. 30	.00½
Larkin	Cal.	Apr. 12	Apr. 12	.02
Little Chief	Utah	Apr. 11	Apr. 19	.01
Little Standard Oil	Cal.	Apr. 12	May 12	.10
Martha Washington	Utah	Apr. 9	Apr. 22	.01
Mexican	Nev.	Mar. 25	Apr. 15	.10
Nagara	Utah	May 1	June 18	.0
Old Colony & Eureka	Utah	Apr. 16	May 2	.00½
Old Evergreen	Utah	Apr. 5	May 3	.03
Ophir	Nev.	Apr. 14	May 6	.15
Overman	Nev.	Apr. 10	Apr. 29	.10
Patterson Creek	Cal.	Apr. 10	Apr. 10	.10
Potosi	Nev.	Apr. 16	May 7	.05
Savage	Nev.	Apr. 15	May 6	.10
Sierra Nevada	Nev.	Mar. 25	Apr. 14	.10
Silver King	Ariz.	Mar. 11	Apr. 8	.25
Tanana	Cal.	Apr. 7	Apr. 29	.10
Tetro	Utah	Apr. 1	Apr. 26	.01
Tintic	Utah	Apr. 10	Apr. 28	.00½
Willietta	Cal.	Mar. 5	Apr. 7	.01
Yuba Con.	Cal.	Mar. 24	Apr. 14	.08



that the mine will be closed. This stock, while not a market leader, has had a depressing effect during the week on the mines list.

Findley strengthened from 11¼@11½, to 12½ during the week; 14 was asked, but was not reached. The appreciation in value was due to the fact that the 900-ft. level is scheduled to open the Findley vein this week at a point 100 ft. below the deepest point ever opened before. Lexington was a market leader among the lower-priced stocks, selling a week ago at 8c., and holding fractionally stronger all week. The improvement is due to the opening of an entirely new ore shoot in a virgin portion of the company's ground. The strike is still too new to place much dependence upon it, however. The market generally has shown a good trading tone, the prices fairly firm. The exchange suspended its call on Friday.

**Salt Lake City. March 29.**

(From Our Special Correspondent.)

The week ending March 29 has seen some splendid advances all along the line. The market has begun to take on much of its former appearance during the high price season, and the shorts, who have been holding the best securities to the bottom, have been caught for sums that would cause most traders on the outside to smile. Prophets are not so free with their advice as they were a couple of weeks ago. They have begun to think all signs fail in wet weather. Every one has an umbrella. Daly-West was the feature of the Exchange during the week and in its wake came other stocks fully deserving of the advance. It now stands at \$44.25 and that is close to the high price it had before it was hammered down to as low as \$17.40 in the last raid by the rumors of the fight with the Quincy.

Ajax has more than doubled in price since the opening on Monday morning and has been one of the heavy traders, pushing from 34c. low to 63c. at the close. Lower Mammoth lacks only 3c. of having doubled from the opening, its high point being \$1.50. May Day has held somewhat steady, but climbed to 49c. from its opening of 37½c. low. Uncle Sam Consolidated has fluctuated between 34 and 28c. all week with its sales marking 39,300 shares.

The Consolidated Mercur has posted a dividend of 3c. a share payable April 7. The company has decided to pay monthly in the future instead of quarterly as heretofore.

A meeting of the stockholders of the Yankee Consolidated is called for April 19 to consider the proposition of selling the properties to the Boston-Yankee Consolidated Company.

The Little Bell Consolidated Mining Company, of Wyoming, has filed its acceptance of Utah's provisions for foreign corporations. The object of the company is to operate and purchase the Little Bell, Joker No. 2, Brysbon, Bolivar, Horseshoe, Jesse, Moguel, Maria, Peeler, Bolivar No. 2, Bay Horse, and Silver Hill claims situated in the Uintah District, Summit County, and the Kilkenny claim in Snake Creek District, Wasatch County. The company is capitalized for 300,000 shares of the value of \$1 each. Herman Bamberger is designated to accept service in Utah.

**San Francisco. March 29.**

(From Our Special Correspondent.)

Moderate activity early in the week, with a quieter market at the close, will cover the week. Prices were fairly steady. The move to close the Exchange on Friday did not succeed, and business went on as usual.

Consolidated California & Virginia sold at \$1.25 @ \$1.30; Ophir, \$1; Silver Hill, 55c.; Mexican, 48c.; Hale & Norcross, 28c.; Sierra Nevada, 26@27c.; Best & Belcher, 26c.; Chollar, 13@14c.

On the Producers' Oil Exchange business was more active and there was some excitement. Sales were numerous and prices generally firmer. Hanford sold at \$87; Peerless, \$6.75@7; Sterling, \$1.55@1.60; Monte Cristo, \$1.45; Sovereign, 36c.; Giant, 35c.; Junction, 19@20c.; Lion, 7@8c. The special feature of the week was Sterling, for which there was a lively demand, with large sales.

**London. March 21.**

(From Our Special Correspondent.)

The London mining market has been confined within narrow limits this week. The market has not yet got over the effect of Lord Methuen's defeat. Prices have receded in most cases, and though the professional element are trying to entice the public to buy by declaring that the present set back is their opportunity to get in cheaply, there seems to be very little buying.

The West Australian market has been enlivened this week by the return of Mr. Govett, the chairman of Lake View Consols. Though no report has yet been issued, some people appear to have received news of the actual condition of the mine, and their tactics tend to weaken the market. The shares now stand as low as £3, and are weak at that. On the other hand, shares in Great Boulder Perseverance have

been strengthened considerably by Mr. Frank Gardner's speech at the meeting of shareholders. He has promised them quarterly dividends of 10s. each for an indefinite period, so that the £1 shares are in demand at £15, and should go higher. We know that Mr. Gardner is an optimist, but his promise of dividends will, I think, be more reliable than similar promises made in the West Australian market a year or two ago. The mine has not been gutted nor robbed, but has been opened up on a more systematic scale, and though the expenditure has been somewhat lavish, the ore contents will easily stand it.

Speculation in shares in companies operating in West Africa has been quite dead during the last few months. Several companies have had to report that their concessions were entirely worthless, and in some cases bogus; while no definite reports have yet come to hand of any really successful or promising work. One of the great drawbacks encountered in this country is to be removed eventually by the building of a railway from the coast at Secondi to Loomassie, a distance of 170 miles. The money for this work is being raised by a loan of £1,000,000, guaranteed by the British Government, and offers for the stock are now being invited. The money will be found easily enough owing to the nature of the guarantee and the benefit obtained by the railway will not be confined to the mining industry, but will be felt by the whole community. It is true that the revenues of the Gold Coast Colony are to be relied on for the payment of interest, but it is perfectly understood that should these fail the Imperial Government will be prepared to make good the balance.

The difficulty as regards the control of the two Whitaker Wright companies, the Rossland Great Western and the Kootenay mining companies has been amicably settled by the resignation of two of the directors and the retention of one of them. The new directors, Mr. Williamson Milne and Mr. Holloway, are well acquainted with British Columbian mining, and they should be of service to the companies. It is proposed to amalgamate the two companies if any equitable and acceptable scheme can be found, but some difficulty will be met with from the fact that the Rossland Great Western possesses a much better property than the Kootenay, and shareholders in the two may be irreconcilable. An unexpected difficulty has arisen by the sudden resignation of Mr. Bernard Macdonald from the position of consulting engineer, but it is probable that his services will eventually be secured again when it is made known to him that the new boards are desirous that he should not sever his connection.

The present depression in the price of copper is causing shares in copper mining companies to be unpopular. Last week I mentioned that the announcement of a dividend by Rio Tinto at a rather higher rate than was expected had caused the shares in that and other copper companies to harden slightly. This week the Tharsis Company announces a dividend at the rate of 20 per cent, as compared with 30 per cent last year. As this is a considerable fall the shares have become weak and have fallen to £6, the par value being £2. Two years ago the shares were over £11. This fall has caused all copper shares to become weak again.

**Paris. March 23.**

(From Our Special Correspondent.)

The mining stock market has been moderately active, though somewhat uneven in its course.

There has been a slight revival in South Africans, which had been very dull since the boom, which started in January, collapsed. The reason is not clear. On the one hand we have a steady increase in production, though the January total is less than one-tenth of an average month before the war. On the other hand, there are new British reverses, which seem to put peace further off. Prices are generally well maintained.

The foreign merchandise trade of France for the two months ending February 28 is reported by the Ministry of Commerce as below:

	1901.	1902.
Imports .....	Fr. 799,555,000	Fr. 783,443,000
Exports .....	588,457,000	691,565,000
Excess of imports.....	Fr. 211,098,000	Fr. 91,878,000

There was a decrease this year of 16,112,000 fr. in imports, an increase of 103,108,000 fr. in exports, and a resulting decrease of no less than 119,220,000 fr. in the excess of imports. The increase in exports was in manufactured goods and raw materials.

The movement of gold and silver in France for the month of January is reported by the Ministry of Commerce as below:

	Imports.	Exports.	Excess.
	Francs.	Francs.	Francs.
Gold:			
1902 .....	25,902,000	10,026,000	Imp. 15,876,000
1901 .....	89,860,000	741,000	Imp. 39,119,000
Silver:			
1902 .....	6,305,000	6,715,000	Exp. 410,000
1901 .....	6,945,000	11,297,000	Exp. 4,352,000

Imports of copper and nickel coins were 6,000 fr.,

against 8,000 fr. in January, 1901. Exports were 432,000 fr., against 24,000 fr. last year.

The metallurgical shares are quiet, with few variations. The coal stocks are rather heavy.

In copper shares there has been some active buying of Rio Tintos, and a new movement in that stock seems probable. The dividend announcement is better than was generally expected.

We continue to accumulate money in Paris, but there is no disposition to go into any new enterprises. Foreign loans seem to be the only outlet for surplus money which investors are willing to accept.

AZOTE.

**COAL TRADE REVIEW.**

**New York.**

**ANTHRACITE.**

**April 4.**

There will be no general strike at the mines this spring—the new spring price lists are a good indication of that. As to the various proceedings leading up to the issuing of the price lists, much might be said. In fact, to some critics in the trade, the Shamokin convention with its absolutely impossible resolutions, the calling in of the Civic Federation, the famous conference between the presidents of several of the anthracite roads and the representatives of the Mine Workers, and the decision for a 30 days' truce, followed by the announcement of spring prices, are all acts in a drama, the hero of which is a distinguished member of the Civic Federation. That is, the various acts followed in such rapid succession as to preclude the idea that everything was unpremeditated. However, operators and representatives of the miners have talked things over together, and certainly the organization of which Mr. Mitchell is head has obtained recognition. Whether the rank and file of the miners will be satisfied with this or will make further demands, as has been the case with past organizations in the anthracite fields, remains to be seen. It is sufficient that this year will not see the miseries of a long-drawn strike.

The new price lists are expected to bring out a lot of orders, particularly from the West, where so many dealers last year, distrusting the permanency of the new order of things, delayed ordering until summer, and paid 30, 40 or 50c. more a ton for the privilege. In the Northwest there will be considerable supplies left on Lake docks when the first boats arrive in the course of a week or so. The market at present is rather quiet. In Chicago territory dealers are preparing to look up their probable needs and cover their wants as soon as possible. Along the lower lakes and in Canadian territory there has been a fair degree of activity in the trade. Here, as elsewhere, the new price lists were received with proper deference. Along the Atlantic seaboard some rather raw cold weather has kept up consumption pretty well, and the total demand has been large enough to satisfy dealers.

As was prophesied in this column some weeks ago, the new price lists put egg on a parity with stove and nut sizes in the East. In the past there has been sometimes a difference of 50c. in favor of egg. Eastern sales agents say this difference has always been so much clear profit for the jobber and retailer, since in winter time egg retails on a parity with stove. This year, as last, prices are to be advanced 10c. on the first of each month until September. The April prices for free-burning white ash coal f. o. b. New York Harbor shipping ports are: Broken, \$3.50; egg, stove and chestnut, \$4. The steam sizes continue in good demand at full prices. Pea is selling at about \$2.75@3.00; buckwheat, \$2.25@2.50.

**BITUMINOUS.**

The Atlantic seaboard soft trade shows no changes of importance. Demand is good, but coal continues to come through quickly from the mines, thus helping relieve the pressure on producers, who, though not yet up with pressing orders, still find the situation much easier than it was a few weeks ago. There seems to be a slight lull in making contracts for this year and the indications are that most producers have taken about all the contracts that they care to, though a lot of coal has not been contracted for yet. Things have certainly changed from what used to be the regular order a few years ago. Then producers were running after consumers; now the reverse is the case. The outlook for labor troubles, barring the strike in the Beech Creek region, is not particularly threatening. There has been a lot of newspaper talk about a strike in the West Virginia fields, but that State has always been a tough proposition for labor organizers, and the chances are that the leaders of the United Mine Workers will not care to call a general strike there until the miners are much better organized than at present, though there may be trouble at places in the Kanawha and Fairmount regions.

The trade situation at points beyond Cape Cod is easier, though practically no coal is in stock there. Along Long Island Sound there is a heavy demand for the better grades, while consumers continue to supply their needs with the poorer. At New York Harbor points demand is comparatively easy and producers



are putting in heavy cargoes where, a few weeks ago, they had to piece out.

Transportation from mines to tidewater has been very good for the past week, coal running through in 3 or 4 days. Car supply at the collieries is about 50 per cent of the demand. In the coastwise vessel market vessels are in fairly good supply. The smaller craft are coming out of winter quarters. We quote current rates from Philadelphia as follows: Providence, New Bedford and Long Island Sound, 75c.; Boston, Salem and Portland, 85c.; Newburyport and Wareham, 95c. @ \$1; Portsmouth, 90c.

Clearfield coal is now selling for \$2.65 @ \$2.85 f. o. b. New York Harbor shipping ports.

The prices named for this season's business, as last year's, are as follows: Clearfield, Beech Creek, Meyersdale, Fairmont and Davis, small vein, f. o. b. shipping ports, \$2.65; f. o. b. Philadelphia, \$2.35; f. o. b. Baltimore, \$2.28. George's Creek and Cumberland coals, f. o. b. New York Harbor shipping ports, \$2.85; Philadelphia, \$2.50; Baltimore, \$2.43; Chesapeake & Ohio coals, f. o. b. New York Harbor shipping ports, \$2.85; Newport News, \$2.50. Norfolk & Western and Pocahontas coals, f. o. b. Norfolk, \$2.50.

**Birmingham. March 31.**

(From Our Special Correspondent.)

The coal production in Alabama is improving as new mines are being developed. The completion of the Ensley Southern Railroad, from Ensley in Jefferson County to Parrish in Walker County, a distance of 35 miles, is announced and already three mines have been opened along this line and coal is being shipped. Other property is being developed along the route. The mines in operation already in the State are making good outputs. The demand for the product is very good, the larger consumers still having some trouble in getting their full supply. The river and rail shipments of coal from this State to New Orleans are heavy and promise to keep up through the entire year. The feature of the coal mart in Alabama is the development in the virgin fields.

**Chicago. April 1.**

(From Our Special Correspondent.)

On the eve of a general readjustment of prices and freight rates, the Chicago coal market is in an uncertain condition. Within the next two days, it is expected, the usual spring readjustment will be definitely settled. There are rumors to-day that a new tariff has been adopted by the railroads, but confirmation of the report is wanting. A decline in rates and consequently in prices is looked for by the trade. In the last three days prices have dropped generally for Eastern coals and there is an abundance of all the principal grades of bituminous. Hocking is especially plentiful and has gone down from \$3.25 to \$2.80, with a surplus supply on tracks that must be moved, and that is selling at \$2.50. Indiana block is now selling at \$2.45; Indiana semi-block at \$2.20; Clinton lump, \$2.10; West Virginia splint, \$3.25; Indiana lump, \$2 @ \$2.10; Northern Illinois run-of-mine, \$1.80; Southern Illinois, run-of-mine, \$2. There is practically no demand for the smokeless grades, or for Youghiogheny. Blacksmith's coal remains at \$3.50, through the expectation of a strike at the mines. But little coal will probably be brought to Chicago by lake during April, should navigation open early, because of the desire of dealers to have as little in stock when the spring appraisals, for taxing purposes, are made. These are completed by May 1.

Anthracite, as well as bituminous, shows the effect of lessened demand due to milder weather; the price has gone down from \$6 to \$5.50 for all coal taken in April, though quotations remain at \$6. There is a plentiful supply of all grades.

**Cleveland. April 2.**

(From Our Special Correspondent.)

The movement of coal toward the lakes for the current season of navigation has started in briskly. The railroads are now in first-class condition to take care of the movement of the material and have set aside the usual amount of equipment for the transportation of the boats' cargoes. The yards all along the south shore of Lake Erie are practically filled with coal waiting for transfer to the holds of the lake vessels. Some boats of the lake fleet are already in motion for this year, but these all belong to the ore-producing concerns and carry no coal. The coal carriers, however, will be on the market in a week at least and then the shipment for the season will start. No season contracts have so far been made. A few charters have been made for the first trip of the boats, but aside from that nothing indicative of what the season's business will amount to has been done. The opening rates are 35c. to the head of the lakes and 45c. to Milwaukee. It is expected on all sides that this same rate will prevail when a few contracts for the season have been made. The opening of the coal-shipping season cannot now be delayed long, because the railroads will insist upon their cars being freed, and in addition the need of coal in the Northwest is very great.

**Pittsburg. April 2.**

(From Our Special Correspondent.)

**Coal.**—No official announcement has yet been made of an advance in the price of coal by the Pittsburg Coal Company, but it is reported that rates are soon to be increased from 10 to 15c. a ton. The Monongahela River Consolidated Coal and Coke Company, the river combination, this week announced that no change will be made in prices at present. The rivers are navigable again and the combine has shipped 2,500,000 bush. of coal to Southern markets, leaving no coal in the pools and harbor that is not required for the local trade. The mines are all in full operation and the only difficulty the railroad combination has to contend with is a lack of sufficient cars to move the product to the consumers. There are a number of rumors regarding probable movements of the two combinations, but all lack official confirmation. It is said that the railroad combine proposes to load its surplus stock, when railroad cars cannot be secured, in river craft and enter the markets now supplied by the river combination. It is again reported that the two concerns are to be consolidated but this is denied.

**Connellsville Coke.**—The production and shipment last week was about the same as the previous week. There is a continued heavy demand and premiums are freely paid for prompt delivery. The leading producer is still quoting furnace coke at \$2.25 and foundry at \$2.75 @ \$3; but 75c. and \$1 over these rates are being paid. The Courier in its last issue gives the production in the region for the previous week at 214,765 tons. The shipments for the week aggregated 11,954 cars distributed as follows: To Pittsburg and river tipples, 3,989 cars; to points west of Pittsburg, 5,639 cars; to points east of Connellsville, 1,966 cars. This was an increase of 936 cars.

**Foreign Coal Trade. April 3.**

Export trade continues quiet, with little to note beyond the usual shipments to the West Indies and some business to French and Italian ports.

Ocean freights from the United States to Mediterranean ports continue easy, especially for time charters. Rates noted are 8s. 6d. (\$2.04) from Philadelphia to St. Nazaire, France, prompt sailing. Future sailings to other French ports are quoted at 7s. 9d. (\$1.86), and to Italian ports at 7s. 6d. @ 7s. 9d. (\$1.80 @ \$1.84) from Norfolk, Va., Baltimore, Md., or Philadelphia, Pa. Last year at this season the rates were 13s. 9d. @ 16s. 6d. (\$3.30 @ \$3.96), according to port, showing a heavy fall in 1902.

Exports of coal and coke from the United States for the two months ending February 28 are reported by the Bureau of Statistics of the Treasury Department as follows, in tons:

	1901.	1902.	Changes.
Anthracite .....	312,108	215,465	D. 96,643
Bituminous .....	830,298	750,337	D. 79,961
Total, coal.....	1,142,403	965,802	D. 176,604
Coke .....	57,006	68,626	I. 11,620
Totals .....	1,199,412	1,034,428	D. 164,984

The decrease in anthracite this year was 31.0 per cent, in bituminous, 9.5 per cent; and in the total coal, 15.5 per cent. There was an increase of 20.4 per cent in coke. The distribution of these exports was as follows:

	1901.	1902.	Changes.
Canada .....	765,327	623,009	D. 142,318
Mexico .....	96,993	84,103	D. 12,887
Cuba .....	67,911	71,826	I. 3,915
West Indies .....	77,558	76,369	D. 1,189
Europe .....	65,300	55,437	D. 9,863
Other countries.....	69,317	55,055	D. 14,262
Totals.....	1,142,406	965,802	D. 176,604

**IRON TRADE REVIEW.**

**New York. April 3.**

The general market shows the unusual condition of an effort on the part of leading interests to keep down prices, which show a tendency to get away from control. This, however, does not affect the great bulk of business, but is shown chiefly in offers of premiums for early deliveries, and in extra prices paid middlemen for small lots of material. The latter is especially manifest in structural material for builders.

The early opening of navigation will be a help to the blast furnaces. On the other hand there are threats of labor trouble in the Pittsburg District and the Mahoning and Shenango Valleys, where the demand of the blast furnace employees for three instead of two turns—that is for eight hours' work—may result in a strike. The strike of the coal miners of the Rochester & Pittsburg Company also affects the fuel supply of some furnaces.

The report of the United States Steel Corporation for its first year is given on another page.

Imports of pig iron and steel billets continue, but on a small scale only. It is said, however, that options are held on a large quantity of British and German material.

**Birmingham. March 31.**

(From Our Special Correspondent.)

The pig iron market remains steady. There is a strong demand but very little iron is to be had on reasonable time for delivery. Sales are being made for delivery absolutely during the last of the year and premiums ranging from \$1 to \$2 per ton are being offered for immediate delivery iron. The furnacemen in this section are still fighting any general advance in iron. The reports in Northern and Western circles had it that the iron-makers in the South contemplated holding a meeting and making a general advance in prices, but this move is opposed by the iron-masters who believe that conservatism is more profitable than a runaway market.

Shipments have been disturbed during the past few days on account of inclement weather. Incessant rains caused floods and the railroads were handicapped terribly and unable to move the product.

The production in Alabama is holding its own. It is proposed to have a larger output this month, through the blowing in of a couple of furnaces, including the large new furnace of the Republic Iron and Steel Company at Thomas. The company has prepared itself for a greater consumption of raw material and has started work on 160 more bee-hive ovens at Thomas.

The following quotations are given: No. 1 foundry, \$12.50; No. 2 foundry, \$12; No. 3 foundry, \$11.50; No. 4 foundry, \$11; gray forge, \$10.50 @ \$11; No. 1 soft, \$12.50; No. 2 soft, \$12.

The steel mill at Ensley, belonging to the Tennessee Coal, Iron and Railroad Company, is making its usual amount of steel and the shipments are steady. Some extensive improvements are being made about the plant, extensions are being placed to the open-hearth building, two 60-ton cranes and 10 ladles to be installed. A 250-ton mixer with the necessary crane and gas producer will be ordered and other improvements made. The various mills at Ensley using steel are running on full time and are shipping out large quantities.

The foundry and machine shops are all busy with bright prospects for some time to come. Good prices prevail in these circles and a large complement of men are now being given employment.

**Buffalo. April 1.**

(Special Report of Rogers, Brown & Co.)

The situation in the local pig iron market is practically the same as noted in our last report. The scarcity of iron has eliminated sales for early delivery and closed the books of many furnaces for deliveries during the entire year. Producers have as yet shown no desire to solicit business for next year and consequently, so far as actual sales are concerned, the market is comparatively quiet. Buyers everywhere are calling for shipments on their contracts and consumption goes on at a tremendous rate, the limit to the tonnage produced being the only thing which keeps the consumption from jumping still higher. We quote below on the cash basis, f. o. b. cars Buffalo: No. 1 strong foundry coke iron, Lake Superior ore, \$19; No. 2, \$18.50; Southern soft, No. 1, \$18.75; No. 2, \$18.25; Lake Superior charcoal, \$20.50.

**Chicago. April 1.**

(From Our Special Correspondent.)

Both Northern and Southern pig iron are very scarce in the Chicago market, and the products of furnaces are generally sold out to the last quarter of the year. There is hardly any Northern iron in sight. Nominally, the prices have not advanced beyond those of a week ago, No. 1 Northern being quoted at \$18.50 @ \$19, and No. 2 at \$18 @ \$18.50. Under the continued demand Northern seems bound to advance in price soon. The price of Southern is largely speculative; there is little to be learned from the nominal quotations of \$16.50 for No. 1 and \$16 for No. 2; sales are said to advance these prices in some cases as much as \$2 to \$2.50 per ton. Lake Superior charcoal is in great demand at \$21 @ \$21.50, with almost none in sight. Coke is a trifle lower, being quoted at \$5.25 @ \$5.50. There is more Connellsville coke coming in, though the supply is still scarce. Of West Virginia coke the supply is somewhat better, but not enough of any kind is being received to fill the demand. The railroad situation is better, in general, though scarcity of equipment is still complained of. Pig iron producers apprehend worse conditions, rather than better, from the opening of lake navigation; the demand for cars to supply the demands of Eastern lake ports will probably, it is thought, diminish the number of those available for Chicago traffic, and the new equipment being added by the railroads appears to be about counterbalanced by the retirement or diversion of old cars.

**Cleveland. April 2.**

(From Our Special Correspondent.)

**Iron Ore.**—Contracts for the transportation of iron ore on the lakes are now being made on the basis of 75c. between Duluth and Ohio ports. During the past week the Republic Iron and Steel Company has placed some ore on a five-year contract, the same



rates prevailing, and M. A. Hanna & Co. have done the same thing. In addition other shippers have come upon the market during the past few days and have placed some ore on the same basis of rates. It seems now as if most of the ore that is to be taken hereafter will be on the same basis instead of at the 80c. rate, which some of the smaller shippers established during the earlier portion of the season. On both rates something like 17,000,000 tons have been provided for so far and it is expected that the season's movement will amount to 22,000,000 tons. This leaves very little material to be placed on contracts as a certain fixed portion of the season's movement has its transportation arranged for when the shipment is to be made. Very few sales of ore are now being made, but the old prices prevail, namely, \$4.25 for bessemer old range; \$3.25 for non-bessemer old range and bessemer Mesabi; and \$2.75 for non-bessemer Mesabi.

**Pig Iron.**—The producers of foundry announce that they have entirely sold up their capacity for the remainder of the year. There is practically no foundry on the market, and what little can be had for quick shipment changes hands at such prices as the holder chooses to make. Some malleable iron has been sold at \$19 at furnace. The foundry quotation of No. 2 is virtually the same. Some basic iron has been sold at \$17.50 for fourth quarter delivery, but the bessemer iron producers have sold nothing for that period. It is expected that a meeting of the Bessemer Association will be held soon to fix prices and some advances from former quotations are expected.

**Finished Material.**—Sales of structural steel have been made this week, anticipating deliveries into next year. This presents a situation seldom if ever equalled in the history of the steel trade here. As this indicates the mills are sold up for the present year's delivery and practically no steel remains of which to make disposition. The mill quotations on this product are 1.70c. while the jobbers are getting between 2½c. and 3c. out of stock. The bar iron quotation has been advanced to 1.80c. Pittsburg, because of the growing scarcity of the material brought about by heavy selling, and also by the fact that some of the producers have withdrawn from the market as bar iron producers and have turned their capacity to the manufacture of the steel product. Bar steel prices are advanced this week absolutely to the 1.60c. Pittsburg basis, and the foreknowledge of this increase caused heavy buying during the past week, the sales in this territory aggregating 25,000 tons. It is likewise reported that sales have been made entailing delivery between July 1 this year and the same date of 1903, the amount being 500,000 tons. The prices are 1.60c. Pittsburg for bessemer steel bars and 1.70c. Pittsburg for open-hearth steel bars. Steel plates are well sold up for the present year and no material is being offered on the market. The quotation remains at 1.70c. Sheets are being sold in large quantities but mostly out of store here. On these transactions the old price of 3.45@3.60c. for No. 27 one-pass cold-rolled is being asked. Black pipe is still bringing 60 to 67 off list, and galvanized pipe 48 to 55 off list, Pittsburg basing discounts.

**Old Material.**—The scrap trade is comparatively quiet, with quotations remaining as they were.

Pittsburg. April 2.

(From Our Special Correspondent.)

The pig iron market has quieted down somewhat and sales this week are for delivery during the second quarter. Prices are higher for bessemer and gray forge, but a few lots of foundry iron were sold at a trifle less than the rates quoted a week ago. All the furnaces are pretty well sold up to July 1 and into the third quarter. The United States Steel Corporation has not yet closed its order for the fourth quarter and is evidently holding off for better prices than can be obtained under the present market conditions. It is estimated that the big steel combine will require fully 150,000 tons of iron for the last quarter. As nothing had been heard of the proposed demand of the workers for a three-turn system for several weeks furnace owners had about concluded that the matter had been dropped. The officers of the National Blast Furnace Workers, however, were merely strengthening their organization and preparing to enforce the demand. A meeting of representatives of the various local unions who constitute an executive committee of the association, was held in Youngstown during the week. It was decided to give the furnace owners official notice on April 1 that the organization would enforce the demand on May 1 for three turns instead of two turns without and reduction in wages. This notice was formally sent out yesterday. The demand so far is only for the furnaces in the Mahoning and Shenango Valleys. If these terms are insisted upon it is certain that a strike will result as the furnace owners have determined to reject the proposition. It was officially given out to-day that an agreement had been entered into by the United States Steel Corporation, the Republic Iron and Steel Company, the Bessemer Furnace Association and the independent operators to resist the new system proposed by the workers. It is asserted that the employees are asking for something that is practically impossible to concede.

Besides increasing the labor cost 50 per cent, which would result by granting the terms, it would be a most difficult matter to secure the additional number of men necessary to operate the furnaces if the present two-turn system is changed to three turns. While the men are on duty 12 hours they do not work the full time. It is not believed that the organization will attempt to enforce the demand, but that a compromise will be offered that will give the workers an advance in pay.

The new price of 1.80c. for iron bars and 1.60c. for steel bars became official yesterday. It was expected that steel bars would be advanced to 1.70c. in order to continue the differential of 0.10c. but now it seems more likely that iron bars will be reduced to 1.70c. There has been a heavy demand for both iron and steel bars and most of the mills are entirely sold up for the first half. The demand for scrap is increasing and heavy melting stock is quoted at \$19.50. Relaying steel rails sold during the week at \$25.

At a meeting of the wire and wire nail interests, held in Chicago, present prices were reaffirmed. An advance had been expected, but it is said that reports showed that most of the plants were sold up to July 1 and a change in prices at this time was not deemed advisable. The meeting of cut nail manufacturers which had been scheduled to be held in New York was postponed for a week. As no change in the price of wire nails as made it is not likely that cut nails will be advanced.

**Pig Iron.**—Bessemer pig iron is quoted this week at \$17 to \$18, Valley furnaces, and about 3,000 tons were sold. Basic iron is held at \$18, Pittsburg, but no sales are recorded. Foreign basic has been offered at a price equivalent to a little over \$19 delivered in this market. Gray forge is higher this week. One lot of 1,000 tons sold at \$18.25, Pittsburg, and 2,500 tons were contracted for at \$18, Pittsburg. The price of foundry No. 2 is a shade lower than last week and it is quoted at \$18 to \$19, Pittsburg, the latter price being for prompt shipment.

**Steel.**—Bessemer steel billets are held this week at \$32, but no sales of any consequence were made. It is almost impossible to get structural material for delivery within six months. Jones & Laughlins, Limited, are practically out of the market for the balance of the year. Steel bars are now officially quoted at 1.60c. and the price of plates remains unchanged.

**Sheets.**—The sheet market is decidedly quiet at a time when it usually is active. This is taken as an indication that many consumers bought ahead of time. No. 28 gauge is still quoted at 3.10@3.15c., and galvanized sheets remain at 70, 10 and 5 per cent off in car-load lots and 70 and 10 per cent off in less than car-load lots.

**Ferro-Manganese.**—The principal producer continues to quote 80 per cent domestic at \$52.50.

New York. April 4.

**Pig Iron.**—Spot iron is even harder to get than last week. The market is firm, with certain brands higher. We quote for tidewater delivery: No. 1 X foundry, \$19.25@19.50; No. 2X, \$18.50@19; No. 2 plain, \$18@18.50; gray forge, \$17.25@17.50. For Southern iron on dock, New York, No. 1 foundry, \$16.50@17; No. 2, \$15.75@16.50; No. 3, \$15.50@16; No. 4, \$14.75@15.75; No. 1 soft, \$16.50@17; No. 2, \$16@16.50.

**Bar Iron and Steel.**—There is no change in the market; trade is good. We quote 1.70c. for common bars in large lots on dock; refined bars, 1.83c.; soft steel bars, 1.83c.

**Plates.**—Mills that recently advanced prices \$2 per ton continue to receive more orders than they are anxious to take. Demand is heavy. We quote for tidewater delivery in car-loads: Tank, ¼-in. and heavier, 1.78@1.80c.; flange, 1.88@1.90c.; marine, 1.98@2c.; universal, 1.78@1.80c.

**Steel Rails.**—There is no change in the market. Standard sections are still quoted at \$28 at Eastern mills; light rails at \$30@33, according to weight.

**Structural Material.**—Demand continues active and several large contracts have been placed during the week. Spot material continues to command a good premium. We quote for large lots at tidewater as follows: Beams, 1.90@1.95c.; tees, 1.85c.; angles, 1.80c.

**Nails.**—Demand for both cut and wire nails is good. We quote for car-load lots on dock: Cut nails, \$2.18; wire nails, \$2.55.

#### CHEMICALS AND MINERALS.

(For further prices of chemicals, minerals and rare elements, see page 510.)

New York. April 4.

**Heavy Chemicals.**—Domestic high-test alkali finds ready sale over next fire at 75@77½c. per 100 lbs. f. o. b. works, while foreign continues quiet at 90@92½c. in New York. Imports of alkali into the United States in the 2 months ending February were

5,388,651 lbs., or 51,341 lbs. less than the corresponding period last year. Domestic high-test caustic soda is in better request for 1903 delivery at \$1.85@1.87½ per 100 lbs. f. o. b. works, while early shipments bring \$1.90@1.92½. Foreign caustic soda, quoted at \$2.25 per 100 lbs. for high test, shows larger imports. In the 2 months ending February 28 the United States received 862,226 lbs., which is 281,615 lbs. more than was reported last year. Domestic bicarb. soda suffers from competition among makers, and, although \$1 per 100 lbs. is quoted f. o. b. works for the ordinary grades, lower prices have been heard. The better grades hold at \$3 up per 100 lbs. f. o. b. works. Sal soda shows a good spring demand at 55c. per 100 lbs. f. o. b. works. Foreign sal soda is also improving, sellers asking 62½c. per 100 lb. in New York for arrivals. The imports into the United States in the 2 months ending February 28 amounted to 658,060 lbs., being an increase of 43,840 lbs. over last year. Bleaching powder is weaker, as there is a pressure to sell. Continental brands have sold down to \$1.65, and Liverpool prime around \$1.80. At the close quotations are \$1.65@1.85 per 100 lbs., according to make and seller. United States imports in the 2 months ending February 28 were 21,069,347 lbs., as against 21,920,256 lbs., the decrease of 850,909 lbs., being due partly to the larger domestic production. Chlorate of potash is quiet at \$8@8½ per 100 lbs. for crystals or powdered. Domestic forward orders are still taken at \$7.75 per 100 lbs. f. o. b. works. Imports into the United States in the 2 months ending February 28 were 162,266 lbs., against 168,389 lbs. last year; showing a decrease of 6,123 lbs. The domestic production is becoming more important, and the time is not far distant when imports will amount to little or nothing.

**Acids.**—Contract callings are not large, as this is the quiet season for many acids. Better transportation has facilitated shipments on orders delayed during the floods. Exports of acids show an improvement over last year. In the 2 months ending February 28 the United States exported \$54,723 worth, chiefly to Central and South America. The exports of copper sulphate during the same period were 8,463,279 lbs., against 12,358,694 lbs. in 1901; the decrease of 3,895,415 lbs. being due chiefly to the curtailed demand in Italy.

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 Vitriol.....	4.37½@4.50	Sulphuric, 50 deg., bulk	ton.....	14.00@14.00
Muriatic, 18 deg.....	1.50	Sulphuric, 60 deg.....	1.00	
Muriatic, 20 deg.....	1.62½	Sulphuric, 60 deg., bulk	18.00@20.00	
Muriatic, 22 deg.....	1.75	Sulphuric, 66 deg.....	1.20	
Nitric, 36 deg.....	4.00	Sulphuric, 66 deg., bulk	21.00@23.00	
Nitric, 38 deg.....	4.25			
Nitric, 40 deg.....	4.50			
Nitric, 42 deg.....	4.87½			

**Brimstone.**—Little more doing at \$23.50 per ton for best unmix second on spot, and \$22.50@22.75 for shipments. Best thirds are quoted \$2.50 under seconds. Imports into the United States in the 2 months ending February 28 were 26,938 tons, as against 21,162 tons last year; the increase of 5,776 tons being credited to the sulphite pulp manufacturers. The Anglo-Sicilian Sulphur Company, known as the brimstone trust, paid an interim dividend on the preferred stock at the rate of 6 per cent per annum on April 4.

**Pyrites.**—Importers anticipate firmer freight rates from Spain, owing to the restricted exports of heavy goods from America. Vessels chartered abroad usually calculate their ocean rate to this side on a full return cargo, and if that cannot be had, they expect a higher initial rate. It is thought that before long we shall see freights over 11s. (\$2.64) from Huelva, Spain, to Atlantic ports. Our imports are heavy, and in the 2 months ending February 28 amounted to 58,747 tons, against 51,780 tons last year; showing an increase of 6,967 tons, credited to the sulphuric acid makers. The average value per ton of the imports this year is \$3.40, being 23c. more than was invoiced last year. Most of these imports were from Spain, though several thousand tons also came from Pille's Island, Newfoundland, and 1,450 tons were from Norway.

Quotations are f. o. b.: Mineral City, Va., lump ore, \$5 per ton, and fines, 10c. per unit; Charlemont, Mass., lump, \$5, and fines, \$4.75. Spanish pyrites 12@13c. per unit, New York and other Atlantic ports. Spanish pyrites contain from 40 to 51 per cent of sulphur; American, from 42 to 44 per cent.

**Sulphate of Ammonia.**—Stronger, as buyers have awakened. Domestic 25 per cent gas liquor is quoted at \$3 per 100 lbs. for immediate delivery, and \$2.97½ for later shipment. Foreign is in better request, and shipments from Great Britain are larger. Sellers hold to the same prices asked for the American product. It is evident that the higher price for nitrate of soda has helped to strengthen the sulphate of ammonia market.

**Nitrate of Soda.**—At present high prices; buying is in small lots only, and, apparently, nothing is being done in future sailings. Spot stocks are held at \$2.35 @ \$2.40 per 100 lbs.; to arrive soon, \$2.25@2.27½; April, \$2.25; May, \$2.20; June, \$2.05, and remainder



of year, \$2. Prices this year are considerably higher than last year, as shown by the New York monthly averages:

	January.	February.	March.
Spot, 1902.....	\$2.02	\$2.24	\$2.30
Spot, 1901.....	1.84	1.82	1.82
Increase, 1902.....	\$0.18	\$0.42	\$0.48
Shipments, 1902.....	1.98	2.05	2.08
Shipments, 1901.....	1.84	1.84	1.82
Increase, 1902.....	\$0.14	\$0.21	\$0.26
Average increase, 1902.....	\$0.16	\$0.31	\$0.37

For the quarter ending March 31, 1902, prices show an increase of 36c. per 100 lbs. for spot, and 21c. for shipments; making an average of 28c.

The imports of nitrate of soda into the United States in the 2 months ending February 28 aggregated 24,860 tons, as against 27,540 tons in the same period last year, showing a decrease of 2,680 tons. This falling off is due to the higher prices this year and to the curtailed shipments from the west coast of South America, owing to the laborers' strike at loading ports.

The exports from Chile to the United States in March amounted to 440,000 qtls. by the steamers *Cumbal*, *Cacique* and *Whitgift*, and the bark *Danae*. The loadings on April 1 were 185,000 qtls. by the steamers *Britannia* and *Elleric*.

The shipments from Chile to Europe in March were 2,900,000 qtls., against 1,288,994 qtls. in the same month last year; showing an increase of 1,611,006 qtls. Loadings on April 1 were 1,400,000 qtls., which compares with 1,778,198 qtls. last year. The visible supply in Europe on April 1 was 60,000 tons less than at the same time last year.

A reform in shipping nitrate of soda has been ordered by the Chilean Government, which has decreed that from January 1, 1903, the product shall be exported in bags containing a uniform weight of 100 kilos (220 lbs. avoirdupois). At present shipments are made in bags that weigh from 224 lbs. to 336 lbs., the larger size going chiefly to the European market.

Fear that the Chilean Government will eventually increase the export tax on nitrate of soda from 2s. 4d. (56c.) per quintal to 2s. 10d. (68c.), or thereabouts, is not supported by the recent official decision that no change would be made. It is true, however, that certain politicians are in favor of such an advance.

Messrs. Mortimer & Wisner's monthly statement of nitrate of soda, dated New York, April 1, gives the following statistics:

	1902.	1901.	1900.
	Bags.	Bags.	Bags.
Imported into Atlantic Ports from West Coast, S. A., from Jan. 1, 1902, to date.....	194,790	357,989	225,489
Imported into Atlantic Ports from Europe.....	.....	.....	.....
Totals.....	194,790	357,989	225,489
Stock in store and afloat April 1, 1902, in:			
New York.....	28,481	36,251	.....
Boston.....	1,000	.....	.....
Philadelphia.....	1,800	.....	.....
Baltimore.....	4,000	.....	.....
Norfolk, Va.....	.....	.....	.....
Charleston.....	.....	.....	.....
Savannah.....	.....	.....	.....
To arrive, due July 15, 1902.....	331,800	274,007	343,000
Visible supply to July 15, 1902.....	337,600	303,488	379,251
Stock on hand Jan. 1, 1902.....	77,517	13,446	9,586
Deliveries past month.....	80,600	118,340	60,492
Deliveries since Jan. 1 to date.....	266,507	341,954	198,824
Total yearly deliveries.....	1,308,820	1,176,651	.....

Prices current, April 1, \$2.30, \$1.80, \$2.10@2%.

**Phosphates.**—Sellers of Florida and Tennessee rock are firm in their views as the fertilizer season is at hand, and in Europe superphosphates are in better demand. South Carolina rock is quiet, and one of the large companies, the Coosaw, has stopped work for an indefinite period. The Coosaw shipped last year over 33,000 tons of phosphate, or about twice as much as it produced. Consequently the company has little stock left on its hands.

Phosphate land sales in Florida are not as frequent as they used to be, as desirable properties are rather scarce. Recently, however, the firm of J. Buttgenbach & Co., who are important miners, purchased the Edward Holder plant and deposits, comprising 40 acres, and located 1½ miles from Dunnellon, Fla. The price is believed to be \$95,000 or \$100,000.

Exports of all phosphates from the United States in the 2 months ending February 28 were 79,459 tons, as against 99,066 tons in the corresponding period last year, showing a decrease of 19,607 tons. The de-

crease is attributed chiefly to the restricted shipments of Tennessee rock to Italy and France.

We quote phosphate prices below:

Phosphates.	Per ton F. o. b.	C. i. f. Un. Kingdom or European Ports.	
		Unit.	Long ton.
*Fla. hard rock (77@80%)....	\$7.50	6¼@7d	\$9.75@10.82
*Fla. land pb. (68@73%)....	3.00@3.25	4¼@5d	6.95@ 7.00
*Fla. Peace Riv. (58@63%)..	2.25@2.50	4¼@5d	5.70@ 6.00
†Tenn. (78@80%) export.....	3.50	.....	.....
†Tenn., 78% domestic.....	3.00@3.25	.....	.....
†Tenn., 75% domestic.....	2.75@3.00	.....	.....
†Tenn., 73@74% domestic.....	2.40	.....	.....
†Tenn., 70@72% domestic.....	2.10@2.25	.....	.....
‡So. Car. land rock.....	3.25	4¼@5d	5.67@ 6.30
‡So. Car. river rock.....	2.75@3.00	.....	.....
Algerian, rock (63@70%)....	6@6¼d	8.04@ 8.70	.....
Algerian, rock (58@63%)....	5@5¼d	6.00@ 6.30	.....
Tunis, Gafsa (58@63%)....	5@5¼d	6.00@ 6.30	.....

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

**Liverpool. March 19.**

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

The export demand for heavy chemicals is still light and outside of home trade deliveries against contracts there is not much going on. Soda ash is held for the usual full prices as to destination. The nearest spot range for tierces may be called about as follows: Leblanc 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 5s.@£4 10s; 58 per cent, £4 10s.@£4 15s. per ton, net cash. Bags, 5s. per ton under price for tierces. Soda crystals move off steadily at generally £3 7s. 6d per ton, less 5 per cent for barrels, or 7s. less for hags, with special terms for certain export markets. Caustic soda is only in moderate request, but values are without change, as follows: 60 per cent. £8 15s.; 70 per cent, £9 15s.; 74 per cent, £10 5s.; 76 per cent, £10 10s. per ton, net cash. Bleaching powder is nominally quoted at £6 15s.@£6 17s. 6d. per ton, net cash, for hardwood packages, with special terms for Continental and a few other export quarters, but buyers operate very sparingly. Chlorate of potash is still dull at 3@3¼d per lb., net cash. Bicarb soda is in moderate demand at £6 15s. per ton, less 2½ per cent for the finest quality in 1 cwt. kegs, with usual allowance for larger packages; also special terms for a few favored markets. Sulphate of ammonia is strong and dearer at £11 15s.@£11 18s. 9d. per ton, less 2½ per cent for good gray 24@25 per cent in double bags f. o. b. here, as to quality. Nitrate of soda is dearer on spot, holders now asking £10 12s. 6d.@£10 15s. per ton, less 2½ per cent for double bags f. o. b. here, as to quality.

**METAL MARKET.**

**New York. Apr. 3.**

**GOLD AND SILVER.**

**Gold and Silver Exports and Imports.**

At all United States Ports in February and Year.

Metal	February.		Year.	
	1901.	1902.	1901.	1902.
<b>Gold.</b>				
Exports.....	\$416,812	\$8,617,287	\$8,637,971	\$10,590,562
Imports.....	1,859,274	1,884,893	6,124,500	3,989,620
Excess. I. \$1,442,462	E. \$6,932,394	E. \$2,513,071	E. \$7,601,282	
<b>Silver.</b>				
Exports.....	\$4,579,249	\$3,924,183	\$9,369,488	\$8,433,356
Imports.....	2,189,489	2,005,593	5,378,907	4,113,274
Excess. E. \$2,389,760	E. \$1,918,590	E. \$3,990,581	E. \$4,320,122	

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 April 3, 1902, and for years from January 1, 1902, 1901 and 1900.

Period.	Gold.		Silver.		Total Excess Exports or Imports.
	Exports.	Imports.	Exports.	Imports.	
Week.....	\$12,000	\$34,000	\$87,300	\$25,180 E.	\$46,120
1902.....	13,551,695	848,541	8,488,299	334,436 E.	22,140,017
1901.....	10,508,393	813,240	9,962,794	1,081,294 E.	18,776,467
1900.....	2,948,784	1,135,400	11,005,040	1,171,192 E.	11,648,233

Gold exports this week were to South America and the West Indies; the silver went chiefly to London. Imports were from Central and South America and the West Indies.

**Financial Notes of the Week.**

Business continues steady and the activity in most directions shows no diminution. The speculative markets, however, are somewhat depressed, chiefly on account of scarcity of money for short loans and higher interest rates. There are funds enough for regular business requirements, however. Foreign exchange is firm and somewhat higher, but no gold exports are noted.

The statement of the New York banks, including the 63 banks represented in the Clearing House, for the week ending March 29, gives the following totals, comparison being made with the corresponding weeks of 1901 and 1900:

	1900.	1901.	1902.
Loans and discounts.....	\$742,611,900	\$916,880,900	\$904,074,500
Deposits.....	\$87,816,600	1,004,283,200	965,353,300
Circulation.....	20,136,000	31,635,000	31,423,100
Specie.....	149,273,800	186,570,800	177,382,700
Legal tenders.....	62,516,500	72,370,500	70,921,200
Total reserve.....	\$211,790,300	\$258,941,300	\$248,303,900
Legal requirements.....	201,954,150	251,070,800	241,338,325

Balance surplus..... \$9,836,150 \$7,870,500 \$6,965,575  
Changes for the week, this year, were increases of \$550,300 in specie, \$973,700 in legal tenders, and \$3,494,325 in surplus reserve; decreases of \$8,878,600 in loans and discounts, \$7,881,300 in deposits, and \$11,400 in circulation.

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:

	—1901.—		—1902.—	
	Gold.	Silver.	Gold.	Silver.
N. Y. Ass'd.....	\$186,570,800	.....	\$177,382,700	.....
England.....	180,839,325	.....	180,513,865	.....
France.....	475,570,545	\$219,816,340	511,013,545	\$261,414,235
Germany.....	137,980,000	64,930,000	195,755,000	72,405,000
Spain.....	70,010,000	82,800,000	70,335,000	90,645,000
Netherlands.....	25,292,000	28,352,500	25,430,500	32,995,000
Belgium.....	14,965,000	7,480,000	15,716,665	7,858,335
Italy.....	76,225,000	9,651,000	80,375,000	10,640,000
Russia.....	371,985,000	35,520,000	364,250,000	39,950,000

The returns of the Associated Banks of New York are of date March 29 and the other March 27, as reported by the *Commercial and Financial Chronicle* cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

While the pressure to sell silver has not been great, at the same time offerings have been sufficient to satisfy buyers and silver has shown no indications of an advance. The Easter holidays have contributed to the dulness of the trade.

The United States Assay Office in New York reports receipts of 36,000 oz. silver for the week.

Shipments of silver from London to the East for the year up to March 20 are reported by Messrs. Pixley & Abell's circular as follows:

	1901.	1902.	Changes.
India.....	£2,094,500	£1,712,585	D. £381,915
China.....	109,875	16,500	D. 93,375
The Straits.....	48,376	256	D. 47,726
Totals.....	£2,192,751	£1,729,335	D. £463,415

Arrivals for the week, this year, were £153,000 in bar silver from New York, £12,000 from Chile, and £33,000 from Australia; total, £198,000. Shipments were £90,000 in bar silver to Bombay, and £15,000 to Calcutta; total, £105,000.

Indian exchange is firm, and there is an increasing demand for money in India. The Council bills offered in London were all taken at 16d. per rupee. The demand for silver from India continues very light.

The coinage executed at the Mints of the United States in March, and the 3 months of this year, is reported by the Bureau of the Mint, as below:

Denominations.	Pieces.	March.	January-March.
		Value.	Value.
Double Eagles.....	39	\$780.00	\$14,220,780.00
Eagles.....	38	380.00	380.00
Half-eagles.....	41	205.00	205.00
Quarter-eagles.....	77	192.50	84,042.50
Total gold.....	195	\$1,557.50	\$14,305,407.50
Dollars.....	1,500,312	1,500,312.00	5,336,312.00
Half-dollars.....	440,312	220,156.00	1,057,793.00
Quarter-dollars.....	3,720,312	930,078.00	1,474,078.00
Dimes.....	3,150,312	315,031.20	495,031.20
Total silver.....	8,811,248	\$2,965,577.20	\$8,363,214.20
Five-cent nickels.....	3,283,000	164,150.00	350,000.00
One-cent bronze.....	5,245,000	52,450.00	185,000.00
Total minor.....	8,528,000	\$216,600.00	\$535,000.00
Total coinage.....	17,339,443	\$3,183,734.70	\$23,203,621.70

As compared with last year the total coinage in the first quarter of 1902 shows a falling off, especially in gold.

The amount of money in the United States on April 1 is estimated by the Treasury Department as follows:

Table with columns: Total, In Treasury, In Circulation. Rows include Gold Coin, Silver Dollars, Treasury Notes, National Bank Notes.

Population of the United States April 1, 1902, estimated at 78,777,000; circulation per capita, \$28.59. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the Treasury...

Prices of Foreign Coins.

Table with columns: Bid, Asked. Rows include Mexican dollars, Peruvian soles, Victoria sovereigns, etc.

OTHER METALS.

Daily Prices of Metals in New York.

Table with columns: Mar. Apr., Sterling Exchange, N.Y. Cts., London Pence, Lake Cts. per lb., Electrolytic per ton, Lead N.Y. St. L., etc.

London quotations are per long ton, (2,240 lbs.) standard copper, which is now the equivalent of the former 2 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.

At the annual meeting of the New York Metal Exchange on March 31 the following officers were elected: President, Col. Robert M. Thompson; vice-president, Adolph Lewisohn; treasurer, Charles S. French; secretary, C. Mayer; managers, B. Hochschild, H. H. Hendricks, L. Nachmann, Julius H. Lobdell, Jesse Lewisohn, William J. Ives, George W. Jaques and J. H. Lang.

Copper.—The market remains quiet. In Europe the demand improved somewhat after the holidays, but was freely met, and in consequence prices did not go higher. Manufacturers both here and abroad are busy, but being still well supplied with copper bought at lower prices, orders are not plentiful. We quote Lake copper at 11 1/8@12c; electrolytic in cakes, wirebars and ingots, at 11 1/2@11 3/4c, in cathodes at 11 1/4@11 1/2c; casting copper at 11 1/2@11 3/4c.

The foreign market, which closed last week at £52 12s. 6d., opened on Tuesday at £52 10s., but on Wednesday it improved to £53. On Thursday it touched £53 17s. 6d., closing 10s. lower for spot and three months.

Statistics for the second half of March show an increase in the visible supplies of 1,600 tons.

Refined and manufactured sorts we quote: English tough, £55@£55 10s.; best selected, £55 10s.@£56; strong sheets, £66@£67; India sheets, £65@£66; yellow metal, 6@6 1/4d.

Exports of copper from New York and Baltimore in the week ending April 2, are reported by our special correspondents as follows: To Great Britain, 954 tons; Germany, 60; Holland, 465; Italy, 141; France, 1,050; Austria, 526; Belgium, 80; other countries, 156; total, 3,432 tons. Also 120 tons matte to Great Britain. Imports were 300 tons copper from Mexico, and 300 tons from England; total, 600 tons.

Imports of copper into the United States for the two months ending February 28 are reported by the

Bureau of Statistics of the Treasury Department as below, in long tons:

Table with columns: 1901, 1902, Changes. Rows include Copper ore and matte, Fine copper.

As the report does not separate ore and matte, it is impossible to estimate the total contents in metal.

Tin.—The market has been active, and a large business has been done for both early and distant deliveries. Spot tin continues scarce, and April delivery is also not plentiful. Consumption appears to be very good indeed. At the close we quote spot tin at 26 1/4c, April delivery at 26.60c, May at 26 1/4c, June at 26 1/4c.

The foreign market, which closed last week at £116 10s., opened on Tuesday at £1 higher. On Wednesday it advanced £2 to £119 10s., and closes on Thursday at £119 5s. for spot, £117 7s. 6d. for three months.

Statistics for the month of March show an increase in the visible supplies of 1,200 tons.

Imports of tin into the United States for the two months ending February 28 are reported as below, in long tons:

Table with columns: 1901, 1902, Changes. Rows include Straits, Australia, London, Holland, Other countries, Totals.

The increase this year was in shipments direct from the East, the receipts through London showing a large falling off.

Exports of tin from the Straits in March are reported at 4,645 long tons. For the three months ending March 31 the total was 12,995 tons, against 11,705 tons in the first quarter of 1901; an increase of 1,290 tons, or 11 per cent.

Stocks of tin in sight on April 1 are reported as below, in long tons:

Table with columns: Store, Afloat, Total. Rows include London, Holland, U. S., exclusive Pacific ports, Totals.

The total compares with 18,062 tons on April 1, 1901; an increase of 69 tons.

Lead is unchanged. The ruling quotations are 4@4.05c. St. Louis, 4.05@4.10c. New York.

The foreign market is somewhat higher, Spanish lead being quoted at £11 8s. 9d.@£11 11s. 3d., English lead at £11 11s. 3d.@£11 13s. 9d.

Imports of lead into the United States from all sources, and re-exports of domestic lead, are reported by the Bureau of Statistics of the Treasury Department as below, for the two months ending February 28. The figures are in short tons:

Table with columns: 1901, 1902, Changes. Rows include Lead, metallic; Lead in ore and base bullion; Total imports; Re-exports; Balance.

Of the imports this year 16,629 tons, or 90.3 per cent, came from Mexico, and 1,509 tons, or 8.2 per cent from Canada. In addition to the foreign lead given above there were 5 tons of domestic lead exported this year, against 1,807 tons in the corresponding period last year.

Spelter.—The market continues to improve. There appears to be little over for early delivery, and higher prices are asked. The ore market has gone up, and in consequence the smelters have raised their views. We quote the market at 4.20@4.25c. St. Louis and 4.37 1/2@4.40c. New York.

The foreign market is steady, good ordinaries being quoted at £17 15s., specials at £18.

Exports of spelter, or metallic zinc, from the United States for the two months ending February 28 were 685 short tons, against 774 tons for the corresponding period in 1901. Exports of zinc ores were 6,086 tons, against 7,171 tons in 1901; a decrease of 1,085 tons this year.

Antimony is unchanged. We quote Cookson's at 9 1/4@10c.; Hallett's at 8@8 1/2c.; Hungarian, Italian, Japanese and U. S. Star at 7 3/4c.

Imports of antimony into the United States for the two months ending February 28 were as follows, in pounds:

Table with columns: 1901, 1902, Changes. Rows include Metal and regulus, Antimony ore.

There was a large decrease this year, both in ores and metals.

Nickel.—The price continues firm at 50@60c. per lb., according to size and terms of order.

Exports of nickel, nickel oxide and nickel matte from the United States for the two months ending February 28 were 677,070 lbs., against 838,566 lbs. for the corresponding period in 1901; a decrease of 161,496 lbs. this year.

The organization of the International Nickel Company—the combination to which some references have heretofore been made—is fully discussed on another page.

Platinum.—Consumption continues good. Ingot platinum in large lots brings \$19.50 per oz. in New York.

Chemical ware (crucibles and dishes), best hammered metal from store in large quantities, is worth 82c. per gram.

Imports of platinum into the United States for the two months ending February 28 were 841 lbs., against 1,189 lbs. for the corresponding period in 1901; showing a decrease of 348 lbs. this year.

Quicksilver.—The New York price continues \$48 per flask for large lots, with a slightly higher figure for small orders. In San Francisco quotations are firm at \$47.50@\$48 for domestic orders, and \$44 for export. The London price is £8 15s. per flask, with the same figure quoted from second hands.

Exports of quicksilver from all United States ports for the two months ending February 28 were 133,904 lbs., against 144,129 lbs. for the corresponding period in 1901; a decrease of 10,225 lbs. this year.

Minor Metals and Alloys.—Wholesale prices, f. o. b. works, are as follows:

Table with columns: Per lb., Aluminum, Ferro-Tungsten (37%), Magnesium, Manganese (over 90%), Mangan'e Cop. (20% Mn), Mangan'e Cop. (30% Mn), Molybdenum (Best), Phosphorus, American, Sodium metal, Tungsten (Best).

Variations in prices depend chiefly on the size of the order.

Average Prices of Metals per lb., New York.

Table with columns: Tin, Lead, Spelter. Rows include months from January to December and Year.

Average Prices of Copper.

Table with columns: Month, Electrolytic, New York—Lake, London—Standard. Rows include months from January to December and Year.

New York prices are in cents, per pound; London prices in pounds sterling, per long ton of 2,240 lbs., standard copper. The prices for electrolytic copper are for cakes, ingots or wire bars; prices of cathodes are usually 0.25 cent lower.

Average Prices of Silver, per ounce Troy.

Table with columns: Month, 1902, 1901. Rows include months from January to December and Year.

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.



STOCK QUOTATIONS.

NEW YORK.

Table of stock quotations for New York, listing companies and locations with prices for various dates from Mar. 27 to Apr. 2.

BOSTON, MASS.

Table of stock quotations for Boston, Mass., listing companies with prices for various dates from Mar. 27 to Apr. 2.

Coal and Industrial Stocks.

Table of coal and industrial stock quotations, listing various companies and their prices.

Official Quotations Boston Stock Exchange. Total sales, 133,900 shares. \*Holiday. †Ex-dividend

ST. LOUIS, MO.\*

Mar. 31.

Table of stock quotations for St. Louis, Mo., listing companies and prices.

\*From our Special Correspondent.

SPOKANE, WASH.\*

Mar. 27.

Table of stock quotations for Spokane, Wash., listing companies and prices.

Total sales 33,100 shares. \*Reported by Hunner & Harris.

SALT LAKE CITY.\*

Mar. 29.

Table of stock quotations for Salt Lake City, listing companies and prices.

\*By our Special Correspondent. Total number of shares sold, 492,376.

PHILADELPHIA, PA. §

Table of stock quotations for Philadelphia, Pa., listing companies and prices.

Reported by Townsend, Whelen & Co., 309 Walnut St., Philadelphia, Pa. Total sales 6,066 shares. \*Holiday.

MEXICO.

Mar. 15.

Table of stock quotations for Mexico, listing companies and prices.

STOCK QUOTATIONS.

COLORADO SPRINGS, COLO.

Table of stock quotations for Colorado Springs, Colo., listing companies like Acacia, Alamo, Am. Con., Anaconda, Aola, etc., with columns for par value, high/low prices, and sales.

Total sales 379,626 shares.

Colorado Springs (By Telegraph.)

Table of stock quotations for Colorado Springs (By Telegraph), listing companies like Acacia, Alamo, Am. Con., Anaconda, Aola, etc., with columns for par value, high/low prices, and sales.

\*Holiday.

MONTREAL, CANADA.

Mar. 31.

Table of stock quotations for Montreal, Canada, listing companies like Big Three, California, Can. Gold Fields, etc., with columns for par value, high/low prices, and sales.

LONDON.

Mar. 22.

Table of stock quotations for London, listing companies like Alaskan-Treadwell, Anaconda, Copiapo, etc., with columns for authorized capital, par value, last dividend, and quotations.

c.—Copper. d.—Diamonds. g.—Gold. l.—Lead. s.—Silver.

PARIS.

Mar. 13.

Table of stock quotations for Paris, listing companies like Acieries de Creusot, Huta-Bank, la Marine, etc., with columns for country, product, capital stock, par value, latest dividend, and prices.

TORONTO, ONT.

Table of stock quotations for Toronto, Ont., listing companies like Ontario, Olive, British Columbia, etc., with columns for par value, high/low prices, and sales.

Total sales, 19,000 shares. †Ex-dividend. \*Holiday.



DIVIDENDS.

GOLD, SILVER, COPPER, LEAD, QUICKSILVER AND ZINC COMPANIES.

COAL, IRON AND INDUSTRIALS.

Table listing company names and locations for Gold, Silver, Copper, Lead, Quicksilver and Zinc companies. Includes entries like Aberdeen, Adams, Aetna, Alaska Goldfields, etc.

Main table containing financial data for Gold, Silver, Copper, Lead, Quicksilver and Zinc companies. Columns include Authorized Capital Stock, Shares (Issued, Par Val), Dividends (Paid 1902, Total to Date, Latest), and Amt.

Table listing company names and locations for Coal, Iron and Industrials. Includes entries like Ala. Coal & Iron, Allis-Chalmers, Altoona Coal & Coke, etc.

CANADA, CENTRAL AND SOUTH AMERICA, MEXICO.

Table listing company names and locations for Canada, Central and South America, Mexico. Includes entries like Amistad y Concordia, Athabasca, Bartolome de Medina, etc.

CHEMICALS, MINERALS, RARE EARTHS, ETC. CURRENT WHOLESALE PRICES.

Abrasive		Cust. Meas.	Price	Barium		Cust. Meas.	Price	Graphite		Cust. Meas.	Price	Paints and Colors		Cust. Meas.	Price
Carborundum, f.o.b. Niagara Falls, Powd., F. F. FFF.	lb.		\$0.08	Oxide, Am. hyd. cryst.	lb.		\$0.02 1/2	Am. f.o.b. Prov.	sh. ton		\$8.00	Metallic, brown	sh. ton		\$19.00
Grains	"		.10	Sulphate (Blanc Fixe)	"		.02	Pulverized	"		30.00	Red	"		16.00
Corundum, N. C.	"		.07@.10	<b>Barytes</b>				German, sum. pulv.	lb.		.01 1/4@.01 1/2	Ocher, Am. common	"		9.25@10.00
Chester, Mass.	"		.04 1/2@.05	Am. Crude, No. 1	sh. ton		9.00	Best pulverized	"		.01 1/4@.02	Best	"		21.25@25.00
Barry's Bay, Ont.	"		.07 1/4@.09 1/4	Crude, No. 2	"		8.00	Ceylon, common pulv.	"		.02 1/4@.03 1/4	Dutch, washed	lb.		.04 1/2
Crushed Steel, f.o.b. Pittsburg	"		.05 1/2	Crude, No. 3	"		7.75	Best pulverized	"		.04@.08	French, washed	"		.01 1/4@.01 1/2
Emery, Turkish flour, in kegs	"		.03 1/2	German gray	"		14.50	Italian, pulv.	"		.01 1/4	Orange mineral, Am.	"		.07 1/4@.07 1/2
Grains, in kegs	"		.05@.05 1/2	Snow white	"		17.00	<b>Gypsum</b> —Ground	sh. ton		8.00@8.50	Foreign, as to make	"		.07 1/4@.11 1/2
Naxos flour, in kegs	"		.03 1/2	<b>Bauxite</b> —Ga. or Ala. mines:				Fertilizer	"		7.00	Paris green, pure, bulk	"		.11 1/4@.11 1/2
Grains, in kegs	"		.05@.05 1/2	First grade	lg. ton		5.50	Rock	lg. ton		4.00	Red lead, American	"		.05 1/4@.05 1/2
Chester flour, in kegs	"		.03 1/2	Second grade	"		4.75	English and French	"		14.00@16.00	Foreign	"		.06 1/2@.08
Grains, in kegs	"		.05@.05 1/2	<b>Bismuth</b> —Subnitrate	lb.		1.40	<b>Infusorial Earth</b> —Ground			20.00	Turpentine, spirits	gal.		.48 1/2@.49
Peekskill, f.o.b. Easton, Pa.	"		.01 1/2	Subcarbonate	"		1.65	American, best	"		37.50	White lead, Am., dry	lb.		.04 1/4@.04 1/2
Crude, ex-ship N. Y.: Abbott (Turkey)	lg. ton		28.50@30.00	" " " " " " " "	"		.03 1/2	French	"		37.50	American, in oil	"		.05 1/4@.05 1/2
Kuluk (Turkey)	"		22.00@24.00	<b>Bitumen</b> —" B "	"		.05	German	"		40.00	Foreign, in oil	"		.07 1/4@.09 1/4
Naxos (Greek) h. gr.	"		26.00	" " " " " " " "	"		.02 1/4@.02 1/2	<b>Bone Ash</b>	"		2.45	Zinc, white, Am., ex dry	"		.04 1/2@.04 1/2
Garnet, as per quality	sh. ton		25.00@35.00	<b>Borax</b>	"		.07 1/4@.07 1/4	Sulphate	100 lbs.		2.00@2.50	American, red seal	"		.06 1/2
Pumice Stone, Am. powd.	lb.		.01 1/2@.02	<b>Bromine</b>	"		.40	<b>Cadmium</b> —Metallic	"		1.40	Green seal	"		.07
Italian, powdered	"		.01 1/2	<b>Cadmium</b>	100 lbs.		2.00@2.50	Sulphate	"		1.40	Foreign, red seal, dry	"		.05 1/2@.08
Lump, per quality	"		.04@.40	<b>Calcium</b> —Acetate, gray	"		1.30	<b>Caesium</b> —Metallic	"		1.40	Green seal, dry	"		.06 1/2@.08 1/2
Rottenstone, ground	"		.02 1/4@.04 1/2	" " " " " " " "	"		.90	<b>Cerium</b> —Metallic	"		1.40				
Lump, per quality	"		.06@.20	Carbide, ton lots f.o.b. Niagara Falls, N. Y. or Jersey City	sh. ton		75.00	<b>Chalk</b> —Lump, bulk	sh. ton		2.45				
Rouge, per quality	"		.10@.30	N. J.	sh. ton		75.00	Ppt. per quality	lb.		.03 1/4@.06				
Steel Emery, f.o.b. Pittsburg	"		.07	Carbonate, ppt.	lb.		.05	<b>Chlorine</b> —Liquid	"		.30				
				Chloride, com'l.	100 lbs.		.75@.80	Water	"		.10				
				Best	"		1.00	<b>Chromic</b>	"		.06				
				<b>Cement</b>				Nitrate	"		.60				
				Portland, Am., 400 lbs.	bb.		1.70@1.90	Sulphate	100 lbs.		.75@.95				
				Foreign	"		1.65@2.25	<b>Manganese</b> —Powdered,							
				"Rosendale," 300 lbs.	"		.75	70@75% binoxide	lb.		.01 1/4@.01 1/2				
				Slag cement, imported	"		1.65	Crude, pow'd.	"		.01 1/4@.02 1/4				
				<b>Ceresine</b>				75@85% binoxide	"		.02 1/4@.03 1/4				
				Orange and Yellow	lb.		.12	85@90% binoxide	"		.03 1/4@.05 1/4				
				White	"		.13 1/2	Carbonate	"		.16@.20				
				<b>Chalk</b> —Lump, bulk	sh. ton		2.45	Chloride	"		.04				
				Ppt. per quality	lb.		.03 1/4@.06	Ore, 50%, Foreign	unit		.20@.21				
				<b>Chlorine</b> —Liquid	"		.30	Domestic	"		.30				
				Water	"		.10	<b>Marble</b> —Flour	sh. ton		6.00@7.00				
				<b>Chrome Ore</b>				<b>Mercury</b> —Bichloride	lb.		.77				
				(50% ch.) ex-ship N. Y.	lg. ton		24.75	<b>Mica</b> —N. Y. gr'nd, coarse	"		.32@.04				
				Sand, f.o.b. Baltimore	"		33.00	Fine	"		.04@.05				
				Bricks, f.o.b. Pittsburg	M		175.00	Sheets, N. C., 2x4 in.	"		.30				
				<b>Clay, China</b> —Am. com., ex-dock, N. Y.	lg. ton		8.00	3x3 in.	"		.80				
				Am. best, ex-dock, N. Y.	"		9.00	3x4 in.	"		1.50				
				English, common	"		12.00	4x4 in.	"		2.00				
				Best grade	"		17.00	6x6 in.	"		3.00				
				Fire Clay, ordinary	sh. ton		4.25	<b>Mineral Wool</b>							
				Best	"		6.00	Slag, ordinary	sh. ton		19.00				
				Slip Clay	"		5.00	Selected	"		25.00				
				<b>Coal Tar Pitch</b>	gal.		.08	Rock, ordinary	"		32.00				
				Carbonate	lb.		1.75	Selected	"		40.00				
				Nitrate	"		1.50	<b>Nickel</b> —Oxide, No. 1	lb.		1.00				
				Oxide—Black	"		2.26@2.30	No. 2	"		.60				
				Gray	"		2.28@2.40	Sulphate	"		.20@.21				
				Small, blue ordinary	"		.26	<b>Oils</b> —Black, reduced 29 gr.:							
				Best	"		.20	25@30, cold test	gal.		.06 1/4@.10 1/4				
				<b>Copperas</b>	100 lbs.		.30@.35	15, cold test	"		.10 1/4@.11 1/4				
				Carbonate	lb.		.18@.19	Zero	"		.11 1/4@.12 1/4				
				Chloride	"		.25	Summer	"		.09 1/4@.09 1/4				
				Nitrate, crystals	"		.35	Cylinder, dark steam ref.	"		.08 1/4@.10 1/4				
				Oxide, com'l.	"		.19	Dark, filtered	"		.11 1/4@.15 1/4				
				<b>Cryolite</b>	"		.06 1/4	Light filtered	"		.14 1/4@.17 1/4				
				Blasting powder, A	25 lb. keg		2.85	Extra cold test	"		.21 1/4@.26 1/4				
				Blasting powder, B	"		1.40	Gasoline, 86@90°	"		.14@.19				
				"Rackarock," A	lb.		.25	Naphtha, crude, 68@72°	bb.		9.05				
				"Rackarock," B	"		.18	"Stove"	gal.		.12				
				Judson R. R. powder	"		.10	Linseed, domestic raw	"		.62@.63				
				Dynamite (20% nitro-glycerine)	"		.13	Bolled	"		.95				
				(30% nitro-glycerine)	"		.14	Calewa, raw	"		.85				
				(40% nitro-glycerine)	"		.15	<b>Ozokerite</b>	lb.		.11 1/2				
				(50% nitro-glycerine)	"		.16 1/2	<b>Paints and Colors</b>							
				(60% nitro-glycerine)	"		.18	Chrome green, common	"		.05				
				(75% nitro-glycerine)	"		.21	Pure	"		.16				
				Glycerine for nitro (32 2-10° Be.)	"		.12 1/2@.13	Yellow, common	"		.10 1/4				
				<b>Feldspar</b> —Ground	sh. ton		8.00@9.00	Best	"		.25				
				<b>Flint Pebbles</b> —Danish, Best	lg. ton		14.75	Lampblack, com'l.	"		.04 1/2				
				French, Best	"		11.75	Refined	"		.07				
				<b>Fluorspar</b>				Litharge, Am. powd.	"		.04 1/4@.05 1/4				
				Am. lump, 1st grade	sh. ton		\$14.40	English flake	"		.08 1/4@.09				
				2d grade	"		13.90	Glassmakers'	"		.07 1/4@.07 1/4				
				Gravel and crushed, 1st gr.	"		13.40								
				2d grade	"		12.40								
				Ground, 1st grade	"		17.90								
				2d grade	"		16.50								
				Foreign, lump	"		8.00@12.00								
				Ground	"		11.50@14.00								
				<b>Fuller's Earth</b> —Lump	100 lbs.		.75								
				Powdered	"		.85								

THE RARE EARTHS.

	Cust. Meas.	Price
<b>Boron</b> —Nitrate	lb.	\$1.50
<b>Calcium</b> —Tungstate (Scheelite)	"	.60
<b>Cerium</b> —Nitrate	"	11.00
<b>Didymium</b> —Nitrate	"	35.00
<b>Erbium</b> —Nitrate	"	40.00
<b>Glucium</b> —Nitrate	"	20.00
<b>Lanthanum</b> —Nitrate	"	36.00
<b>Lithium</b> —Nitrate	oz.	.60
<b>Strontium</b> —Nitrate	lb.	66 2/3@.07
<b>Thorium</b> —Nitrate 49@50%	"	5.00
<b>Uranium</b> —Nitrate	oz.	.25
<b>Yttrium</b> —Nitrate	lb.	40.00
<b>Zirconium</b> —Nitrate	"	8.00

NOTE.—These quotations are for wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. Readers of the ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable. See also Market Reviews.