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A Volumetric Method for Tin.

BY JAMES DARROCH AND C. A. MEIKLEJOHN.

The methods usually employed in estimating tin are either inaccurate, or they are tedious and involve so much time as to preclude their use by most assayers. The insolubility of the oxide presents the chief difficulty in the adoption of wet methods. The tin may be brought into solution by first reducing the oxide with hydrogen; but in many places this is impracticable, as it involves the use of special apparatus. A second method is to convert the oxide to sodium stannate, which is soluble in water, by fusion with caustic alkalies, or with sodium peroxide; the latter is to be preferred to caustic soda, as not only is the conversion more complete when it is used, but much less time is required for fusion.

The volumetric method described herewith gives good results; it is applicable to all ores of the metal, and by it an assay may be completed in an hour. The estimation is conducted in the following manner:

From one-half to two grams of the ore is fused at a dull-red heat with from three to ten grams of sodium peroxide in a nickel crucible. The fusion is continued for five minutes after the assay has melted; during this latter period, the contents are gently swirled round the crucible, this rotary motion being continued until the assay sets on cooling. After solidification, cooling is hastened by placing the crucible in water. This treatment converts the stannic oxide to sodium stannate which is soluble in water; while iron, lead, and copper are converted to their respective oxides.

The crucible is now transferred to a beaker, the fused mass extracted with boiling water, and the crucible lifted out and washed thoroughly with hot water. The assay is then transferred, without filtering, to the flask in which the titration is to take place; it is acidified with hydrochloric acid, some strips of zinc are added, and the solution is boiled. The tin is precipitated on the zinc in the boiling solution. When the tin is all down, the solution is made strongly acid with hydrochloric acid, and boiled until the tin and excess of zinc are completely dissolved. The assay is then titrated with a standard solution of ferric chloride. The titration should be done slowly as the end point is approached; and the solution should be again brought to boiling at this stage, as the reaction is not very rapid in the cold.

The reaction is complete when the solution assumes a yellow tinge (due to the presence of ferric chloride) which does not disappear on boiling. The assay should be thoroughly shaken during titration. Ammonium sulphocyanide solution, on a spot plate, may be used as an indicator, if desired, to verify the end point.

The stannous chloride is converted to stannic chloride in the boiling solution in accordance with the reaction:

$$SnCl_2 + Fe_2Cl_6 = SnCl_4 + 2\,FeCl_2.$$

The volume of the standard ferric chloride solution required for titration, times the standard of the same, equals the weight of tin in the ore taken for assay. Consequently the following calculation gives the percentage of tin in the ore:

The standard, times the c. c. of ferric chloride used; divided by the weight of ore taken; and the whole multiplied by 100, equals the per cent. of tin in the ore.

Should arsenic, antimony, bismuth, copper (or any other substance likely to interfere in the titration) be present, it may be precipitated by boiling the solution with iron. The interfering substance is filtered off, the tin is precipitated with zinc, and the estimation conducted as above. Unless some element which interferes is present, no filtering is required in this method. The solutions required for the assay are:

A standard solution of ferric chloride: This should be of such a strength that one c.c. is equivalent to about 0.003 gram of tin. As ferric chloride is of uncertain composition, owing to the hygroscopic water it contains, it is best to dissolve 15 or 20 grams in 500 c.c. of water, adding a little hydrochloric acid to keep the solution clear; standardize, and then dilute to the required strength. The solution is, of course, again standardized before use. The ferric chloride must be free from chlorine and nitric acid.

A standard solution of stannous chloride for standardizing: Two-tenths gram of pure tin is dissolved in hydrochloric acid in a flask fitted with a Bunsen valve, and the solution is titrated boiling with the standard ferric chloride solution as described above. The tin-equivalent of the ferric chloride solution is found by the following calculation:

Two-tenths gram, divided by the c.c. of ferric chloride used, equals the tin (in grams) represented by one c.c. of the standard ferric chloride solution.

Photographic Records of Bore Holes.

The surveying of deep bore-holes does not yet seem to be correctly practised in general, although the investigation of this problem in South Africa has developed accurate methods. However, the majority of the mining companies which are drilling extensively, are still determining the direction of the bore-holes by introducing small tubes having a magnetic needle suspended in melted gelatine, or where the needle cannot be used because of magnetic disturbances, the method of introducing tubes partly filled with hydrofluoric acid, which etches a ring on the tube, is used. The latter method is worse than the first, for in this case, we only secure a record of the vertical drift of the hole. During 1905, some attention and much experimenting was directed to this subject. The apparatus constructed by William Helme, of Johannesburg, produced good results in several tests. The instrument comprises a brass cylinder 30 in. long, made in two portions which screw together. In this cylinder are a small watch, dry battery, and two tiny electric lamps, operating in connection with a compass supported on gimbal bearings, and a suspended plumb-bob. At a certain hour the watch makes a contact for lighting the electric lamps, and photographs of the position of the plumb-bob and the magnetic needle, are taken on a small disk of sensitized paper.

The only two properties on which any work of importance is being done in the Bushveld tin fields are Vlaklaagte, belonging to the South African Lands and Exploration Company, and Enkeldoorn, the property of the Bushveld Tin Mines, Limited, where the original discovery was made.

Magnetite Deposits and Mining at Mineville, N. Y.—VI.

BY J. H. GRANBERY.

The product of the various workings and processes is divided into a variety that ranges from crude ore to chicken-feed, for the ferro-phosphate that was formerly a waste product is now being utilized and sold as grit for poultry.

The Old Bed lump ore is sold in the run-of-mine size, without separation or other treatment, for puddling and fettling in blast furnace work. The second product is the "Harmony Cobbed" ore, running about 61 per cent. iron and used largely for furnace work. The third, or "Old Bed concentrates," is an electrically separated product of Mill No. 2, which runs usually 65 per cent. in iron, but which can be raised to nearly pure magnetite, say 70 per cent. iron. This is used for furnace work, foundry pig and basic steel production. A product which is made occasionally for special purposes but that is not a regular product is known as "middlings;" this runs 45 per cent. iron. The fourth, and final of the iron-bearing products is "retreated concentrates." This is the purest commercial magnetite of which I have knowledge; a 25-ton shipment made from this material averaged 71.85 per cent.; the pure mineral only carries 72.41 per cent. This is handled by the regular process and then re-treated by an additional separation. The particular shipment noted was made for the General Electric Company for use in the manufacture of the magnetite lamp introduced by it.

The first by-product is apatite, pure crystals of the mineral, with a little pure sharp silica; it is a product of re-treated tailings from the Ball & Norton belt-type separators and is made from Old Bed crude ore; a memorandum showing a complete analysis of this apatite or "first grade phosphate" follows:

Magnetic oxide of iron	8.823
Sulphide of iron	0.354
Silica	18.671
Alumina	1.294
Calcium Carbonate	1.682
Calcium Sulphate	0.576
Calcium Silicate	2.929
Calcium Phosphate	62.460
Calcium Fluoride	1.753
Calcium Chloride	0.153
Magnesia	0.094
Manganese oxide	0.047
Alkalies	0.435
Water and organic matter	0.823
	100.094

The three mill products that are of market value are magnetite, or iron concentrates, apatite concentrates and second grade apatite concentrates, or "poultry grit."

The two mills have, each, a capacity of 800 tons of crude Old Bed ore in 10 hours. Of the crude material 85 per cent. is recovered as iron concentrates, the tailings are about equally divided between first- and second-grade apatite concentrates. The products on this basis are as follows:

	Tons.
Crude ore	1600
Iron concentrates	1360
First-grade apatite concentrates	120
Second-grade apatite concentrates	120

An average analysis for one year's run follows:

Product.	Per Cent.		
	Iron.	Phosphorus.	Bone Phosphate.
High phosphorus Old Bed crude ore	59.59	1.74	....
Old Bed concentrates.	67.34	0.675	....
First-grade apatite concentrates	3.55	12.71	63.55
Second-grade apatite concentrates	12.14	8.06	40.30

The other elements of Old Bed concentrates are:

	Per Cent.
Silica	2.20
Manganese	0.08
Alumina	0.90
Lime	3.14
Magnesia	0.31
Sulphur	trace.

The two mills are also capable of treating 600 tons of Harmony and New Bed crude ore in 10 hours. Of the product 77 per cent. is recovered as concentrates, the remainder being discharged as tailings. An analysis of Harmony concentrates gives the following results:

	Per Cent.	
	Iron.	Phosphorus.
Lean Harmony ore	50.26	0.292
Harmony concentrates	64.10	0.133
Harmony tailings	13.97	0.877

Another by-product is the poultry grit previously mentioned; this is known as No. 2 apatite, or ferro-phosphate. It is practically sized hornblende tailings, with silica and phosphate. It is screened to about 10 mesh.

TONNAGE OF CRUDE ORE PRODUCED.

Workings.	Average of 12 months.	February, 1906.
Old Bed (Joker and Bonanza shafts)	25,000	29,000
Shaft "A"	8,000	9,000
Shaft "B"	5,000	7,000
Smith Mine (Cook shaft)	3,000	5,000

TONNAGE OF PRODUCT AFTER TREATMENT.

Classification.	Average of 12 months.	February, 1906.
Harmony cobbed	6,000	8,000
Old Bed concentrates	18,000	19,000
Apatite	850	1,000
Ferro-phosphate ("poultry grit")		

Re-treated concentrates are made only to satisfy special orders, and figures are therefore omitted. The increase for the first two months of 1906 over 1905 is 40 per cent., approximately.

The tailings from the Harmony ore are used for the manufacture of concrete blocks. A Hercules cement-stone block machine for this purpose is installed, and is used for making blocks for foundations and such new building work as is going on. A new office building is to be erected of this material at Mineville this season, and contracts for the new 800-kw. turbo-generator station at Port Henry are also being let. This latter has already been noted. About 35 per cent. of the material that has gone through the various processes is represented in the tailings dump and in the concrete blocks made from this material.

Sampling of the product is carried on at the plant by Andrew S. McCreath and Son, Harrisburg, Penn. This department is under the direction of Geo. M. Boorn, to whom I take this means of extending thanks for courtesies rendered. The operation is substantially as follows: The car numbers are taken for both shifts, and the weighmaster keeps a record of these cars and their weights. The samples are taken by inserting a trough-shaped pan into the stream of ore that is fed into the car or bin, withdrawing it, and again inserting it when sufficient time has elapsed to effect any probable change. As belt conveyors are used, the entire stream must be cut, and it is found that by this method an accurate sample is obtained without difficulty.

The samples taken are quartered down to a point where the ordinary shot-bag will hold them. The bags are arranged on shelves in the regular order of the daily runs and are tagged and held for further quartering and shipment. Shipments of samples are made on the 8th, 15th, 22d and on the last of the month. The shipping sample is quartered down from the daily samples until it half fills a bag. The rejects from the first two quarterings are quartered down for the use of the company's chemist.

The selling analysis is made at Harrisburg, the samples analyzed in the works laboratory being used as a check on the mill operation and on the selling analysis. The laboratory is of frame about 20x30 ft., with a 5x8-ft. draft-cupboard in the middle of the laboratory proper, with sink and shelves, together with heavy built-in frames for supporting the moller and grinders. A storage cupboard for chemicals is arranged at one end, alongside the office, where all weighing is done. In the iron assay the permanganate method is used; and the "1:13 titration" is also used; as a general thing for iron and phosphorus only. The chemical laboratory is in charge of A. B. Weaver.

The aggregate of all the labor employed totals 700 men, exclusive of chemical, engineering and superintending accounts. The classification by nationalities is as follows:

Nationality.	Number Employed.	Per Cent.
Americans	76	10.9
Irish	117	16.7
French	27	3.9
Swedes	6	0.8
Hungarians	174	24.9
Polish	157	22.4
Italians	143	20.4
Total	700	

The men of different nationalities are scattered, so as to take advantage of any race prejudice by giving an opportunity to each class to demonstrate its excellence by the resulting rivalry.

Classification of labor by occupations is as follows (the division between different workings is variable, and is therefore omitted):

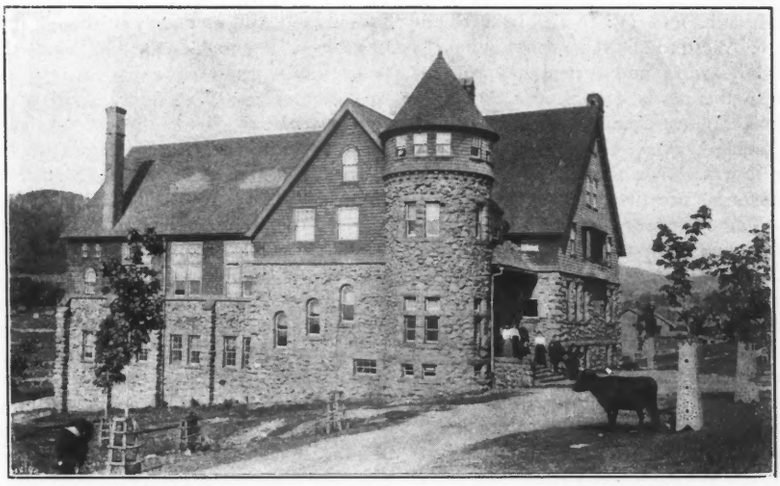
Mine captains and shift-bosses	22
Drill-men	66
Helpers	66
Muckers	15
Trammers	214
Hoistmen	14
Roofmen, firers and pump-men	25
Diamond drilling	14
Surface laborers	18
Power-house employees (engineers, firemen, oilers, electricians)	28
Mill employees, including loaders	90
Pocketmen and surface trammers	30
Blacksmith and drill-sharpeners	16
Machine-shop employees	13
Carpenter-shop employees	12
Sawmill employees	5
Teamsters	11
Engineering, sampling and chemical laboratory	8
Miscellaneous; stock piles, loaders, etc.	33

The machine shop is located in a brick building near the railroad and warehouses. It is driven by a horizontal simple slide-valve engine arranged to be operated on compressed air or steam at will. The air supply is taken from the large main supplying the workings. The shop is fitted with 3 engine lathes of 15-in. swing and with 5-, 7- and 12-ft. beds, respectively, and with one engine lathe of 40-in. swing, 14 ft. between centers. A 24x24-in. planer and a 28-in. shaper are also installed. Two drill presses, 18 in. and 24 in., respectively, are provided, and 6 benches are regularly worked. The shop is served by a Franklin 3-ton portable crane.

A testing buffer for the air drills is installed here. This is used in determining the condition of drills before sending them into the mine. In operation, the drill is set up and the air turned on; the piston is allowed to operate, through a stub tool, against a compression spring. The machine is solidly set in the floor and is arranged so that the drills may be operated, as nearly as possible, under mine conditions. All piston parts, side-bars, cylinders and feed-screws and nuts for the drills are made in this shop.

The sawmill is a frame building at the extreme western end of the settlement. It is operated from a G. E. type I motor, of form K, class 12-150-600, operated through a starting compensator and two 75-kw., type HT transformers, wired in open delta. Here are installed a 54-in. circular saw, a band saw, lathes, a lath machine, and a planer-and-edger. The mill is kept constantly at work, furnishing material for ties, car repairs and frame buildings; a large part of the work enters into the construction f the miners' dwellings. The company is this year sawing about 500,000 feet of lumber, pine, spruce, hemlock, beech, birch and maple.

The families of the late Silas H. and Jonathan G. Witherbee in 1893 erected Memorial Hall, at a cost of $65,000, in memory of them. The building is shown in the illustration; it is 80 ft. front, and the basement and first story are built of stone, the two upper stories of timber. The local high school occupies two basement rooms, and a barber-shop, baths and showers, pool and billiard tables, and a cigar-stand, are also in the basement. On the ground floor an auditorium, with stage and scenery seats 300; this is also used as a ball room and for other social occasions, fairs, etc. The library, reading room, dining room and kitchen, together with a club meeting room, are also on this floor. Bedrooms, guest-rooms, bath, and an emergency hospital with all conveniences for giving treatment for extended periods, are all provided on the second and third floors. The hospital was equipped by Mrs. R. C. Black of Pelham Manor, and endowed by Mrs. F. S. Witherbee. A resident nurse is always within call. Funds for the support of the institution are contributed by the Memorial Association (consisting of the Witherbee heirs). A good band has been organized among the workmen, and has a fine equipment, instruments being furnished by the association. No charges are made for billiard or pool playing. Many entertainments are held here, a course of lectures being one of the winter attractions, and a cooking school is operated for the benefit of the young women of the village.



WITHERBEE MEMORIAL HALL.

Houses for the workmen number over 100; they are owned by the company and are rented at a nominal sum. The type is seen in the clusters of houses shown in some of the illustrations. They have five rooms each and are all painted red, to distinguish between those of the two companies; the houses of the Port Henry Iron Ore Company are painted yellow. An Italian boarding-house for single men is also provided. This accommodates 60 men, two in a room, with individual iron beds. In the basement are baths and a changing-room and the heating plant. The building is lighted by electricity and is far in advance of most of the practice seen at this day.

Much of the information contained in the foregoing is derived from the most reliable sources—the men who are carrying on the operations described. I wish to express at this time my thanks for the unfailing courtesy shown, and the information so freely extended by Messrs. S. Norton, general manager; S. Le Fevre and R. F. Hunt, mining engineers; H. J. Lamborn, mechanical engineer; A. E. Hodgkins, chief accountant, and finally to Witherbee, Sherman & Co., more especially to Mr. F. S. Witherbee, for the interest which has made the collection of these data possible.

Mining at Broken Hill.

C. A. Moreing, of Bewick, Moreing & Co., London, who has recently been visiting the districts of Australia in which his firm is interested, including Broken Hill, in an interview spoke highly of the mining outlook at that place. He said that the Proprietary was one of the greatest assured mining propositions in the world, and that Broken Hill had entered upon a stage of prosperity which has never been equalled in its past history, and this has been brought about by the development of numerous processes for the recovery of the zinc in addition to the lead and silver, and by the operations of the Zinc Corporation. Practically new zinc mines have been created out of what were formerly waste products. The value of the field has been probably doubled, and its permanence for a great number of years assured.

"I have heard," he remarked, "that there are rumors here that my firm has the intention of reducing wages, and also that we have great ambitions for control. The people who spread these rumors can be but little acquainted with our past history, as nothing is more contrary to our wishes or our practice. We pay the highest wages in the world, and yet we are able to show, ton for ton, lower costs than they can accomplish with Chinese cheap labor in South Africa."

The heat loss from boiler radiation and leakage is due in large part to poor setting and to infiltration through the interstices between the bricks.

Arizona and Sonora—IV.

BY DWIGHT E. WOODBRIDGE.

The Calumet & Arizona Group.

Mention has been made of the developments at Bisbee by the Lake Superior & Western Development Company, and its successor, the Calumet & Arizona Mining Company. In many respects these have been among the most remarkable ever made in the history of copper mining. Since the beginning of operations in 1899, six vertical shafts have been sunk to an average depth of more than 1200 ft.; many miles of drifting have been done, both in ore and barren limestones; net earnings have been made from one shaft, of more than $7,500,000; and nearly as much has been spent in the purchase and development of additional lands. A new producer has risen into prominence in the copper trade; one whose annual control of copper is now in the neighborhood of 130,000,000 lb. and whose expectations are that this amount, large as it is, will soon be much increased.

In March, 1901 (when the Lake Superior & Western Development Company ceased its work and turned its property over to the newly organized Calumet & Arizona Mining Company), examinations were made by T. F. Cole and others; from these it was shown that the average copper tenor of ore then blocked out in the Irish Mag claim was 7 per cent., with 2 oz. in silver and $1 in gold per ton. Ore had been cut on the 750- and 850-ft. levels; and the gross value of all ore in sight was about $2,200,000. It was Mr. Cole's opinion that "we shall find sufficient ore on this claim alone to supply a 500-ton smelter for many years to come." At the same time the superintendent, I. L. Merrill, reported on many portions of the mine in which the average copper tenor was from 5 to 45 per cent. Since that time the copper recovery has been from a trifle above 8 to about 7.60 per cent.; and for the last year it was 7.91 per cent.

When Mr. Cole stepped off the Arizona & Southeastern train from Benton, on his initial arrival at Bisbee, he looked around at the Copper Queen's old glory-hole; at its busy shafts and its crowded and active smelting works, with their dust-flues laid up the side of the almost vertical mountains back of its narrow gorge-like streets; at the queer, lively little burg seething in the bottom of the gulch; at the new and promising Irish Mag shaft crowning a nearby eminence; at the red porphyry of Sacramento hill; and at the iron gossan cropping out in almost every direction, indicating the vastness of the mineralization beneath. He quickly said: "Isn't there any more ground that we can buy here?"

As the result of the attraction this locality had for him and other members of the Calumet & Arizona company, commencing early in the year 1902, there were organized, successively, four companies; the Calumet & Pittsburg, which paid nearly $950,000 for its property; the Lake Superior & Pittsburg, which paid $1,200,000; the Pittsburg & Duluth, whose ground cost $1,160,000; and the Junction, whose land purchases amounted to $650,000. In addition to these, were other more or less closely associated companies; as the American and the Warren, on the second of which more than $600,000 has already been spent. The American has recently consolidated with the Saginaw Development Company, whose projectors had expended more than $275,000; so that the American-Saginaw now represents an investment of more than half a million.

These companies (together with the original limits of the Copper Queen, and its later purchase of the tracts explored by the Lowell & Arizona, the lands of the Shattuck-Arizona and of the Denn-Arizona companies) cover all the ground in the Bisbee district that is now under active development and in which ore is reasonably certain to exist. A few other prospects are in course of exploration; little can be said of these yet, though it is of course impossible to tell what the future holds in store.

It is unnecessary to refer again to the general geology of the district. As was the case with the adjacent mines of the Copper Queen company, the Calumet & Arizona has driven miles of drifts through barren ground in its search for mineral, and will doubtless duplicate this for many years to come. The workings are all in Carboniferous limestone, and are quite near the porphyry contact of Sacramento hill, to which much of their high-grade ores may be attributed. The mine has two vertical shafts 1600 ft. apart; each has developed a large mine. Between them lies the Buckeye claim; on this also, the company has an important mine. This latter will be reached from its southeastern shaft, named the Oliver, in honor of the late H. W. Oliver, of Pittsburg. These two shafts are connected on the 800-, the 900-, the 1100-, and the 1200-ft. levels; extensive series of drifts from them reach all the various affiliated mines of the camp. Indeed it is possible to pass through workings of the Copper Queen (starting under the town of Bisbee) and come to the surface through the Cole shaft of the Lake Superior mine, more than two miles away. All this insures safety, and makes perfect ventilation of the great area of workings of the two companies.

The depth of mineral-bearing ground in the Calumet & Arizona mine is not known; but diamond-drill borings from the bottom of the shaft have shown it to reach more than 2000 ft. from the surface. The greater part of this company's production to date has come from the stopes in a comparatively small ore deposit, and covering but a few acres; the bulk of this was between the 850- and the 1050-ft. levels. The mine is being developed at the rate of from four to five miles per annum; last year 21,737 ft. of drifting and sinking were done, besides nearly 4000 ft. of diamond drilling.

In the matter of equipment, the Calumet & Arizona mine is well provided. It was the original policy of the company to place on the ground a sufficient plant to develop economically, believing it better to make a considerable initial expenditure for a good plant, and get the benefit of it during exploration; than to use make-shift appliances, only to discard them a short time later for something more modern. So the Mag shaft has a first-motion hoist, capable of handling up to 1000 tons of ore per day, in addition to waste from level to level. This has been in continuous operation since the beginning of 1899, and is still serviceable.

But the Mag shaft is "drawing"; the hill upon which it stands is cracking and creeping badly, so that in a short time the bulk of the product must come out of the Oliver, 1600 ft. away. For that purpose there has been installed one of the most efficient mine plants in the country. It consists of an inclined four-cylinder double-reel hoist, for flat ropes; it is the first of this particular arrangement to be erected. It is designed to hoist an unbalanced load with four cylinders, and a balanced load with two; it also permits two to be cut out after the load has been started. It is expected to save at least 20 per cent. in steam consumption over any hoist that has been adopted in the camp. A feature of this hoist is that its present bore of cylinders is adapted to a depth of 1500 ft.; but by re-boring, the hoist can be readily changed for a depth of 2500 ft. It is for this latter depth that the plant has been designed. There has also been ordered a large Parsons steam-turbine to generate electricity for pumping all water from this entire mine, and for tramming all ores from the Mag end of the mine, as well as from elsewhere. For this work there will be a 300-kw. generator. This will obviate long transmission of steam by pipe-line. The plant includes 1120 h.p. in boilers, all of the marine type. The equipment will handle much more ore than the Calumet & Arizona now produces; but it is not understood to be the policy of the company to greatly increase its copper output for the present. The company employs just now about 600 men at its mine, but is running slightly shorthanded.

To the east of Calumet & Arizona, and separated from it by the Copper Queen's splendid Lowell mine, is the ground of the earliest of the associated companies. This is the Calumet & Pittsburg. It has been under development since early in 1902, and has been seriously troubled by water. For a long time sinking was suspended, but for the last 22 months it has been steadily going on; and

for months as high as 2700 gal. per min. has been lifted to a hight of from 1035 to 1150 ft. The mine has a station pump-equipment of 3000 gal. total; this is made up of one 1000-gal. duplex triple-expansion engine; one 1500-gal. duplex triple-expansion engine; and one 500-gal. compound-duplex engine. Its sinking equipment consists of four 600-gal. duplex pumps. In addition, there has just been ordered (to be placed on the 1330-ft. and later on the 1530-ft. level) one 2000-gal. duplex-triple pump, which is, like the rest, of the Prescott make. For more than 100 ft., the sinking of the company's Briggs shaft was executed with the men working in water up to their waists; at times it was necessary to discontinue sinking, as enough sinkers could not be assembled in the shaft, notwithstanding its great size, to pump and sink. At times, the work did not proceed more than 3 in. per shift. Since that time water has so diminished that sinking will soon be renewed; but with renewal, it is expected that the volume of water thrown will again increase. It is now down to 1600 gal. It is a peculiarity of this shaft that, at most times, the water coming in is from the bottom; indicating, not an underground stream, but an absorption in the limestone which, once drained, will be comparatively dry.

A second shaft, called the Hoatson, situated 3000 ft. from the Briggs, was driven last year. It is believed that this shaft has exceeded all sinking records in the West. During the months of October, November, December and January, 1906, the shaft was driven 157 ft., 120.5 ft., 162 ft. and 138 ft. respectively. At the close of the year, the shaft was 1000 ft. deep. It has since gone down to nearly 1200 ft., and is now in a very promising formation, showing leached lime and ore. The advance during the most rapid months was in hard crystalline limestone. Costs were high, as the men received a premium for fast work. A slight flow of water was encountered in this shaft.

This mine has so far found but little copper ore, though it has as good indications as any property in the camp, and is considered sure by the management. There is some ore in drifts run into the company's ground from the 1006-ft. level of the Junction; and near the Briggs, ore has been cut at several points, both in drifts and winzes. The Hoatson is expected to cut ore shortly. The location of the property is such as to make it seem one of the most promising tracts in the camp. The Briggs vertical shaft at this property is one of the largest in the West, and contains four compartments; one 5x 11 ft.; one 5x5; and two each, 4.5x5 feet.

Directly south and southeast from the Calumet & Arizona, and adjoining both the Calumet & Pittsburg and the Lowell, is the Lake Superior & Pittsburg, with its 640 acres. The Cole shaft (which is now being sunk to 1500 ft.) has high-grade orebodies on the 1000- and 1100-ft. levels; it is developing promising ground in which there are indications of large deposits of ore. Drifts on the 1100-ft. level will probably soon cut ore on the Election claim. A four-cylinder hoist (similar to that of the Oliver shaft) will soon be installed; by it the production of this mine and that of the adjacent Pittsburg & Duluth will be handled. A second shaft is located some distance south, but will probably be of little use; a third shaft will be sunk south of the Lowell.

This mine has been producing since October, 1905; but at the close of the year none of its copper had passed through the refinery. Its ores (which are all oxides) average a recovery of 158 to 160 lb. of copper per ton; they carry about $6.30 in precious metals per ton of refined copper. They are extremely wet, the moisture averaging about 20 per cent., but with better drainage this is expected to diminish; indeed, it has already fallen somewhat. About 200 tons of ore are hoisted daily, giving a copper return of better than 10,000,000 lb. per annum. The mine is really in its initial stages of development, and this product is but an evidence of what it may become. About 225 men are employed. It will be many years before this mine can be thoroughly explored.

The third producer of the group is the Pittsburg & Duluth, which has been in course of development about three years. Its land lies further from the intrusive porphyry of Sacramento hill than parts of other companies; doubtless for this reason it is regarded with little favor by many investors in the district. But it is developing rich oxide ores above its main levels. These ores run into its ground from the Lake Superior property (at a depth of about 1400 ft.), and soon reach (by the deep contour of its ground) 1700 ft. from surface. This main work was apparently too low for the oxide ores; raises have now been cut upward into oxides at several points. Some of this latter ore is cuprite, running to great values. The indications are for large bodies of good ores, both sulphide and oxide; diamond-drill work in the lower levels has shown that the sulphides improve, and continue to considerably greater depth than they have been opened. At present the mine is producing about 100 tons of sulphide ore daily. From this, the copper recovery is 65 lb. per ton, making it considerably the leanest ore smelted at Douglas. It is, however, sold to the Calumet & Arizona at a premium on account of its excess of sulphur, and its low moisture (only 3 per cent.) makes it more valuable than at first appears. This sulphide ore is mixed in small quantity on account of the desire that the mix at the Douglas furnaces be self-fluxing; this amount (100 tons per day) is about what is needed to flux the furnace engaged on Lake Superior & Duluth mine ores. Later, as this mine's oxide bodies are capable of being stoped, and as a fourth furnace becomes available, its production will be materially increased, and of possibly richer ores than those now mined.

There is a sulphide stope (in the Pittsburg & Duluth) on the 1000-ft. level, 60x45 ft., and from 16 to 48 ft. high. The sulphides are clean, and one stope runs 17 per cent. Oxide drifts are cutting upward rapidly into large deposits. This mine is opened in many places by stulls, for the nature of the ground permits that class of timbering; while in the remaining mines of the group, square-sets are necessary.

The Pittsburg & Duluth has the three-compartment Congdon shaft, 1350 ft. deep, and connected with the Cole shaft by drifts 4500 ft. long. It is not probable that this shaft will ever become a producer, and its surface equipment is of an exploratory character. In a short time, drifts from the 1100-ft. level of the Cole shaft will cut Pittsburg & Duluth ground and at 100 ft. deeper than the present workings. This will doubtless be in altered-sulphide ores. It is the expectation of the management that this property will show great value; to that end, careful study is now being made of the territory opened, with the view of developing ore from many stringers that have been cut. Like other mines of this group it is running shorthanded, with about 70 men.

Of this group of properties, Junction is the fifth and last. It has a five-compartment vertical shaft, 1006 ft. deep. Its ground lies on, and close to, the porphyry contact, which here seems to dip to the north and east, giving more mineralized ground at depth than appeared on the surface. Indeed, when the company optioned this ground, it was generally supposed about Bisbee that it all lay on the "wrong" side of the contact. But development has shown the falsity of this supposition. A large steel headframe and a four-cylinder hoist (similar to that of the Oliver and Lake Superior) have just been erected. This shaft was placed close to the Calumet & Pittsburg line, and is designed to serve both mines. There is on the 1000-ft. level a plant of Prescott triple-pumping engines, of 3300 gal. per. min. normal capacity, and capable of much heavier duty; to this is to be added (for the 1300-ft. level) a 1500-gal. pump from the same factory. The heaviest work these pumps have been called upon to do is 1700 gal. per minute, and that for a brief period, when some vug was encountered; they are now averaging about 800-gal. The installation of such a set of pumping engines is no small matter. At this mine there are three pump galleries, each 100x15x9-ft., surmounted by corresponding galleries almost as large, for ventilation; these are on the 1000- and 975-ft. levels. The mine has, all told, a capacity for lifting to surface of 4000 gal. per min. In addition to this, there is capacity in the new hoist for bailing equivalent to 1500 gal. more.

The Junction is driving on the 900- and 1000-ft. levels; on the former, in ore near the shaft and in much leached material further out; on the latter, in leached material, and further out, in ore running to high values. It is expected that the richer and larger ore-deposits at this mine will come in at greater depth. The mine is a favorite among the speculative public at Bisbee.

All these mines are heavily equipped; their work is carried on in a most skillful and energetic manner. A marked feature is found in the great pumping and hoisting plants, which surpass anything in the Southwest previous to the advent of the Lake Superior promoters. The mines are equipped with air drills, and as high as 250 to 280 ft. of drifts have been driven in 30 days. Though there have been errors in details of management, yet the properties, as a whole, have been run with exceptional smoothness and skill, and are in the hands of a manager of unusual ability. In all but name and stock ownership, they are a consolidated property, and they could undoubtedly be more successfully and economically managed if they were actually combined. Probably some consolidation of the four younger mines will take place in due time; and the resulting company will take its place as one of the large copper producers of the world. All smelting for the group is now done at the works of the Calumet & Arizona, at Douglas, Ariz. The group employs about 2000 men at mines and smelter, and is making 4,000,000 lb. of blister copper per month.

Russian Mineral Production.*

Unofficial figures for the whole of 1905 for the South Russian district have been published, as follows: Coal mined, 12,863,000 tons; pig iron produced, 1,659,800 tons; iron and steel billets, 1,302,600 tons; finished iron and steel, 1,106,700 tons; steel casting, 12,800 tons; metal goods, 100,000 tons; iron ore mined, 3,000,000.

There has been a diminution both in production and sales in all branches as compared with 1904. The only export from the south was a small quantity of anthracite from Mariupol.

Coal—The quantity of coal mined in European Russia in 1904 was 17,930,000 tons, of which about 70 per cent. came from the South Russian fields. The following are some of the new coalfields reported to have been discovered in 1905:—

In the Karatav mountains on the River Bugun, in the Syr Daria territory, over an area of 100 square versts, a claim has been entered for working brown coal; the seam is said to be one-seventh to three-quarters of a fathom in thickness; it is, however, doubtful whether it would pay to build the railway necessary for the working of the coal.

*Abstract from a British Consular Report.

At Izykh, near Minusinsk, trials of the coal on the Siberian Railway are said to have given excellent results.

Near Dragomirovo station on the Central Asian railroad, in the Sulyuktin pass, the coal is better than that from Kokinesai, it burns easily and leaves hardly any residue; if a light railway were built from the mines to Dragomirovo the coal could be delivered at 13s. to 15s. 6d. per ton. Not all the locomotives on the Central Asian line burn liquid fuel—a good deal of that valuable plant "saxaul" is unfortunately burned; the coal now used costs about £2 5s. per ton. The Sulyuktin coalfield is said to contain nearly 100,000,000 tons of good coal.

Iron Ore—At Migei, in the Elizavetgrad district of Kherson, ore containing 60 per cent. of iron is said to have been found.

Ferro-Manganese—The works in the south have received large orders for ferromanganese from America, but the stoppage of the Transcaucasian Railway delayed the despatch of the necessary manganese from Chiaturi.

Magnesite—Magnesite was formerly imported from abroad, but by the imposition of a customs duty and a special railway tariff the native product from the Urals has been enabled to compete.

Graphite—Graphite has been found at Kokotau in the Okpetinsk district of Semipalatinsk, 50 versts from Sergiopol. The projected Tashkent—Polomoshnaya railroad would open up this locality, which is difficult of access. At Balta-Karak, near Kokotau, graphite was worked 30 years ago, though it was not of good quality. The new deposit is said to be of superior quality and abundant.

Alabaster—Large deposits of alabaster have been discovered in the Bulatov canton, Tashkent district, stretching along the right bank of the Bossu for 17 miles, with a breadth of nearly 1,200 yd.

Zinc—The zinc works in Poland suffered from the strikes, and their production in 1905 fell to 7,515 tons, against 10,440 tons in 1904.

Copper—On the Ukhna, a tributary of the Pechora, a Russo-Belgian group of prospectors report the discovery of a large deposit of copper ore, but the region is still more difficult of access than that of Okpetinsk, which is also reported to be rich in copper.

Petroleum—Pumping was to have begun at the Chimion oilfield in Turkestan last September, but labor troubles interfered with the work. Reservoirs to hold 5,000 tons had been built at Vannovskaya station, and the Orenburg-Tashkent Railway gave an order for 1,000,000 poods at 25 c. per pood.

Another field is said to have been discovered at Gulkhan, in the Kanibadam district of Kokand, near Sel-Rokho, which was already known as a petroleum-bearing place.

At Chongelek, on Kertch Strait, the existence of petroleum has long been known, and renewed efforts to create an industry there are now being made.

On the River Ukhta, a tributary of the Izhma, which runs into the Pechora, there was a small naphtha refinery in the early part of the eighteenth century, and the product was sent to Moscow. An attempt was made to start work again 40 years ago. Recently renewed borings resulted in a fountain at a depth of 270 feet. The oil is said to be better in quality and more abundant than that of the Caucasus. The region is difficult of access, and the field could not be worked unless the Kotlas railway were extended to the works.

Gold—The gold refined at the Russian laboratories in 1904 was officially estimated to weigh about 43 tons. Since the introduction of free refining only about one-fifth of the gold mined in the Urals goes to the Government laboratory.

Some dredgers of the Australian type are in use in the Urals, and a local factory is making dredgers and selling them at from £2,600 to £4,000. At Berezovsky a new amalgam process is being applied to old washings.

In the Urals generally 1905 was a worse year for gold mining than 1904—e.g., the North Ekaterinburg mines produced only 67 poods in 1905 against 74 poods in 1904, and most other works show a diminution. In many cases, however, there was an increased output of platinum.

While gold mining is decaying in the Central and South Urals it is growing in the north—e. g., in Cherdynsk the output increased from 5 lb. in 1901 to 72 lb. in 1904, but the wild nature of the district hampers the growth of the industry; the only mode of transport is in small boats on the swift rivers Kolvy and Velsa, which run through dense forests; the cost of conveying 36 lb. of flour to the mines is from 4s. to 6s. 6d.; at the headwaters of the Verkhnaya Pelymka there are said to be deposits which have never been worked.

The decline of gold mining in the Urals has become more and more apparent since 1898; first the Bodoibinsk company, in the Olekminsk taiga, which employed 800 hands and washed more than 1½ tons of gold per annum, stopped; then the Bazilevsky company spent £300,000 and did not obtain a pood of metal in three years. One company after another has shown a diminished output, and it is expected that the figures for 1905 will fall short of the minimum. The causes are said to be primitive methods, official formalities, and the difficulty of acquiring land from village communities.

Platinum—Large fields of platinum were reported at Ugora and Kochomory, in the Urals.

The gas engine has within the past few years been developed to a point where it is an extremely economical agency for the production of power.

The Wisconsin Lead and Zinc District.

STAFF CORRESPONDENCE.

This district is not a new one, for as early as 1700 the French missionary Father Le Sueur found the Indians, near the present site of Galena, Ill., mining lead. In 1788 Dubuque obtained from the Indians some land near the present site of Dubuque, Iowa, on which lead had been found a few years before. Some lead mining was carried on and it is said that some of the lead used at New Orleans in the war of 1812 came from ores produced in this region. By 1830 lead mining had become quite general in southwestern Wisconsin and especially in the vicinity of Dubuque, Iowa, and Galena, Ill. This industry reached its climax during the Civil War, when the price of lead reached $100 per thousand pounds. Soon after 1870, owing to the fall in the price of lead, mining for this metal began to retrograde. About 1859 appeared a zinc buyer who began to purchase the dry bone which was being found in depth associated with the lead, and soon after the first load of zinc blende or "jack" ore was sold in the district. This was bought by the Matthiessen & Hegeler Zinc Company, whose spelter plant at La Salle, Ill., had recently come into operation. It was from the southern portion of the district that mining spread until now this field extends from Highland, Wis., on the north to Elizabeth, Ill., on the south and from Dodgeville, Mineral Point and South Wayne on the east to Lancaster, Potosi and Dubuque on the west.

Much jack and drybone mining was done in the region as early as the time of the Civil War, but not until very recent years has it been possible to mine at a profit any jack ore except that which lay in sheets and which was very free from iron. The ore was washed in hand jigs, or else cobbed, and only a very low price was obtained. But within recent years magnetic separation has been introduced into the field and has proved a great success. Since then the district has advanced with leaps and bounds. Churn drills come in on every train; at present there are probably 300 of them at work in the district. Nothing is talked about except jack and its mining. Shares are bought blindly in all sorts of mining ventures. Every day brings reports of the striking of jack in some new locality. Some of these reports, of course, are greatly exaggerated, but it is true that each month sees the boundaries of the probable ore-producing area extended. Promoters and all the concomitants of a western mining boom have been dropped down suddenly into the center of this quiet agricultural district. Instead of for good crops, the farmer now hopes that some one will strike jack in a drill hole on his land, for the 10 per cent. royalty paid the owner of the land for all ore produced from below his surface is indeed tempting. To organize a drilling company, it is only necessary to get a working lease on some farm where once there were some lead diggings, when a churn drill is set up and drilling is begun. Unfortunately, a good part of this drilling is directed by persons who have never had any experience in mining and many of them are little acquainted with this district.

Most of the successful mining is being directed by men who have grown up with the district. There are a few mining engineers, but is a fact that the producing mines are practically all run by local men who have gained their experience in the district. A certain amount of overconfidence among both engineers and local promoters has led, disastrously, to the erection of a few large mills before they were warranted by the ore supply. It must be recognized that these mines will not support large and expensive equipments.

System or Series.	Formation.	Lithological Character.	Average Thickness.
Quaternary.		Residual soil, Alluvium, Loess.	7 ft.
Silurian.	Niagara.	Dolomite.	100 ft.
Ordovician.	Maquoketa (or Hudson River).	Shale.	160 ft.
	Galena.	Dolomite.	230 ft.
	Platteville (or Trenton).	Limestone and Dolomite.	55 ft.
	St. Peter.	Sandstone.	70 ft.
	Lower Magnesian.	Dolomite and some sandstone.	200 ft.
Cambrian.	Potsdam.	Sandstone with some shale and dolomite.	700 ft.
Pre-Cambrian.		Various metamorphosed sediments and igneous rocks.	

In the above, the general characteristics of the different strata are given and it only remains to describe in more detail the areas in which occur the ores of the district.

The St. Peter sandstone, which immediately underlies the Platteville limestone, rests unconformably upon the lower magnesian limestone, and for this reason it varies a great deal in thickness, to which fact the localization of the folding has been attributed by T. C. Chamberlin, This is the only unconformity in the older sediments, the transition between the St. Peter and the Platteville being marked by a shale from 1 to 5 ft. thick, while the transition from the latter to the Galena is also marked by a shale impregnated with the remains of algae.

Near the top of the Platteville occurs a hard, dense, fine-grained limestone locally known as the "glass rock." This occurs generally as beds 3 or 4 in. thick with thin partings of shale, and has a total thickness of 18 in. to 4 ft., although in

FIG. I. "COG" MINERAL, SKENE MINE, ELIZABETH, ILL.

The district consists of an even upland, cut by broad valleys varying from 100 to 400 ft. in depth below the general level. The elevation of this upland on the north is about 1150 ft. above sea level, while in the southern portion it is about 800 ft. As the district is situated well within the "driftless area," the region is covered only with residual soil; this varies greatly in thickness.

The surface is underlain by a series of Paleozoic strata which dip very slightly toward the southwest. These strata have been subjected to a slight compression from the south which has formed small local folds. There is no faulting of any consequence in the district and ingeneous intrusions are entirely absent.

the eastern part of the district it reaches 15 ft. thick. The very top of the Platteville is a blue shale, which becomes soft when opened up to the air. This frequently marks the base of ore deposits in the district.

Immediately above the Platteville comes the Galena limestone. This is the most important rock of the region, for not only does it form the upland surface, but it also is the rock in which the most important orebodies are found. The Galena, as a whole, is a coarse-grained, porous limestone but its base is marked by the most important rock in the series—the oil rock. This is a thin-bedded shale about 2 ft. thick, and is highly carbonaceous. When dry it will burn, giving off a peculiar petroleum odor. Last fall a series of experiments was carried on at Platteville to see whether the rock might not be used as a source of fuel. This oil rock, in the majority of the mines thus far developed, has proved to be the limit below which ore deposition ceased. Exceptions, however, are observed in the region about Linden, Mineral Point and Shullsburg.

The orebodies of the region are remarkable for the small variety of minerals that occur in them. The principal ones are galenite, sphalerite, marcasite and calcite, and their oxidation products, cerrusite, smithsonite, hydrozinkite and limonite.

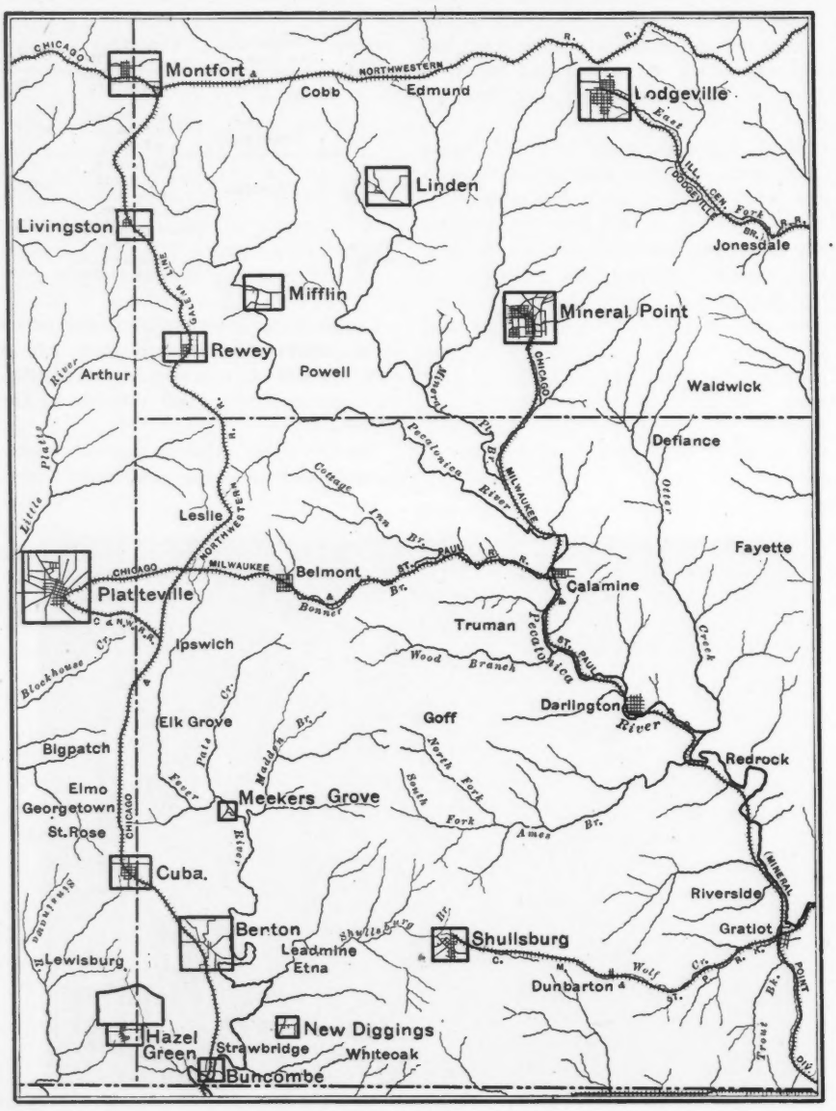


FIG. 2. THE WISCONSIN DISTRICT.
Localities indicated by squares show where mining or prospecting is going on.

The galena, termed "mineral" by the miners, occurs commonly in cubic crystals. When these form large aggregates the miners call it "cog mineral," while the smaller crystals are called "dice mineral." The galena contains practically no silver. Sphalerite, generally referred to by the miners as "jack," is by far the most important ore of the district. The jack occurs generally below the level of the ground water and on that account was not mined much in the early days. It is generally dark brown in color, less commonly black, as at Highland, Wis. The sphalerite rarely occurs as crystals, but mainly in sheets varying from 1 in. to 2 ft. thick. The iron sulphide occurs mainly as marcasite, but there is some pyrite, as at the Great Northern mine at Platteville. The marcasite occurs generally as a thin lining next the rock in the sheet deposits. The marcasite, or "sulphur," increases in amount toward the bottom of the orebodies, and has caused several mines, which at first produced a high grade concentrate, later to install roasters and use magnetic separation to get rid of the iron sulphide in their wet concentrates, as at the Empire mine near Platteville. The calcite or "tiff" occurs as the center filling in many of the sheets and also occurs as irregular patches in the orebody. Barite occurs at the Gritty Six mine near Cuba City. Luckily for the district, barite occurs in but few of the deposits.

The order of deposition of these minerals has been almost universally: first, marcasite; second, blende; third, galena; and fourth, calcite. Aside from this paragenesis the orebodies show also a vertical arrangement. Galena at the surface frequently passes into dry bone and sphalerite at water level, while below the water are the main deposits of blende. In some of the zinc deposits, however, there is no apparent connection with lead deposits.

The orebodies apparently were formed by lateral secretion.[1] Their localization, however, is still a matter of dispute. Prof. T. C. Chamberlin thinks that it was due to depressions in the original sea bottom into which was accumulated the slime of metallic sulphides precipitated out of the ocean water by decaying organic matter. These sulphides, scattered through the strata of these local basins, the deepening of which was accentuated by folding going on during deposition, were then subsequently concentrated in open channels in the strata of the basin. Calvin and Bain have suggested a geographic cause for this localization, while Professor Van Hise, leaving open the question of the original regularity or irregularity of the deposition, accounts for the present irregularity of distribution of the ores by the varying conditions in different places during subsequent concentration of the scattered sulphides.

Of all the articles written on the district, the one by T. C. Chamberlin is the most valuable. When he visited the district in 1881 there were but few jack mines in the district and there was little mining below the water level, but he was able to predict extensive zinc deposits underlying the lead and to account for their formation and localization of the deposits. He predicted the finding of sphalerite in the characteristic sheets and pitches and the general east and west

[1] "The Ore Deposits of Southwestern Wisconsin." T. C. Chamberlin, 1881, Geology of Wisconsin, Vol. IV.
"Lead and Zinc Deposits of Wisconsin." U. S. Grant, 1906, *Bull.* XIV, Wisconsin Geo. Survey.

trend of the more important deposits. Later investigators have only filled in with more detail the theory worked out by Chamberlin. All subsequent prospecting has been along the lines indicated by him and subsequent developments have verified his predictions.

The orebodies of the region all appear to have been formed in local depressions. Folding has caused the strata to break in a series of crevices which run generally east and west. These have been crossed by a less prominent series of north and

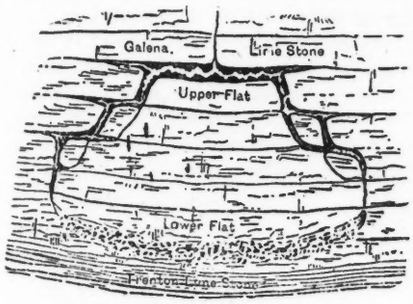


FIG. 3. IDEAL SECTION OF OREBODY.

south crevices. They have also been crossed by a series of jointings which have a general northeast-southwest and also a northwest-southeast direction, called locally "two o'clocks" and "ten o'clock's" respectively. Any one of this series of crevices may be the seat of the dominant ore deposition, but, in general, east and west is the direction of the main orebodies. These crevices are found in belts or zones called locally "ranges." Extending downward, these crevices passed into more yielding strata so that they formed a series of open spaces following the bedding planes of the strata and then again cutting sharply across

FIG. 4. DISSEMINATED ORE IN THE OIL ROCK.

Klondike mine west of Platteville. The dark-lined areas represent the usual oil rock; the stippled areas porous, lighter colored oil rock; and the dark areas sphalerite.

them. In these were deposited the "flats" and "pitches" of the jack orebodies shown in Fig. 3. Of course none of the mines represents all of the conditions. In some there is only a south pitch, in others the ore occurs only in flats. The galena, of course, occurs to some extent associated with jack ores in the flats and pitches and also in the disseminated jack ores, but the lead as a whole is confined mainly to the network of crevices near the surface.

The disseminated deposits are broad horizons in which the rock has been more or less impregnated with crystals of sphalerite and some galena. The flats and pitches often graduate into disseminated deposits; often there is a top and bottom sheet of ore with a layer of disseminated ore between, as at the St. Rose mine near Platteville. In some cases, disseminated orebodies occur without any connection with sheet deposits, as at the Baxter mine near Cuba City. As a general rule the disseminated ores carry considerably less iron sulphide than do the sheet deposits.

Whether the deposits are in the form of sheets or of disseminated ores, they vary greatly in width and in direction. They are not well defined like deposits formed along lines of faulting, but wander about, now following one fracture and now another. They spread out in one place only to contract in another, but they are quite persistent, extending, at Linden, for a distance of several thousand feet.

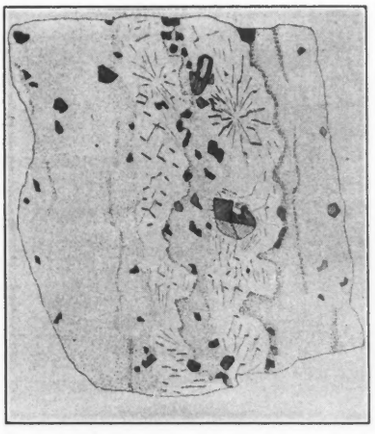


FIG. 5. BLUE LIMESTONE CONTAINING BARITE, SPHALERITE AND GALENA.

Enterprise mine. The stippled areas represent limestone; the clear areas with radiating lines represent barite; the double-lined areas, sphalerite; the single-lined areas, galena.

The oil rock at the base of the Galena limestone in many cases seems to limit the orebody, but in other places, the ore cuts through the oil rock, as at the Hibernia mine at Platteville, where a 4-in. and 3-in. sheet of jack, separated by about 6 in. of rock, cut through the oil rock and are going down into the underlying limestones. Also at the Kennedy mine, near Hazel Green, the east pitch cuts through the oil rock. In other mines, as near Shullsburg, the orebody occurs in the main glass-rock horizon of the Platteville. At Linden, in the Mason and in the Glassville mines, there are orebodies both above the oil rock and underneath the glass rock. This is also the case at the Tripoli mine near Mineral Point. There seems to be little likelihood of developing orebodies below the base of the Platteville, on account of the depth to which it

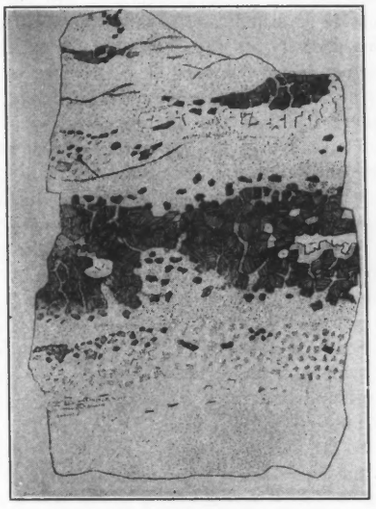


FIG. 6. DISSEMINATED ORE IN THE BLUE LIMESTONE JUST ABOVE THE OIL ROCK.

St. Rose mine west of Platteville. The stippled areas represent blue limestone, the clear areas calcite, and the dark areas sphalerite.

would be necessary to drill everywhere but in the extreme northern part of the district. Owing to the large amount of Galena and Platteville strata near the surface that has not yet been prospected it will be a long time before any extended prospecting is done much deeper than the main glass-rock horizon of the Platteville limestone.

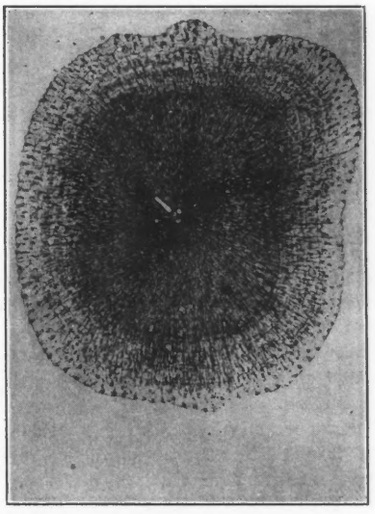


FIG. 7. CROSS SECTION OF A STALACTITE-LIKE MASS, NEW DEAL MINE.

The solid black in the center represents galena; the small clear areas represent marcasite; the finely radiating lines show black radiating sphalerite; outside of which is yellow sphalerite in coarse, radiating and concentric structure.

Whether the sheet deposits or the disseminated orebodies are the more persistent is a mooted question in the district. The sheet mines are the ores that have

been most extensively developed, because when zinc ore brought only $15 to $16 a ton, as it did for several years, only the richest mines could be worked, and these were the sheet mines. It is very probable that the disseminated orebodies will prove just as persistent as the sheet deposits, for the porosity of the strata in which the former were deposited is even more uniform than the fractures in the brittle rocks where the flats and pitches occur.

The cause of this peculiar form of the deposits—flats and pitches—is also a question; whether the simple folding of the strata made these step-like open spaces, or whether a slight undermining of some of the lower strata, through dissolution, produced a settling of the overlying strata, is not clear. That such a settling would exactly produce the pitches and flats is shown by a caving which occurred in the Highland mine where the strata had been extensively undermined. The fallen block is 80 ft. wide at the base and 30 ft. wide at the top. There is a well marked opening on top corresponding to a top flat, while a series of smaller flats, following the bedding planes of the strata, are connected by a series of pitching surfaces. The whole mass of ground that fell appears to be broken up by numerous cracks. The top flat is 20 ft. above the bottom of the workings that caused the caving. This caved block exactly reproduces the conditions shown at the Kennedy mine, where a strong top flat merges into a series of smaller step-like flats and pitches, all marked by a strong sheet of jack. The whole intervening ground is filled with jack wherever open spaces formerly existed.

The illustrations, Figs. 4-7, accompanying this article are from the Wisconsin Geological and Natural History Survey.

The Pyrites Deposits of Huelva, Spain.

BY RICHARD E. CARR.*

The Huelva deposits consist of iron pyrites more or less impregnated with copper. The iron pyrites is a clean, massive, homogeneous fine-grained ore, in which the copper is very finely disseminated in the form of chalcopyrite and other sulphides, more or less altered. The copper minerals are rarely visible to the naked eye, but they impart a certain shade or character to the appearance of the pyrites, which enables the practiced eye to gage roughly the copper content from *nil* up to 10 per cent. Soon after exposure to the atmosphere the copper sulphide begins to change to sulphate and is easily washed out.

The deposits range in width from a few inches up to about 700 ft. and are extremely variable in shape. Some are shallow layers; others wedge out quickly; while some go down to unknown depths. As a rule the masses have the porphyry on one wall, or are close to it, and sometimes on both walls. At Rio Tinto the masses are on both sides of a huge porphyry outcrop surrounded by slates. The Tharsis company works a number of masses at Tharsis and another enormous one at Catañas, about 16 miles toward Rio Tinto. Its ore averages now about 1.5 per cent. copper.

The number of men employed at Rio Tinto is about 11,000.

The pyrites which is sold for its sulphur content alone is washed ore, i. e. the ore after having had the greater part of the copper leached out. All the companies now sell these leached ores for sulphur value, and this is what goes to America as a rule.

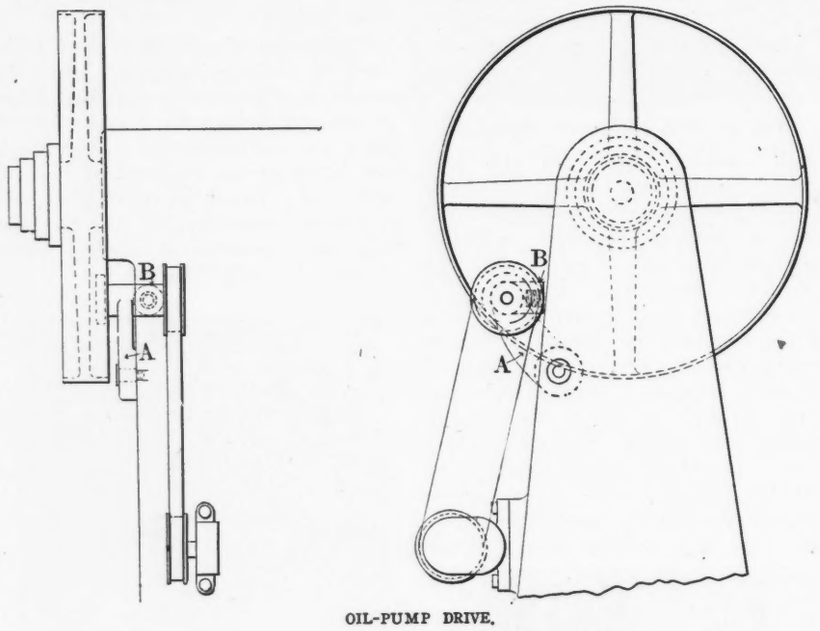
*Cordoba, Spain.

A Pump Drive.

SPECIAL CORRESPONDENCE.

The accompanying illustration, Fig. 1, shows a pump drive, built in consequence of an oversight in the design of a special machine. The machine needed a liberal supply of oil, but no provision had been made for pumping it, and strange though it may seem, the fact was not discovered until the machine was erected and ready for running. As can be seen, it was not practical to place a pump drive pulley on the spindle because it would necessarily need to be placed outside of the cone pulley. This would require a long shaft extended from the pump, or the pump placed on a bracket extending from the rear of the machine, neither of which was desirable. The pulleys were of different bore and not transferable. The spindle was finished to correct length and diameter and it could not easily be altered to move the pulleys outward far enough to admit a pump pulley between them and the bearing. Again, a drive pulley on the spindle would necessarily be of so large a diameter in order to give the correct pump speed that it would be almost prohibitory. Another difficulty presented itself when direct drive from the spindle was considered. The spindle bushing was eccentric and fitted with a screw to turn it, thus giving a fine vertical adjustment to the cutter. This adjustment would of course tighten or slacken the pump belt and cause trouble. In the device used the spring takes care of this movement.

In the illustration, the bracket *A* was made to contain a shaft; on one end of this was placed a drive pulley, and on the other end a friction wheel. The boss *B* on the bracket was bored out as shown to receive a stiff spiral spring. The large



OIL-PUMP DRIVE.

drive pulley shown was turned out on its inner surface for about one inch back from the edge of the pulley. The bracket *A* was then pivoted to the bed in a position which brought the friction wheel against the trued surface inside of the pulley, and yet placed the end of the boss *B* very near to the surface of the bed. As will be seen, the spring mentioned will tend to throw the bracket outward, bringing the friction wheel hard against the inner surface of the pulley, thus rotating the shaft, and, through the belt shown, operating the pump.

The device is simple, is easily made, gives the correct speed and takes care of the eccentric movement. It is so well adapted for its purpose that it is a question whether the fact that the oil supply was overlooked in the design is not after all, fortunate, else it is probable that we would have a drive much less desirable.

Zinc is injurious in genuine babbitt; it produces an alloy which runs sluggishly and with a large amount of dross.

Mergers in Placer Mining.

BY J. P. HUTCHINS.*

The last decade has represented a time of consolidations. Mining enterprises of all types have been consolidated, but mergers in dredge-mining operations of considerable magnitude and effect have taken place only during the last year.

There have been mergers in the Oroville districts, by which three companies now control more than one-half of the total proved acreage. The conditions there might have led to this result several years ago. In 1901, the absorption of one electric-power company by another was a forerunner to the recent concentration. This had the effect of a general raising in power rates, with consequent greater working-cost. At the same time a power-and-lighting company was purchased by a dredging corporation but it had no ef-

*Mining Engineer, New York.

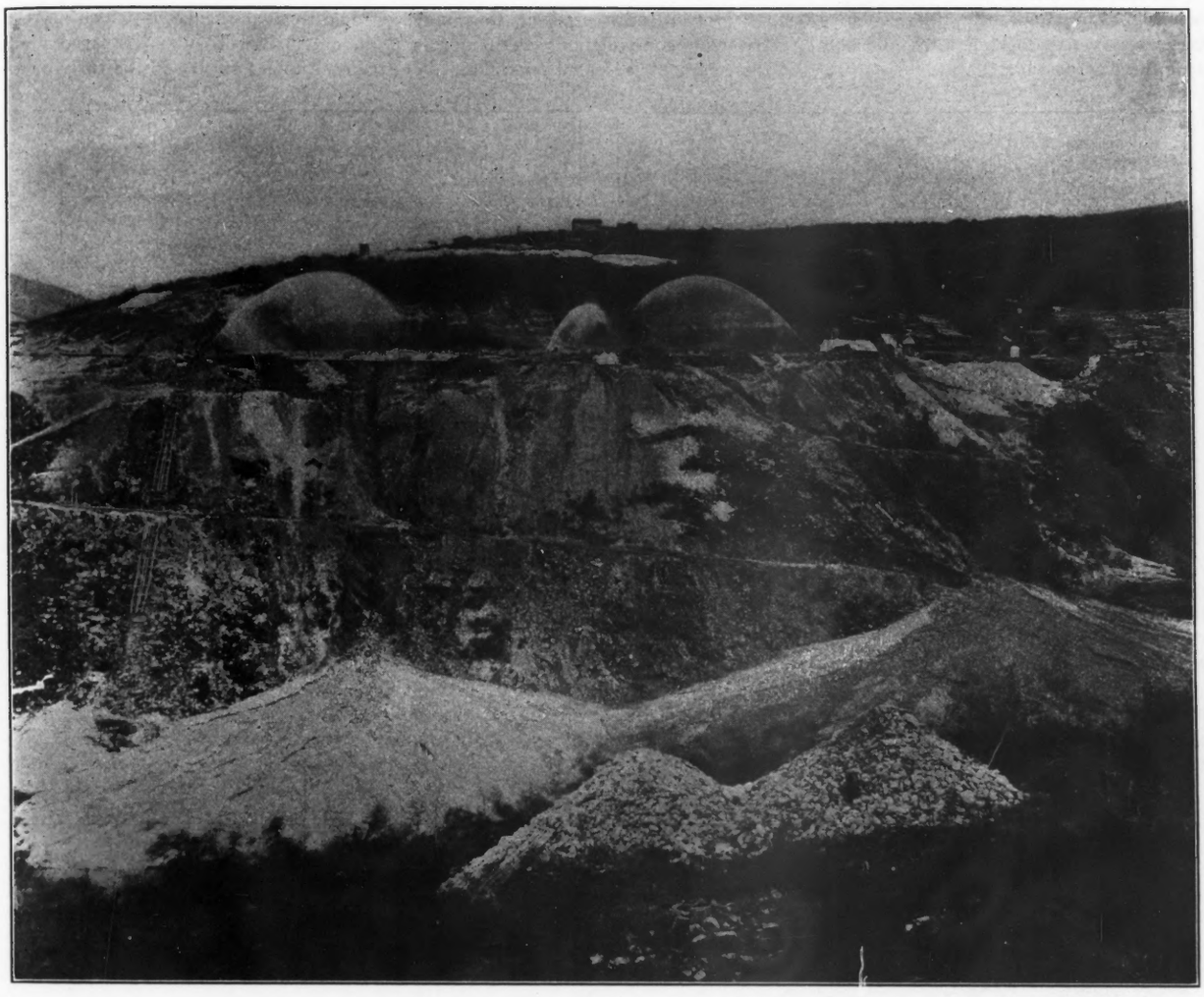


FIG. 1. HYDRAULICKING ON LARGE SCALE

FIG. 2. FROZEN ALLUVION.

FIG. 3. PART OF HYDRAULIC BANK.

fect on operating expense, as none of its power was used for dredging, better returns being obtained by its sale for municipal purposes.

The largest consolidation has been that of several dredging companies, by interests controlling the power supply of the dredges. It has been said that it was the realization that any industry able to pay such high rates for such unsatisfactory power was worth looking into; and this made the deal possible.

La Grange mine in Stanislaus county, California.

In all these instances, topographic as well as economic reasons dictated the procedure. The necessity of operating (as at the Hidden Treasure) developed as exploration of the gravel deposits showed that they could be worked successfully under one ownership. A tunnel over four miles long is now used at that mine. Thus these consolidations were mergers in the commonly accepted sense; and they

after dissolution of the corporation) have resulted badly. They were of the "one-man proposition" type; and to be successful, they required constant attention and careful working by the owner, who was usually superintendent, foreman, bookkeeper, etc. There are many mining properties such as those resulting from unfavorable environment in the frigid and tropic zones particularly—which make for the one-man proposition. A large number of such mines existed in the early days of

FIG. 4. HYDRAULICKING ON A SMALL SCALE.

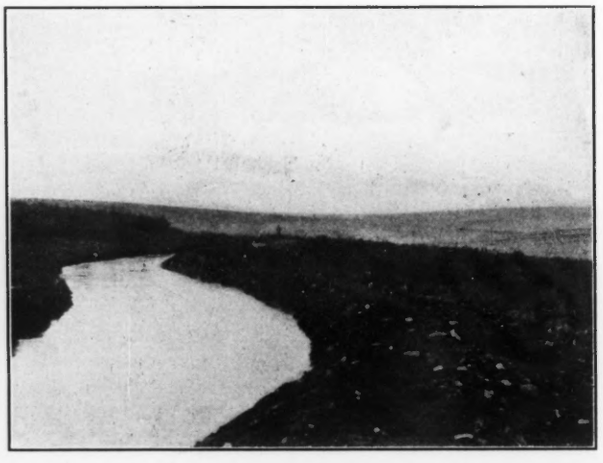


FIG. 5. DITCH IN NOME DISTRICT.

Power bills at Oroville (where the rate is 1.5c. per kw. hour) amount to about 20 per cent. of the operating cost.

The merger is illustrated in the organization, and subsequent conduct, of several enterprises for drifting long reaches of the "White Channel;" also at the Bald

were made for the same reasons, namely, the cheaper working-cost and other advantages.

Like many other developments in high finance, the practice of merging, in the abstract, as a means of reducing costs and increasing profits, has become popular,

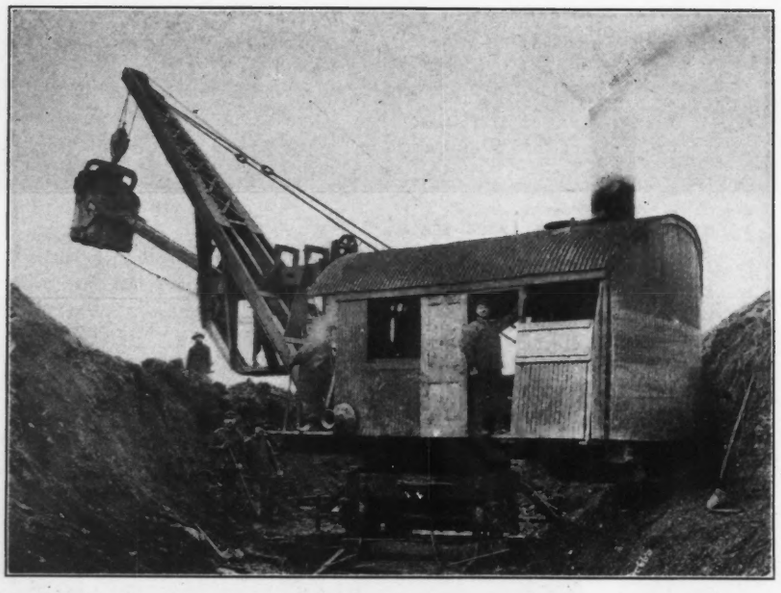


FIG. 6. STEAM SHOVEL ON SOLOMON RIVER.

Mountain mine in Sierra county, and at the Hidden Treasure mine in Placer county, Cal. Large areas have been united under one management, for hydraulic exploitation; as at the North Bloomfield mine in Nevada county, and at

and there is a marked tendency to apply this method rather indiscriminately.

There are numerous instances where consolidations of several holdings (profitable to their owners both previous to grouping under one management and

the Klondike. Many of them were grouped, and when under company ownership, they were almost universal failures, although in several noteworthy instances, rich ground was mined. Bad management contributed largely to the general result, but the claims were essentially one-man propositions. Parallel cases are seen in all mining camps.

Dredge and hydraulic mines are peculiarly suited to working as consolidations. The advantages come from the more economical operation of a number of dredges under one management, by reason of cheaper supplies when purchased in large quantities. Cheaper power is also procurable, as it is possible to use a threat of installing an independent plant where a short-sighted concern supplying power asks too much. Operating expense is also affected in many other ways, principally in cost of superintendence.

One company recently included in a consolidation had five dredges in operation; it is interesting to compare its operating cost with that of a company having one dredge. The cost of operating the five dredges (three of which are old installations, and of small capacity) for about five years' work was 6c. per cu.yd. For one dredge, of larger capacity and later construction (maintaining a working staff at the mine, sharing the expense of a city office, and having a general manager whose residence was not at the mine) 8.5c. per cu.yd. is given. Where but one dredge is operated, administration, etc., often amounts to over 12.5 per cent. of the total operating expense. With

a number of dredges (say five) the cost of administration, etc., for each will be more than one-fifth of that for one dredge, but there is a material saving. Other economies, possible when a number of dredges are operated, lessen costs considerably.

Dredge mining is simply a problem in excavating, transporting and extracting. Although the characteristics of gravel and environment may vary in different parts of the same district, yet the problems encountered are essentially similar, and thus the possibilities for consolidated working are great. Dredges of the same design (thus making unnecessary a large number and variety of spare parts) are a means of reduced outlay.

As an example of benefit from merging, the recent practice of a dredging corporation building its own dredges is a good one. Not only is a considerable saving in construction expense effected, but the feature of suitable design can receive an attention commensurate with its importance. The procedure now under way on the Yuba river in California (where dredges are depositing tailing so as to aid the Debris Commission in the work of rectifying the bad conditions resulting from hydraulic mining) could only be possible under circumstances resulting from a merger.

What has been said concerning merging in dredge mining, applies with greater force in hydraulicking. Large volumes of material must be excavated and transported (over the gold-saving devices) to the dump. Here water excavates and transports, and it is usually the only power used; therefore, under average conditions, the mine with the best water-supply pays best. It is also a circumstance (not sufficiently recognized) that doubling the water supply, at many mines, means considerably more than twice as great an output.

Thus, in one instance, in augmenting a flow of 50 to 100 sec. ft. (from 2000 to 4000 miners' inches), the duty of the miners' inch was increased from 1.52 to 2.06 cu. yd. This was due to the ability of a 6-ft. sluice (which was set on a 2 per cent. grade) to transport a greater proportion of boulders and fines per inch of water, than when a 4-ft. sluice was used. This addition to the efficiency made a seeming failure successful.

It is necessary to build not only larger but frequently much longer ditches, with flumes, inverted syphons and storage reservoirs, to obtain larger volumes of water. This means a heavy expenditure, requiring: first, the grouping of claims to make such installation justifiable; second, a larger outlay such as consolidated interests are able to furnish.

As instances of low cost in hydraulic mining operations by consolidated interests, the following figures are given for working ten claims of La Grange Mining Company, Stanislaus county, Cal. During two years (in which time 2,275,967 cu.yd. was washed, on a sluice grade of about 1.5 per cent., and with a duty of about 1.48 cu.yd. to the miners' inch) 6c. per cu.yd was the cost. The normal water supply was over 60 sec. ft. At North Bloomfield, Nevada county, Cal., 7,071,000 cu.yd. was handled in three years, on grades of about 4.33 per cent., with an average duty of 4.43 cu.yd., and at an average cost of 4.1c. per cu. yd. Ordinarily 80 sec. ft. was used in piping at North Bloomfield. No figures are available for working cost when the same deposits were exploited on a small scale; however, washing similar alluvion with much less water (about 10 sec. ft.) for a short run, cost about 10 c. per cu.yd.

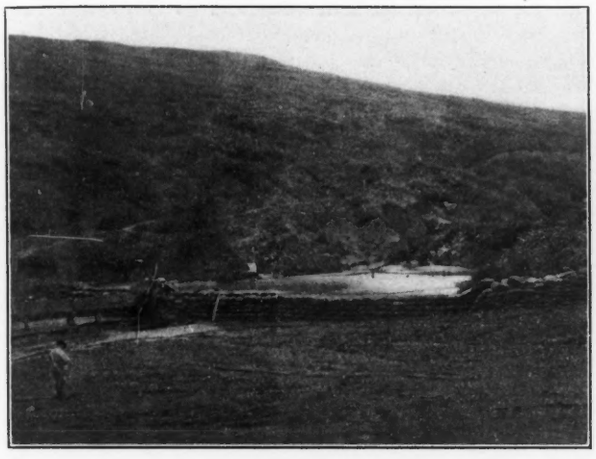


FIG. 7. TEMPORARY DAM.

FIG. 8. CHINA PUMP.

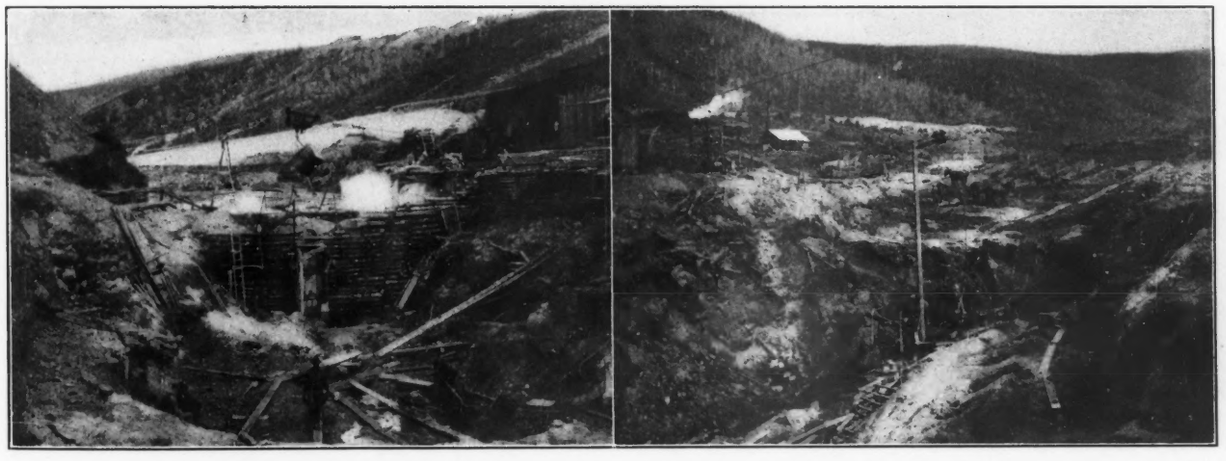


FIG. 9. OPEN CUT MINING.

FIG. 10. HORSE SCRAPING AND OPEN CUTTING.

If an adequate supply of water is ever obtained for working the "White Channel" in Klondike, some interesting data will be available for comparisons. At present this deposit is exploited with an entirely inadequate supply of water; only about 7 sec. ft. is used in any one of the largest mines. Even with steep grades (8 to 16 per cent being common), it is necessary to employ as many as eight men at $6 per day, to handle boulders too large for transportation through the sluices with the small amount of water; but these would run with ease and economy, were, say, 12 sec. ft. available. This makes the labor item considerable, often more than 60 per cent. of the operating expense.

Numerous concessions granted by the Canadian government (in 1899-1900-1901) were given to encourage working low-grade Klondike gravels by the hydraulic method. In their grants, there were provisions for the acquisition of any claims within their limits lapsing because of non-representation. This was "merging" in its strictest sense, contemplating, as it did, the absorption of claims by a larger interest.

The peculiar condition of the northern placers (where most of the alluvion is frozen) is conducive to merging. Large and numerous thawing surfaces are a *sine-qua-non* to an economical use of water and a maximum duty. I have hydraulicked material from a shady exposure, having a thawing area of about 50,000 sq.ft., with a duty of 8 cu.yd. to the miners' inch. Part of the water was used as a bank head and a maximum thawing-effect was thus accomplished (after the bank had been cut into a form resembling saw-tooth mountains). This duty, though seemingly large, could have been increased had larger thawing-areas been possible. Similar gravel on the same grade but with more water, has been washed with a duty of over 24 cu.yd. in California. Merged interests can better supply larger faces and thawing areas.

The one-man proposition is more common in hydraulic than in dredge mining. Where the deposit is limited, not much water is available for a time, and a short ditch is needed.

Drift mines are ordinarily less amenable to merging than other placers. Topographic peculiarities which involve driving long tunnels are often responsible for a combination of interests; but there are many one-man propositions in such mining. For drift mines requiring long tunnels (for draining the gravel and tramming it with electricity to the sluices), for deep ventilating shafts and other costly installations, merging is unquestionably good practice. For instance, the economy effected in tramming by electricity is in itself a large item.

At the Hidden Treasure mine in Placer county, Cal. (where a long tunnel is used for draining and tramming) an electric tramway has resulted in a saving of about 13 per cent. in the total cost of mining. Several composite items contribute to this aggregate; first, there is economy in handling cars; second, because of less time required in getting the shifts into and out of the mine, a saving of more than 12.5 per cent. of the miner's time is effected. The items of greater output that would be possible with animal traction, and the elasticity of electric haulage, are impossible to estimate in exact figures, but nevertheless, they are potent.

Of open-cut and dry excavating, it can be said in general that there are varying conditions which may make merging good or bad practice. Where there are no particular reasons (such as the need of long bed-rock cuts for drainage) merging is likely to increase cost. When the owner with a small cheap equipment (like the steam-scraper and self-dumper of Klondike) is actually not only superintendent, but often does much other work as well, it is possible to work at a profit when other procedure would inevitably result in failure. It was the consolidation of such claims that resulted so disastrously in Klondike. There the frozen condition of the ground prevented the use of mechanical excavators, such as steam shovels; such placers are unusually favorable to one-man exploitation. He can manipulate his small equipment easily, allowing sun and air to do his thawing; and it is not necessary to get large yardage. On the other hand, the consolidated interest cannot move its steam shovels or other cumbersome devices as readily; artificial thawing costs 40c. per cu.yd.; blasting is even more expensive and less satisfactory (in that material not thawed cannot be sluiced). Profits vanish, for it is necessary to handle a large yardage in order to pay interest on plant, greater working cost, etc.

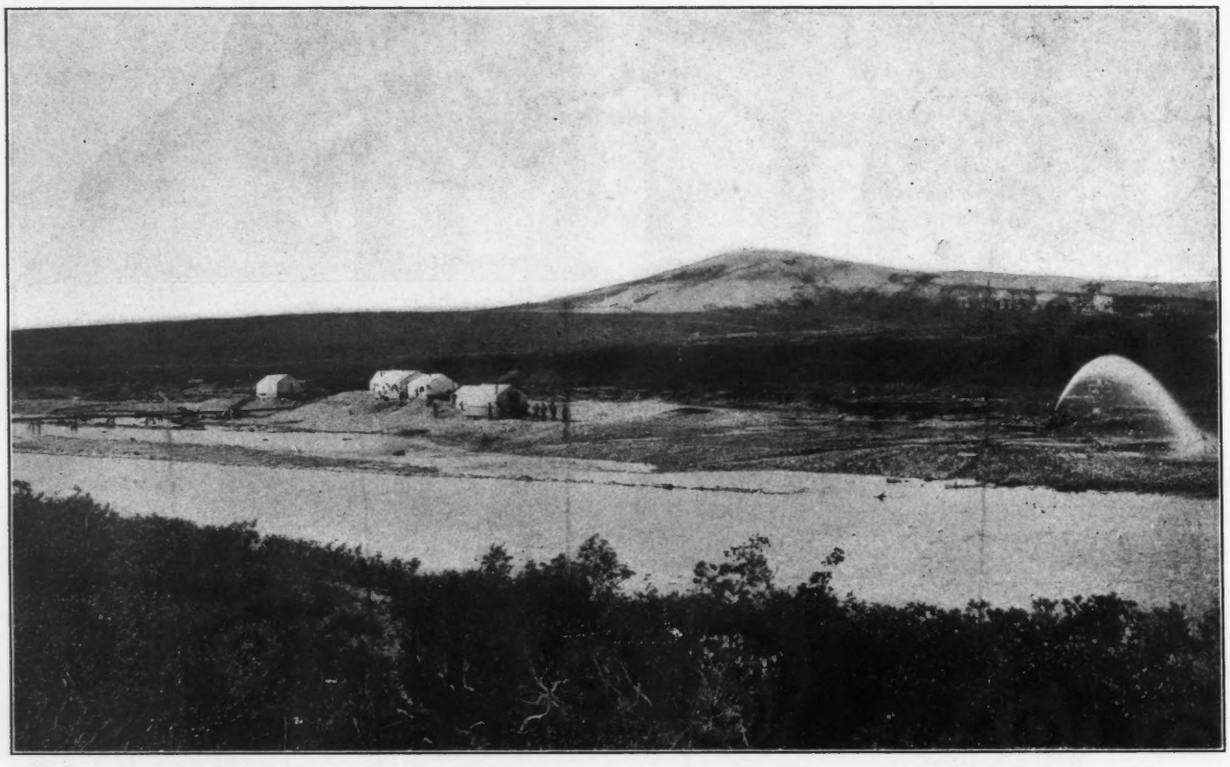


FIG. 11. HYDRAULICKING ON SOLOMON RIVER.

As examples of working cost, the following are the high and low figures: $1.90 and $0.50 for open cutting per cu.yd. Steam shoveling on a large scale, and hand shoveling on a small scale, were used respectively in similar environment. While there is a great apparent discrepancy in the figures, yet the true difference (when the many governing factors are considered) is much less. The favorable thawed condition (conducive to exploitation with a steam shovel) is to a large degree responsible for the smaller figure. But these costs, when examined casually and without consideration of equipment expense, amortization, etc., may be misleading.

Legitimate merging is unquestionably a benefit. But the mere reduction of working cost is not always sufficient; it may result in installing an expensive plant to operate in a limited area which could have been worked at slightly greater expense and without a great outlay for equipment by another method. Had such claims been exploited by more humble and less picturesque methods (as drifting, horse- or steam-scraping, etc.) success might have crowned the efforts.

The possibilities for illegitimate formation of mergers by unscrupulous promoters are as great in mining as in other enterprises. Merging has acquired a popularity which makes it hardly less than a fad. It is regarded by many as a panacea for all ills; however, like other remedies, it must be used with much care and discretion.

In the illustrations shown herewith, Fig. 1 depicts the largest-scale hydraulicking yet done in the Klondike. About 7 sec. ft. is used on a long face, and thawing is thus facilitated. Fig. 2 and 3 show two closer views of the hydraulic pit shown in Fig. 1. The serrated condition of the back is the result of using a bankhead on frozen gravel. Fig. 4 illustrates one-man hydraulicking on a small scale. Fig. 5 shows a long ditch installed to furnish water to claims which might have been worked to better advantage as one-man propositions. Fig. 6 is merged shoveling on a one-man proposition. Fig. 7 shows a temporary dam needed on a one-man proposition. Fig. 8 shows a one-man proposition and one-man methods. Figs. 9 and 10 show open-cut work by one-man concerns, with methods of stripping and mining well adapted for such procedure. Fig. 11 depicts hydraulicking without natural dump where one-man methods are particularly suitable. Fig. 12 shows advance thawing for one-man steam-shovel work (the shovel is shown in Fig. 13) where simpler methods are much preferable.

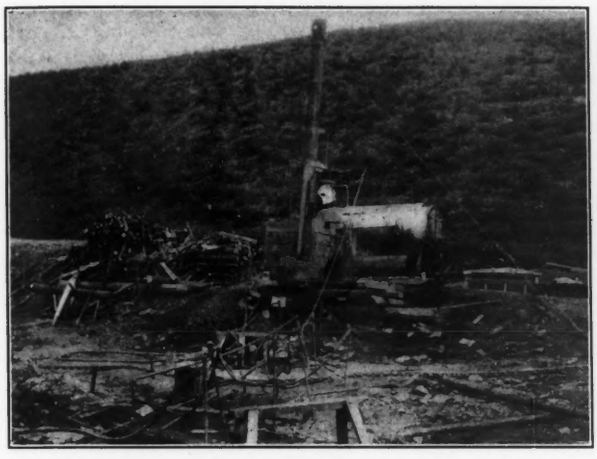


FIG. 12. STEAM THAWING FOR STEAM SHOVELING.

FIG. 13. STEAM SHOVEL ON EL DORADO.

The "Slash" System of Mining.

BY CLAUDE T. RICE.

This system of mining is a modification of both the square-set system and the caving system, which is being employed at the Jordan and the Telegraph mines of the United States Mining Company at Bingham, Utah. It has been in use there for several years and has proved quite satisfactory. Like other methods it has its advantages and disadvantages, but its cardinal point is that it is a very safe method of mining in heavy stopes. It is an underhand, square-set method, in which the overburden is allowed to follow down after the caved timbers.

The ground at the United States mines is heavy and the stopes are large. The wall rock is limestone, in which a soft sulphide ore has been deposited by replacement. A raise is put up to the top of the stope. Then the top slash is mined out by means of square sets, the posts being planted on the ground with braces, or spreaders, between them at the bottom. The set is lagged, and a floor is also laid. When the sets have been pushed to the boundaries and the ore on that floor or slash has been mined out, holes are bored into the posts and loaded with dynamite. They are then blasted and the overburden caved down upon the floor. In case the ground becomes too heavy the floors can be mined in sections and each section caved as soon as the ore in that section is mined out. The miners then drop down a set in the raise and begin to mine out another floor, or slash. The floor of the slash above is caught up by the square sets and so the waste is kept from mixing with the ore. This slash or floor of ore is mined out as before, a floor of 2-in. plank lagging being laid as the mining progresses. This slash is caved and the process repeated in the slash below.

The timbers used in these mines are 8x8-in. Oregon pine. The posts are 7 ft., 7 ft. 4 in. or 7 ft. 8 in. long. The caps are 5 ft. 4 in. long, as are also the girts, so that the caps and girts are placed at 5-ft. centers. No timber is recovered and no back of ore is caved.

The advantages of this method are that all the ore is recovered, that smaller timbers can be used and that the method is safe for the miners. The disadvantages are that a bottom of ore must be taken out on each floor. It is like continually mining on a sill floor, except that sill timbers are not laid. As a result the cost of breaking the ore is high. Raises must be driven in the solid rock instead of carried up in the sets as in the case of ordinary square-set mining. Moreover, the stopes are very hot and the air poor, because there are no raises to levels above to promote ventilation. The decay of the timbers, which follow down with the caved overburden soon fouls what little air gets up into the stope. The crushing of the caved overburden and the timbers also aids in making the air hot.

This system could be easily converted into a regular caving system by caving a back of ore each slice, but on account of the value of the ore and the consequent loss of some of it, entailed by the caving system, this is not attempted at the United States mines. As with any system it is simply that method which is cheapest considering everything coming into the problem.

Pyrites Concentration at Hermon, N. Y.

A new concentrating plant is now under construction at Hermon, N. Y., for the production of pyrites; the concentrating machinery for this is to be furnished by the Allis-Chalmers Company, Milwaukee, Wis., and is in many respects typical of the best modern practice.

The machinery to be provided is designed for a 250-ton concentrating plant with the addition of a Hancock jig, intended for the extraction and concentration of the coarser portion of the material to be treated. Fines are carried from the mill and stored for future treatment.

The crude ore, crushed at the rock house, will be dumped from standard cars into ore bins, from which it will be drawn by means of two 12x24-in. plunger feeders, delivering ore into two shaking grizzlies with 1-in. openings. The undersize will be passed behind the crusher and fall into the boot of a Gates elevator; the oversize falls directly into the hopper of a No. 5 style "K" Gates breaker, which will reduce the material coming to it to 1-in. size, the head of the crusher allowing for ¾ in. crushing if found desirable. The product from the crusher joins the fines in the boot of a No. 4 Gates elevator, by which it is lifted into the crushed ore bin, which has a capacity of 175 tons.

The ore is drawn from the bin by a 12x24-in. plunger feeder and delivered upon the face of a shaking screen covered with perforated plates, having 5 mm. round holes. All material small enough to pass 5 mm. will pass the roughing rolls and go directly into the boot of the main elevator. Material coarser than 5 mm. goes directly to the first set of rough rolls, 36x15 in. type A, set at approximately ½ in. and the ore, reduced through these rolls, will join the fines from the shaking screen and be elevated by the main mill elevator which is a 12x15½ in. belt and bucket type.

From this elevator the crushed material will be delivered into two trommel screens, arranged in pairs and covered with steel plates punched with 5 mm. round holes, the oversize being returned to the secondary or fine rolls; consisting of a set of 36x15 in., rigid type. The ore reduced through these secondary rolls is spouted to the main mill elevator and again lifted into the pair of trommels as before.

The plan of operating trommels in pairs obviates the necessity of shutting down the mill when screen repairs are necessary; the entire feed can be handled by one trommel temporarily, while the other is undergoing repair. The driving arrangement is designed so that one trommel can be shut down at any time required.

The undersize through the trommel screens is spouted into a specially designed Richard's annular cone classifier, which will make two products, a spigot product, which will be carried to the Hancock jig and an overflow product which will be carried to a centrifugal pump and elevated by it to a place where these fines are to be stored. This classifier is designed to handle 250 tons in 24 hours and will make a spigot product of from 5 to 40 mesh. The overflow will consist of material from 40 mesh and smaller. The estimated tonnage of the spigot is 200 in 24 hours with an overflow of 50 tons.

The mill will be provided with a standard 25-ft. Hancock jig, which will concentrate all free mineral released from the various stages of crushing in the first three hutches of the jig, depending upon the grade of concentrate to be produced. The product of the fourth hutch may be returned again to the main elevator and re-treated in the jig. The fifth hutch will make a middling requiring recrushing and the sixth will make tailings.

The middlings from the fifth hutch of the Hancock jig will be reground in a set of 36x15 in. rigid type rolls, the pulp from which will be elevated by an 8-in. elevator to a second Richard's annular 13-in. cone classifier. This makes a spigot and an overflow product. The spigot will consist of material ranging from about 10 to 40 mesh, and the overflow of material smaller than 40 mesh.

The spigot product from this classifier is spounted to a 16-ft. Hancock jig, while the overflow is carried to the centrifugal pump previously mentioned, and conveyed to the storage space. The concentrates from both jigs will be spouted into the boot of a 10-in elevator of sufficient hight to run it into the concentrate bins. The mill will have five concentrate bins with a combined storage of concentrates, at 9 cu. ft. to a ton, of about 1200 tons. In order that the concentrates may be readily drawn out of the bins, each is equipped with two 24x24-in. double rack and pinion ore bin gates. A swinging spout, which can be raised or lowered by means of pulley and weight, is provided for each gate; the spout being long enough to project into a door of a box car. The bins are inside of the mill and the storage end will contain them and allow also for the loading of the concentrates into standard box cars, as well as containing a 100-h.p. boiler for drying the concentrates and heating the mill.

The storage bins contain nothing but material under 40 mesh, and have a series of plugs at the bottom and in front through which excess water coming into bins with the concentrate can be drained. Coils of steam pipe will be placed under bins to dry the concentrates for shipping during the winter, in order to prevent freezing.

Blasting caps or electric exploders should be kept away from thawing houses used for dynamite.

Health and Safety of Miners.

The King of England, on the recommendation of the Home Secretary, has appointed a Royal Commission to inquire into and report on certain questions relating to the health and safety of miners and the administration of the Mines Acts.

The commission is constituted as follows: Lord Monkswell (Chairman), William Abraham, M.P. (Rhondda), Henry Hardinge Cunynghame, C.B., of the Home Office; Frederick L. Davis (Chairman of the South Wales Conciliation Board), Enoch Edwards, M. P.; T. Ratcliffe Ellis (Secretary to the Mining Association of Great Britain), John Scott Haldane, F.R.S.; Robert Smilie (President of the Lanarkshire Miners' Union), and Sir Lindsay Wood, Bart.

The following are the questions referred to the commission:

Whether it is desirable to make compulsory the watering of the roads in dry and dusty mines.

Whether it is desirable to prescribe the forms of safety lamp which may be used in mines or to prohibit any of those now in use.

What steps could be taken for the better prevention of accidents, particularly those from the use and firing of explosives, from falls of roof and side, from underground haulage, and from winding; whether any special provision should be made to facilitate the work of rescue in the event of an accident; and whether any improvement can be made in the present system of investigation and inquiry into accidents.

Whether any steps should be taken to lay down a standard of ventilation in mines.

What steps should be taken to guard against the disease known as ankylostomiasas.

Whether the present system of special rules is adequate, and whether the method of establishing such rules could not be made simpler and more effective.

Whether any, and if so what, steps should be taken to improve the administration of the Mines Acts and the discipline in mines.

Whether any change is desirable in the present system of examination for managers' and under-managers' certificates of competency; whether the managers of metalliferous mines should be compelled to hold such certificates; and whether certificates granted by Colonial Governments should not be accepted in this country.

Correspondence may be addressed to the secretary, S. W. Harris, at the Home Office, Whitehall, London, S. W.

According to the British Consular report, the Tacoma smelting works in 1905 produced 238,950 oz. of gold, 2,178,965 oz. of silver, 20,351,261 lb. of copper, and 30,032,718 lb. of lead.

The Courrieres Colliery Disaster.

BY MATTHEW VINGOE.

The terrible and extensive nature of the catastrophe which wrecked the workings of the Courrières colliery on March 10, causing a death roll of at least 1100 victims, undoubtedly constitutes the greatest disaster ever recorded in the annals of mining. The Courrières mine was the third largest in France in point of output.

STATION LANDING IN COURRIERES MINE.

The Compagnie des Mines de Houille de Courrières works a French Government concession, granted in 1849, consisting of about 13,484 acres (20 square miles) in the Department of the Pas de Calais, and from recent statistics employed about 7000 persons, 5800 of these working below ground. There are eight shafts, situated alongside canal and railway. The output in 1905 was 2,372,500 tons of soft and anthracite coal.

The Courrières was known as a model mine in France, and both prudence and good management were said to have been here shown at their best. At all events the average death rate for persons working below ground was very low; in the decade ending 1879 it reached 1.27 per 1000, and for the following 20 years ending in 1899, the average death rate was reduced to, and maintained at 0.44 per 1000 employed.

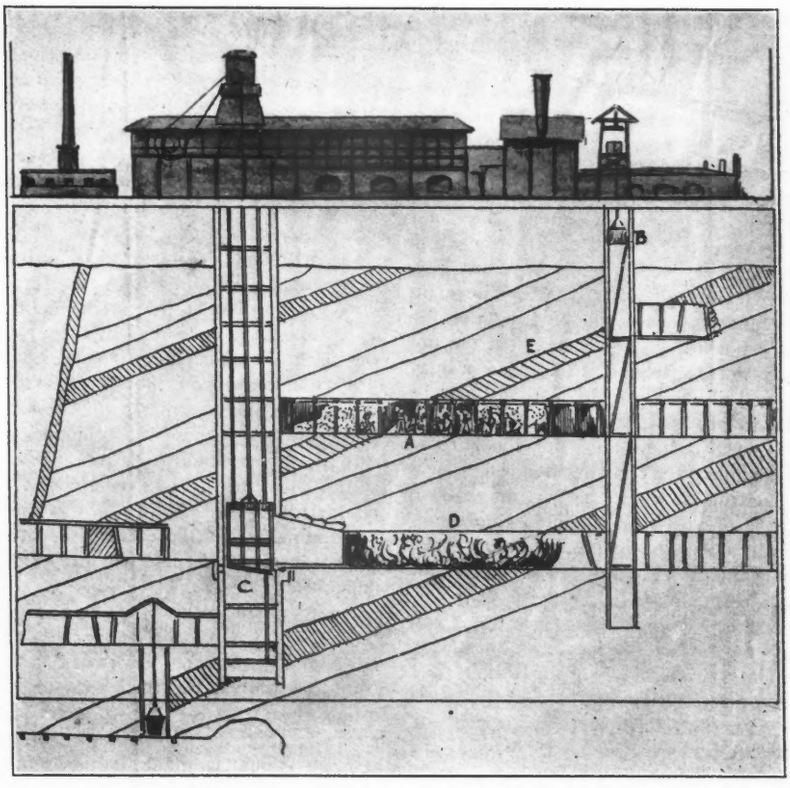
The figures above quoted were so striking that the Courrières mine received official visits from the mining commissions of both Great Britain and Belgium, and the former country, in 1904, modelled a set of rules regarding timbering of mines after the method employed in Courrières. It appears that the figure in Great Britain for deaths in coal mines for the year 1904 was 1.35 per 1000 persons employed, which compares unfavorably with the average rate at the French mine.

At Courrières were employed about 10 under managers, 50 deputies (who make reports) and 50 *surveillants* or corporals (who do not report) and who work at night. The working places were examined between midnight and 5 a. m., when the miners commenced work, and at least once again, during the shift. Indeed the discipline was exceedingly strict, although the seams are not fiery, and do not give off much gas.

No serious explosion of firedamp had been noted in the mine since work was started in 1849, and it was the custom to use naked lights in several workings. It is more than probable that the generation of carbon monoxide (resulting from incomplete combustion) or of coal gas itself behind the barriers erected around the fire in the "Cecile" gallery of No. 3 pit, is alone to be blamed as the immediate cause of the catastrophe. This appears to be the more likely in view of the faulty building of the barriers and the gross incompetence now recognized on all sides, or the inexperience of the engineers who were coping with the fire at the period of the disaster. The matter is being sifted with complete thoroughness, although it may be months before the final report of the facts is published. The change in the French Government bringing with it a new Minister of Public Works, in view of public opinion, has pledged itself to make an exhaustive inquiry, which is now in the hands of a special commission, and the investigation well under way.

That 13 living men should have been able to find their way to the bottom of a shaft of the ill-fated mine, where they stumbled on a party of workmen busy clearing away debris, is admitted to be a shameful proof of the incompetence of the mining engineers incriminated, and a proof that the conditions in the mine were in some respects not so bad as at first represented. The living men existed during 20 days on horse-flesh and horse food found in the stables along a gallery in which they were working. This gallery happened to be wet and from time to time water was obtained from the roof drippings. The men do not seem to have greatly suffered, as most of them walked to the infirmary on being hoisted from the mine, and since then have made rapid recovery.

The gallery in which the fire existed, and where the explosion originated, is situated almost immediately below that in which the miners were entombed, and the explosion appears to have caused a falling-in of both ends of the gallery, thus protecting the men from the deadly after effects. For about a fortnight no great effort had been made to explore the mine, which was, however, slowly cleared of debris. Needless to say the responsibilities weigh heavy on the engineers in charge, as more vigorous action might have saved more lives. The French Minister of Public Works, in view of the events, descended the mine to ascertain the actual conditions, and the two inquiries now be-



DIAGRAMMATIC SECTION OF PORTION OF COURRIERES MINE.

A, stable where men were entombed; B, coal hoist; C, miners descending cage; D, where fire actually was; E, coal seam.

ing held to fix the responsibilities, one a governmental commission, and the other a legal inquest, are expected to thoroughly investigate, and bring to justice all those who were guilty of negligence.

It is stated on behalf of the engineers in charge of the mine, that the salvage corps was not lacking in initiative or courage, but that it was impossible to find guides who knew the mine, in view of the great mortality. Be this as it may, they are greatly blamed for having done nothing to discover the existence of living beings, and the fact remains that the 13 survivors practically saved themselves.

Meanwhile, with labor troubles, and the continuance of urgent investigation by the commissions, the affairs of the Courrières company remain in an unsettled condition, What the final outcome will be, it is not yet possible to say.

Bore-Holes for Life Saving in Coal Mining.*

BY ROBERT H. DUNDAS.

In mining operations, many and varied are the uses to which bore-holes have been put, but probably they have never been used as a method of communication with entombed miners prior to the recent disaster at Clackmannan. In the work of rescue in connection with this accident, boring operations were successfully carried out, food and restoratives being passed through to the imprisoned men.

This happy achievement leads to a consideration of the benefits to the mining industry which can be derived from the use of bore-holes, where, owing to unforseen circumstances, human life may sometimes be at stake, a contingency which may at times occur even in the best regulated collieries. It is true that no manager expects disaster to occur at the colliery of which he has charge, but the unlikely does happen at times, and it may be well if such simple methods can be used to provide against it.

The use of bore-holes for the purpose of communicating with entombed miners and passing food and restoratives to them in case of a disaster, might be more universally adopted than has hitherto been the case. In the event of an inrush of water, where some of the miners may unfortunately be cut off before they can reach the surface, they naturally make for the rise workings, where for a time they are comparatively safe, especially when the water may have reached its level, or have been obstructed in its passage in some way before overtaking them, as in the Clackmannan and other similar disasters. In such cases lives might have been saved had there been any means of communicating with the men, such as by a bore-hole, through which food and other restoratives might have been passed to them, enabling them to live while measures for their release were being taken.

To provide against such a disaster (without running any undue risks), especially in cases where the workings may be advancing upon a body of waste water, or passing under surface water, bore-holes might be put down from the surface and from seam to seam, passing through the main roads in such parts of the workings as would be amongst the last to be cut off by the water. The men, knowing a bore-hole was there, would then, if possible, make for it, and thereby stand an excellent chance of getting into communication with the mine officials on the surface, or in other seams of the workings, who could supply them with food and restoratives to sustain them until their release.

In cases where pipes are laid along the roadways of the mine, for the purpose of watering the roads or damping the air, and the water being of a good quality, provision might be made in the vicinity of the bore-hole for the men to get access. But if the conditions of the mine did not require such pipes, then ½ or ¾ in. pipes, fitted with screw and thimble joints, might be conveniently put down the bore-hole and carry a fresh supply of water from the surface. This could be done more conveniently than by leading the pipes down the shaft and along the roadways of the mine, and the water thus supplied could be used to serve the men and ponies, or for other uses in that part of the mine. This would save the men from having to depend upon putrid water in case of a disaster, as happened at Clackmannan.

To provide still further for the men in event of a catastrophe, a chest containing a small supply of restoratives and ambulance appliances and a few brief instructions for the use of the latter might be kept near to the bore-hole, so that if any one of the imprisoned men had been injured or suffered from shock or weakness, he might be at once treated for the same. Moreover, a telephone communicating with the offices might be fitted and used by the men in such an emergency. It could also be used in the daily working of the mine, and in the event of a serious accident medical aid could be more quickly summoned.

Such then, are some of the uses to which bore-holes might be more universally put, and knowing that the work was in the interests of humanity, the extra cost of putting them down—while it would not materially increase the cost of working the mine—would be gladly borne by most companies now engaged in mining. The admirable use to which such bore-holes have recently been put compares favorably with the proposed method of using stored compressed air in mines to be used by miners in the case of an explosion.

*From the *Iron and Coal Trades Review*, April 20, 1900.

Thawing houses for dynamite should not be heated by live steam pipes.

Phases in Coal Formation.

There are three successive phases distinguishable in the formation of coal. First, the accumulation of vegetable matter; second, the work done by chemical reactions under water, including the complete dehydration, and deoxidation of the cellulose, during which phase, the mass shrinks from 10 to 30 per cent. of the original volume of accumulated vegetable matter; third, the work subsequently done by chemical reactions underground. The last is the period of "posthumous molecular displacement," wherein the vegetable remains are bituminized, or as the case may be, silicified, ferruginized and pyritized. The causes responsible for the variations in the character of the different coal seams, are various; one reason is found in the different character of the vegetable remains, also the variations in the conditions of maceration due to the depth of the water overlying the deposits; and lastly, the character of the coal is influenced by the differences in desiccation, aeration and pressure due to the thickness of the deposit, and nature of the roof.

Black Ends in Coke Making.

In coke manufacture, it is generally known that "black-ends," or the portion of the coke product which has been only slightly carbonized, is due to the fact that certain portions of the coal rest against the doors where the heat is not sufficient to properly coke the slack. A device said to remedy this trouble is a specially-designed door, which may be briefly described as one having an internal vertical flue of sinuous or zig-zag formation, with an external gas admission aperture at the base, and an external escape port at the upper extremity, in which flue gas is burned so as to heat to incandescence that portion of the door in contact with the charge of coal in the oven.

Establishment of Rescue Stations.

An excellent suggestion has recently been advanced, advising that rescue stations should be erected in the various coal fields, to serve the collieries within a certain radius. The cost would thereby be divided among the different mines. A properly trained man would be kept at each station to attend to and keep in order all the apparatus. This would be more satisfactory than allowing each colliery to have its own equipment, for in this latter case the instruments might often be out of order and only serve as a trap instead of being of assistance. Teams from the various stations could compete annually, and thus the interest in the work could be stimulated.

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*Illustrated.

Safety in Mines.

A Royal Commission on safety in mines has been appointed in Great Britain, as noted elsewhere in our columns. This is a matter on which there have been many commissions, but it is an ever present problem, and the many avoidable accidents which occur in mining are demonstrations of the fact that the proper rules for insuring safety have not yet been fully formulated, or that the regulations to insure compliance with them are deficient. The appointment of a new commission to consider seriously this important matter will, therefore, be welcomed by the mining industry.

It is much to be regretted, however, that mining engineers are not represented among the members of this new British commission. Sir Lindsay Wood is the only engineer among its members, but he is so largely identified with the masters' interests that he is felt to be more or less unrepresentative of the general interest. Moreover, he is no longer a young man, having been a member of the commission of 1879. Naturally the British mining profession is much hurt over the situation, and the general feeling is that the present commission is essentially of a political character, appointed to satisfy the labor party in Parliament. However, a good many things may happen before the commission completes its work, and it is to be hoped that developments will convert it into a thorough, scientific investigation.

The appointment of the commission was not generally expected. Presumably the labor members of Parliament asked the Home Secretary to do something for them, and he turned the matter over to a commission, the present Government having apparently a fondness for commissions. In this case, at least, the purpose of the commission is highly laudable, and it is to be hoped that some real good may be accomplished by it.

Reinforced Concrete in San Francisco.

In connection with the rebuilding of San Francisco an absurd demand has been made by certain of the trades unions, which have asked the city authorities not to allow the use of reinforced concrete, except under burdensome restrictions. The bricklayers are seeking to prevent the use of this kind of construction unless the concrete be laid with a trowel, the work to be done by them. In this effort they have naturally the co-operation of the plasterers and also of the brick manufacturers. One of the great advantages of concrete construction is the fact that it can be done by ordinary labor, which under many conditions makes it much cheaper than brickwork. Reinforced concrete has certain advantages peculiar to itself. These advantages are especially important in San Francisco, where, in the light of the recent catastrophe, the idea is naturally to safeguard against its repetition in every possible way.

The present condition of San Francisco shows that the brick buildings did not well withstand the shock of the earthquake, except when they were very well constructed. There are now scattered more bricks than anything else on the streets, sidewalks and business lots of the city. Where poor mortar is used, as unfortunately is frequently the case, brick buildings apparently are not well adapted to withstand earthquake shocks.

We do not think that the good judgment of the authorities in San Francisco will permit efforts to prevail which would hamper engineers and builders in the use of the most desirable material, whether that be reinforced concrete, ordinary concrete, wire glass, or something else that has been proved advantageous in modern building construction. However, it appears that the citizens' committees and others are having to fight to secure a fair chance for reinforced concrete. Such a state of affairs is deplorable in this time of emergency.

The International Miners' Congress.

The seventeenth International Miners' Congress, which met in London during Whitweek, was attended by 116 delegates from Great Britain, France, Belgium, Germany, Austria, and the United States, which sent 84, 49, 15, 2 and 2 delegates respectively. It is interesting to note, as an indication of the present political power of the mining population, that 14 of the British delegates were members of the House of Commons, and that two of the French, and two of the Belgian delegates were members of their respective parliaments. The figures published by the Congress give a good idea of the extent to which mining labor is now organized. It was stated that out of 700,000 miners in Great Britain, 480,000 belong to the la-

bor unions; out of 200,000 miners in France, 150,000 are organized; of the German miners, only 182,000 out of the total of 600,000 belong to the unions; in Austria only 40,000 out of 135,000. The figures given for the United States were a total of 550,000 miners, of whom 365,000 belong to unions.

In so far as the United States is concerned, especially as to the total number of miners, the figures given appear to be rather incomplete, but any criticism on this ground is entirely dependent upon the definition of "miner." According to the last census report, the average number of men employed in the mines and quarries of the United States during the calendar year 1902 was 588,591, but in this enumeration are included all the men engaged in stone quarrying, all engaged in the production of petroleum, etc., the total being representative of the number of men engaged in the mining industry in its broadest classification. Moreover, it is to be remarked that the census figures are reduced to an average of employment, and the actual number of miners engaged is considerably larger. Thus in the month of maximum employment in 1902 the census figures showed 646,922, or allowing for underground foremen, about 654,000. This is considerable more than was estimated at the Congress, although the total number has doubtless increased materially during the last three years, which have been a period of great expansion in the domestic mining industry. We have no statistics as to the union membership.

A great variety of subjects was discussed at the Congress, and on the whole an admirable temper was exhibited. A minimum wage, compulsory holidays, and more efficient inspection were the chief topics, and resolutions of the usual character were passed. The general tendency of the Congress was to bring to the fore the many grievances of the German and Austrian miners, and the many advantages enjoyed, both socially and politically, by the British miners. We are doubtful as to the value of international action by miners, because the miners of each country have different political forces to meet and must necessarily use different methods of meeting them. The improvement in the relations between employer and employed are progressing at different rates in the various countries, and many of the resolutions placed before the Congress were, from this point of view, provocative of confusion. The chief good effected by the Congress was to bring individuals of different nationalities together, and thereby promote the general understanding by exchange of experience and views.

"Chinese Slavery" on the Rand.

The present Government of Great Britain declared officially on June 8 that the ante-election cry of "Chinese slavery" on the Rand had been absolutely unjustifiable. Shortly after the Government assumed office, it posted proclamations in the Chinese quarters of the Rand, offering to repatriate the coolies and even encouraging them to return voluntarily to their native country. The result has been, however, that after three months of this agitation, only about 100 coolies out of the 50,000 now on the Rand have availed themselves of the offer, and not even the most partisan Liberals have cared to analyze the reasons prompting the handful to return.

According to recent press despatches from Johannesburg, Lord Selborne, with his staff, visited, on May 27, the Chinese compounds at the Glen Deep, Jumper's Deep, and Simmer mines, and inspected eight thousand coolies. The "boss boys," in reply to questions put by the officials, said that all the white men over them treated them fairly, and that they were comfortable, earned more than they could earn in China, and fully understood the repatriation notice. At the Jumper's Deep, some of the coolies presented a petition, in which they declared that they did not want to go home; and that, if they were compelled to do so, they wanted the balance of their three years' wages, as they had given up situations in China.

Although the Liberal party is to be blamed for allowing its political enthusiasm to lead it to make statements with respect to labor on the Rand, which have since been proved to be entirely unjustifiable, nevertheless full credit must be given to the Government for the strict weeding out of undesirable coolies and the deportation of ungovernable characters. The inevitable presence of such has not been a problem peculiar to South Africa. According to a recent issue of the *Straits Times*, the coolies now imported for mining purposes in Banka seem to be mostly the off-scourings of China. They give trouble the moment they land on the island, wherefore new arrivals are now being put under guard, immediately upon landing, and are kept apart until they have been inspected. The Government itself has undertaken the return of the undesirable coolies from Banka to China. From South Africa, since the beginning of this year, about 1500 objectionable coolies have been sent home.

Although it has now been proved conclusively that the coolies are not the slaves of the South African mine owners, and the cry of "Chinese slavery" has been given an official quietus, there is still a large section of the British public, which objects to the presence of the Chinese in South Africa, besides which there is the hostile attitude of the Boers in South Africa itself. The Labor party in Great Britain is strongly antagonistic to the importation of coolies into South Africa, for reasons which are not quite clear. It does not appear that the presence of the Chinese in any way affects the British workingman, except to create more work for him in a variety of ways, more or less direct. Politicians recently spoke lightly of sending 5000 Cornish miners to the Rand to replace the Chinamen. But where are the 5000 Cornish miners to be found? As a matter of fact, the revival of mining in Cornwall is attracting many of its sons back to the old shores, and 300 or 400 a week are returning from South Africa. Indeed, the scarcity of labor in Cornwall is in itself an economic question of considerable magnitude (not as large of course as that in South Africa) which is engaging the serious consideration of those who are desirous of extending the Cornish mining industry.

At the present time the possibility of obtaining any other labor than the Chinese for the Rand seems remoter than ever. Evidently the reliance must be placed entirely on Chinese and Kafir labor. The supply of the latter was thoroughly proved to be inadequate, before the Chinese were introduced. All the Kafirs who want to work are working, and there are places for many more. Now that the Chinese question bids fair to disappear from hot-tempered political discussion, it is to be hoped that South Africa will be allowed to settle its own labor question in its own way.

Metallics.

The resistance of steel to corrosion by acid is said to increase with the percentage of combined carbon.

Stills of cast aluminum, together with worms of aluminum tubing, are now used in acetic acid factories.

The Bolivian government has raised the export duty on bar bismuth from $5 (8s. 4d.) to $10 (16s. 8d.) per 100 lbs.

Manganese, the hardest of the common metals, is approximately half as hard as the diamond; cobalt and nickel are harder than iron; platinum and paladium are harder than zinc; silver, iridium and gold are about of equal hardness, and potassium is the softest of the solid metals.

At Collingwood, in New Zealand, considerable quantities of native lead, in the form of round shot, have been found for many years in the the sluice boxes, with the gold. In places it is so abundant as to choke up the riffles. Samples collected by James Park, and submitted to chemical examination, disclosed the fact that the lead is almost chemically pure, and sometimes encloses a skeleton of gold.

The steamer "J. Pierpont Morgan" June 12 loaded 13,294 gross tons of iron ore at Escanaba, and exceeded all cargo records. The cargo will be delivered at South Chicago, and she carried 956 tons more than the steamer "E. H. Gary" did when she made the record between the two ports. The "Gary" holds the record from Lake Superior. She carried 11,093 tons through the canal at the Sault Ste. Marie.

Although iron is acted upon by most acids, it is largely used for vessels in chemical works, because of its cheapness. Cast iron is not so readily attacked by acids as wrought iron, and stands sulphides and alkalies at high temperatures very well. Sulphuric acid may be kept in wrought-iron tanks, if the specific gravity does not go below 1.7, and if the acid be kept cool. More concentrated acid can be kept in, and even can be boiled in, cast-iron vessels.

Copper is usually employed for stills, condensers, and digesters, because of its heat conducting properties, its malleability and tenacity. The chief substances to be avoided in the use of copper vessels are ammonia and its fumes, and the fumes of mineral acid. Nitric, sulphuric and hydrochloric acids attack copper, but organic acids have little or no effect upon it. Gun metal and manganese bronze will withstand the corrosive action of dilute sulphuric acid, and consequently are employed for making acid pumps, etc.

Alluvial gold originated from the weathering and denudation of country containing gold bearing veins, or impregnations, during countless ages, followed by the concentration of the gold in leads or channels, by a process of natural sluicing. Some writers have thought that the occurrence of occasional large nuggets in gravel drifts was an evidence that alluvial gold has been deposited in situ from gold bearing solutions circulating through the gravel, but there is very little evidence to support this contention.

The new copper smelting plant at Mount Morgan, Queensland, is reported to be doing good work. In five weeks one unit treated 5000 tons of ore producing matte containing upward of 150 tons of copper and 2000 oz. of gold. When the two units of the plant are in commission the value of the product of the mine will, it is stated, be augmented by at least £40,000 a month. Stoping has begun at the 750 ft. level, and it is asserted that there will be no difficulty in supplying the smelting plant with 10,000 tons of copper ore monthly.

The reabsorption of carbon dioxide by caustic lime is an exceedingly slow process. If moisture is present, however, the formation of a double compound of calcium carbonate and hydroxide is comparatively rapid; when moisture is fully excluded no combination between lime and dry carbon dioxide can take place. A lime mortar, after being slaked, first shows a hardening, due to the absorption of super-abundant water; this must not be confused with the final hard setting of the mortar which may occupy years in its completion.

Calcium sulphate, or gypsum, is slightly soluble in water, much more so than the carbonate. At a temperature of 60 deg. F., one part of sulphate of lime will dissolve in 490 parts of water. As temperature rises the solubility increases up to 100.4 deg., when it again decreases; at the boiling point, one part of sulphate will be dissolved in 571 parts of water, but by long continued exposure to warm water the proportions may be varied considerably; freshly precipitated sulphate is more soluble than gypsum, and raw gypsum is less soluble than that which has been calcined.

Although over-burned plaster cannot be slacked in the ordinary way, hydration can still take place if the substance is finely ground, but the process is very slow. If the plaster is calcined at a temperature of bright redness, it will melt into a glassy paste which, upon cooling, forms a crystalline mass like anhydrite. This cannot be decomposed by heat, but if strongly heated with charcoal, or in the presence of decomposed organic matters, it loses part of its oxygen and is converted into calcium sulphide, which substance is in turn acted upon by carbon dioxide and water, giving rise to the evolution of sulphuretted hydrogen. It was probably in some such manner as this that the sulphur deposits of Louisiana were formed.

The new open-hearth furnaces of the Lackawanna Steel Company, at Buffalo, have been doing some remarkably good work. None of the five new furnaces of this type has, as yet, been out for repairs, but the first to be put in commission, No. 7, has already made 300 heats without repairs, and is good for from 50 to 100 heats more, the ports and roof being in absolutely perfect condition, the only weak spot being that the checkers are clogging up so that the furnace is only making from 15 to 16 heats a week. This is doing exceedingly well when it is considered that this is on producer gas and all cold metal, and that the heats average over 60 gross tons ingots. The equipment for getting stock up to the furnace is inadequate and is being remodeled.

The density of a metal is dependent on the intimacy of the contacts between its molecules. It varies therefore according to the crystalline structure, and is influenced by temperature of casting, by rate of cooling, by mechanical treatment, and by the purity of the metal. With the exception of bismuth all metals are lighter when melted than when in the solid state. Cast iron, which passes through a pasty state during solidification, has a less density in that state than when it is either fluid or solid. Wire drawing or hammering increases the density of a metal. The density of standard gold, by compression between dies of the coining press, is increased by 0.9; the density of cast platinum may be increased by 0.2 by hammering, but annealing will again diminish its density.

Of the thermo-couples used in thermo-electrical pyrometry, the most common are the following: (1) Pure platinum, with an alloy of one part rhodium and nine parts platinum. (2) Pure platinum with an alloy of one part of irridium and nine parts platinum. (3) Pure silver with an alloy of ¼ nickel and ¾ copper (constantan). (4) Pure copper with constantan. (5) Pure silver with an alloy of ¼ platinum and ¾ silver. (6) Pure iridium with an alloy of one part ruthenium and nine parts iridium. Of the first two couples above mentioned, the iridium and the rhodium couples give equally good results; the iridium alloy, however, is much cheaper, can readily be obtained in sufficient purity for industrial work, and has a higher e.m.f. at temperatures above 1000 deg. than the rhodium alloy. The ruthenium-iridium couple is useful only for high-temperature measurement, above the melting point of platinum. It is extremely brittle, but can be used up to 2100 deg. C. The silver and platinum-silver couple is convenient for temperatures up to the melting point of silver (962 deg. C.). This couple costs much less than the platinum element, and has nearly double its e.m.f. The constantan couples are very useful for low temperatures from zero to 300 deg. C. They have a high e.m.f. with the further advantage of being cheap.

Colliery Notes.

In the Abaville coal field of Wyoming there is a seam of coal 90 ft. in thickness, which is of particular interest, not only because of its great thickness, but also from the fact that the entire seam is practically free from partings.

In Oregon, the mines at Coos Bay are the only collieries of importance. These produce 100,000 to 120,000 tons of lignite, per annum, which is of good quality. Coal exists in other parts of the State, but the seams are not worked because of lack of railway facilities.

Gas engines which have lately come into more general use, especially where the power required is small, have shown a consumption of 0.78 lb. of coke per i.h.p., which greatly exceeds the best fuel results that can be obtained from modern steam engines.

The production of coal in Washington in 1905 was 2,818,045 tons, which was less than in 1904, the diminishing output being due to the increasing use of fuel oil from southern California. Thirty-one coal mines were in operation in 1905. The production of coke in 1905 was 50,972 tons.

In sinking a shaft to open a new property, much care should be observed to determine accurately the dip of the seam, so as to place the long side of the shaft in the line of the dip. This permits the gangways leading to the shaft to be driven level and straight, and the cars to run directly upon each cage.

Bore holes may be brought back to the plumb, if deviated, by forcing an india-rubber washer down to a depth of 20 yd. or so beyond the point of deviation, and then running in liquid cement to a few feet above where the hole has deflected. The cement is allowed to harden properly, when boring may again be commenced in the right direction.

In burning pea and other small sizes of anthracite, a draft of not less than 1½ in. of water must be used. The crust of the fire is broken in the thin spots, and the air is allowed to come through in such quantities that a large proportion of the heat is wasted. Inefficient combustion in a furnace is one result, and the passing of unused heat units out of the chimney is another.

Instead of sending green timber or props into the mine as soon as cut, it is more advisable to allow them to season or dry gradually. This increases their durability as was proved by experiments recording a gain of as much as 49 per cent. in the strength due to seasoning. This fact is being recognized at some collieries, and specially-constructed drying sheds have been erected.

The cost of sinking a circular shaft 20 ft. in diam., 1800 ft. deep, with 18-in. brickwork, in a Welsh colliery was $132,-814.08. This included wages, salaries, brick, lime, sand, fuel, timber, stores, and contingencies. The wages and salaries amounted to 52 per cent. of the total cost. The rate of sinking averaged 25 ft. per week, and 3000 to 4000 gal. of water per hour had to be pumped.

All colliery managers should adopt, and endeavor to enforce strictly, special rules governing the recovery of the explosive of a missed-fire shot. Carelessness and a lack of caution on the part of the miner, have frequently resulted seriously. If the miner were permitted to extract the explosive only under the personal superintendence of the pit-boss or other mine official, much trouble might be averted.

Tests recently made in England, showed that the least consumption of coal per i.h.p. per hour was 1.3 lb., at steam plants of the most economical type. Five express locomotives showed an average of 3.16 lb., and a general estimate, where all the steam engines and boilers in Great Britain were included, placed the average consumption at 5 lb., although some of the worst engines showed a consumption of 36 pounds.

The use of steam as a power underground is growing more in disfavor. The disadvantages attending its use are: Loss of pressure due to condensation and leaking joints; sudden bursting of a pipe; discomfort from the heat due to the increased temperature of the mine air; bad effects of the moisture on the roof and timber; difficulty of dealing with the exhaust steam; danger of fire when pipes are led into confined places.

The calorific value of the fuel used in steam power plants is of great importance, owing to its effect upon the efficiency of the entire plant. More and more large companies and users of power are adopting the principle of paying for fuel on the basis of the B.t.u. contained, without regard to the weight of the coal itself. When this is done, however, suitable restrictions are placed on the maximum amount of volatile matter, ash and sulphur contained in the fuel.

Circular shafts are employed in England, Wales, and also on the Continent for coal-mining. This form of shaft is best adapted to resist heavy pressure, and therefore is suitable for deep shafts. It is also best suited for ventilating purposes, as there is always a certain amount of space unoccupied by the cages. Rectangular shafts are more economical to sink, easier lined and secured, and the space can be better utilized for hoisting and pumping, while less material requires to be excavated.

In sampling coal in power house work to obtain its thermal value, the usual practice is to take a small predetermined amount automatically from each filling of the weighing hoppers, the final sample being quartered down and representing a true average of the total quantity used. The sample is pulverized and tested for value in a bomb calorimeter, after which an approximate analysis is made of another quartering of the same sample. This is the method used by many of the large power plants in New York City, including those of the Interborough Rapid Transit Company.

The strength of an explosion depends upon the volume of gases liberated, the rate at which decomposition proceeds, and the temperature of ignition. The gases liberated by the ignition of gunpowder, amount to about 2000 times the original volume of the powder used. The force exerted by ordinary blasting powder has been estimated at 22,000 ft.-lb. per sq.in. The actual work performed, however, is limited by incomplete combustion, compression, waste of energy in cracking and heating material not displaced, and by the escape of gases through the shot hole and through fissures in the rock. The efficiency, or ratio of work done to theoretical energy liberated, is estimated to range from 5 to 30 per cent.

If a pound of coal yielding 14,000 B.t.u., could be converted into mechanical energy, it would represent about 5½ h.p. It is only possible, with present methods, to convert about 14 or 15 per cent. of the heat energy of coal into mechanical work, even though an economical type of boiler and engine be used. Experiments show that 5 per cent. of the heat is lost by imperfect combustion, or retained in the ashes; another 5 per cent. escapes by conduction and radiation, and 15 per cent. passes off in the chimney gases, the remaining 75 per cent. is usefully expended in generating steam. The engine, however, does not utilize much more than one-fifth of the heat imparted to the steam, the remainder being carried off by the exhaust.

In determining what system to adopt in working a coal mine, the first consideration is the thickness of the seam. If the seam is less than 4 ft. in thickness, the longwall method, which has not been generally favored in America, is deserving of attention. The longwall system is especially economical when the roof and bottom are good, and free from water. Also the coal must not be too soft and friable, nor the seam inclined too highly. In longwall it is necessary to keep the walls going regularly, and the faces as even as possible. No portion of the face should be more than a single "cut" in advance, as this makes the coal more difficult to get, and causes more slack. No timber should be left in the waste as it keeps the roof from subsiding, besides increasing timber costs. Where conditions are favorable, longwall gets from 92 to 95 per cent. of the coal; the working price is cheaper; there is less expense in blasting; more round coal is obtained; less cost is incurred in maintaining the roads, and where properly worked, the mine is easier to ventilate.

Professional Ethics.

ADDRESS OF ROSSITER W. RAYMOND, PH. D., LL.D., TO THE GRADUATING CLASS AT LEHIGH UNIVERSITY, JUNE 1, 1906.

Fellow Graduates:

Wearing for the first time the garb of an Alumnus of Lehigh University, I address you as one of yourselves, and therefore with fraternal sympathy, rather than patronizing superiority. Let me hope that you, as sons of the Alma Mater, will not look down upon me as an adopted foundling. I can assure you that I regard her with affection like your own, and with a pride like your pride in her heroic struggles past, her victorious achievements present, and her greater glory yet to come! As a veteran, scarred with well-nigh 50 years of service, I would fain speak to my younger brothers some helpful word. But I am not so senile as to fancy that I can instruct you further in those departments wherein you have received instruction here. We old fellows have had hard work to keep up with the advances of this generation in scientific theory and technical practice. After we have strained every nerve in the effort to maintain an up-to-date place as learners, we surely ought not to be expected to hold forth as teachers! We must eitner sit at your feet, or continue to race after your heels!

On the other hand, there are a few things which are not taught in school; and among these are the ever-changing problems of professional ethics, concerning which, perhaps, age may still fairly claim a respectful hearing from youth, although it be inferior in other knowledge. And a word on this subject may be all the more apropriate now, when the ethics of business are involved in confusion by the volunteer reformers who find fierce delight or selfish gain in attacks, denunciations, exposures, and "sensations."

In my judgment, men mostly try to do right, and fail chiefly in their decisions as to what is right through inexperience and incomplete knowledge.

Some have partial, or what is called "barbaric" codes. It is, of course, easier to keep one or two commandments than ten; and such barbaric codes are therefore obeyed with a fidelity which puts an all-round Christian to shame. After you have eaten bread and salt with an Arab, you may trust him with your life and goods absolutely—but not otherwise! I have known on the frontier, rough, stalwart fellows who would not have felt the smallest compunction in selling me a worthless mine, or cheating me out of my money at poker (if I had been fool enough to play poker) as a stranger and a supposed tender-foot; but if I were the accepted "pardner" of one of them, I would rather have had him at my side in a meeting with hostile Indians or grizzly bears than the president of a Young Men's Christian Association!

Yet among those who acknowledge the whole Christian code, there are great differences in observance, due to lack of practice. Merchants, as a rule, clearly understand the obligations of notes and contracts, and strain every nerve to meet these obligations promptly, whatever else they do or omit. Lawyers, on the other hand, seldom fail in the administration of trust-funds, though they be never so lax concerning their private bills and promissory notes. Brokers on the stock-exchange may be guilty of many tricks and devices intended to advance or depress the prices of stocks; but they will stand to their bargains, made verbally in a chaos of noise, though their fidelity cost them many thousands. But authors, clergymen, women, and charitable workers, whose ideals of duty are unquestionably higher, in some respects, than those of the world in general, are strangely blind to the obligations of debt and contract. The man who has lent them money is a cruel creditor if he insists upon repayment at the time agreed upon. They construe the Golden Rule to mean that what you don't like ought not to be done to you; that a hardship is a wrong; and that it is unfair to enforce the penalty of an obligation against one who would like to fulfill it, but cannot do so without sacrifice. Consequently, banks do not like to deal with ladies or ministers or literary men!

In all these cases, the deficiency is not one of principle, but rather one of lack of knowledge and practice.

Most of you are going to be engineers, in one or another department of that multifarious profession. All of you, I think, will be called upon to serve your generation in one or more of the following ways, namely, as authors, employees, agents or advisers. Let me offer, therefore some suggestions, born of experience, as to the ethics of each of these positions.

As authors, take pains to think clearly, and to state your thought clearly. Faults of style are usually moral faults. Qualifying clauses out of place indicate belated after-thoughts; mixed and false metaphors declare that you have pretended to see pictures which you could not possibly have seen, because they were absurd. When a distinguished Senator of the United States, complaining of the unjust criticism which he had suffered, declared that he had been "gibbeted at the cross-roads of public reputation by every foul bird of passage," he was mixing two visions, professedly seen by his poetic eye, which were so inconsistent that he clearly could not have seen either. And when one of the most eminent of American orators of the last generation, arguing for universal education and universal suffrage, said (in my hearing) that the time was at hand, "when Liberty would stand by every new-born child, to drop in its cradle the school-house and the ballot-box," he uttered not merely a mixed metaphor, but also an implied and unconscious falsehood, because he professed to see in a poetic vision a performance which would have been fatal to every American baby, and therefore not glorious reform, but the meanest kind of murder!

It is the product, not the process of your thinking, which you will be called, as authors, to express to your fellowmen. Don't give them unnecessary trouble in finding out what you mean to say, or on what grounds you say it; don't assert, as of your own knowledge, more than you really know; and don't hide in generalities or ornamental illustrations, your actual ignorance as to this or that definite proposition.

One of the most frequent sins of authorship is the reckless use of quotation-marks. Even the eminent historian, Froude, was guilty of this sin, when he printed as quotations, his own summaries and interpretations of letters in the case of Mary, Queen of Scots. I think it was the *Saturday Review* which uttered the famous verdict, justly considered to express the utmost severity of condemnation, "Mr. Froude does not understand the meaning of quotation-marks!" Remember always that a quotation, making the original author responsible, must not be condensed or modified by you.

Again, verify all quotations, direct or indirect, whenever you can, and give such full references as will enable your reader to pursue the subject further for himself. If you are unable to do this, then plainly say so, referring, not to the original author of the statement you cite, but to the author whose professed quotation of it you adopted. Remember that, when you quote, you guarantee the accuracy of your quotation, and practically assure your readers that you have verified it.

As employees, think more of your duties than of your rewards or your supposed rights. Even from a selfish standpoint, loyalty commands to-day the highest price in the market.

One of the greatest inventors and mechanical engineers of the last century once said to me: "I can find many young men who are competent to erect engines, but very few whom I can thoroughly trust to do it, in complete devotion to my interest as employer."

Believe me, my young brothers, such devotion is today, not only more honorable, but more profitable, than ever before in human history.

As agents, your duties are as clearly defined by law as by honor. Under either rule, you may not have secret personal interests, affecting your relations to those whom you represent.

Perhaps the commonest question of casuistry occurring in modern business is that of "commissions." As the agent of

your employers, you have to purchase a steam-engine. After getting the prices and inspecting the engines of all the manufacturers, you decide upon the machine most suitable, on the whole, for your purpose, and, in all legitimate ways, beat down the sellers thereof to their lowest price. Just as you are about to close the bargain at that price, they say "This covers, of course, your commission of 10 per cent." When you reply that you do not expect any commission, and suggest that, instead of paying it to you, they take it from the amount of the bill they send to your employers, they tell you that, according to some trade-agreement, they cannot charge a lower price, but can pay a commission to the selling-agent. Now you are not the selling-agent, but the purchasing-agent; and, explaining this difference to them, you tell them that you will be in honor obliged to pay your employers whatever commission may be paid you. To this they reply, with a kindly but cynical smile, that they do not care what you do with the money, after you have got it; and you see clearly that they regard your protestations of honor as part of the formula which precedes your acceptance of the money. They do not really believe that you will not keep it, if you get it.

I am repeating an episode of my own experience; and perhaps my solution may be of use to you. I declined the commission offered in currency; required it to be put in the form of a check to my order; endorsed that check to the order of my employers; and presented it to them, leaving them, if they saw fit, to return it to me as a legitimate perquisite of my position. They did not see fit; and they were quite right. But the most important feature in my action was, that the return of the check, thus endorsed by me in their favor, convinced the manufacturer of my honesty, as no amount of high-toned oratory on my part could have done.

As expert advisers, you may be called to counsel either private clients, or the public at large, or courts of justice.

As advisers of clients, you will encounter little difficulty in deciding what professional honor requires of you. Yet now and then, perplexing cases may arise. For instance, you are called upon to estimate the prospects and suggest the best method of exploration of a mineral property owned by your employer. He asks you, not how much money the property is worth, but whether, in your judgment, it is promising enough to warrant the expenditure of money upon it by the actual owner. You make an encouraging report, which he afterwards publishes, in whole or in part, to aid the sale of the property or of the stock of a company to which he has transferred it, at a price never considered by you, and beyond your estimate of its present value.

In view of such a possibility, you ought, in the first place, to put into a report of this class no vague, glittering prophecies of future profit, or paragraphs which could be used, without their context, to support sanguine speculative appeals. State clearly, at the beginning of such a report, its purpose and scope. If your employer should subsequently make such use of it as would involve you in propositions you never made or meant to make, protest promptly. Such a protest, to be effectual, should be reinforced by your own original and carefully guarded statement. Nevertheless, make it anyhow, and make it promptly, if you deem it worth making at all. Post-mortem disclaimers by experts, after the collapse of mining schemes with which their names have been fairly or unfairly connected, have very little effect.

Reports for clients comprise also those avowedly made for vendors of mining property, industrial patents, etc. Here also, perfect frankness is the only way of safety, as well as honor. For instance, you are asked to make such a vendor's report for a contingent fee, payable if the property should be sold upon your report. There is nothing wrong in such an agreement, provided you do not conceal it, and do not pretend to be entirely disinterested in your opinion. I can assure you that the frank statement at the beginning of an expert report—"I am interested in this property; but I do not think that my interest has influenced my estimate of its value"—would enhance, rather than diminish, the effect of the opinions thereafter expressed.

Or, your employers may be prospective purchasers. In that case, they may have said to you:

"Here is a property, offered to us on such and such terms. Examine both the property and the proposition, and advise us what we shall do.'

In such a case, you would evidently be free to report, for instance, that the property is all that the vendor has represented it to be, but that equally promising properties could be had in the same district for less money.

Or, your employers may have said to you, in substance:

"Here is a vendor's statement concerning the property offered to us. We engage you to investigate and verify this statement."

Evidently, in this case, you have no concern (and may have no acquaintance) with the terms of the proposed purchase. If you happen to know what they are, and believe that, though the vendor's statement is truthful, the vendor's price is too high, in comparison with the price at which other, and equally promising, property could be acquired, such an opinion is wholly outside of your commission, and you cannot properly express it in your report. But you should frame your report so that its limitation shall be clear, and you have a right to require that it shall not be garbled or unfairly used, to the possible injury of your own reputation.

Reports of this class may be regarded as, in some degree, advice to the public, since they are almost invariably embodied or quoted in the prospectuses of mining companies. This is especially the case in Great Britain, because, under the English statutes, the promoters of a mining scheme are protected against legal responsibility by the favorable reports of experts employed in the interest of the intending purchasers. I need not say that no honorable mining engineer would lend his name to the protection of an empty or inflated scheme. But I have known good men to become unconsciously involved and undeservedly disgraced in such undertakings. You cannot be too careful to make your record absolutely plain, and to protect it by instant protest and exposure, against even the appearance or suspicion of connivance in delusion or deceit.

Again, you may have occasion to appear as expert witnesses in court. Such witnesses are called in cases involving patents, mining titles, the detection of poisons, the details of medical practice, or the value of professional services, etc.

Expert testimony has been, and is, the subject of endless controversy. It is often urged that experts should be appointed by the Court, to give advice without favoring either party. This is, in fact, done in criminal cases, where analyses are made for poison; in cases of alleged lunacy, etc.; but I think experience has shown that in ordinary litigation, especially as to patents and mining titles under our laws, justice is best secured by allowing each party to present its own experts, requiring them to submit to cross-examination, and leaving the bench and the jury-box to pass judgment upon the evidence. The difference between an expert and an ordinary witness is that the former is permitted to give his opinions, however reached, while the latter can give only facts of personal knowledge. The oath of an expert, therefore, binding him to tell "the truth, the whole truth, and nothing but the truth," covers the ordinary obligation as to facts, and also the obligation of the full and truthful statement of expert opinion. Yet there is no doubt that this opinion must be, to some extent, a partisan one. No party to a lawsuit will put an expert on the stand without knowing beforehand that his opinion will be favorable to the contention of his employer. Nor would any such expert be doing his duty, either to the court or to his employer, if he uttered an opinion so carelessly formed or loosely held that he could not vigorously defend it, or would run the least risk of changing it under cross-examination. The situation is often complicated, critical and exciting. The following suggestions may assist young experts to deal with it:

When such an engagement is offered to you, accept first a retainer for which you undertake to examine the case, form an opinion, and state it to your employer. In a mining case, two such preliminary investigations may be necessary: the first being based upon the *ex parte* case, submitted to you by one side, and the other upon your own personal examination of the facts. After the latter, state clearly to your client the opinion which you are prepared to maintain. If it does not support his contention, he will not wish to put you on the stand as a witness; but you are bound not to assist, either in that case, or (without his permission) in any other, involving the knowledge you have acquired in confidence from him, parties whose interests may be hostile to his.

If you take the stand as an expert, you ought to know already all the facts and authorities which bear upon your opinion. Whatever has been previously adduced in the pending case, you should, of course, have taken into account. What is produced which takes you by surprise, you should not meet with a rash denial or quibble. Your true and wise course is to declare that you are giving your deliberate and careful opinion upon all the facts known to you, and you cannot hastily revise that opinion upon new evidence, which you cannot, in a moment, test, sift and weigh.

Don't try to be smart or witty under cross-examination. Such an encounter is like a fencing-match in which you have your hands tied. For you are answering under oath, while the inquiries and insinuations of your antagonist are unrestrained. Maintain your opinion manfully; but do not even seem to be fighting for your client. Still better: do not fight at all, but assume throughout that the cross-examination attorney is honestly in quest of information, and give it to him with courteous generosity. If you thus give him no opening for insulting comment, he will probably not make any. If he should do so, do not try to protect yourself, but let your counsel, or the Court, protect you. I have seen a witness get the better of a lawyer in repartee, and lose the case; and I have seen witnesses brow-beaten and embarrassed by clever lawyers, but vindicated by the verdict of the jury, which could not be diverted by mere wit from its search for truth and justice.

If you are called upon to answer categorically, Yes or No, a question ingeniously so framed as to involve through such an answer some misconstruction of your opinion, do not fence, dodge or quibble, as if you were afraid to meet the issue, but give at once the categorical answer demanded, and immediately ask the Court to permit you to make an explanation. This is your right, and will be promptly granted, while your enemy gnashes his teeth.

It happens sometimes, in mining cases, that an expert, after the trial of a case in which he has testified, is obliged by later developments to change his opinion. For instance, in a certain lawsuit, it is a vital question whether a certain mining claim exhibits two lodes, or only one. You testify that there are clearly two. But deeper mining shows these two to have united, so that there is, as you are obliged to acknowledge, only one.

Such changes of scientific conclusions are common enough. We are all revising our old views upon new evidence. But permit me to urge upon you a rule of policy which is most important. If you have once advocated under oath, and for an expert's fee, a given opinion, do not announce your recantation of that opinion as a paid expert. Put it in a technical journal or book, if you like—but do not let yourself be caught in a situation where you have to explain it to a jury! If you ask me whether you have not a perfect right to announce anywhere an honest change of opinion, I reply that it is your duty not to do an honest thing in such a way as to incur a probable suspicion of dishonesty. You might honestly call upon me in Brooklyn as a stranger, and tell me that you had had your pocket picked of nearly all your money, and lacked 49 cents to get you back to South Bethlehem. But you had better foot it back to Bethlehm than bring me that story! Honest people have no right to act like impostors! And, to return to the instance I have given, if you have once appeared as the defender before judge or jury of an opinion which you have been subsequently obliged to abandon, make your new opinion known (if it be of sufficient importance) in some clearly disinterested way; but not under circumstances which might cast suspicion upon your sincerity.

I might extend indefinitely these desultory and fragmentary suggestions. But I could not make my treatment of the subject symmetrical and comprehensive by simply enlarging it in the one dimension of length; and I will therefore break the tenuous thread at this point, adding a single general observation, which covers, I think, most of what I have hinted in detail.

Is there no general formula, by which a man may be guided in all such questions of casuistry? The Ten Commandments, the Golden Rule, are formulas which often prove difficult of application, or easy of evasion, in concrete cases. Let me suggest to you, for rough, practical use, a maxim, apparently (though, I think, not really) framed on a lower plane.

Do nothing that you cannot tell.

If there be any doubt as to the matter, tell it anyhow to the parties affected by it. If there be no reason for telling it at the time, make a complete and unchallngeable record, for the possible future use of yourself, as well as of others. To forget circumstances may be equivalent in effect to hiding them. It is mortifying indeed to face the partial record of some old transaction which you know was all right, but cannot now prove it so, because the stub of your check-book shows no particulars!

In these days especially, we are learning the folly of secresy. On every side, eminent men, and (I make bold to say) really honorable men, are incurring disgrace by reason of acts hidden either from them or by them. Some of these acts they might be able to defend, but for the damning suspicion attached to the circumstance of concealment.

It may be—and, to speak frankly, such is my personal opinion—that the present excited public feeling is in great danger of going too far in its hasty and indiscriminate condemnation of alleged evils. But that is not the question that I am now considering. My present deduction from the prevalent chaos of accusations is this: If many things, now represented, or misrepresented, to us as scandalous abuses, had been openly done from the beginning, how much more comfortable good men would be! And, on the other hand, how many things which could not have been done openly would never have been done at all!

Certain it is that men "love darkness rather than light," when "their deeds are evil." If you are not of such, why not walk always in the light?

Correspondence and Discussion.

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

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of this JOURNAL.

Letters should be addressed to the Editor.

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

Mitchell Mining Company.

Sir—My attention has lately been called to a circular issued by the Mitchell Mining Company, of Arizona, in which I am quoted as endorsing the property in La Dicha, State of Guerrero, Mex., to the extent of about 8,000,000 tons of ore having a value of about $57,000,000. I wish to deny absolutely ever having made such a statement by letter or verbally. My examination of the property in January, 1905, showed 1,800,000 tons of ore that can only be smelted, averaging 1.86 per cent. copper, and traces of gold and silver. I hope that you will find space in your esteemed publication for this statement. T. H. FRANCE.

Mexico, D. F., June 1, 1906.

The Mexican Chamber of Mines.

Sir—What virtually amounted to indorsement, by what purported to be a

bona fide miners' organization of Mexico, of the two greatest enemies of legitimate mining in this Republic, took place in this city on May 15, at the meeting which had been called to organize a Chamber of Mines. This consisted in the election of Lic. Pablo Martinez del Rio, a director, large stockholder, and general counsel of the Mexican Dynamite Trust, as president of the Chamber of Mines, and Lic. José Luis Requña, as first vice-president, the latter being the general counsel for the MacArthur-Forrest Cyanide Patents (Mexican Gold and Silver Recovery Company). This was precisely what the mining interests of Mexico least desired, and the effect has been that the Chamber of Mines in Mexico is a tabooed organization.

I was present at the session of this organization, held in the palatial home of Lic. Pablo Martinez del Rio. Particular pains was taken to ascertain the sentiments of those present, who are recognized in the Republic as mining men in the best sense of the term. These men were universally of the opinion that the organization had been "packed," and that it could, in no sense of the word, be termed a meeting of the representatives of the mining interests in Mexico. There were present a great number of Mexican lawyers, who hold a few mining shares; some few dealers in mining machinery, rock drills, coal, etc.; a goodly representation of the promoter element, which at all times makes its headquarters in Mexico's hotel corridors, and a very small number of the mining engineers and operators of Mexico. The meeting was classified as a Chamber of Lawyers, by one of the representatives from Guanajuato. This, by the way, was the only camp which could be said to have had anything like an adequate representation. Such men as C. W. VanLaw, W. H. McCord, Carlos Robles, and Bernard McDonald, were its representatives; but when the trend of the meeting demonstrated itself to be so hostile to general mining interests, it was noted that these men no longer gave their sanction to the deliberations. Representatives of the Guggenheim interests, the Dos Estrellas mines, the American Smelters' Securities Company, the W. C. Greene interests, or in fact any of those who are considered the leading spirits in mining in Mexico, were conspicuous by their absence. There was only one session, and that of but two hours' duration.

The mining men of Mexico say privately that the organization as effected, was a cooked-up scheme by the cyanide trust and the dynamite trust, to choke off the investigation of their operations, which it was said was scheduled to take place. The only other action, aside from the election of officers and the adoption of by-laws, occurred on the day after the convention, when a number of the delegates called upon President Diaz, informing him of the formation of the organization, and asked for his official recognition of it. This was given, the President congratulating the trust representatives on their signal success in effecting the organization. This was, of course, a mere formality.

The meeting will have absolutely no significance to the real mining men in Mexico, who will be but nominal members. The Government is known to favor the idea of a Chamber of Mines and likes to have every mining man interested in Mexico as a member of this organization. Consequently every mining man here will make it a point to be *conforme,* as the saying is here, which means agreeable to the wishes of the Government. It is to their interest to be so and can do them no harm. They cannot afford, for various reasons, to maintain a hostile attitude to the organization, and therefore they say they will pay their dues and keep up the appearance of being loyal members, at the same time carrying on their business as though the organization had no existence.

A thing which is particularly displeasing to the mining fraternity is that the *Asociacion Financier,* an organization which publishes an inconsequential paper, was given the power to make its paper the official organ of the Chamber of Mines. The offices of this organization were also made, temporarily at least, the headquarters of the new body, and its director-general placed on the list of vice-presidents.

There was an attempt to hold a second session of the organization, but this met with a dismal failure. Most of the mining men had left town in disgust and there was nobody who could talk intelligently on mining subjects left to attend the sessions of the body. It is not known when the organization adjourned, or whether it did adjourn. All that is known is that two days after the first session the official announcement was given out that the body had adjourned after electing its officers.

The discussions in the two hours' session hinged on such important topics as whether or not to pay $10 Mex. a year as dues for the organization, or whether the salary of the secretary was to be $250 or $300 per month, or whether he was to be appointed by the President or be named by the body in a regular elective way. None of the matters which are of real moment in the mining business was touched upon at all; and unless there is a change in the head of the organization, will not be.

Mexico, May 27, 1906. T. A. C.

The steam turbine has made possible the use of generators of extremely high speed, with their corresponding saving in weight and iron content, as well as being primarily responsible for the great reduction in floor space required for steam engines.

Commencement Day at Lehigh.

This university, founded by Asa Packer, at South Bethlehem, Penn., in 1865, celebrated its 38th annual graduation exercises on June 13. The occasion marks the beginning of a new era of her prosperity.

At 10:30 in the forenoon, the candidates for degrees, 94 in all, with the ceremony which befits the gown and mortar-board, marched in formal procession to the Packer Memorial chapel, whither they escorted the faculty and trustees, including also Dr. Rossiter W. Raymond, the orator of the day.

The formal program which was brightened by frequent organ selections, was made up substantially as follows: R. J. Van Reenen, of Seapoint, South Africa, gave a short but illuminating address on "The native problem of South Africa." Charles F. Gilman, of Williamsport, Penn., presented an analysis of "The economic causes of expansion." David N. Showalter, of South Bethlehem, suggested the possibilities of the Canadian Northwest, with the title, "A new nation."

Samuel B. Warriner, general manager of the Lehigh Valley Coal Company, of the class of 1890, spoke for the Alumni. He congratulated the university on its having for the first time in her history, in the president, Dr. Henry S. Drinker, a man who is both an alumnus of the institution, and a successful engineer. Mr. Warriner then discussed at some length, the relation of capital and labor. Stewart J. Cort, of Allegheny, spoke "On ore deposits and industrial supremacy," closing with the class valedictory.

This was followed by the conferring of the various degrees on the graduates, 94 in number; these were distributed as follows: Master of Arts, 1; Master of Science, 2; Bachelor of Arts, 4; Civil Engineer, 26; Mechanical Engineer, 25; Engineer of Mines, 9; Metallurgical engineer, 1; Electrometallurgist, 7; Electrical Engineer, 14; Analytical Chemist, 4; Chemical Engineer, 1.

Hitherto Lehigh has given no degrees except to students taking the regular work in course. But this year, the institution, for the first time in her history, bestowed the honorary degree of LL.D. The recipient of this was Dr. Rossiter W. Raymond. He was formally presented for the degree of Doctor of Laws by the Rt. Rev. Ethelbert Talbot, D.D., LL.D., representing the trustees; and by Prof. William H. Chandler, Ph.D., representing the faculty, and with the following formula:

Mr. President: On the recommendation of the Faculty and by the authority of the Board of Trustees, we present Rossiter W. Raymond for the degree granted by Lehigh University. We present him as a man distinguished alike by his professional and literary work—teacher, sci-

entific expert, engineer, lawyer, author; long United States Commissioner of Mining in the Public Domain; honorary member of the Society of Civil Engineeers of France; honorary member of the Iron and Steel Institute of Great Britain; honorary member of the American Philosophical Society; United States Commissioner at Vienna Exposition; for years a member of the faculty of our sister college, Lafayette, and bearing her degree as Doctor of Philosophy; past president and one of the founders of that great body of scientific men, the American Institute of Mining Engineers, and for many years, and still its honored secretary, being the successor in that office of our beloved Dr. Drown.

The presentation of this degree to Doctor Raymond was followed by applause, the only instance where this showed in the whole program. Dr. Raymond responded to this with a short, practical, and stirring address to the graduating class, which is given elsewhere in this issue.

Mine Accidents in Great Britain.

The complete returns of the British mine inspection bureau, some advance figures from which were published last January, have now been issued. The mines of Great Britain are classed under three heads, coal mines, metaliferous mines and quarries, or open workings. The total number of employees in the mines of the United Kingdom in 1905 was as follows:

	Underground.	Surface.	Total.
Coal mines	691,112	167,261	858,373
Metalliferous mines	17,286	11,865	29,151
Quarries	59,978	34,841	94 819
Total	768,376	213,967	982,343

Women are no longer employed underground, but of the surface workers last year 5929 at coal mines and 225 at metalliferous mines were females. In the coal mines, 60,058 boys under 16 years of age were at work. At quarries, underground employees are those who work in the pits or excavations.

The number of persons killed and injured during 1905 is reported as below:

	Killed.	Injured.	Total.
Coal mines	1,159	3,380	4,539
Metalliferous mines	43	245	288
Quarries	97	1,193	1,290
Total	1,299	4 818	6,117

As compared with 1904, there was an increase of 104 deaths in coal mines, and of 11 at metal mines; but a decrease of 13 deaths in quarries. The report notes that the figures given for numbers injured are not a sure guide to the number of non-fatal accidents which actually occurred, because the standard of severity governing the notification of accidents at mines and quarries is vague, and allows much latitude to the agent in his interpretation of it. Until a definite standard is fixed by statute no stress should be laid upon these figures, excepting as regards injuries caused by explosions of firedamp, explosives, and steam boilers; in these three cases notifications have to be sent to the inspector, no matter how slight the injuries.

The proportion of boy workers under 16, in the coal mines, was 7 per cent. The number of boys killed was 87, or 7.5 per cent. of the total. The difference in proportion was slight.

The number of deaths per 1000 employees was as follows in 1905:

	Inside.	Outside.	All workers.
Coal mines	1.49	0.75	1.35
Metalliferous mines	2.49	0.25	1.58
Quarries	1.42	0.40	1.04
All workings			1.32

This is a low death rate, the small number of 1299 killed out of nearly a million persons, shows that mining in Great Britain can hardly be called a hazardous occupation.

Notes From Broken Hill.

SPECIAL CORRESPONDENCE.

The fire which has been burning at the 490-ft. level in the Junction mine, Broken Hill, New South Wales, has occasioned much concern, as it is recognized that if the fire spreads to the upper levels the mine must be abandoned until it burns itself out. Representatives of the adjoining mines, the Junction North, and North, accordingly met in consultation and finally agreed to close down the mines and flood the workings to a hight above the seat of the fire. The Junction mine will be flooded to a depth of 450 ft., and this will carry the water into the North mine between the 400 and 500-ft. levels, and in the Junction North to the 470-ft. level. Satisfactory progress is being made with the work of flooding, but it is expected that mining operations cannot possibly be resumed for some three or four months yet. In all about 300 miners have been thrown out of employment. Pending the resumption of operations the Junction mine will keep its re-treatment plant going on tailing, and at the North, and Junction North, the surface construction work for the new plants designed to treat the tailing will be proceeded with.

The fire in Block 11 at the Broken Hill mine has been successfully kept within confines, and work is now proceeding underground as usual. No present difficulty is anticipated from this source, and large quantities of water are being poured daily on the seat of the fire with appreciable effect. The lode has recently been opened out in this mine at the 1100-ft. level, where it is 65 ft. wide, and assays: Lead 19 per cent.; zinc 17 per cent.; and silver 13 oz. per ton. This company declared its 145th dividend, absorbing £72,000, on May 2. The South Broken Hill Company has also given evidence of the splendid profits which are being earned, by the declaration of a dividend and bonus absorbing the sum of £25,000, which brings the amount distributed by this company, to date, up to £365,000. A movement is started to consolidate the holdings on the northern end of the Broken Hill lode into one large company. The proposal finds considerable opposition from the smaller shareholders, who strongly resent the influence which recent operators are exercising. It is strange that at a mass meeting of the workmen recently held on the field, inflammatory speeches were made respecting the grip British and German investors, as represented by several firms, were obtaining over the Broken Hill mines.

New Publications.

"Industrial Furnaces and Methods of Control." By Emilio Damour. Authorized Translation with additions by A. L. J. Queneau. Pp. 317; illustrated. 6½x9½ in.; cloth, $4. New York and London, 1906: THE ENGINEERING AND MINING JOURNAL.

Contents: Heat of combustion and calorific power. Origin and development of gas furnaces. Influence of the temperature on the heat utilization in a furnace. Characteristics of direct-fired furnaces and their principal industrial application. Gas-fired furnaces. Regenerative furnaces. Classification of the various types of furnaces. Experimental study of the heat utilization in furnaces. Discussion of the theory of heat recuperation in the light of experimental data. Pyrometric practice and instruments. Gas analysis. Calorimetry. Elementary fuel analysis. Chimneys. Regenerators, recuperators, reversing valves. Powdered fuel.

There is no subject of more importance in technology, whether it be metallurgy, the manufacture of chemical products, or the generation of steam, than the economical combustion of coal. The French and German literature has been rich in works upon this far-reaching subject, while English and American literature has been singularly deficient. It is, therefore, satisfactory to see this gap filled by so admirable a work as that of Mr. Queneau.

The first part of his volume is a translation of the valuable treatise of Emilio Damour on "Le Chauffage Industriel et les Fours á Gas," but to this the translator has added many notes and comments which greatly increase the value of the original. The second and third parts of the book are due to Mr. Queneau alone, except that Dr. Myrick N. Bolles has made contributions to the chapters on calorimetry and the ultimate analysis of fuel.

Prof. Henry M. Howe, has written an appreciative preface to the work, from which the following is quoted:

"Mr. Queneau has here laid the industrial world, and especially the metallurgical world, under great obligation, by bringing together his own admirable translation of Damour's admirable work and

welcome chapters by himself and Dr. Bolles, both of whom I am happy to count among my past students, on the control and efficiency of heating operations through pyrometry and chemical analysis, and on the design of chimneys and of regenerative gas furnaces. To the practicing metallurgist as well as to the advanced student, this work should be very valuable, giving as it does with well combined clearness and condensation, the results of scientific experiment and of practical experience, and the explanations needed for a firm grasp of the subject. The writers are to be congratulated on having reduced within moderate limits the use of mathematics, probably recognizing, as so many experienced teachers do, that to the minds of nearly all men ideas are brought by far most easily by means of their own native and every-day language, and of visible pictures. If we are to teach, let us teach not only with all our force, but with all our skill, along the line of least resistance to the introduction of new thought, that with the strength and time allotted us we may work the greatest aid to our fellows. To all but a very small group of men mathematical formulæ remain not only a foreign but a repellant language, to be used for giving perfect precision and definition to ideas already expressed in the vernacular, or in extremities when verbal language fails, somewhat as when in despair we turn to Latin or Greek to drive a thought home deeper and surer than we can with English, sometimes perhaps because of its defects, but oftener because of our own clumsiness in its use; or as when we turn to medicine because diet and temperance fail.

"By his translation, in which his skill in a foreign language, our puzzling English, rouses our applause, Mr. Queneau gives us easier access to Damour's valuable work; but in their original chapters he and Dr. Bolles add the fruits of their own keen study, and of their labors at once faithful, strenuous and efficient.

Let us, their beneficiaries, wish them the fullest enjoyment of the second greatest of human pleasures, the consciousness of work valuable to our kind, well and faithfully done."

To this it is necessary to add but very little. The importance of the subject which is treated is very great; indeed, far greater than is commonly recognized. There is, perhaps, nothing in which we are so wasteful as in our use of coal. The great volumes of black smoke that are discharged from the chimneys in the majority of industrial works furnish ocular evidence of the great waste that is going on. Economy is effected by careful firing, and further by the employment of gas firing and regenerative furnaces, but even in the highest type of the latter installation, the waste of heat is still very large and there is ample room for further improvement in its utilization. It is in economies in this direction that lie the greatest possibilities for further reduction in operating expense. Such improvements will be greatly facilitated by a thorough knowledge of the principles of the proper design of the furnace itself, and its many accessories. These are the subjects, which are treated in a highly lucid and scientific manner by Messrs. Damour and Queneau. Their book is to be thoroughly recommended, and should be in the hands of every copper, lead and zinc smelter and also every steel maker, glass maker, cement burner, and in fact all technologists who have to burn fuel as a part of their process.

Abstracts of Official Reports.

United Copper Company.

As the first step towards taking its stockholders into its confidence, the United Copper Company has issued its president's report, which was read at a special meeting, April 26. As the company is merely a holding corporation, only the most remote references to mining and smelting are found in his report.

The company has been able to settle all of the litigation which has for so long hampered its operations, on a basis that appeared eminently fair to the management of the company. This settlement involved the dismissal of some hundred and fifty causes of action and claims for damage against the subsidiary companies aggregating close to $100,000,000.

The litigation which has been persistently and unintermittently prosecuted for more than eight years has cost the subsidiary companies, directly and indirectly, in excess of $1,000,000 per annum, and, in addition, has occupied the time of most of the executive officers to such an extent as to make the actual business of copper mining almost secondary.

As a result of the recent arrangement, the company is to-day the owner of securities having a market value in excess of $20,000,000, and it has cash and its equivalent in excess of $8,500,000 on hand. These securities cover interests in nearly every Butte copper-mining company whose stocks are traded in and copper-mining stocks of companies operating in Utah and California, and represent an interest in the production of a greater number of pounds of copper than the company has been interested in at any time since its formation. The company owns considerably more than a majority of the securities of the La France Copper Company, which is now operating several mines in Butte, from which over 300 tons of exceptionally rich gold, silver and copper ore is being mined daily from above the 500-ft. level. This output can shortly be increased from the upper levels, and the machinery is all on the ground to unwater the mine to the 1450-ft. level, and when this has been done there is no question that the output will be considerably more than doubled.

The company is also largely interested in a considerable mining territory in the heart of Butte, which, in the opinion of the management, will shortly be producing copper in large quantities. In addition, it has a contract for the concentrating of the Butte Coalition Company's ores at its plant in Basin, which is equipped in the most modern manner to handle 1,500 tons daily of these ores. The smelter of the Basin Reduction Company is also located at Basin, and could, on very short notice, be blown in, if considered desirable by the management, but, in the meantime, the company's ores are being handled at the Washoe company's plant at a rate for smelting more advantageous than could be done by the company in its own plant. The company further controls interest in copper and gold deposits in Montana, Utah and Alaska, which it expects very shortly to equip on a large scale, running into several thousand tons daily in each State or Territory.

Since the date of the special meeting above referred to a supplementary report has been made public, stating that the $3,500,000 of the bonds of the subsidiary companies have been sold for par and accrued interest and the money has been placed in trust companies and banks, at current rate of interest for such deposits. The plans of the company with reference to the acquirement of new and extensive copper and gold deposits are progressing in a most satisfactory manner.

Operations in the Butte district continue to meet with increasing success. The unwatering of the Lexington is proceeding with all the despatch that could be expected in so large an undertaking. The machinery which has been installed has proved adequate to meet the demands of the situation in a reasonable time. This involves the raising of 150,000,000 gal. of standing water besides what water is being made above the 650-ft. level of all the territory north and west of the Lexington shaft. To remove this water will take 60 days. In the meantime, developments in the upper levels of the mine continue as heretofore and the company expects to continue the extraction of ore uninterruptedly without any interference by reason of pumping and water hoisting.

According to Adolfo Ortuzar, immense nitrate deposits have been discovered in the provinces of Antofagasta and Atacama, Chile, which, it is estimated, contain 15,000,000,000 quintals of nitrate. Adding this amount to the 2,000,000,000 which exist in the province of Tarapacà, there is estimated to be 17,000,000,000 quintals actually located in Chile. In 1906 there will be 132 nitrate concessions, with a productive capacity of 77,000,000 quintals.

Thawing dynamite in, over, or close to a stove or steam boiler, is apt to have disastrous consequences.

Personal.

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

P. G. Lidner, mining engineer of New York, has just returned from Haiti.

Leo Wreschner, of Frankfurt-on-Main, Germany, is visiting New York.

W. W. Degge, of Boulder, Colo., has gone to Nevada to look at mining property.

Frank G. Willis, of Cripple Creek, has returned from a professional trip to California and Nevada.

Charles W. Leavitt has removed his engineering office to the St. Paul Building, Broadway, New York.

L. E. Tobias, of Idaho Springs, Colo., has returned from an extended mining trip to Eastern points.

Elfric Drew Ingall, of the Geological Survey of Canada, has been making a brief visit to New York.

P. R. Stanhope, of Dumont, Colo., has returned from a four months' trip on mining business to the East.

Tenney C. DeSollar, engineer and assayer of the United Elkhorn mines, Baker City, Oregon, is in Denver.

Fred G. Farish has returned from Idaho to Denver, and has left again for Mexico City on professional business.

A. T. Holman, superintendent of the Golden Cycle mine at Cripple Creek, is taking a vacation on the Atlantic coast.

Sydney Smith has succeeded W. R. Beall as general manager of the Bully-choop copper mines in Shasta county, California.

George Westinghouse has had the degree of doctor of engineering conferred upon him by the Technical University of Berlin.

Lord Templeton, of England, has secured several square miles of mineral land in the Lake Chibogamoo district of Quebec.

John H. Mackenzie, of San Francisco, was in Seattle, Wash., recently, in connection with a trip to Alaska on mining business.

A. H. Kidney, of New York, has been in Gilpin county, Colo., looking at the property of the Heatherbloom Mining Company.

W. F. R. Mills, president of the Mining Reporter Publishing Company, of Denver, Colo., has been in New York on a flying visit.

J. W. Bell, manager of the Nicola mines, British Columbia, passed through Denver a few days ago, on his way north, from Mexico.

J. C. McLennan, professor in Toronto University, has been lecturing on the Metric System in Vancouver and Victoria, British Columbia.

Richard A. Parker, of Denver, Colo., has been examining the Big Copper mine, near Greenwood, Boundary district, of British Columbia.

E. H. Straub, of the Goldfield-Homestake Mining Company operating in Gilpin county, Colo., is making a business trip to Eastern points.

W. H. Foringer and C. A. Constable, of Erie, Penn., have been looking over their interests in the Jefferson-Calhoun Mining Company in Colorado.

F. L. Ransome, of the United States Geological Survey, will be engaged during the coming summer in geological work in the eastern half of Arizona.

A. H. Melin, treasurer of the Amalgamated Copper Company, spent a few days in Butte recently, returning to New York with B. B. Thayer, June 10.

W. H. Knowles, mining engineer, of Denver, Colo., has been looking at new discoveries in Grand and Routt counties, Colo., along the Moffatt road.

J. P. Hutchins, of New York, is making an extended professional trip through the West. He will go as far as California, and will be absent several weeks.

John Hays Hammond received the honorary degree of doctor of engineering from the Stevens Institute of Technology at the Commencement last week.

H. D. C. Richards, hydraulic and mining engineer, of San Francisco, is in New York on professional business. His local address is at the Engineers' Club.

W. M. Brewer, of Victoria, B. C., has gone to Kodiac Island, off the Alaskan Peninsula, where he will be engaged in professional work during the summer.

Martin J. Heller, consulting engineer to the Nipissing mines, of Cobalt, Ont., has returned to New York from his regular quarterly trip of inspection to the mines.

Ernest Richter, of Cincinnati, has been looking after interests of the Richland Mining Company, of which he is president, in Clear Creek county, Colo., recently.

William L. Coble, mining engineer of San Francisco, lost his office there by the great fire. He has established a temporary office at Tallac, Cal., on Lake Tahoe.

Dr. R. Chalmers, of the Dominion Geological Survey, is making a tour of the Western provinces with a view to locating clay suitable for the manufacture of fire-brick.

Ben B. Thayer, representing the mining interests of H. H. Rogers in Amalgamated, who went to Butte early in May to inspect the properties, has returned to New York.

H. H. Lang, formerly superintendedt of the Kendall mine in Montana, is now consulting engineer. E. S. Kinney, late mine foreman, succeeds Mr. Lang as superintendent.

T. H. Oxnam has resigned his position as consulting engineer and general manager of the Palmarejo & Mexican Gold Fields, Ltd.; he is proceeding to England for a few months' rest.

Among the new members admitted to the Institution of Mining and Metallurgy, which held its general meeting in London, England, last month, was Dr. J. Bonsall Porter, professor of mining at McGill University, Montreal..

George F. Bridger, has resigned as cyanide superintendent of the Guanajuato Consolidated Mining and Milling Company, in order to accept a position with the Dos Cabezas Mining Company, of Nueva Casas Grandes, Chihuahua.

James Underhill, who is connected with the Denver Laboratories, of Denver, Colo., has received the degree of doctor of philosophy from the University of Colorado, in recognition of his work on the geology of the lower Clear Creek valley.

Arthur W. Stevens, mining engineer, with headquarters in Chicago, has just returned from making extensive examinations of properties in Wisconsin, and leaves at once for Idaho to examine several large placer properties for Chicago parties.

M. K. Shaler, of the United States Geological Survey, has been detailed to the Durango-Gallup coalfields of Colorado and New Mexico for the purpose of determining the economic value of certain coals occurring along the western border of the field.

In the note on "Iron Ores in Canada" in the issue of the JOURNAL of June 9, page 1107, we gave the names of the parties in charge of the work as F. Cirkel, W. Shele and Professor Woodman. This should read: F. Cirkel, W. Hille, and Professor Woodman.

L. W. Trumbull, professor of mining, University of Wyoming, Laramie, is in Gunnison county, Colo., examining mining property for eastern investors. Upon his return to Laramie he will go into the Shoshone Indian Reservation to examine a reported find of borax.

R. W. Brock, of the Geological Survey of Canada, in charge of a party including W. H. Boyd, Dr. G. A. Young, and six student assistants, has resumed the work of making a structural geological survey of the more developed part of Rossland camp, British Columbia.

Waldemar Lindgren, of the United States Geological Survey, will spend two weeks in New Mexico during the coming summer, completing work which was interrupted by the early snows last fall. Afterward he will be engaged in geological work in the western half of Arizona.

J. S. Burrows and J. W. Groves, employees of the United States Geological Survey, have nearly completed a canvass of some of the Rocky Mountain States, in the course of which they have supervised

sampling and shipping of several carloads of coal to the Fuel Testing Plant at St. Louis.

C. L. Gilson, late general manager of the DeLamar properties in Utah, has just accepted the position of general superintendent of the Sultan mine in Sonora, Mexico, owned by the Giroux Consolidated Mines Company. The mill and smelter for this property have recently been completed.

Schuyler Skaats Wheeler, president of the Crocker-Wheeler Company, Ampere, N. J., sailed June 14 for a short European trip. He was accompanied by Francis B. Crocker, Professor of Electrical Engineering at Columbia University, who has been associated with him in business for many years.

Anthony J. McMillan, managing director of the Le Roi Mining Company, has been requested by the Board of Trade of Rossland, British Columbia, to act at its delegate to the Sixth Congress of Chambers of Commerce of the Empire, to be held in London, England, in July. Mr. McMillan is at present at Rossland.

John Y. Brooks has become superintendent of the Ensley, Ala., plant of the Southern Steel Company, formerly the Alabama Steel and Wire Company. Mr. Brooks has been connected with the Colorado Fuel and Iron Company for some time and was previously superintendent of the Joliet mill of the American Steel and Wire Company.

Lochiel M. King, of the late firm of Simonds & King, of San Francisco, will continue the former business of assaying, analyses and ore testing, etc., and has equipped at 1311 Franklin street, Oakland, a laboratory, including power, crushing and grinding machinery, and a complete chemical and assay outfit. A branch receiving office is at 920 Fulton street in San Francisco.

Lawrence M. Lambe, vertebrate palæontologist of the Geological Survey Department of Canada, will be engaged during the ensuing summer in examining certain tertiary deposits of the southern interior of British Columbia, with a view to gaining better knowledge of their exact geological horizons. The fossils he may obtain during the season's work will, it is hoped, form a desirable addition to the collections of the Survey.

The directors of the Canadian Metal Company, Ltd., have appointed Edward Riondel general manager in place of J. J. Constant Fernau. This company has been engaged for some time past in erecting a zinc smelter at Frank, Southwest Alberta, and in overhauling and adding to the equipment of the smelter at Pilot bay, Kootenay lake, British Columbia, beside operating several zinc and silver-lead mines in Slocan and Ainsworth districts.

John Hopp, of Cariboo, B. C., has made arrangements for operating two hydraulic gold mining properties in that district. Included in his arrangements is the leasing of the extensive water supply system of the Cariboo Gold Fields, Ltd., an English company which did not work its Williams creek properties last season. Mr. Hopp, who lately returned from a visit to England, was for years in charge of the Slough creek deep-drift placer mine.

E. E. Reynolds, who about the close of 1903 resigned his office of mine inspector of the Seventh District, Pennsylvania, to become general superintendent for the International Coal and Coke Company, then opening and equipping a coal mine at Coleman, Southwest Alberta, Canada, has resigned the latter position after about two and a half years' service with the company, during which period the mine has been developed to a point where its daily output exceeds 1000 tons of coal of excellent quality.

L. C. Graton, of the United States Geological Survey, during the coming summer will visit the principal copper mining districts of this country, including those of Lake Superior, Bingham, Butte, Clifton, Bisbee, Globe, Jerome, and Shasta county, California. Mr. Graton will spend most of the summer at Redding, California, but will visit the other camps en route. While at Redding he will make detailed investigation of the geology of the district. After Jan. 1, 1907, the collection of copper statistics for the Geological Survey will be in the hands of Mr. Graton.

Obituary.

John B. Francis, who for many years has been superintendent of the Argonaut mine at Jackson, Cal., and identified with other California mines, died recently at Jackson. Mr. Francis was severely injured at the Argonaut mine several years ago in an over-winding accident, from the effects of which he never fully recovered.

Peter M. Hitchcock, a pioneer Ohio ironmaster, died at his home in Cleveland, Ohio, June 9, at the age of 67. He was educated at Painesville, O., and at Western Reserve College and in 1853 went to work at a blast furnace near Ironton, O. A year later he went to the rolling mills at Youngstown, then enlisted in the Union army. In 1865 he located in Cleveland and organized the iron and steel firm of Cleveland, Brown & Co., in which he was active until its purchase by Bassett, Presley & Co. in 1892. He was one of the organizers of the Moon Run Coal Company, which was absorbed in 1898 by the Pittsburg Coal Company, of which he was a director for several years. He was also interested in the Mahoning Valley Iron Company, the Brown-Bonnell Iron Company, of Youngstown, the Vulcan Steel Works, of St. Louis, and the Hamilton Steel and Iron Company, of Hamilton, Ont. He was an active member of a large number of financial, manufacturing and philanthropical institutions.

Sir Charles Tennant died in Scotland, June 4, at an advanced age. He was one of the foremost chemical manufacturers in Great Britain and owned the chemical works at St. Rollox, Glasgow, celebrated for their great chimney. These works were founded by his grandfather, the inventor of bleaching powder. Sir Charles was well known in mining circles in London as the financial backer, from the first, of the Indian gold mines managed by John Taylor & Sons. He was head of the Tharsis Sulphur and Copper Company, a director of the United Alkali Company, of the Steel Company of Scotland, and chairman of the North British & Mercantile Insurance Company. He was a prominent liberal in politics and a friend of Gladstone, though more recently he supported Chamberlain's tariff reform proposals. Probably the only time when his business sagacity was at fault was when he backed the Cassel gold extracting process in 1884. He was a man of culture, possessing an important collection of paintings, and he was also a keen sportsman. It would be of interest to add that the Steel Company of Scotland, which he helped to found, was started originally with an idea of utilizing spent pyrites from the Tharsis mines as an iron ore, but this was soon dropped and the orthodox open-hearth process adopted instead.

Societies and Technical Schools.

University of Nevada—At the commencement exercises of the University of Nevada at Reno, May 31, President Stubbs announced that Clarence H. Mackay and his mother, Mrs. John W. Mackay, have together given $50,000 for the immediate erection of a building for the College of Mines. This building is to house the department of Mining and Metallurgy and of Geology and Mineralogy, and has been planned according to the recommendations of the heads of these departments. A recent State appropriation for the metallurgical laboratory has provided the University with a new ore-treating equipment which will be suitable for installing in the new quarters. The building will also contain a geological museum which is intended to care for the present collections that are now largely stored away on account of lack of room. With the opportunity for proper care and display of specimens, it is planned to develop rapidly a collection representing as completely as possible the mineral resources of the State whose chief assets is its mineral wealth. Furthermore, F. M. Smith has arranged to provide a perpetual income of $1000 a year to be used for the support and encouragement of students in the Mining School. This will, in gen-

eral, be divided into five annual scholarships of $200 each, to be known as the F. M. Smith scholarships, and open to deserving students irrespective of citizenship or residence. As tuition is free and as board and rooms may be obtained at the dormitories for $150 for the college year, these will provide for most and, in some cases, all of a student's necessary expenses.

Industrial.

The Armstrong Manufacturing Company, Bridgeport, Conn., has opened a new branch office at 23 South Canal street, Chicago, in charge of Hugh S. Laing, formerly of the New York branch.

The Buffalo Forge Company and Buffalo Steam Pump Company will abandon their office in Columbus, beginning July 1, locating in Cleveland and Cincinnati; A. J. Vance taking charge of their interests in the latter territory; W. A. Rowe having in hand the Cleveland district.

The firm of Simonds & King, of San Francisco, California, has been dissolved, its laboratory and other equipment having been destroyed by the recent fire. Mr. Simonds will open an office as a metallurgical engineer at Berkeley, California, and Mr. King will continue in the assay and analytical business, having established a laboratory at Oakland, California.

The C. & G. Cooper Company, Mt. Vernon, Ohio, has been awarded contracts by the Carnegie Steel Company, for three tandem compound condensing rolling mill engines. Two 32x52x60 engines will be installed at the Homestead works, for driving direct connected roughing and finishing rolls. One 42x74x60 will be installed at the Duquesne Steel Works.

The Compressed Air Machinery Company, of San Francisco, has been reorganized, W. A. Hewitt retiring, and P. H. Riordan becoming president and general manager. A new factory has just been completed and occupied, corner of Ecker and Jessie streets, San Francisco. The company will continue sole manufacturers of the Word drill sharpener, and will also manufacture other specialties, drills and air compressors.

The Rix Compressed Air and Drill Company, San Francisco, E. A. Rix, manager, has established itself temporarily in Grass Valley, where arrangements have been made with the Taylor Foundry and Engineering Company to allow the Rix men to work in the shops on both old and new work and on drills. Certain machinery in the Rix shops in San Francisco was destroyed by fire, and is being rebuilt at Grass Valley.

The Colorado Iron Works Company, Denver, Colorado, is constantly receiving shipments of ore to be treated at its testing plant. These shipments vary from 25 lb. to one or more carloads. A recent 500-lb. shipment came from Japan; others have come from Mexico, the Philippines, Australia and South America, as well as from points all over the western half of North America. The company's testing facilities include stamp milling, amalgamation, concentration and cyanidation, with all the modern accessories for each process.

Trade Catalogs.

Receipt is acknowledged of the following trade catalogs and circulars:

Ingersoll-Rand Company, New York. Quarrying Machinery; Pp. 19, illustrated; paper, 4x6 in.

Sanford-Day Iron Works, Knoxville, Tenn. Advance Sheets, Price List No. 11. Pp. 6, illustrated; paper, 9x12 in.

The Graphite Lubricating Company, Bound Brook, N. J., U. S. A. Graphite Bushings; Pp. 16, illustrated; paper, 8x11 inches.

The Green Fuel Economizer Company, Matteawan, N. Y. Bulletin 103, Green Planing Mill Exhausters; Pp. 15, illustrated; paper, 4x6 in.

Robins Conveying Belt Company, Park Row Bldg., New York City. Advance Sheets, Robins Belt Conveyors. Pp. 9, illustrated; paper, 9x11 in.

Blaisdell Company, Pacific Electric Bldg., Los Angeles, California. Automatic Cyaniding Machinery; Pp. 19, illustrated; paper, 7x10 in.; March, 1906.

Construction News.

Galena, South Dakota—The Aurizona Mining Company is considering the question of putting in a mill. The address is at Galena.

Goldsprings, Utah—The Jennie Gold Mining Company, Charles A. Short, Fay, Nevada, manager, will soon be in the market for a milling plant.

Leadville, Colorado—It is proposed to install machinery at the Glass-Pendery mine on West Carbonate hill. Robert O'Neil, Leadville, is lessee.

Lexington, Kentucky—The Elkatawa Fuel Company is preparing to open a coal mine and will need machinery. C. F. Brower, Lexington, Ky., is president.

Coaldale, Arkansas—The Southern Smokeless Fuel Company will need hoists and other coal mining machinery. George Sengel, Fort Smith, Ark., is president.

Deadwood, South Dakota—The Golden Placer Company is preparing to increase the size of its mill, and to put in a cyanide plant with a capacity of 200 tons a day.

French Gulch, California—A 20-stamp mill is to be installed at this mine. H. D. Lacy, of New York, is owner, and F. B. Rossi, French Gulch, Shasta county, Cal., is also concerned.

Hawkeye District, Colorado—Eastern people who have become interested in the Old Kentucky property in Hawkeye district, Gilpin county, Colo., intend to erect their own mill. P. P. Rooney, Central City, is manager.

Pine Creek District, Colorado—It is reported that the Evergreen Gold and Copper Mining Company operating in the Pine Creek district, Gilpin county, Colo., is intending to put up a small smelter plant to handle low-grade ores. J. L. Walter, Apex, Colo., is manager.

Washington, California—The mill at the Ethel mine is to be enlarged by the addition of more stamps and other machinery. Albert Maltman, Washington, Nevada county, Cal., is superintendent.

At the Ocean Star, also under charge of Mr. Maltman, it is proposed to put in a power plant and air compressor.

Prickly Pear, Montana—The Butte & Rocky Mountain Gold and Silver Mining company has announced its intention of building a mill, cyanide plant and gravity tramway at its property in Prickly Pear gulch, 21 miles from Silver, in Lewis & Clarke county. Henry Auerbach, of 817 West Broadway, Butte, is managing director of the property.

Revelstoke, British Columbia — The Prince Mining and Development Company, Ltd., owning 18 mineral claims situated in Standard Basin, Big Bend district of British Columbia, has just had a survey made of a route for an aërial tramway from the company's Standard mine to the Columbia river, a distance of about six miles. The company proposes erecting a smelter on the river, which is navigable thence to Revelstoke, a junction and divisional point on the Canadian Pacific transcontinental railway, and the aërial tramway is to be used for conveying ore down from, and supplies up to, the mine, at which development work has been in progress for several years, opening up promising bodies of copper ore.

Boundary, British Columbia—At the Carmi mine, on the west fork of Kettle river, Boundary district of British Columbia, the stamp mill is being enlarged and other additions made to the small gold-saving plant—the pioneer plant in this district—the new machinery including a five-stamp battery (1260-lb. stamps), two-stamp Tremain battery, amalgamating plates, Overstrom table, cyanide plant, centrifugal pump, etc. Several years ago the Carmi shipped to the B. C. Copper Company's smelter at Greenwood 885 tons of ore which yielded a little better than $20 gold and 4 oz. silver per ton. The cost of hauling 50 miles to the railway terminus was, however, too high to admit of the mine being worked at a profit, so operations since have been confined to development and sampling tests, pending the construction of a railway up the west fork, now in progress.

Special Correspondence.

San Francisco. June 14.

The bulletin on the "Structural and Industrial materials of California," issued in January of this year by the State Mining Bureau, has suddenly become a volume of great value, owing to the great demand for the various building stones, marble, clay products, lime, cement and quarry materials of various kinds. The "Bulletin" has separate chapters on the various substances, stating where they occur in the different counties of the State, the owners, etc. There are also illustrations showing the buildings which have been erected with materials of this nature produced in California. The book is one of over 400 pages and is very useful indeed, particularly in view of the rebuilding of the city of San Francisco. The material to do this can be found within the borders of the State in unlimited quantities, both as to useful and to ornamental substances of a structural character.

The Sierra Railway Company, with headquarters at Jamestown, Tuolumne county, announces that parties having deposits of marble, granite, chrome iron, magnesite, manganese, soapstone, asbestos, iron ore, copper ore, talc, kaolin or any other material on land adjacent to the railway, can obtain a free analysis by sending a small sample to the general freight agent, with description of property, locality and proximity to railroad. Inquiries are frequently received from investors, and efforts will be made by the company to bring owners and buyers in touch without expense. This move is a good one, and it is a new thing in this State, for the railroads have taken little or no interest in the mineral industry as far as opening new deposits is concerned.

New shears are under construction at the Union Iron Works at the Potrero, to take the place of those shaken down by the earthquake. The new ones will be of even greater capacity and of more modern type than the old ones. With the completion of the big shears and the repairing of damage to the dry docks the Union Iron Works plant will, it is said, be in its former good condition. The downtown offices were burned, but the main works of the company were little injured aside from the dry docks and ships being built on the ways.

The North California Mining Company, of which H. H. Yard, of San Francisco, and W. P. Hammon, of Oroville, are the leading spirits, has commenced its annual assessment work on mining claims in Butte and Plumas counties, and several gangs of men are now engaged upon it. The assessment work of this company alone in 1905 called for an expenditure of $70,000 in cash, and a large amount must be spent this year, as more claims have since been acquired. Most of these are placer claims which will be worked in groups as soon as the new Western Pacific is built.

The Delta Consolidated Gold Mines Company has filed an action in the Superior Court against the estate of F. M. Whitlow, and the executors of the estate. The suit affects the title to the Caledonian mine, near Delta, Shasta county. The plaintiff company asks that the defendants be debarred and enjoined from entering on or asserting any right to the property.

The culmination of the suit brought last fall by George Osterman and 29 other lien holders who had claims for labor and supplies against the Morning Star Mining Company, operating at Cherokee, near North San Juan, Nevada county, was reached last week when the mine and improvements were sold by the sheriff pursuant to law, to satisfy the judgment obtained in the Superior Court. The property was bid in for the plaintiffs in the name of George Osterman for the sum of $4469, which was the amount of the judgment and costs.

The miners who have been working in the Wildman mine, Sutter Creek, Amador county, and to whom the company is indebted for wages, have taken legal steps to protect their interests. Sixteen liens have been filed for record, the demands aggregating nearly $15,000. The liens are all filed against the Lincoln Mining Company. It appears that the Wildman Company made an agreement with the Lincoln Company by the terms of which the first named company acquired the right to prospect the Wildman-Mahoney mines through the Lincoln shaft. The actual mining was done mainly on the Wildman ground. During the period covered by this work, there existed a trust deed, to secure an indebtedness of something like $80,000. This took precedence of the miners' wages claims. The Wildman property passed to Bishop, the holder of the mortgage. The sum involved in this indebtedness was in excess of the market value of the property, and the sale to the mortgagee extinguished the rights of the miners to hold liens against that property. The Lincoln mine belongs to other parties, and the wage earners, inasmuch as the work done involved the Lincoln ground, have filed liens against that property.

The old race track near Yreka, Siskiyou county, has been bonded to John O. Harrison, of Pine Bluff, Arkansas. There are about 100 acres in the ground. They adjoin the Blue Gravel mine on the west and it is believed that the ancient river channel from which the gold is taken extends west under the race track grounds. Mr. Harrison will endeavor to solve the problem by thoroughly prospecting the ground. It is a pretty extensive proposition, as it is about 110 ft. to the bedrock.

A number of the ranches in Indian Valley, Plumas county, were bonded a few months ago to J. D. Williams, with a view of dredging the ground. High prices were offered for the various ranches, in fact three times what they were worth for agricultural purposes. Now, however, the whole scheme has had to be abandoned and the bonds forfeited, for the expected San Francisco capital can not be obtained for investment in such directions.

The property of the Syracuse Gold Mining Company, a short distance north of Nevada City, has been sold at sheriff's sale. It was bought in by Louis Will and E. H. O'Hara, of Syracuse, N. Y., for $5000. The sale was made to satisfy a claim which H. C. Dickerman, of Nevada City, had against the company, the amount being $7069. This mine was worked at one time quite extensively.

By reason of the San Francisco disaster numerous owners of mining claims throughout the State of California have suffered such financial loss that they will be unable this year to perform the $100 worth of assessment work required by the law of the United States. A resolution has been adopted at the special session of the Legislature on this subject which is self-explanatory and is as follows:

"Whereas, The recent conflagration which destroyed a large portion of the city and county of San Francisco has resulted in withdrawing a large amount of capital annually employed in the State of California in the prospecting for, working and developing of mines, has practically worked a hardship upon such persons who annually contribute a large amount of money for the performance of annual labor upon mining claims as required by the provisions of section 2324 of the Revised Statutes of the United States;

"Resolved, therefore, by the Senate of the State and Assembly jointly, that our Senators and Representatives in Congress use all honorable means to secure the passage of legislation for the suspending for the year of 1906 of that portion of the Revised Statutes of the United States, section 2324 thereof, requiring the expenditure annually of $100 in labor and improvement upon unpatented mining claims, similar legislation having been enacted in the years 1893 and 1894."

Butte. June 16.

All subsidiary companies of Amalgamated have filed with the county assessor reports showing the gross and net income of their properties for the year ended June 1. These reports are required by law in order that the net returns may be taxed. They show that during the year 3,405,157 tons of ore were mined by the six companies, an average of more than 9329 tons a day for the entire 365 days. Of this quantity Anaconda produced 1,521,310 tons; Boston & Montana, 1,209,805 tons; Butte & Boston, 246,593; Trenton (formerly Colorado) 168,770; Parrot, 163,569; Washoe, 95,210. Gross procceds: Anaconda, $16,613,537; Boston & Montana, $15,509,832; Butte & Boston, $2,821,319;

Parrot, $1,379,407; Trenton, $1,549,099; Washoe, $1,146,981: Total, $39,038,176. Cost of Mining: Anaconda, $5,525,321; Boston & Montana, $4,182,508; Butte & Boston, $866,358; Trenton, $492,553; Parrot, $596,509; Washoe, $412,723. Total, $12,075,972. Freight on ore: Anaconda, $231,999; Boston & Montana, $1,129,547; Butte & Boston, $49,319. Trenton, $25,-315; Parrot, $29,442; Washoe, $19,042. Total, $1,484,665. Cost of reduction: Anaconda, $3,457,007; Boston & Montana, $2,958,666; Butte & Boston, 509,028; Trenton, $353,280; Parrot, $353,159; Washoe, $260,288. Total, $7,891,429. Marketing $353,280; Parrot, $353,159; Washoe, $260,-288. Total, $7,891,429. Marketing charges: Anaconda, $1,645,944; Boston & Montana, $1,081,001; Butte & Boston, $320,722; Trenton, $136,422; Parrot, $141,-282; Washoe, $97,764. Total, $3,423,135. Total expenditures: Anaconda, $10,860,-272; Boston & Montana, $9,351,722; Butte & Boston, $1,745,427; Trenton, $1,007,571; Parrot, $1,120,391; Washoe, $1,322,702. Total, $25,408,085. Leaving net profits: Anaconda, $5,753,265; Boston & Montana, $6,158,110; Butte & Boston, $1,075,893; Trenton, $541,528.54; Parrot, $277,015. Total, $13,805,812. This is an increase of $5,113,568 over the year ending June 1, 1905.

Red Metal and North Butte have alsa submitted reports as follows:

	Red Metal.	North Butte.
Tons of ore extracted....	$ 149,101	$ 259,650
Gross proceeds.....	1,929,568	5,480,545
Cost of mining.....	587,461	1,160,766
Freight on ore.....	89,461	52,017
Cost of reduction..... ...	587,696	1,255,753
Marketing charges	223,652	.....
Improvements.....	.....	1,164,000
Total.....	$1,488,270	$3,632,536
Net proceeds.....	441,299	1,848,009

Red Metal net proceeds are from February 1 to June 1. The report of the Alice Company shows that it mined 3831 tons of ore from which it derived $31,525 gross. It had no net proceeds.

Arrangements have been made for more extensive development and greater output from Amalgamated mines. The company has ordered a new hoisting engine for the Pennsylvania mine and will order one for the Tramway, a shaft on which is sinking. It is preparing to extract ore from the Pacific and Michael Davitt. The latter is a Butte & Boston mine, and is one of the best in the system. Two large air compressors have been ordered for the new shaft of the Leonard. This company and Coalition have practically determined their rights as to the orebodies in ground in dispute between Heinze and Amalgamated, and the report of engineers will be submitted to the boards of directors of the two companies for approval. Coalition will increase its output by opening new ground known to contain bodies of ore, as the result of diamond drilling. The capacity of the Washoe and Great Falls plants is to be increased 1000 tons each. Anaconda will mine Pacific ore through the Buffalo shaft, which Raven has been using, and will also hoist all ore of the Raven.

North Butte will be ready to increase its output by July 1. Its new engine is about ready for trial and the head-frame is finished. Boston & Montana will begin raising Mountain View ore through its new 800-ft. shaft on that property about July 1, and will re-timber 500 ft. of the old shaft. Trenton (formerly Colorado) will add another 100 ft. to its Gagnon shaft, making it 2000 ft. deep.

Socorro, N. M. June 14.

In Grant county, a surveying party has located a good tramway route between Lordsburg and Pyramid camp. The road will be 8 miles lond, with several branches, and will probably be constructed. In the adjoining Virginia district, J. A. Leahy has opened up some good ore on the Eighty-Five group. At Stein's Pass a strike has been made on the 100-ft. level of the Beck mine; it shows an 8-ft. vein with considerable wire silver; numerous improvements are under way including bunk houses and a crushing plant. North of Lordsburg, the Robert E. Lee and the Bonny companies have purchased some new machinery; for lack of a suitable hoist, the latter company was closed down for some time. The Burro Mountain Copper Company is pushing developments in the hope of making a larger producer. At Malone, the Gold Brick group has been leased by the International Gold Mining Company, on condition that the leasers finish the mill in Thompson cañon. This mill contains a crusher, two Huntington mills and cyanide tanks. As the ore runs $18 in gold and silver, milling it ought to pay.

In Central district, W. R. Jackson expects to erect a 50-ton concentrator on his Rose group of claims, which have a good showing of copper sulphides, and is near the famous Ivanhoe mine. At Chloride Flat, C. M. Park & Co., leasers on the Hidden Treasure mine, are shipping a rich pocket of ore, that occurred near the find recently made by Manuel Taylor; other leasers are also doing well here. The new 250-ton blast furnace of the Comanche Company, at Silver City, is in place, but was not blown in as scheduled, owing to an accident to the briquetting plant. The fines to be briquetted will come over a tramway from the concentrator. The latter plant is well started, as is also the electric power station, while the battery of six boilers is all ready.

At the Victoria mines in Luna county, H. R. Fry, while examining the old dumps with the view of purchasing them from the Hearst estate, had some samples assayed from an adjoining abandoned prospect. These ran so well in silver and lead that he re-located the ground and will start active development soon. Near here are the St. Louis and Chance mines, the famous wolframite producers. In the Florida mountains, R. C. Arnold has bought the Silver Cave group, and is building houses and erecting machinery, with the view of reviving work in this old silver-lead camp. It has been quiet since the early eighties.

In the Gallinas mountains, in Lincoln county, a heavy mantle of snow insures much activity this summer. The Buck Horn is a high-grade silver vein that is interesting Eastern people. The Iron Hat and the Byran group are also promising. Near the romantic Gran Quivira ruins an abandoned mine, supposed to have lain covered since Indian days, was recently found by a party of Mexicans.

Salt Lake City. June 15

The Ohio Copper mine at Bingham has been undergoing examination; but in whose interest, has not been divulged. However, an official states that the company will negotiate the sale of bonds for the purpose of raising funds to develop the property to greater depth and to equip upon a larger scale.

The directors of the Thompson Mining Company, operating at Park City, are scheduled to meet in a few days, for the purpose of authorizing the resumption of development work.

An examination of the properties of the Southport Mining Company at Stockton, which are controlled by Indiana parties, is being conducted. The ground is situated near the Honerine mine.

At the Bamberger-Delamar mine at Delamar, Nevada, work is being pushed with energy. On the tenth, or main level, a new hoist is being installed for the purpose of sinking an incline to develop the mine to greater depth. This new hoist is going in at a point about 200 feet from the Hog Pen incline, in what is known as the Lowery drift. The Hog Pen incline has reached the thirteenth level and a drift has been started from the bottom to tap the ore body coming down from the tenth level. The mill is working 350 tons of ore per day. The new tailings plant, which has been in operation about three weeks, is running through about 300 tons daily and is working satisfactorily.

The Daly West mine and mill at Park City are still closed on account of labor troubles. The management attempted to introduce a new lamp to which the men objected, and insisted on the miners giving the lamp a trial, but they stubbornly refused and went out in a body.

Articles of incorporation of the Caliente & Pioche Railroad Company have been filed under Utah laws. The road will be a feeder for the Salt Lake Route and the length of the line will be about 30 miles. It is said the Nevada-Utah Mines and Smelters Corporation, which has been developing its Pioche mines with considerable vigor for some time, deposited $80,000 to the credit of the railroad for construction purposes, the same to be

returned in the shape of credits on future freight charges on ore and bullion. The construction of the line will begin soon and it is expected the line will be in operation some time next fall. The road was graded a number of years ago almost the entire distance. J. Ross Clark, of Los Angeles, Cal., is named as president.

The Utah Copper Company has awarded the contract for the electrical equipment of its new Garfield mill to the General Electric Company. Included in the order are two 2000-h.p. steam-driven generators, the largest of the kind ever brought into this State. The Telluride Power Company at Provo has one water-driven machine of 3000 h.p. About 30 motors for use in various parts of the concentrator were included in the order. The company has also placed an order with the Union Iron Works, of San Francisco, for 110 vanners.

The work of raising the steel buildings at the site of the Utah Copper mill at Garfield is progressing. The excavations for the second section are nearing completion, while the concrete foundations are being laid.

The main shaft of the New Stockton mine at Stockton is now down to 1000 ft. and a drift is being run to catch the Catherine vein. The mill is running at full capacity—about 75 tons a day—and 15 tons of crude ore is being shipped.

Four mining companies declared dividends this week. The directors of the Daly West posted one for $108,000, which is the regular quarterly distribution, payable June 15; the Beck Tunnel Company will pay $25,000, or 2½ c. a share, June 20; the Mammoth, $20,000 and Swansea, $5,000, on the same date.

The farmers of the Salt Lake valley continue to insist that the smelters operated at Murray and Bingham Junction are bringing ruin to crops and farms. A committee waited on the county attorney of Salt Lake county with grievances and asked that official to take steps toward having the smelters declared a nuisance and ask the court to order the plants closed. The official took the matter under advisement, stating that he would begin an investigation. The farmers allege that, owing to the rains, of late more damage has been done to vegetation this year than ever before.

The new five-drill compressor ordered some time ago for the Bingham Central mine at Bingham is in operation.

The Garrison and Monster groups of mining claims in the Deep Creek district have been merged, and have formed the basis for the organization of the Garrison-Monster Mining Company.

The ore and bullion settlements reported by Salt Lake banks last week aggregated $382,350.

Stoping of ore from the new channel, the largest ever opened in the Utah Consolidated mine at Bingham, has begun. The grade of the ore is said officially to be better than 7 per cent. copper. The bullion output of the smelter for May was the largest in its history.

Some of the principal mine owners of Alta have been discussing the advisability of organizing a company to drive a long drain tunnel, but definite action is probably remote.

The Bingham mill of the Utah Copper Company turned out, it is said, during the month of May a little more than 1000 tons of concentrate, which were sold to the American Smelting and Refining Company.

Leadville. June 16.

Seemingly the famous Little Jonny mine will never cease surprising the mining world with the richness of its ore. It was only a short time ago that a set of lessees took out over 100 lb. of ore that was nearly pure gold. During the week this has been surpassed by another set of lessees who have opened and taken out to date 300 lb. of the richest ore that was ever taken from the mine, and they are still taking it out. The ore was found in a part of the mine that had never been worked, as it was considered off the main shoot. The striking of this exceedingly rich pocket will result in all of the vacant territory in the property being worked and thoroughly prospected.

Timothy Kyle, an experienced miner and an old-timer, first opened the Fitzhugh mine on the northeast side of Fryer hill. After shipping considerable ore he disposed of the property to the Elkhorn Mining Company. When this company suspended operations in this camp, the Fitzhugh was closed down, and has been idle for several years. Mr. Kyle knowing the conditions of the property and having unlimited faith in it, secured a 50-year lease on favorable royalties, interested New York capital, and has resumed work on the mine. The shaft is being fixed up and a general clean-up is in course of progress: when this is completed underground work will be pushed vigorously. This work will be carried on to the south and west where he formerly took out a heavy tonnage of good ore. A drift will also be run north over the fault, as Mr. Kyle is firm in the belief that when the fault is passed he will find a good shoot of ore.

The Lady Alice, Badger and Triangle claims, Adelaide Park, are under lease and bond to the Triangle Mining Company, which secured the lease from the Gaff estate. At the time of Mr. Gaff's death he had sunk the Lady Alice and Badger shafts to a depth of 900 ft. and did considerable prospecting, opening up several pockets of rich sulphide ore. The properties are well located, being on the trend of the large ore channels from south and north Iron hill. When the properties were operated, about 15 years ago, considerable trouble was experienced with water, making operating very expensive. With the draining of the downtown mines the water problem in the Adelaide Park section has been very much reduced, so no trouble is looked for from this source, when work is resumed. At present a new plant of machinery is being installed at the Badger shaft, the shaft is being re-timbered, and when this work is finished, underground work will be started from the bottom of the shaft and the ground thoroughly prospected in different directions to locate the Iron hill ore shoots. The Badger shaft was sunk in a dike and the drifts run north and south through it. The new company will continue those drifts.

In early days the Aetna and Glass-Pendery mines, on West Carbonate hill were shipping large quantities of ore from a depth of 125 ft. At this time the second contact was unknown, so when the surface deposit was worked out the owners shut the property down, and it has been idle ever since. Robert O'Neil has secured a lease and bond on the ground and has started work, cleaning up and installing a plant of machinery. When this is completed the Glass-Pendery shaft will be sunk to a depth of 400 ft., which is considered deep enough to carry on prospect work from the bottom.

The Hoffer shaft, on the western edge of Big Evans gulch, will be sunk to a depth of 600 ft., when prospecting will be started from the bottom in different directions to catch the ore shoots, supposed to be in this section of the camp.

The Mammoth shaft has penetrated the flint, and now a station is being cut at the bottom, where heavy pumps will be installed. From this point drifts will be run to open up the ore-shoot.

During the month of May the New Monarch Mining Company shipped 1600 tons of ore, doubling the output of the previous month. Development work is being pushed at the Winnie and Cleveland and when the work is completed it will be the principal point for the output for the next two years.

Lessees on the Climax have opened a body of iron carrying 12 oz. silver and 40 per cent. excess iron. The ore was found on top of the quartzite at a depth of 125 ft., and so far neither top nor bottom has been reached. Alongside of this ore are three acres of ground that has never been prospected, so the chances are favorable for the shoot to extend into this virgin territory.

All of the properties on Rock hill have resumed shipping, and the output from this section is heavy. The Sequin shaft will be sunk deeper, as the ore is dipping so rapidly below the levels that it is impossible to work it successfully. The present drift, run from the Rock-Dome shaft, will connect in a few days with old workings, giving better air and opening up new ground.

Pueblo parties have taken hold of the

Little Kittie, Iowa gulch, and will sink the shaft to a depth of 400 ft. A new plant of machinery is being installed.

Denver. June 17.

As predicted last week, the Western Federation of Miners expressed its belief in the innocence of Charles H. Moyer and William D. Haywood, who are at present in jail at Boise, Idaho, and the convention, held in this city, re-elected them respectively as president and secretary. It was decided to retain the headquarters in Denver.

Within the past few weeks some excitement was caused by the finding of some promising specimens of gold ore in the vicinity of Antelope Springs, in South Park, but thus far nothing has been discovered to warrant any rush.

Articles of incorporation of the United States Portland Cement Company, have been filed at Cañon City, with a capitalization of $800,000. Plans have been made for the erection of a large plant, a short distance below Portland, on the north side of the Arkansas river.

It looks as if, besides the Moffat road, the Union Pacific will also build toward the northwestern coalfields of Routt county, and with that object in view surveys are being made.

There are at present about 50 sets of lessees operating on Stratton's Independence mines and about 3000 tons of ore, averaging about $35, were shipped during the month of May.

Railroad transportation to La Sal mountains seems to be an assured fact now, and considerable activity is shown in the district.

The construction of the Cañon City & Royal Gorge interurban railway, is progressing rapidly and nearly 10 miles of the roadbed have been completed, while tracklaying will be commenced next week, it is hoped, the necessary ties having been delivered along the line. If the bridge companies deliver the necessary material, another month or so will see the completion of this very interesting enterprise.

An interesting point, or rather complication, has arisen during the adjustment of the insurance loss on the Campbird mill, near Ouray, from the fact that the snowslide, which destroyed the mill, while the debris was destroyed by fire, had dumped quantities of mill supplies and materials, into the mill, this property being insured in another location, higher up the mountain.

News comes from Lincoln, Neb., that the Yankee Hill Development Company, which commenced operations a couple of months ago, a short distance southwest of Lincoln, has discovered oil at a depth of about 650 ft. in its first well.

The O. K. property on German mountain, near Central City, has been sold to J. R. Hastings, of Chicago, and A. H. Frost, of San Diego, Cal., the reported consideration being over $50,000. Alfred Anderson, of Central City and others were owners. C. K. Harris, Central City, has been placed in charge.

Duluth, Minn. June 15.

The ore movement from the upper lakes is now at its hight; ships are not badly bunched, and railways to the lake are working freely, while at the eastern end the congestion feared from overcrowding of docks is not yet apparent. The daily movement is now at the rate of 200,000 gross tons a day. During July and August it will probably reach a somewhat larger figure. The Duluth, Missabe & Northern road expects to handle as high as 2,000,000 tons during each of those months. There is some car shortage on old ranges of Michigan, but it will probably be overcome later. The old-range traffic has not quite come up to expectations so far this year, but the Mesabi is able to meet any demands and take care of any probable shortage elsewhere. Such roads as the Duluth, Missabe & Northern and the Duluth & Iron Range are handling their business with the utmost ease and smoothness and not only have cars, but give the utmost despatch and assist all mines—independent, as well as those owned by their own companies—in every way possible. This tendency is especially notable, as it has always been the fear that these roads, owned by the United States Steel Corporation, would operate to the advantage of that company and sidetrack or delay, when convenient, outside and independent shippers. That this is not the case is a matter that is now causing much favorable comment.

The Shenango Furnace Company is to ship a far larger tonnage of Mesabi iron ore this year than ever before. Its Shenango mine will produce about 400,000 tons and its new Webb mine 200,000 tons. Shenango lies in section 23-58-20 and Webb in section 6-57-20. Both are large deposits, the former, especially, being a very large mine of excellent ore. Webb, while a big body of ore, is not quite so desirable as the other.

Active operations are under way by the Rhodes Mining Company, which is the western branch of the Cherry Valley Iron Company and of which Alexander Maitland, formerly manager of mines for the Republic Iron and Steel Company, is head. The company has the Nassau, Brunt and Hobart for new mines, as well as the various properties it bought from the Sellwood and other interests. At the Brunt, which lies in section 10-58-18, a shaft has been sunk and developments underground are in rapid progress. The mine is quite dry and a large amount of ore, estimated by the management at 100,000 tons, will be moved this year. This will be an exceptionally good record for a new underground development. The Hobart is much more difficult to open, as it is very wet, and two 125-ft. vertical shafts with little lateral development have been making up to 3,000 gal. a minute. It was known by all Mesabi range men, when this property was first explored, that it would prove a wet mine. It lies close to the Pettit, which has been one of the water problems of the Mesabi from the beginning, and it is so placed that it must take a large part of the Pettit water. The company will make a large shipment from its group of mines this year, especially from LaRue, which it is pushing heavily. It has a large tonnage for reserve, and several of its mines, especially La Rue and Croxton, are very fine ores.

Experiments in the washing and mining of soft, sandy ores of the western Mesabi are still in progress, and the Oliver Iron Mining Company has ordered a lot of machinery for working these ores. It expects to mine and ship up to a million tons a year, and more, from one location on the western Mesabi, and is developing toward this end. Every device for handling these ores both for mining at low cost and for concentrating, is being tried out, and without doubt the results will prove exceedingly valuable to all mining men interested in moving and dressing ores on a large scale. It will not be astonishing if some very interesting new devices for mining should be adopted in this district.

Platteville, Wis. June 16.

After several months' shut-down, during which time considerable drilling has been done, it is reported that the Platte will resume operations. The Platte began with the brightest kind of a future predicted, but it was not long before the rich ore pinched down to almost nothing. The recent prospect drilling developed the continuation of the orebody some rods distant. The Platte has a complete outfit of sufficient capacity to handle large quantities of ore.

The initial run of the Trio mill demonstrated the fact that a roaster will be needed, if the ore continues to run as high in iron, but it is thought from prospect work that has been carried on, that the sulphur does not extend to the lower veins. A test of the mill shows the tails to contain less than 1 per cent. zinc.

The three producing mines of the Platteville camp were all shut down during the last week, taking advantage of the good weather to clean their ponds and overhaul the machinery. The most interesting piece of news to mining men has been the finding of ore in all of the holes drilled recently by the West Main Street Mining Company. This property underlies some of the best residence portion of the city of Platteville.

At Benton a large body of zinc ore has been opened up on the Shaffer ground, the mine run averaging over 50 per cent. and assaying 65 per cent. zinc. This is, so far as known, the highest-grade ore that has been produced in this district.

The Ollie Belle and Looney mines are both ready for concentrating plants. It is the intention of the owners, after much deliberation and investigation, to adopt the standard style of mill, as generally installed.

Galena camp is to have another strong company, which will operate on 120 acres, near the Black Jack. The promoter, W. Swing, of Galena, states that he has evidence of a rich range on the property.

The Baxter mill was started the first of the week after having installed two new sets of jigs, thereby doubling the capacity. A new steam engine was also installed.

Among the new organizations is the O. K. mine, near Rewey. A large number of its stockholders are Mineral Point people. The mine lies near the Coker and Sunrise. In drilling, an 18-in. vein of heavy disseminated ore was encountered.

Calumet, Mich. June 16.

John T. Been, chief engineer for the Bigelow group of mines, has been appointed assistant superintendent of the Tamarack mine, taking rank immediately under Superintendent William Uren in the local executive staff of that company. Charles D. Hohl, an instructor in the Michigan College of Mines at Houghton, has been appointed chief engineer of the Tamarack, Osceola, Isle Royale and Ahmeek mines, succeeding Mr. Been.

Work on another shaft was started at the Superior mine this week by the Calumet & Hecla Mining Company, which has an option on the controlling interest. The new shaft is located 2400 ft. south of the first shaft, which leaves about 2400 ft. intervening between the site of the new shaft and the boundary line between the Superior and the Atlantic Mining Company's Section 16. The Superior carries the Baltic lode to a total length of 6000 ft., there being 1000 ft. of the formation on its lands to the northeast of the first shaft. As the overburden at the Superior is shallow, it is not expected that there will be any difficulty in starting the new shaft, and sinking should penetrate the ledge within a very short time. All the necessary machinery and equipment will be provided at once. In No. 1 shaft sinking in the foot-wall section of the lode has reached a point 75 ft. below the third level. As soon as an additional depth of 25 ft. has been reached, the fourth level well be established and a crosscut extended to tap the Baltic lode, which is 40 ft. distant. It will be July before this is accomplished. Besides the drill used in sinking the old shaft, two more are in service, one drifting alternately north and south from the shaft at the third level, and the other is crosscutting the lode at intervals of 50 ft. in the drift at the second level. The work of crosscutting the lode 200 ft. from surface is revealing ground of satisfactory character. The lode at that point is 45 to 50 ft. wide, with copper values fully as good as expected. At the third level the drifts have been opened for a length of 200 ft., or 100 ft. each north and south from the shaft, with satisfactory copper values exposed.

It is understood that the Calumet & Hecla Company's option on the controlling interest in the Superior has been extended from Aug. 1 to Jan. 1, 1907. If the developments in the interim have been satisfactory, the big corporation will then take over the Superior mine through one of its subsidiary corporations.

Scranton. June 19.

An immense development of the Pennsylvania anthracite field is promised in the Pottsville territory, where 14 mine openings are to be made within a year. The new collieries will be in the region between the city of Pottsville and Tremont to the west, Phoenix Park to the north, and Tuscarora to the east. Scarcely any of the openings will be ready for big shipments of coal within 12 months. All the new openings are to be made by the Philadelphia & Reading and the Lehigh Valley companies and will reach to the bottom measures.

The Schuylkill Coal and Iron Company, which for some months, has not acquired any coal property, last week purchased the Eckel & Spangler tract near Pottsville, comprising 180 acres, for $140,000. The principal part of the tract forms a basin underlying Tremont borough at a great depth, about 1800 ft., and on the Red mountain the measures come to the surface. About fifteen years ago a 4-in. test hole was drilled to a depth of more than 1800 ft., but results were not very satisfactory. Since then, particularly in recent years, more elaborate tests have been made with better results, and some of the coal lands have been sold for $2000 an acre. There appears to be no doubt that the Delaware & Hudson Company, acting in conjunction with the Pennsylvania, is securing these valuable tracts.

At Monday's meeting of the Conciliation Board the new rules were formally adopted, and they will tend to diminish materially the work of the members. The most important provision is that the individual members shall make every effort to settle grievances before they are brought to the entire board. The object of this rule is to eliminate all petty complaints without a formal hearing before the board. The new rule should reduce the business of the board fully one half. Mr. Fahy submitted a resolution directing that any member of the board shall at all times, have the right of entry to any colliery in the region. The resolution was defeated. It was decided that whenever grievances accumulate the board shall remain in session until they are disposed of. In the event that any complainant and his witnesses are absent, when his grievance is to be heard, the case shall be dismissed. In the event that the defendant is absent, then the board is to assume that the grievance is well founded, and allow the prayer of the complaint. The only important grievance considered at the session was the complaint of the miners employed at the Plymouth colliery of the Delaware & Hudson Company that the company was not living up to the award of the umpire, in connection with the alleged reduction in the price for boney. It was decided, after hearing evidence, that the umpire, together with the members of the board, visit the mine and once for all determine whether the miners are entitled to increased pay.

Some excitement has been caused in Monroe county by the report that a vein of anthracite coal has been found at the bottom of a small stream, near the borough of Stroudsburg. This is fully 60 miles from Scranton, the nearest point in the anthracite field. Samples of the coal have been analyzed and declared to be anthracite. Stroudsburg capitalists have secured options on the land and will investigate whether the coal is present in paying quantities.

The members of the sophomore and junior classes of the Pennsylvania State College will attend the mining summer school, which will be held in Jeddo, for the next two weeks, and will visit the anthracite mines, to witness the practical working. They will make surveys and do other work in the daily routine of the mines.

Holes are to be drilled from the surface, into the inner workings of the Locust Spring colliery, at Locust cap, to test whether there is any fire remaining as the result of the explosion of two years ago, when several miners lost their lives. Black damp has been discovered near the affected part, and this aroused suspicion of fire.

Toronto, Ont. June 4.

Gold mining operations in the Wabigoon district of New Ontario promise to be active this season. Work at the Redeemer mine, will be resumed on an extensive scale under general superintendent Eames, who is now on the ground. The present shaft is now 255 ft. deep. A crosscut will be run from the 200-ft. level in a northerly direction for several hundred feet, tapping two large veins, on the farther of which another shaft will be sunk 200 ft. The Lost mine, immediately adjacent to the Redeemer, will be opened and a 100-foot shaft sunk.

American capitalists are showing much interest in this locality. J. W. Keenan, of Detroit, recently visited the neighborhood and secured two promising locations.

At the Laurentian mine in the Kenora (Rat Portage) district the installation of a 20-stamp mill has been completed. At the Olympia, five stamps are being erected.

The Cobalt camp ever since its establishment has been noted for the peace and

good order maintained there. Pistols were, however, drawn for the first time in its history on May 28 in a dispute between S. R. Clarke, of Toronto, and Lindsay Morton, of the Lawson mine. Clarke, who is a lawyer, stated that he represented a client in Toronto, who had purchased an interest in the mine from Thomas Crawford, and had come to take possession. Hot words followed and Clarke ordered some men who accompanied him to seize Morton. The latter then drew a revolver and threatened to shoot. Clarke, who was also armed, tried to draw but, as Morton had him covered, finally desisted and retired. The case of the disputed title to the Lawson is now before the Court of Appeal.

The Ontario Department of Mines announces that for the three months ending March 31, 360 tons of ore were shipped from Cobalt district to the smelters. The silver contents aggregated 580,825 oz.; valued at $362,248, an average of 1613 oz. to the ton. The cobalt contents amounted to 10 tons, worth $10,360. The total shipments of ore from Cobalt since the latter part of 1904 are valued at about $2,250,000.

The excursion of members of the Ontario Legislature to the Cobalt mining district and the country beyond left Toronto May 26. Fifty-nine members availed themselves of the opportunity, including four members of the government, Messrs. Cochrane, Hanna, Matheson and Willoughby. At Cobalt the party visited the Tretheway and Timmins' mines, in the latter of which a new and rich vein had just been struck. A number of the party went on to the "end of the steel" on the Timiskaming & Northern Ontario Railroad, which is now 52 miles above New Liskeard. Some 1500 men are now employed in constructing the road further to the north. The excursionists returned to Toronto June 1, much impressed with the importance of the mineral resources of the region. The Tretheway mine is installing another compressor, bringing the mine's capacity up to twelve drills. A large silver nugget has been found at the King-Cobalt mine and a paying vein located.

Summer classes in mining are being held this season as usual, by W. L. Goodwin and J. W. Bain, under the direction of the Department of Mines. The classes at Cobalt, commencing May 22, showed the largest attendance ever known, those held in the evening having 120 pupils.

Orders in Council have been issued by the Ontario Government setting apart the Kenora, Sault Ste. Marie, Sudbury, Port Arthur, Fort Frances and Timiskaming mining divisions under the new Mines Act.

Victoria, B. C. June 10.

Cariboo—The Cariboo Consolidated (1904) Ltd., an English company which for several years has been engaged in a deep drifting mining enterprise on Lightning creek, Cariboo (see JOURNAL for May 26, p. 1019) appears to at last give promise of soon earning profits. Writing to his London office about the beginning of May, the mine manager said: On Tuesday last I secured additional miners for breasting work, and since then have made fairly good progress in breasting operations. During the week we took out 21 setts of gravel, containing 178.5 cu.yd., from which we obtained 20¼ oz. of gold, or at the rate of $2.04 per cu.yd. We are now getting the faces well opened up, and our values should improve as we work more into the channel.

Rossland—A press despatch from Rossland states that at the lead and copper reduction works, at Trail, and mines at Rossland, of the Consolidated Mining and Smelting Company, of Canada, there are employed more than 1000 men. Of these some 550 are at work at the Canadian Smelting Works, Trail; about 325 at the Centre Star mine and 125 at the War Eagle mine and some neighboring Rossland properties under examination. The average number of men employed in 1905 at Rossland mines, as reported by the local gold commissioner, was as follows: Centre Star, 250; Le Roi, 225; War Eagle, 145; Le Roi No. 2, 85; White Bear, 40; Jumbo, 16; Spitzee, 16; total, 777. An increase in numbers during the current year at both the larger mines and the smelter at Trail is looked for.

The tonnage of ore produced during five months to June 1 is about 138,000. The approximate tonnage of the several mines is: Centre Star and War Eagle, 71,000 tons; Le Roi, 47,500 tons; Le Roi No. 2, 11,000 tons; Jumbo, 3000 tons; other mines 5500 tons; total, 138,000 tons.

Mexico. June 8.

A labor strike is almost an unknown quantity in this country. As a general rule, the workman lacks that sense of the striking class of the American labor—of following a leader—so when dissatisfied he simply seeks work elsewhere, but there is no unison in action. Their general improvidence also prevents there being long without work, unless "tunas are ripe"—the fruit of the prickly pear, on which the Mexican can live, and when it is ripe he does not need to work. It is to be hoped that a repetition of the Cananea troubles may not come soon, for it tends to put a damper on all the great Sonora section.

No section of Mexico, when the lack of railroad facilities is considered, and despite the troubles with the Yaqui Indians, is being so thoroughly prospected and developed as is Sonora. Of course, easy access from New Mexico and Arizona is partly the cause, but it is principally because of the good results that the prospectors are everywhere, and are soon followed by the machinery, mills and smelters, which are most numerous in this state. The improvements in the plant of the Cananea Consolidated Copper Company, have been frequently spoken of in this JOURNAL, until now that company has an output of 3500 tons of ore per day. One of its neighbors, the Sierra de Cobre, of the Phelps-Dodge Company, after several years of development work, has been put upon the shipping list. And it is now said that F. Augustus Heinze and the Amalgamated Copper Company, are looking with covetous eye upon this camp and its largest property. L. Lindsay and associates, of Los Angeles, are reported to have made a rich copper strike in the Americana, another one of the Cananea's neighbors. And in the Cananea Eastern in the Ajo mountains, about 18 miles east of Cananea and 12 miles from the Cananea, Rio Yaqui & Pacific Railroad, and owned mostly in Cananea and Bisbee, a body of argentiferous copper ore is being opened by its superintendent, L. P. Nash. At the Picacho, bought recently by Clancy Brothers, 500,000 tons of low-grade ore are said to be on the dump, and 1,000,000 exposed in the mine; so new machinery has been ordered to put the property in shape to furnish 100 tons daily for the 200-ton mill, 2 miles distant, of the Oro Maximo Mining Company, which latter company is to furnish the other 100 tons, and which is also controlled by the Clancy brothers.

London. June 9,

The adoption by the Zinc Corporation of the Potter flotation process was generally anticipated here by chemists and metallurgists, who were familiar with the various rival flotation processes. The chief consideration, which prompted the adoption, was that the process had been tried and found workable, and that the installation was inexpensive. Other processes, which may have a claim to be more ingenious, have not yet proved their commercial value or reached finality. Anyhow, the Zinc Corporation, desirous of getting to work at once, has adopted the Potter process. Great interest has been aroused by the appointment of A. L. Queneau, late of the New Jersey Zinc Company, to the position of superintendent of the zinc smelting department. Until he has had the opportunity of investigating the problem on the spot, nothing will be done with regard to the erection of smelters. In the meantime, satisfactory contracts have been made with Aron Hirsch & Son, of Halberstadt, Germany, to sell zinc concentrates to the amount of 10,000 to 20,000 tons during 1906; 20,000 to 40,000 tons during 1907 and 40,000 tons per year during the succeeding year. The Corporation started out with a cash capital of £160,000. Of this a total of £90,000 has been spent on the purchase of nearly 400,000 tons of tailings and £22,500 has been deposited as a guarantee of fulfilment of various contracts. Further capital to the extent of £100,000 has been subscribed by the original vendors, so that the company in a strong financial position.

General Mining News.

ALABAMA.

JEFFERSON COUNTY.

Pratt Mines—The Tennessee Coal, Iron and Railroad Company is putting in five Stewart jig coal washers, with crushers, at these mines. Several new shafts are also to be sunk, the intention being to increase the output.

WALKER COUNTY.

Pittsburg Coal Company—Negotiations are in progress for the sale of this company's coal mine at Corona to L. B. Musgrove and associates, who already own the Gayoso mines in the same county.

ALASKA.

COPPER RIVER DISTRICT.

Close Brothers & Co., of Chicago and London, in conjunction with American and European capitalists, are building this road to develop the Bering Lake coal fields, the Copper river copper fields and the rich gold districts on the upper Tanana Valley and other sections in the interior of Alaska. The proposed route is from Cordova, Alaska, near a bay of the same name, east to the Copper river, thence north along that stream to a point north of Taral, about 135 miles. An extension is projected north through Copper Center, Chisna and Mentasta Pass to Tanana Junction on the Tanana river. Branches are projected also from a point just north of Taral east along the Chitana river to Bonanza Mine, and from a point near the mouth of the Copper river south and east to a point east of Bering Lake. The work now under way is being done by M. J. Heney, contractor for the White Pass Railway. A considerable amount of grading has been finished, and it is expected to commence track-laying shortly. The work is not very difficult. The line and gradients are favorable, maximum grade being under one-half of 1 per cent. There will be two large steel bridges, both over the Copper river.

ARIZONA.

GRAHAM COUNTY.

Arizona Copper Company, Ltd.—This company states that the output of its mines at Clifton during May was 1202 short tons of copper.

ARKANSAS.

SCOTT COUNTY.

Southern Smokeless Coal Company—This company has been organized to develop coal property near Coaldale on the line of the Arkansas Western Railroad. There is a small mine now on the property, the capacity of which is to be increased. The officers are: George Sengel of Fort Smith, Ark., president; Edward A. Garvey, first vice-president, and Thomas A. Bell, second vice-president, both of St. Louis, Mo.; George Sengel, Jr., secretary, and Jerome Sengel, treasurer, both of Fort Smith.

CALIFORNIA.

SAN BENITO COUNTY.

New Idria Quicksilver Mining Company—The furnace and retorts of this company at Idria were somewhat crushed by the earthquake, but are still in working order. Foundations have been laid for a new furnace and retort made from a fine quality of stone found near by.

New Quicksilver Mine—There are several partly developed quicksilver mines in the Coast Range near Idria. One is being opened by Barton Brothers, of Hanford, and is situated about a mile up the San Benito cañon from the road which leads to Hollister.

SAN BERNARDINO COUNTY.

Death Valley Consolidated Company—This New York company has purchased two groups of 13 claims each in Shadow mountain district for $120,000 from Joseph Everett, J. G. Williams and Leonard Merrill. Preparations to develop and install machinery are being made. The stage station of Haven is close to the properties.

Sacaton Springs Mining Company—This company, of which William Heath is superintendent, is developing copper properties near Cima, 12 miles south of the Standard mine on the western slope of New York mountain in the eastern part of the county. A 100-ft. shaft has been sunk and a 300-ft. tunnel run. No ore has yet been shipped.

Standard Copper Company—This company reports a strike of ore in the new 220-ft. shaft. Some 14 carloads of ore have been shipped to the Salt Lake smelters, and teams are hauling more ore to the Cima. Forty men are employed.

Sunrise Mountain—Five groups of claims in Sunrise mountain district have been sold by H. McClure and E. E. Yarbrough to H. E. Woods, of Los Angeles. The camp is 20 miles southwest of Needles and the groups are the Gold Dollar, Storm Cloud, Iron Horse, Hidden Treasure and Blue Bird.

SHASTA COUNTY.

Mountain Copper Company—Contrary to general surmise the Mountain Copper Company has no intention of purchasing the Quartz Hill mine, and has made no offer for it.

Copper—George Graves has sold to W. H. Kent, of San Francisco, an undivided one-third interest in 17 copper claims on section 20 in Backbone mining district. Mr. Kent had previously bought an interest in 18 claims adjoining these new purchases.

SIERRA COUNTY.

Elcey—A five-stamp mill for this property at Jim Crow cañon, J. L. Buckingham, owner, is being built at the Downieville foundry.

SISKIYOU COUNTY.

Siskiyou Consolidated Gold Mining Company—This company has obtained an option on certain mining locations at Nordheimer, on the Salmon river, in the southwestern portion of the county, where recent strikes of high-grade ore have been made. The location is near William Lord's hydraulic mine at Bennett.

TUOLUMNE COUNTY.

Grizzly and New Albany—At these two mines on the North Fork of the Tuolumne river, two miles from the town of Tuolumne, it is reported that 100 stamps are to be installed, the present 20 stamps not being sufficient to crush the ore for the bodies discovered.

COLORADO.

BOULDER COUNTY.

Eldorado—J. E. Carpenter is installing a complete hoisting plant on the Golden Fleece shaft on Spencer mountain. Columbus, O., people are interested. Manager J. D. Kohlman, of the Newsboy, is in Denver purchasing a new hoisting plant for extensive development. A large plant of machinery is being installed on the Revenge mine on Spencer mountain.

Sugar Loaf—Engineers of the United States Gold Corporation are working out details for the installation of a power plant to operate air drills both in shaft and tunnel. The Lincoln Mining Company is going to install an air compressor plant and drills to carry on heavier developments. A compressor plant and air drills are being installed at the Hoosier Dike property. The Pittsburg & Colorado Company is installing an air-compressor plant and another boiler. The Siloam Gold Mining Company has made the final payment on properties to J. Culver.

Sunshine—New hoisting plants are being installed on the White Crow, Boulder Valley, Washburn and Lottie mines. The Progressive Mining Company with main office in Boston building, Denver, is arranging for the early installation of a hoisting plant.

CLEAR CREEK COUNTY.

Cory City Group—Denver and Milwaukee capitalists have purchased this group, near Silver Plume, from C. S. Desch and associates, and the deal is one of the largest made in that section for some time. It is reported that the new owners will erect a concentrating plant.

Lamartine—Two electric hoists, of 18-h.p., are being built by the Denver Engineering works, which are to be installed in the tenth level. A number of leasers are at work.

Jackson Mill—An addition is being built for a 120-h.p. boiler, so as to have plenty of power when the water supply is low on South Clear creek.

Parker Mill—The Gold Leaf Ore Pro-

duction Company has acquired this mill on Chicago creek. The company's office is in Idaho Springs, Colorado.

IDAHO.

BLAINE COUNTY.

Curtis Jackson has located a vein near Red Elephant gulch, ore from which assays well in antimony, with a little silver and traces of gold and lead. Development work is to be begun at once.

Maryland Gold Mining and Development Company—This company has bought the Independence and Golden Star groups near Hailey. The new company proposes to work the mines steadily and to build a concentrating mill. Harry J. Allen, of Hailey, is general manager.

SHOSHONE COUNTY.

Douglas—This silver-lead property has passed under control of the Federal Mining and Smelting Company. At a recent meeting of the Douglas Company, the old directors resigned and the following directors and officers were chosen to succeed them: President, F. F. Johnson, re-elected; vice president, Herman J. Rossi, re-elected; secretary and treasurer, William J. Hall, chief accountant of the Federal Company; manager, W. Clayton Miller, general manager of the Federal Company; superintendent, William B. Fisher, general superintendent of the Federal Company; directors, H. C. Adami, re-elected; John P. Gray, attorney for the Federal Company.

Great Western—A body of galena has been struck at a depth of 200 ft., in this mine, near Burke. Drifts are now being run to determine the size of the ore-body.

Snowstorm—It is announced that at a meeting to be held in Mullan, July 2, a proposition will be submitted for the purchase by the company of the lease now held by J. H. Heward & Co. on the property; also for the purchase of the plant owned by the lessees.

Victor Consolidated Mining Company—This company was recently incorporated at Wallace with a capital stock of 1,500,000 shares of the par value of $1 each. The incorporators are E. P. Spalding, J. C. Feehan, both of Murray; Norman Ebbley, Walter J. Bracking, J. B. Wilcox, all of Wallace. The company is based on the ownership of the Permit, Tuscarora, Ragusa and Roviga lodes in Hunter district. It has also secured a bond on the Oro Fino group on Beartop and some neighboring claims, chiefly the Keystone, Banner and Great Western.

KENTUCKY.

FAYETTE COUNTY.

Elkatawa Fuel Company—This company has been organized at Lexington, Ky., by the election of the following officers: C. F. Brower, Lexington, president; J. C. Patrick, Stanton, Ky., vice-president, and Frank G. Ott, Lexington, secretary and treasurer. The property to be developed consists of about 5000 acres of coal and clay lands on and near the Lexington & Eastern Railway. The products will be mined together, the coal to be shipped to central points in Kentucky and the clay to be manufactured into fire-bricks either at the mines or at Lexington.

LOUISIANA.

CALCASIEU PARISH.

Jennings—Heywood Oil syndicate No. 9 came in a gusher good for 3000 bbl. daily. Jennings Heywood No. 8 has been abandoned, and Producers Oil Company No. 2 has been ruined by a blow-out.

The sheriff will sell on June 11, some 1,500,000 bbl. of crude. The sale is made by virtue of an order of the district court in the suit of the Latrielle Oil Company in the Jennings-Heywood Oil Syndicate.

Welsh—The Central City Oil Company has succeeded in bringing in a 500-bbl. well. It is the best producer ever drilled here.

CADDO PARISH.

Natural gas piped from the Caddo field, 20 miles distant, is now being used in Shreveport. The estimated consumption at present is 5,000,000 ft. daily.

MICHIGAN.

IRON—MARQUETTE RANGE.

Champion—Mining operations are to be resumed soon, after a period of inactivity covering 2½ years. The mine was owned by the Clairton Mining Company when closed down, and shortly after was purchased by the United States Steel Corporation. Pumps will be started immediately, and as only 100 ft. of water is in the mine, it will be ready for operations soon.

It is planned to start work with 300 men. During the past year 50 men have been employed repairing the machinery. Foundations have been renewed and the plant is now among the best on the range. The air compressor has been removed to the main engine-house, alongside the big hoist, and the old compressor house will be converted into a blacksmith shop.

Opened originally in 1868, the Champion was a large producer for over 30 years. The ores are of bessemer grade, being of the magnetic and specular varieties. The walls, of diorite on the foot, and quartzite on the hanging, are of exceptional strength, and the mine is dry and safe, containing some of the largest chambers on the range. No. 7 shaft is a spiral shaft. The curve was necessary to enable the shaft to follow the ore measures. But for the deflection of the shaft it would have been necessary to have sunk at least two other shafts west of No. 7, or to have installed an auxiliary hoist at the point of deviation or to have trammed the ore almost prohibitory distances. The Champion's deepest openings are 2270 ft. below the surface. Previous to work being suspended operations were confined to the seven lower levels. The Oliver Iron Mining Company will put miners on those levels at the start, but gradually work will be extended above the fifteenth level.

NEVADA.

WHITE PINE COUNTY.

Bald Mountain—Important discoveries are reported in this district, which is about 50 miles northeast of Eureka, and many prospectors are going there. A correspondent formerly familiar with the district writes as follows: Bald Mountain proper is situated in White Pine county, 50 miles northeast of the town of Eureka. It is traversed from one to two miles in length by well defined quartz veins in granite and porphyry, the granite everywhere forming the foot-wall. The veins are from 2 to 10 ft. in width, all carrying free gold, but 10 or 12 years ago, not much work had been done on any of the lode claims but for the annual assessments; and the highest average value talked about was $10 a ton for the free-milling ores. There was an acre or two of placer, and at one time there was talk of a company piping in water for hydraulicking. I have no doubt that this section will be favorably heard from should a railway be built through Newark valley, which skirts the base of the mountain. There were good prospects for silver-lead and copper, lying off to the east of the gold-bearing area.

NEW MEXICO.

SOCORRO COUNTY.

Mogollon Gold and Copper Company—At the recent annual meeting of this company, held at Albuquerque, T. J. Curran was elected president of the company. This company operates mines in the Cooney district, equipped with a modern 100-ton concentrating mill. The company has not been running the mill recently, but work has been kept up continuously on the mines and a large amount of ore has been taken out and blocked out, and it is expected that as soon as the new directors of the company meet the mill will again be started up. This district is situated in the Mogollon mountains, about 15 miles from the Arizona line.

OHIO.

ATHENS COUNTY.

Canaan Coal Company—This company is opening up a coal-mine property which it has recently acquired in Canaan township. The tract consists of 6000 acres, and is crossed about midway by the Hocking river and the Baltimore & Ohio Southwestern Railroad, which there follows the river valley. Canaanville is the railroad station. The coal is the Hocking vein, and is from 6 to 9 ft. in thickness lying about 400 ft. below the surface. One mine is now being opened, and the air-shaft is completed. The quality of the coal found in this shaft is very good. This is the most southerly extension of the

Hocking coal yet developed. It is the company's intention to equip this mine in accordance with the extent of the property; the best machinery for mining and preparing the coal will be put in. A steel tipple and a coal washing plant will be included in the equipment. The company is incorporated under the laws of Ohio; the owners reside in Jackson, and have heretofore been interested only in iron making. They are John E. Jones, of the Globe Iron Company; Charles O. Brown and Lewis V. Brown, of the Star Furnace Company. Lewis V. Brown is general manager of the coal company. The office is at present in Jackson, Ohio, but will be moved to Canaanville soon. Plans and specifications for the machinery and equipment are not yet prepared, but will be made ready as soon as possible so that contracts can be let.

OREGON.

BAKER COUNTY.

Flagstaff—This mine, situated in the Virtue district, about six miles west of Baker City, the property of the New Flagstaff Gold Mining Company, a French company under the local management for over six years of N. E. Imhaus, has been developed by thousands of feet of shaft work, tunnels, cross-cuts and upraises, from which many tons of ore have been taken and milled on the ground. It has been idle for two years, the company being interested in other directions. The mine has been sold to a Boston syndicate, represented by Arthur Murphy, for $25,000 cash, the deed being filed by Imhaus for record. This closes a deal which has long been contemplated by the French company and passes the property to other parties who, it is said, will at once take possession and begin operations as soon as they can get their men on the ground.

PENNSYLVANIA.

BITUMINOUS COAL.

Options on a large tract of land near Harmarville, in the Allegheny Valley, have been taken by a syndicate represented by H. O. Evans, Bruce Coleman and Thomas A. Noble, of Pittsburg. The land is owned by the Schoyn-Taylor estate. It is underlaid by the Freeport seam. A company is to be organized to develop the property, and open several mines. It is said that M. A. Hanna & Co., of Cleveland, are interested, and will handle the coal from the new mines.

SOUTH DAKOTA.

CUSTER COUNTY.

Ivanhoe—A 30-ft. orebody was recently encountered in the lower level of the shaft. It shows fair values from wall to wall. The vein crops out on the surface 200 ft. south of the shaft. Sufficient water has been provided for the mill, which will soon run two shifts.

LAWRENCE COUNTY.

Golden Placer—Working through an old shaft, a force of men has penetrated the bedrock 4 ft. below the old workings and located a pay shoot. The company has one mill and is preparing to build the second, which will contain a 100-ton grinding plant and a 200-ton cyanide annex to handle tailings from both mills.

Aurizona—Arrangements have been made to work this property, lying 1½ miles north of Galena, quite extensively this summer. It contains 15 claims and several verticals have been uncovered. There are over 1200 ft. of tunnel and an incline shaft.

Victoria Extension—An important strike has just been made on the Ulster claim on this property. A vertical 6 ft. wide was encountered while driving a drift from the 100-ft. level of the shaft. Nearly 40 tons of ore have now been taken from this vein, which promises to be a true fissure. Twenty men are employed.

Clover Leaf—Pierre Wibeaux, president of this company, is authority for the statement that the mine will be opened up again next month. Machinery will be put at work in a short time to unwater the property, after which it is hoped to continue operations without further delay. The company has a large acreage, a good hoist and stamp mill and free-milling ore. The greatest difficulty has always been the water problem.

Dakota—Another new strike has been made on this property, this time in the vertical. A vein has been opened to a width of 20 ft. and no side walls have as yet been encountered. The strike was made on the Mono claim.

New England Homestake—The new hoist has arrived and will be installed at once. It is capable of working to 1000 ft. The new pump, which can handle 250 gallons a minute, will also be installed. Workmen are tearing out the old concrete bed and putting in a larger and heavier one for the new machinery.

Homestake South Extension—Two shifts of men are employed and drifting both east and west from the 165-ft. level is being continued. The management plans to cut off the water and to explore the formation at this depth thoroughly. This work is being done 2000 ft. southeast of the Homestake Ellison hoist.

PENNINGTON COUNTY.

Holy Terror—Eastern parties are arranging to consolidate the Holy Terror, Keystone and Egyptian group of claims, all lying adjacent to Keystone. A deal involving the latter group has just been consummated.

TEXAS.

BURLESON COUNTY.

Somerville Development Company—This company is making arrangements to develop a deposit of fullers' earth near the town of Somerville. A plant to prepare the material for market is to be erected, with a capacity of 200 tons a day.

UTAH.

JUAB COUNTY.

Tintic Ore Shipments—Shipments last week amounted to 147 carloads, the shippers being: Beck Tunnel, 7; Black Jack, 3; Bullion Beck, 11; Carisa, 8; Centennial Enreka, 35; Dragon Iron, 23; Eagle & Blue Bell, 7; Eureka Hill, 3; Gemini, 26; Godiva (concentrate), 2; Grand Central, 4; May Day, 2; Mammoth, 3; Scranton, 3; Uncle Sam, 5; Victoria, 2; Yankee, 3; other mines, 6 carloads.

SALT LAKE COUNTY.

Utah Apex Mining Company—President E. R. Hastings has issued a circular from the Boston office, which says, in brief: On May 29 the directors voted to ask the stockholders to authorize an issue of $500,000 in 5 per cent. bonds, to run 10 years and to be convertible into stock at par after Jan. 1, 1907, to be sold as required. It is the intention to consider carefully the erection of a smelter of 500 tons capacity; also of a concentrating mill to handle the large amount of second-class ores. The mine will, we hope, by Aug. 1 have tramway and railroad spur in operation. The Parvenu Tunnel (lower main working tunnel) has yet 1000 ft. to go to reach the known orebodies. The probabilities are that for $100,000 the property can be made a moderate dividend payer, but your directors believe that it has greater possibilities than this, and for that reason have arranged for placing the whole issue of $500,000 at par, without commission, should the company require that amount.

The capital stock is $2,500,000, all outstanding. Treasurer, J. W. Horne, No. 53 Tremont street, Boston.

WEST VIRGINIA.

MCDOWELL COUNTY.

Superior Pocahontas Coal Company—This company has been organized with $300,000 common and $200,000 preferred stock. The officers are Justus Collins, president, Charleston, W. Va.; C. J. Milton, vice-president, Cincinnati, Ohio; P. J. Riley, manager and treasurer, Hallsville, W. Va., and J. A. Lathin, secretary, Charleston, W. Va. The company has purchased the Blackstone Consolidated Coal Company, Helena Coal Company, Henritz Mining Company and the Davy Crockett Coal and Coke Company, embracing leaseholds for about 4000 acres of the Pocahontas coal measures located at the railway station of Davy and the postoffice of Hallsville, upon the main line of the Norfolk & Western road. The mines now on the property are producing about 15,000 tons a month.

Foreign Mining News.

CANADA.

BRITISH COLUMBIA.

Tyee Copper Company—This company reports that its smelter at Duncans Station, Vancouver Island, ran 13 days in May and treated 1915 tons of Tyee ore. The return, after deducting freight and treatment charges, was $38,177; an average of $19.94 per ton.

MEXICO.

DURANGO.

F. J. M. Rhodes has secured from the Mexican Government a concession for a tract of land covering 110 square miles in the State of Durango, about 75 miles northwest from the camp of Guanacevi. This is an exploration concession for a term of years which gives Mr. Rhodes the right to locate properties in that section. Mr. Rhodes represents an English company, known as the Rhodes Mexican Exploration Company, and will explore the concession thoroughly.

ASIA.

INDIA—MYSORE.

Kolar Goldfield—The output in May was 48,515 oz. bullion, being 2428 oz. more than in April, but 3659 oz. less than in May, 1905. For the five months ending May 31, the total was 244,140 oz. bullion, a decrease of 16,463 oz. from last year. The bullion reported this year was equal to 219,720 oz. fine gold, or $4,541,736 in value.

Coal Trade Review.

NEW YORK, June 20.

There is little new this week in the Western coal trade. The Illinois and Indiana mines are going to work again, and making shipments.

The seaboard bituminous trade is quiet and the markets well supplied, though the trouble in the Clearfield region is not yet settled.

The anthracite trade is quiet, and seems to have settled down into the usual summer routine.

A dispatch from Columbus, Ohio, June 19, says: "After two months of idleness, an agreement has been reached between the Ohio miners and operators, and the 35,000 men involved have been ordered back to work. Operations in all districts of the State will be resumed not later than Wednesday. In eastern Ohio the non-union men will give way to the union workers, according to the agreement which was signed today by President John H. Winder on behalf of the 'stand pat' operators, and subsequently by officials of the Ohio miners.

"It is agreed to pay an advance of 5.88 per cent. on the mining and day labor scale of wages of 1904-5, this contract to continue for the period beginning April 1, 1906, and ending March 13, 1908. It is agreed in consideration of the signing of the contract that local conditions, prices and rules of the Hocking (basing point of Ohio) and other sub-districts shall be taken up immediately in sub-district joint conventions for adjustment. The general settlement is on the basis of the 1903 scale."

COAL TRAFFIC NOTES.

The total coal and coke traffic originating on all lines of the Pennsylvania Railroad east of Pittsburg and Erie for the year to June 9, was as follows, in short tons:

	1905.	1906.	Changes.
Anthracite..	2,055,521	1,786,277	D. 269,244
Bituminous.....	12,198,260	13,823,037	I. 1,624,777
Coke.....	4,864,384	5,594,927	I. 730,543
Total.....	19,118,165	21,204,241	I. 2,086,076

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the week ending June 16 were 12,974 tons; for the year to June 16, they were 360,028 tons.

New York. June 20.

ANTHRACITE.

The hard-coal market remains featureless and this will probably be its condition for several months. The mines are all working full time, though not full handed, and coal is coming forward with its usual regularity. It is readily disposed of upon arrival for supplying current needs, but all business for future delivery is exceedingly dull. Every kind of coal is in abundant supply.

Prices remain as follows: $4.45 for broken and $4.70 for egg, stove and chestnut sizes. For steam sizes: $3 for pea; $2.25@2.50 for buckwheat; $1.45@1.50 for rice and $1.30@1.35 for barley f.o.b. New York harbor shipping points.

BITUMINOUS.

The dullness of the Atlantic seaboard soft-coal trade remains, with but little change from last week. A slight improvement in some quarters is offset by retrogression in others, so that the trade as a whole is about the same. Conditions are such that producers are simply curtailing shipments from the mines whenever they are unable to dispose promptly of their arrivals at tidewater, and this curtailment, in many instances, amounts to a large proportion of the usual output. This procedure has the effect of keeping prices fairly steady on current business. It is the general opinion that summer throughout will be dull, but that September will see the beginning of an active fall demand.

Trade in the far East is quiet; outside of contracts, little or no business is being done and producers are not even able to persuade consumers to take their full monthly allottments upon contracts. The Sound is very dull; this territory seems to go from one extreme to the other, and contractors simply refuse to accept shipments. New York harbor is dull; coal reaching tidewater is fairly well provided for. Prices range around $2.60@2.75 f.o.b. New York harbor shipping points for fair grades of steam coal. All-rail trade is quiet; transportation is fairly good on all roads, with car supply up to all demands.

Vessels in the coastwise market are somewhat short in supply and freights are accordingly stronger. Current rates from Philadelphia are quoted as follows: To Boston, Salem and Portland, 65@70c.; to Providence, New Bedford and the Sound, 60@65c.; to Lynn, Newburyport and Bangor, 80@90c.; to Saco and Gardiner, 90c. and towages.

Birmingham. June 18.

Although the union miners are in the minority in Alabama, considerable interest has been manifested since the ninth annual convention of Alabama district, United Mine Workers of America, has been on.. The new wage scale was reported in the miners' convention on Friday and made public at the joint conference of the operators and miners today. There are not many changes in the contract; only a few in the differentials. It is expected that the majority of the commercial coal companies which have been dealing with the union miners, will continue their relations with them. Several of the companies which were not represented in the joint conference have announced their intentions of signing the scale. As far as can be learned, the Alabama Consolidated Coal and Iron Company, Col. T. G. Bush, president, is the only furnace company inclined to deal with the union miners.

Controversies through the columns of the daily press between Chief Mine Inspector J. M. Gray and District President Edward Flynn, of the miners' organization, caused interesting reading for the past few days. The chief mine inspector started the ball rolling by setting forth a number of mining rules which he announces he will enforce, no matter what rules are included in the contracts between miners and operators. Mr. Gray asserts that the State mining laws give him the right to make rules and enforce them and he intends hereafter to do so. The leaders of the miners claim that Mr. Gray is making an effort to place all liability on the miners for accidents in mines and none on the operators.

Chicago. June 18.

Dullness continues to mark the local market for coal. The Illinois mines are producing freely and within the coming week the Indiana mines will be sending as much to Chicago as normally, supplies from the State already being plentiful enough for the limited demand. Consumers are buying very little as yet, the stocks laid in for the expected prolongation of the strike not being exhausted in many in-

stances, while other consumers are counting on the natural tendency of prices downward in summer and are buying only small quantities.

There has been probably a large abandonment of contract business as regards western coal, as a result of the strike. Consumers found themselves able, at the close of the period in which their supplies were shut off, to buy at close to contract prices and this will prevent the making of new contracts. The situation at the western mines is well known to the business world—too much coal is being mined to supply the needs of the local territory, except at very low profits and on the keenest of competition.

Run-of-mine from Indiana and Illinois mines brings $1.70@2; screenings $1.40@1.80 and lump—what little is used—$2@2.40. The tendency of prices is downward, with no prospects for either good prices or large sales before summer is over.

There is no large demand for eastern coals. Hocking is in light requirement and large supply so that shipments are being curtailed. The standard quotation is $3.05, but this is said to be shaded slightly. Smokeless, which had a slight increase of business during the strike period, is in comparatively good demand and supplies are well restricted, so that the price holds up well to the standard price of $3.30 (run-of-mine). Youghiogheny is selling at $3.05 for three-quarter, on the few sales made.

Anthracite continues dull with no prospect of briskness before autumn.

Cleveland. June 11.

The demand for coal for shipments up the lakes continues active, but there is little at hand with which to supply the trade, hence movements in that direction are very light. Supplies of coal at Upper Lake ports are reported light. Wild boats are carrying a little, but there is almost no contract tonnage. Brokers say small boats are not difficult to place in the coal trade, but most of the large boats are going up the lakes light.

The local demand has not increased materially and prices remain unchanged. Large consumers are still drawing on their stock-piles which, they say, are large enough to keep them going for some little time. The chief demand is now coming from small consumers who did not lay in stocks last spring. Prices are still $1@1.10 at mine for run-of-mine coal and 75@80c. for slack at mine.

The coke market continues strong at unchanged prices. Both furnace and 72-hour foundry coke are being offered at $3 at the oven.

Indianapolis. June 19.

Upward of 14,000 miners went to work in the bituminous field of Indiana on June 11, and on June 17, 2000 more began work in the Clay county block field, as an agreement there has been effected. During the last three weeks of the suspension the district treasurer of the mine workers sent out strike benefits to more than 13,000 miners. The district treasury used $75,000 in all for this purpose, while the aggregate from the local lodge treasuries was even greater than that amount.

The railroads in Indiana have a big supply of cars today on all the sidings and switches, and more are coming. The resumption of operation will soon put a large number of additional railroad men at work to handle the coal traffic. The suspension had begun to tell heavily on other interests—on the mining-camp stores and on the farmers, who have a good trade with the miners at this season of the year.

There was considerable difficulty in effecting a settlement in the eighth district, which is the block-coal district. After several days' negotiation mutual concessions were made and an agreement reached and ratified. The miners get the 1903 scale, which gives them $1 a ton for the screened coal and 80c. a ton for run-of-mine. The prices for mining in the block-coal district are considerably higher than in the bituminous districts. The conditions and concessions made by the miners of this district pertain very largely to local conditions in the various mines.

The National Executive Board of the United Mine Workers of America was in session in Indianapolis during the week. The principal work of the Board was to issue an order to assess all members who are working 50c. a week. This money will go toward the strike-benefit fund, which has been almost exhausted.

The Indiana mine workers and the independent operators who signed the 1903 scale in April and May are trying to come to some understanding. The indications are that the miners will give the independent operators the benefit of some of the labor conditions conceded to the association operators, who stood out longer against them.

The Indiana State Railroad Commission has handed down a decision in the coal-freight car of Edward Snyder, of New Albany, against the Southern Railway Company. Snyder is a coal dealer and complained that the Southern Railway Company charged more for hauling east-bound coal than for west-bound coal between the same points. The Commission held that the rates were excessive and directed that the decrease should be about 20 per cent. The Commission, however, held that a railroad company may justly charge a higher rate for hauling coal in one direction over its line than another upon a proper showing that the grades are steeper, and that more power and more men are required to do so.

Pittsburg. June 19.

Coal—There is little change in the coal markets here. The demand is good and all the mines are in operation except about half a dozen on the West Penn Railroad. A special scale was offered to the operators, but they refused to pay it, and about 800 miners are on strike. The trouble started early in May when the Allegheny Coal Company, operating the Harwick mine, where the disastrous explosion occurred a couple of years ago, broke away from the United Mine Workers and started its mine on a non-union basis. The present trouble is at the mines in that locality. The Pittsburg Coal Company continues to make heavy shipments to lake ports daily, and so far has not been troubled by a scarcity of railroad cars. Prices remain the same on a basis of $1.10@1.15 a ton for mine-run coal at the mine.

Connellsville Coke—There was a gain in production compared with the previous week but the shipments fell off slightly. Prices remain about the same, strictly Connellsville furnace coke being quoted at $2.35@2.45 and foundry at $2.60@2.75. The *Courier* gives the production for the week at 271,829 tons. The shipments aggregated 14,124 cars distributed as follows: To Pittsburg and river points, 4520 cars; to points west of Pittsburg, 7847 cars; to points east of Connellsville, 1754 cars. The production in the lower Connellsville field for the week amounted to 104,275 tons.

Foreign Coal Trade.

June 20.

Exports of fuel from France for the three months ending March 31 were, in metric tons:

	1905.	1906.	Changes.
Coal	465,680	385,000	D. 80,680
Coke	67,320	51,500	D. 15,820
Briquets	11,300	20,260	I. 8,960
Total	544,300	456,760	D. 87,540

French export trade is small and is chiefly to neighboring countries, Belgium and Switzerland.

Iron Trade Review.

NEW YORK, June 20.

No material change in the iron and steel markets is to be noted. The pressure for basic and bessemer pig iron continues. Apart from the known requirements of the Steel Corporation and other large steel companies, it is possible that there is a speculative tone in this, and that some buying is being done with an eye to future re-sales. Any such buying, however, would naturally be kept quiet.

In finished material there is no change. The call for structural material is still strong, and some big contracts have been let, for railroad terminal improvements chiefly. Small local orders continue to come forward at many points. Sheets, heretofore rather a weak point, are now in demand from many quarters.

The contract made by the Carnegie Steel Company with the Wabash Railroad

about five years ago, whereby that road secures 25 per cent. of the tonnage of the Carnegie mills, will become operative within a few days, as the last rails on the new line of the Union Railroad, the Carnegie property, have been laid and the final ballasting will be completed within a short time. It is estimated that the freight thus given to the Wabash line will be about 4,000,000 tons yearly. In addition, the Wabash is making good progress with its extension to the Clairton plant, which was acquired two years ago from the Crucible Steel Company. The contract further provides for switching rights over the Union Railroad to reach industries connected with it but not owned by the Carnegie company. This includes a number of large plants. It has taken the Wabash about five years to build its line into Pittsburg.

Pig Iron Production—The number of coke and anthracite furnaces in blast on June 1 was 296, the same as on May 1, but the weekly capacity was slightly less—473,000 tons June 1, against 484,000 the previous month. The production of coke and anthracite iron in May is estimated by the *Iron Age* at 2,099,000 tons, being 25,750 tons more than in April. For the five months ending May 31, the total make of pig iron, making allowance for the charcoal furnaces also, is estimated at a total of 10,474,,000 tons.

Birmingham. June 18.

A slight improvement in the pig-iron market in the Southern territory can be reported this week, though sales are still in small lots. The production shows no improvement. The Lacey-Buek Company will shortly have to blow out its furnace for repairs. The Alabama Consolidated Coal and Iron Company will this week be making iron again in No. 2 furnace at Ironaton. The Tennessee Coal, Iron and Railroad Company will have one of the Robertstown furnaces ready soon. Six furnaces in this State are on basic iron for use right at home. The shipments of pig iron from this district show no improvement over a month ago. The report of the Alabama Car Service Association for the month of May shows a falling off of about 2000 cars handled as compared with May, 1905.

The furnace companies are holding up prices well. No. 2 foundry is quoted at $14 per ton. The $13.75 per ton iron is not easily found upon inquiry.

The home consumption is healthy, the cast-iron pipe concerns being among the larger consumers. The Sheffield cast-iron pipe plant has started up.

BY TELEGRAPH.

Birmingham, Ala, June 20—Iron has been sold by the Tennessee Coal, Iron and Railroad Company at $13.50 Birmingham for No. 2 foundry, according to advices received here from sales agents of competing companies. The Sloss Sheffield Steel and Iron Company denies selling under $13.50. Indications are that the agreement between the larger companies in this district looking to maintenance prices has been broken.

Chicago. June 18.

The iron market seems to be stronger than last week and there is general hope that the usual summer dullness may be averted by the turning of the market that has been looked for as a natural outcome of conditions, since the new year. Melters are still running closely to their needs, in the matter of orders, the small lot being the favorite, to piece out requirements until contracts for general supplies are placed. Should this week establish the upward tendency there doubtless will be a rush to cover with the result of a jump in prices and sales. The turn probably would be established by a settlement of the molders' strike, for not more than two-thirds of the foundries in Chicago territory are doing business. Week by week, however, the number of closed foundries is diminishing and this chiefly accounts for the upward tendency in pig iron.

Not so many reports of the cutting of prices below the standard quotations of $14 Birmingham for Southern ($17.90 Chicago) and $18 for Northern, No. 2, are heard as last week. These appear now to be minimum prices with many sales running slightly higher. Compared with a year ago, Northern brings $1.50 and Southern $2 more.

Iron and steel products are steady, with no great activity anywhere. Coke is a trifle firmer, the best Connellsville bringing $5.50, and West Virginia 50c. less.

Cleveland. June 18.

Iron Ore—The past week has been an active one for the handlers of iron ore. Shipments from Upper Lake ports have been heavy and give every promise of fulfilling the prediction of 5,500,000 tons for the current month. If this is accomplished it will break all records for ore shipments, the nearest approach to it being the 5,224,610 tons which were carried last July. The boats have had excellent dispatch at Lake Erie ports and nothing resembling congestion has yet occurred. There is some question, however, as to whether the railroads will be able to handle so great a tonnage. Charters have been plentiful and brokers have had no difficulty in placing all vessels on the market. Rates remain unchanged at 75c. from Duluth, 70c. from Marquette, and 60c. from Escanaba, to Ohio ports.

Pig Iron—The shift from foundry to bessemer and basic which several of the furnaces in this section made a short time ago and the fact that the melt of foundry iron is heavier than ever before, has rendered the market decidedly strong and prices have advanced from 50c. to $1 on foundry grades. No. 2 foundry is now quoted at $16.50 in the Valleys, with sales reported at $16.75 and a few as high as $17. Basic is firm at $17@17.50 and bessemer at $17.50@17.75, both in the Valleys.

Finished Material—Sheets and sheet-bars are the strongest articles in the market. Both are scarce and prices firm. Billets are still in active demand and light supply. Premium prices are being obtained by the few mills in a position to make quick delivery. Structural steel is active and most of the mills are still far behind in their orders. Steel bars are about steady at 1.50c. Prospects for some of the mills closing down next month have given the whole market a decidedly firm tone.

New York. June 20.

Pig Iron—Selling has been moderate so far as foundry iron is concerned, and chiefly in small lots. There is quite a large demand for basic pig, however. The reports of weakness in Southern iron are less heard.

Current quotations for pig iron are, for New York or parallel delivery, in large lots:

Northern:	
No. 1 X foundry	$18.50@$19
No. 2 X foundry	18@17.50
No. 2 plain	17.50@18
Forge pig	16@16.50
Southern:	
No. 1 foundry	18@18.50
No. 2 foundry	17.50@18
No. 3 foundry	17@17.50
No. 4 foundry	16.50@17
No. 1 soft	18.25@18 50
No. 2 soft	17.50@18
Gray forge	16@16.50
Basic pig:	
Northern	17.50@17.75
Virginia	19.10
Alabama	18.25@18.50

City or local deliveries are not included in prices, which are for large lots, on dock or cars.

Cast-Iron Pipe—Prices are steady, the present basis being $30.50 per net ton for 6-in. pipe in carload lots, at tidewater points. The demand is strong, and higher prices are expected.

Bars—Business is better and prices are unchanged. For iron bars, 1.595@1.645c. is named, while steel bars are held at 1.645c. tidewater. Store trade is moderate at 1.75@2c. delivered.

Plates—Steel plates are in light demand. Tank plates are nominally 1.745@1.845c.; flange and boiler, 1.845@1.945c.; universal and sheared plates, 1.745@1.845c., according to width. Sales here are chiefly in small lots.

Structural Material—Prices are nominally unchanged. Beams under 15 in. are 1.845c. for large lots; over 15 in., 1.895c.; angle and channels, 1.845c., tidewater delivery. A large part of the business here is done by jobbers, who are asking 2.50c. for beams and channels out of stock.

Steel Rails—No change in standard sections. Light rails are in steady demand, prices are from $28 for 25-lb. up to $34 for 12-lb. rails. The demand for trolley rails is pressing. The price of $28 for

standard sections will extend into 1907. Open-hearth rails are quoted at $29 for standard sections.

Old Material—Business is good and dealers are stiff in their views. No. 1 railroad wrought is $19.50@20; No. 1 yard wrought, $17.50@18.50; machinery cast, $14.50@15; heavy steel melting scrap, $16@16.50. Old steel rails, $15.50@16.50, according to length. These prices are on cars, Jersey City or other terminal delivery.

Philadelphia. June 20.

The tone of the iron market is very strong, especially in basic and bessemer, in which exceptionally large transactions have been closed. It is understood today that some of the large consumers are not satisfied with the amount of iron they have contracted for, and are negotiating for additional quantities. There is also considerable activity in pipe iron and a number of large orders are reported on terms that are regarded as favorable by the buyers. The condition which is likely to affect the market is the blowing out of some furnaces for repairs. There is some demand for charcoal iron as well as for malleable. Prices have not been modified and quotations are given at $19.50 for best No. 1 foundry; No. 2 foundry has sold this week at $18.50 and No. 2 plain at $18, and these are regarded as the bottom prices. Standard gray forge is $16.50 and basic $17.75; low phosphorus is nominally $25. Bessemer is strong at $20 and charcoal has sold at $21.25.

Steel Billets—A few lots of forging billets sold at $32.50; open-hearth billets are strong at $29.

Bars—The bar-iron market has eased off a little and makers are soliciting business for early delivery. At the same time there is no shading of the usual quotations, which are 1.63½ to 1.68½. Soft steel is being called for and the business foots up to good figures, even though the individual orders are for small lots.

Sheets—The card rate is easily maintained at 2.40@2.80c. Some heavy sheets have been contracted for for prompt shipment. The retail local stores and the country stores are getting rid of a good deal of sheet iron.

Merchant Steel—Considerable merchant steel has been reaching this territory from the mills and it appears that the smaller consumers are pursuing a sort of stocking-up policy.

Pipes and Tubes—Merchant pipe is selling about as usual and boiler tubes are still as active as ever.

Plates—Large orders for plates are coming in. Prices are slightly shaded on large orders, but the tone of the market is strong.

Structural Material—Heavy orders are coming into our Pennsylvania structural mills and there is an increase in the number of smaller orders, such as come from engineers engaged in general construction work in cities. There is no quotable change in prices.

Steel Rails—The heavy requirements of the Pennsylvania Railroad for the next year, amounting to some 200,000 tons, have been practically taken care of by the mills which have had the contracts for years.

Old Rails—Old iron rails are wanted, with $20 offered and $20.50@21 asked.

Scrap—The past week has brought out more inquiry from the scrap buyers, but these inquiries have not developed into business. No. 1 steel scrap is wanted, but it cannot be had at less than $16, and no reported sale has been made at that figure this week. Railroad scrap is nominally $18, with very little to get, as most of it has been swept up lately. Machinery scrap is nominally $16, and is selling somewhere near that figure. Other kinds of scrap are fairly abundant, with a moderate business.

Pittsburg. June 19.

The heavy buying of bessemer pig iron during the past two weeks has practically cleaned up the available supply until Sept. 1, so far as the merchant furnaces are concerned. It is believed a large tonnage will go into the hands of middlemen, and will be held at much higher prices than have prevailed at any time this year. One large furnace interest declared that it could not furnish a ton of bessemer iron for delivery this or next month at $18.50, Valley. All sales made during the week were at $17.75, Valley, and one furnace rejected an order at 25c. a ton under that figure. Recent sales have been confined to lots of 200 and 300 tons, aggregating several thousand tons. Orders placed in the previous week amounted to over 130,000 tons. Inquiries are in for several large tonnages and contracts may be closed this week. The order for 90,000 tons by the Cambria Steel Company was for delivery through the second half and not for the third quarter, as was at first reported. It is expected that the Jones & Laughlin Steel Company and the Lackawanna Steel Company will come into the market for third-quarter iron, and it is reported that the United State Steel Corporation also will be a buyer. It was rumored today that the Corporation is negotiating for 80,000 tons for third quarter, but this lacks confirmation. One of the officials declared that nearly all of the Corporation's blast furnaces are in operation, producing over 600,000 tons of bessemer iron a month, and too much significance is attached to the purchases of outside iron. This enormous tonnage is going into immediate consumption, and if a furnace is forced to go out of blast it will be necessary to buy iron and this, it is believed, will not be difficult, despite the apparent scarcity. A positive statement was made today that it will be impossible to increase the production of bessemer pig iron owing to inability to get more bessemer ore. There is a good supply of other grades of ore, and there has been no difficulty in getting foundry iron for any delivery. The price of No. 2 grade declined to $16, Valley furnaces, owing to the poor demand; but business during the past few days shows some improvement, and one furnace interest today announced that it would not sell No. 2 at less than $16.50. The weakness in the market here is due to a threatened strike of the iron molders and coremakers which, if ordered, will close most of the foundries in this district. The Iron Molders' union of North America, is reported to be preparing for a struggle in the Pittsburg district and the National Founders' Association, it is said, will support the Pittsburg foundrymen.

In finished lines the demand continues, there being but few weak spots in the entire list. Consumers of steel bars who have been holding back orders for a concession in price are beginning to buy, and several large contracts have been placed. Iron bars show no improvement and can be had at 1.50c., Pittsburg, the same rate at which steel bars are held. There is a great demand for sheets and tin-plate, and all orders placed are at the advance made several weeks ago. The mills are about three months behind in deliveries, and all idle plants would be started if sheet and tin-bars could be obtained. The American Sheet and Tin Plate Company was forced to close its large Shenango works at New Castle on Saturday for repairs, and it is likely that some of the idle plants will be started, if it is possible to get the steel. The wire-rod trade has improved and a number of inquiries for large tonnages have been received. The large consumption of steel rails has increased the demand for railroad spikes and prices have been advanced $2 a ton, the minimum price being $2.15 per 100 lb. The plate market continues strong. The American Shipbuilding Company has taken orders for three additional lake vessels, and is about to place the orders for plates. Orders for structural material are still being placed for this year's delivery. The American Bridge Company has received a contract for 27,000 tons for the new Pennsylvania terminal in New York. This work will be turned out at its large shops at Ambridge, 20 miles below Pittsburg on the Ohio river.

An agreement was reached on the wage scale by the Republican Iron and Steel Company and the Amalgamated Association of Iron and Tin Workers on Saturday. The association made some concessions from the scale signed recently by the Western Bar-Iron Association, but all are in the steel departments. The principal one is a reduction of 6 per cent. in the bar mill scale for rolling, heating and catching. Concessions also were made in the

guide, 10-in., hoop and cotton-tie mill scale. At the conference with the American Sheet and Tin Plate Company the present sheet and tin-plate scale was reaffirmed for another year with some modifications in the foot notes. A conference is being held today with the independent sheet and tin-plate manufacturers and it is likely a similar agreement will be entered into.

Pig Iron—Sales of bessemer pig iron during the week amounted to several thousand tons but in small lots, the minimum price being $17.75, Valley furnaces. For foundry, furnaces are quoting $16.25@16.50, Valley furnaces. Gray forge is quoted at $16.35, Pittsburg.

Steel—The billet market is stronger, bessemer billets being firm at $27 and open-hearth at $28. Merchant steel bars remain at 1.50c. and plates at 1.60c.

Sheets—The demand exceeds the production and the mills are about three months behind in deliveries. Prices are firm at 2.50c. for black sheets and 3.55c. for galvanized sheets for No. 28 gage.

Ferro-Manganese—The market is strong and $80@85 is quoted for June and July delivery; $73@75 for the rest of the third-quarter.

Cartagena, Spain. June 2.

Iron and Manganiferous Ores—Messrs. Barrington & Holt report that shipments for the week were one cargo, 5900 tons dry ore and one cargo, 6200 tons Calasparra magnetic, to Rotterdam: One cargo, 3300 tons manganiferous ore, to Great Britain. The market has been firm, with good inquiry. Freight rates continue favorable to shippers, and it is as anticipated that they will remain so for some little time. This is due to the slackness of the Black Sea market, together with the increased tonnage which has been thrown onto the market owing to the new load line regulations, which enormously increase the carrying capacity of tonnage under the British flag.

Quotations are unchanged, at 8s. 8d@8s. 11d. for ordinary 50 per cent. ore; 9s. 2d.@9s. 5d. for special low phosphorus ore; 12s. 1d. for specular ore, 58 per cent.; 10s. 3d. for S. P. Campanil. Manganiferous ores range from 11s. 10d. for 35 per cent iron and 12 manganese up to 18s. 3d. for 20 per cent. iron and 20 manganese. All prices are f.o.b. shipping port.

Pyrites—Iron pyrites, 40 per cent. iron and 43 sulphur, are quoted at 10s. 8d. per ton, f.o.b. shipping port.

Chemicals.

NEW YORK, June 20.

Copper Sulphate—Quotations are unchanged, and there is nothing new to report.

Nitrate of Soda — Trade continues steady and prices unchanged, with 2.30c. per lb. quoted for 96 per cent.; 95 per cent. can be had for 2.50 to 5c. per 100 lb. less.

It has been claimed that valuable deposits of sodium nitrate exist in San Bernardino county, California. Some of these reports are of a very sanguine nature. From reliable sources it is learned that these deposits contain practically no nitrate of any commercial value. It is significant that three of the largest nitrate concerns in this country have investigated the field and have decided that there is no commercial value attached to the discovery.

Phosphates—J. M. Lang & Co. report shipments of high-grade Florida phosphates through the port of Savannah in May as follows: Germany, 15,009 tons; Italy, 2702; total, 17,711 tons.

Sulphur—Emil Fog & Sons write from Messina, Sicily, that shipments of Sicilian sulphur in April and the four months ending April 30 were, in long tons:

	1905.	1906.	Changes.
April	73,301	49,529	D. 23,772
Four months	219,850	182,266	D. 37,584
Visible stock, May 1	309,481	425,448	I. 115,967

There were no shipments to the United States this year. The circular, which is dated May 31, continues: "All the Italian chambers of commerce met in Rome to discuss the 'Consorzio obligatorio.' The necessity for such an extraordinary law was recognized by the majority, though there were some protests, especially from Milan. A committee was appointed to work with the minister, and the bill will probably be law by the end of June. The committee even proposes to include the stock of the Anglo-Sicilian Company in the enforced combination, in order to come to an agreement with Mr. Frasch; the justice of this decision may, however, be disputed. In consequence of this news our market is again looking up; the panic, which began to invade, is ceasing and a more hopeful aspect of affairs prevails. Moreover, the stock of brimstone belonging to dissidents is now practically cleared and there remains the immense stock of the Anglo-Sicilian, which for a long time could not sell, owing to its high prices. In all probability another period of high prices will follow and the legitimate demand for lower values made by industry will scarcely be listened to. The consumption of pyrites will continue to increase to the detriment of brimstone. Our legislators do not seem to realize that these measures will only prove a temporary cure and not a lasting remedy; the evil will break out anew, unless production and consumption be balanced. We know from good authority that pyrite-burners were ordered for South Africa; pulp mills under construction, for whose supply we were treating, gave us notice that they renounce sulphur and will use pyrites instead. Unfortunately, the Anglo-Sicilian has shown during the whole time an inexplicable indifference to all these vital questions."

Metal Market.

New York, June 20.

Gold and Silver Exports and Imports.

At all United States Ports in May and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
May 1906...	$5,716,898	$13,950,671	Imp. $28,233,773
" 1905 .	481,570	2 657 143	" 2,175,573
Year 1906..	28,349,072	59,239,334	" 30,890,262
" 1905..	35,800,708	14,460,402	Exp. 21,340,396
Silver:			
May 1906...	5,544,546	4,370,788	Exp. 1,173,758
" 1905 ..	5,426,590	3,742,113	" 1,684,477
Year 1906 ..	28,923,841	19 844,412	" 9,079,429
" 1905 ..	20.326,631	11,817,345	" 8,509,286

These statements cover the total movement of gold and silver to and from the United States. The figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending June 16, and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	$500	$ 155,708	$1,014,850	$ 34,356
1906.....	5,723,521	44,586,905	28,924,400	952,568
1905.....	33,118,146	5,344,890	14,815,651	1,752,709
1904.....	63,535,915	3,307,807	19,350,009	397,790

Exports of gold for the week were to the West Indies; of silver to London and Paris. Imports, both gold and silver, were from South America and Mexico.

The statement of the New York banks —including all the banks represented in the Clearing House—for the week ending June 16, gives the following totals, comparisons being made with the corresponding week of 1905.

	1905.	1906.
Loans and discounts..	$1,104,800,900	$1,060,076,300
Deposits.....	1,140,284,800	1,048,182,100
Circulation.....	47,359,000	48,487,400
Specie.....	205,857,400	185,357,000
Legal tenders.....	86,423,300	83,761,900
Total Reserve.....	$292,280,700	$269,118,900
Legal requirements....	285,071,200	232,045,525
Surplus reserve.....	$ 7,209,500	$7,073,375

Changes for the week this year were increases of $913,700 in loans, $1,945,600 in legal tenders and $1,046,000 in deposits; decreases of $1,172,600 in specie, $444,000 in circulation and $88,675 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world.

	Gold.	Silver.	Total.
New York.....	.....	.....	$185,357,000
England.... ...	$173,839,630	.....	173,839,630
France.....	588,390,395	$213,211,750	801,602,145
Germany	187,200,000	62,400,000	249,600,000
Spain.....	75,700,000	122,595,000	198,295,000
Netherlands...	27,609,500	28,785,000	56,394,500
Belgium.....	16,670,000	8,335,000	25,005,000
Italy.....	143,235,000	19,931,500	163,166,500
Russia..... .	501,455,000	28,625,000	530,080,000
Austria.	233,095,000	63,980,000	297,075,000

The returns of the associated banks of New York are of date June 16, and the others June 15. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows for the year to June 7:

	1905.	1906.	Changes.
India.....	£ 3,275,871	£ 8,245,113	I. £ 4,969,242
China.....	502,968	.....	D. 502,968
Straits..	2,800	1,750	D. 1,050
Total.....	£ 3,781,639	£ 8,246,863	I. £ 4,465,224

Imports for the week were £4000 from the Straits, £35,000 from the West Indies, £369,000 in bars and £30,000 in Mexican dollars from New York; a total of £438,000. Exports were £292,000 in bars and £339,000 in Mexican dollars; a total of £633,000, all to India.

Indian exchange remains steady, the Council bills offered in London having been taken at 16d. per rupee. Shipments of silver to India continue large.

The foreign merchandise trade of the United States for the five months ending May 31 is valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1905.	1906.
Exports.....	$619,815,537	$732,891,067
Imports.....	499.494,189	536.618,555
Excess, exports ...	$120,321,348	$196,272,512
Add excess of exports, silver....		9,079.429
Total.....		$205,351,941
Deduct excess of imports, gold..		30,890,262
Apparent export balance.....		$174,461,679

The gold and silver movement in detail will be found in the usual place.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars.....	$0.50¾	$0.53½
Peruvian soles and Chilean.....	0.46¾	0.49½
Victoria sovereigns.....	4.85¾	4.87¾
Twenty francs.	3.86	3.89
Spanish 25 pesetas...	4.78	4 80

SILVER AND STERLING EXCHANGE.

June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
14	4.86	64¼	29 1/16	18	4.85¾	65⅜	30¼
15	4.86	64¾	29 1/16	19	4.85¼	65¾	30⅜
16	4.86	65¼	30⅛	20	4.85¼	65½	30 1/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals.

Daily Prices of Metals in New York.

June	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
14	18⅝ @18⅞	18¾ @18⅞	84¾	38¾	5.75	6.17½ @6.20	6.05 @6.10
15	18⅝ @18⅞	18¾ @18⅞	84¾	38¾	5.75	@6.17½ 6.20	6.05 @6.10
16	18⅝ @18⅞	18¾ @18⅞	....	38¾	5.75	@6.17½ 6.20	6.05 @6.10
19	18⅝ @18⅞	18¾ @18⅞	82¾	39	5.75	6.17½	6.02½ @6.07½
20	18⅝ @18⅞	18¾ @18⅞	82 1/16	39	5.75	6.17½	6.02½ @6.07½
	18⅝ @18⅞	18¾ @18¾	84¼	38¾	5.75	6.17½	6.02½ @6.07½

London quotations are per long ton (2,240 lb) standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. The price of cathodes is usally 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting & Refining Co. for near-by shipments of desilverized lead in 50-ton lots, or larger orders. The quotations in spelter are for ordinary western brands; special brands command a premium.

Copper—The event of the week was the sharp break in the London standard market, which has had more or less effect upon the feeling here. Business, both for export and domestic consumption, has been dull. Offerings have been more liberal, especially for near-by shipments, and at slightly lower prices. The close is nominal at 18⅝@18¾ for lake and 18⅜@18½ for electrolytic in cakes, wirebars and ingots; 18⅛@18⅜ for casting copper.

After breaking toward the end of last week to the extent of about £4, there was a reaction in the London market, especially in the near-by options, the close being firm at £84 5s., but three months copper lags behind and closes at £81 2s. 6d.

Refined and manufactured sorts are quoted: English tough, £87@£87 10s.; best selected £88@£89; strong sheets, £97.

Exports of copper from New York for the week were 1678 long tons. Our special correspondent reports the exports from Baltimore for the week at 1423 long tons.

Tin—There was very little interest shown in the market, consumers covering only their immediate requirements. Prices have followed closely the fluctuations in London, where the market has moved within the narrow limits, the close being cabled at £175 5s. for spot, and £175 for three months.

Quotations here rule betwen 38½ and 38¾c.

Lead—The market presents no new feature, prices being maintained at the last level. The London market has declined somewhat further and quotations at the close are cabled as £16 15s. for Spanish lead, and £16 17s. 6d. for English.

St. Louis Lead Market—The John Wahl Commission Company telegraphs us on June 20 as follows: Lead is quiet. Missouri brands are selling at 5.90c., in a limited way.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of June 2, that silver has been 13.25 reales per ounce. Exchange has been 27.04 pesetas to £1. Lead has been 76 reales per quintal, equal, on current exchange, to £15 13s. 1d. per long ton, f.o.b. Cartagena. Exports were 200 tons argentiferous to Marseilles, and 210 tons desilverized lead to Hamburg.

Spelter—Following the activity of last week, the market has relapsed into utter dullness. Offerings are on a somewhat heavier scale, and prices have receded slightly, the close being barely steady at 6.02½@6.07½, St. Louis; and 6.17½ New York.

The London market is slightly lower at the close, quotations being £27 7s. 6d. for good ordinaries and £27 12s. 6d. for specials.

St. Louis Spelter Market—The John Wahl Commission Company telegraphs us on June 20 as follows: Spelter is firm, but quiet. The latest sales here are on a basis of 6.10c., East St. Louis.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of June 2 that the market remains steady and unchanged. Exports for the week were 585 tons of blende to Antwerp.

Zinc Sheets—The price of zinc sheets is $7.90 per 100 lb. (less discount of 8 per cent.) f.o.b. cars for Lasalle and Peru, in 600-lb. cases for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; and lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 lb. The fluctuations in the base price for sheet zinc since Jan. 1, 1906, have been as follows: Jan. 6, 1906, $8; Feb. 5, $7.75; May 18, $7.65; June 9, $7.75; June 18, $7.90.

Antimony—There is no change, the market remaining very much as quoted in last week's report.

Nickel—Quotations for large lots, New York or other parallel delivery, as made by the chief producer, are 40@45c. per lb., for large orders according to size of order and terms. For small lots, 50@65c. is charged.

Platinum—Demand is strong and steady. Prices are a little higher, $26 per ounce in New York. From $20 to 23 per ounce is paid for scrap platinum.

Quicksilver—The metal is firm and New York prices are still $41 per flask of 75 lb. for lots of 100 flasks or over, and $42 for small lots down to 10 flasks. For retail quantities, under 10 flasks, pound prices are charged, which work out to about $43 per flask. San Francisco prices are firm at $39.50 for domestic orders and $38 for export. The London price is £7 7s. 6d. per flask, but jobbers ask £7 10s. for moderate lots.

Aluminum—List prices of the chief maker are as follows, for ingots: No. 1, over 99 per cent. pure, 38c. per lb. in less than 100-lb. lots, 36c. in lots of 100 lb. up to one ton, and 35c. in ton lots; No. 2, over 90 per cent., 35c., 43c. and 33c., as above. Granulated metal is 1c. per lb. over price of ingots. Rolled sheets from 44c. up, according to size.

Wisconsin Ore Market.

PLATTEVILLE, JUNE 16.

The price of 60 per cent. zinc ore was raised from $2 to $3 per ton by the different buyers. The highest price reported was $48 per ton. All the principal buyers were out after ore. After going through the routine sampling, one of them raised the price of last week. The showery weather and unsettled condition of the roads prevented loading all the ore sold. The demand for pyritic ore was strong. The price of low-grade ore did not change as much in proportion as the high-grade.

Lead, owing to the small amount produced, did not cut any figure in the market this week. Sulphur is not over abundant and is selling well. The same is true of drybone.

The camps of the Platteville district loaded ore as follows during this week:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	146,300	.....	.....
Cuba City	427,000	.....	.....
Benton	281,100	.....	.....
Hazel Green-Buncombe	243,200	79,100	.....
Highland	183,240	.....	48,600
Linden	176,120	.....	66,620
Mineral Point	122,280	.....	.....
Rewey	101,000	.....	.....
Livingston	59,000	.....	.....
Montfort	.....	.....	65,000
Total for week	1,732,240	79,100	180,220
Year to June 16	31,168,960	1,683,600	3,032,680

Increasing attention is being paid to the production of higher grades of ore. Jigmen are becoming more and more accustomed to the improved methods, and consequently the ore continues to grade up. The yield of the week was a little below last weeks' shipment due to certain unavoidable local conditions.

Missouri Ore Market.

JOPLIN, June 16.

The highest price reported paid for zinc ore delivered this week was $49 per ton, but it is rumored that ore has been purchased for next week's delivery at $50 per ton. The assay basis price is $44@46 per ton of 60 per cent. zinc. The average price of all ores for the week was $43.76 per ton.

The highest price reported paid for lead was $83 per ton, at which price a large part of the product was marketed. The average price of all grades was $81.62 per ton.

Prices seem inclining toward the point from which they began receding in February, immediately after the announcement that an import duty would be collected on ores of zinc imported from Mexico. It is now probable that there will be a reorganization of producers with a provision in the by-laws prohibiting the mixing of politics and meddling in the outside business of the smelters, confining its objects to securing the most favorable prices, predicated on the local situation and general conditions.

Following are the shipments of zinc and lead from the various camps of the Joplin district for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Carterville-Webb City	2,005,900	498,280	$64,349
Joplin	2,306,240	265,630	64,065
Galena-Empire	1,207,140	142,490	31,232
Duenweg	819,840	216,010	26,892
Badger	693,780	.....	15,960
Neck City	658,510	.....	15,474
Oronogo	646,890	25,840	15,241
Prosperity	200,450	213,420	13,159
Aurora	522,000	.....	10,115
Granby	480,000	25,000	9,200
Carthage	244,040	25,200	6,767
Baxter Springs	241,800	.....	5,100
Alba	203,650	6,510	5,051
Spurgeon	155,770	34,630	3,880
Sherwood	63,370	14,640	2,058
Stott City	42,260	.....	929
Totals	10,491,640	1,462,420	$289,472
24 weeks	251,249,480	34,837,870	$6,743,646

Zinc value, the week, $229,608; 24 weeks, $5,417,821.
Lead value, the week, 59,864; 24 weeks, 1,325,825.

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1905.	1906.	Month.	1905.	1906.
January	52.00	47.38	January	61.50	75.20
February	52.77	47.37	February	57.62	72.83
March	47.40	42.68	March	57.20	73.73
April	42.88	44.63	April	58.00	75.13
May	43.31	40.51	May	58 27	78.40
June	40.75	....	June	57.80	....
July	43.00	....	July	58.00	..
August	48.83	....	August	58.00	....
September	46.75	....	September	63.50	....
October	47.60	....	October	63.86	....
November	49.55	....	November	68.67	....
December	49.00	....	December	76.25	....

Mining Stocks.

NEW YORK, June 20.

The stock market is still mainly given up to insiders, and is dull, with no strong undertone. Two many stocks are pegged at relatively high figures to make the market attractive.

Amalgamated Copper closed at $105 and American Smelting common at $148½, United States Steel finished at $38 for the common and $103¾ for the preferred. There was one sale of Homestake, of South Dakota during the week, at $82½ per share for 300 shares.

On the Consolidated Exchange there is some extension in the list of mining shares quoted. Among recent transactions noted are sales of Diamondfield at 36c.; Bullfrog National Bank, 45c.; Jim Butler, $1.22. Comstock shares were quoted at 19c., and bonds at 14c.; Savage, 75c.; Ophir, $3.75. Other quotations included 43c. for Elkton; $2.35 for Alice; $2.10 for Horn Silver; $2.50 for Ontario, of Utah.

On the curb, trading was irregular, but little strength was shown. With occasional upward spurts, there was a weak tone and downward tendency. Mining stocks were rather slow and not in demand. Greene Consolidated Copper closed at $25; Boston Copper at $27½; Mitchell Mining, $7¾; Nevada Consolidated, $18; Utah Apex, $6; while $31 was paid for Butte Coalition.

Boston. June 19.

The week's market in Boston mining shares has been tiresome and uninteresting. The public continues in an apathetic mood and cannot, apparently, be tempted into purchasing mining stocks. The break which started in the Wall Street market Thursday was reflected moderately in declining prices here, since which time the market has been somewhat uncertain and listless. Amalgamated, of course, has been the worst sufferer touching $103.50, against a close at $108.12½ a week ago. From the low price it recovered to $105. Copper Range is off $2.25 to $74.50. The Baltic, which is practically all owned by the Copper Range Consolidated, has declared a $6 dividend, against $7.50 last December. The Copper Range Company, also a subsidiary company of the Copper Range Consolidated, has declared $1.50, the first this year, and the Champion has declared its fourth $1 dividend this year. Copper Range Consolidated owns one-half of the latter company.

Bingham Consolidated is off $2.25 to $29.75. Although this company has never issued a report to stockholders, it is admitted that its earnings at present are its largest. Heinze is reported to be the owner of 30,000 shares of this stock costing about the present market price. Eventually the company is expected to go into a consolidation with the Balaklala and Davis-Daly Estates Companies. Mohawk ran off $2.75 to $64 on the general selling when there were no buying orders and Osceola broke $3.25 to $110.25. Quincy is off $5 to $93. Utah has been heavy, settling fractionally to $60.25. North Butte is off $2.75 to $87.75 and Old Dominion $3.25 to $38. Adventure settled to $5.75. Late reports state that the bottom of the shaft discloses the best ore vein yet. United States Smelting has lost almost $2 to $57.25.

Colorado Springs. June 15.

With but few exceptions Cripple Creek stocks have been inactive during the past week, and but few stocks have changed hands. Jennie Sample and Acacia have been in the most demand.

El Paso has declared a quarterly dividend of 1c. When the mine became flooded it was expected that dividends would cease until the unwatering of the mine, but it is reported that an average dividend of ⅓c. per month will be maintained.

San Francisco. June 14.

The stock market continues to show active fluctuations in the Tonopah and Goldfield shares, but the Comstocks are quiet. As was to be expected, the public trading is not large, people generally being busy elsewhere. Transactions are only on a moderate scale.

New Dividends.

Company.	Payable.	Rate.	Amt.
Beck Tunnel, Utah	June 20	$0 02½	$25,000
Central Coal & Coke	July 16	1.50	76 825
Central Coal & Coke, pfd	July 16	1 25	23,437
Daly West, Utah	June 15	0.60	108,000
Homestake, S. Dak	June 25	0 50	109,200
Mammoth, Utah	June 20	0.15	20.000
N. Y. & Hon. Rosario	June 23	0.10	15,000
Philadelphia Co	Aug. 1	0.75	434,296
Sloss Sheffield S. & I., pf	July 2	1.75	117,250
Swansea, Utah	June 20	0.01	5,000
Tenn. Coal, Iron & R. R.	Aug. 1	1.00	225,536
Tenn. C., I. & R. R., pf	Aug. 1	2.00	4 960
U. S. Smelting & Ref	July 16	0 87½	656,250
Utah Con., Utah	July 16	2 50	750,000
Va. Carolina Chem., pf	July 16	2.00	360,000

Assessments.

Company.	Delinq.	Sale.	Amt.
Alameda, Idaho	June 11	July 9	$0.04
Chollar	July 10	July 30	0 10
Dobson Pass, Idaho	June 19	July 19	0 01
Exchequer	July 11	Aug. 1	0.05
Lower Mammoth, Utah,	June 16	July 31	0.05
Mexican, Nev.	July 10	July 31	0.15
New Era, Cal.	June 16	Aug. 1	0.02
Silver Shield, Utah			0.03

Tonopah Stocks June 20.

(Revised by Weir Bros. & Co., New York.)

	High.	Low.	Last.
Tonopah Mine of Nevada	19.25	18.50	18.50
Tonopah Montana	2 88	2.83	2.85
Tonopah Extension	8.25	7.87½	8.12
Tonopah Midway	2.25	2.15	2.25
Tonopah West End	2.75	2.50	2.50
Goldfield Mining Co.	.46	.43	.43
Jumbo Mining	1.40	1.30	1.35
Red Top	1.50	1.40	1.45
Sandstorm	.60	.50	.50
Montgomery Shoshone Cons	16.00	15.37½	15.37½
Eclipse-Bullfrog	.88	.85	.85
Denver-Bullfrog	1.62	1.50	1.50

St. Louis. June 16.

Adams, $0.40—$0.25; American Nettie, $0.15—$0.12; Center Creek, $2.20—$2.00; Central Coal and Coke, $65 00—$64.50; Central Coal and Coke, pfd., $80.00—$79.00; Central Oil, $60.00—$65.00; Columbia, $5.00—$2.00; Con. Coal, $23.50—$22 00; Doe Run (old stock), $350.00—$325.00; Granite Bimetalic, $0.25—$0.20; St. Joe (old stock), $32.00—$30.00.

LONDON. (*By Cable.**) June 20.

Dolores, £2 1s. 3d.; Stratton's Independence, £0 4s. 6d.; Camp Bird, £1 5s. 6d.; Esperanza, £3 17s. 6d.; Tomboy, £1 5s. 0d.; El Oro, £1 6s. 3d.; Oroville, £0 18s. 0d.; Somera £0 3s. 9d.; Utah Apex £1 3s. 9d.

* Furnished by Hayden, Stone & Co., New York.

COLORADO SPRINGS. June 16.

Name of Company.	High	Low	Clg	Sales
Acacia	.13	.11½	.13	31,000
C. C. Con	.04¾	.04¾	.04¾	4,000
Elkton	.44	.43	.43	77,000
El Paso	.46	.41½	.43	11,550
Findlay	.75	.74½	.74½	3,500
Isabella	.24½	.22	.22	18,000
Mollie Gibson	.04½	.02	.04½	
Nevin	.03¾	.03½	.03¾	4,000
Pharmacist	.04	.04	.04	
Portland	1.50	1.50	1.50	4,200
Vindicator	.90	.85	.90	
Work	.10	.09¾	.10	9,500

SAN FRANCISCO. June 14.

Name of Company.	High	Low	Clg	Sales
Best & Belcher	.75	.76	.75	450
Caledonia	.40	.30	.30	1,600
Chollar	.09	.06	.06	3 500
Con. Cal. & Va	.85	.67	.69	6 900
Crown Point	.03	.02	.02	2,700
Gould & Curry	.12	09	.11	4 600
Hale & Norcross	.95	.85	.91	2,800
Mexican	.71	.65	.65	2,250
Ophir	3.95	3.60	3.60	2,350
Overman	.09	.07	.08	2,200
Potosi	.10	.06	.06	2,100
Savage	.82	.77	.80	2,900
Sierra Nevada	.22	.18	.18	4,200
Standard Con	1.76	1.76	1.75	
Bullfrog Mining	.42	.32	.32	14 400
Diamondfield	.38	.35	.37	13 782
Jim Butler	1.25	1.00	1.25	6,182
Kendall	.68	.67	.67	700
MacNamara	.87	.75	.85	31,350
Manhattan Dexter	.68	.63	.64	3,500
North Star	.45	.39	.43	15 600
Original Bullfrog	.16	.13	.13	17,000
Tonopah Belmont	6.87½	6.50	5.87½	3,300

STOCK QUOTATIONS.

NEW YORK. Week June 19

Name of Company.	High	Low	Clg.	Sales
Amalgamated	108¾	103¼	104⅝	462,225
Anaconda	269	245¾	248	158,700
Balaklala Mining	15⅝	14	14	
British Col. Copper	8	7⅝	7⅝	1,705
Butte Coalition	33¼	29¾	31⅜	3,400
Cum. Ely Mining	6¾	6⅛	6⅛	7,800
Greene Gold	3⅜	3⅛	3⅛	930
Greene Gold & Silver	2⅛	2	2	8,200
Guanajuato	5⅞	5⅜	5⅞	2,160
Micmac	4⅛	4⅛	4⅜	6,700
Mines Securities	⅛	⅛	⅛	500
Mitchell Mining	8½	7½	7½	3,225
Nev. Utah M. & S.	4	3¾	3⅞	5,420
Nipissing Mines	5⅛	5⅛	5⅛	17,720
Tennessee Copper	43⅛	41¾	41¾	650
Union Copper	1⅛	1¼	1⅛	5,905
Utah Apex	6¾	6	6	4,300

NEW YORK INDUSTRIALS.

Am. Smelting & Ref.	156¼	147¾	150	148,400
Am. Smelt. & Ref., Pf.*	119¾	116⅜	116½	2,200
Bethlehem Steel	31	27½	27⅜	1,100
Colo. Fuel & Iron	57½	50½	52⅜	105,250
Federal M. & S., Pf*	98¼	95¼	97⅛	1,600
Inter. Salt	34	33	33	3,880
National Lead*	76	71⅛	74	13,460
National Lead, Pf*	101	100½	100⅛	1,375
Pittsburg Coal	14	13⅞	14	950
Republic I. & S.	30⅝	28½	29	15,050
Republic I. & S., Pf*	105⅛	99	99	3,700
Sloss-Sheffield	78⅛	73	73½	4,400
Tenn. C. & I.	156	153	153⅝	1,100
U. S. Red. & Ref	39¼	36	36⅛	2,300
U. S. Red. & Ref., Pf.	80	78½	79⅛	2,300
U. S. Steel	40⅝	37¾	38⅝	372,050
U. S. Steel, Pf.	105⅞	103⅜	104⅜	69,420
Va. Car. Chem	42⅞	40	40	10,045

* Ex. div.

These stocks, not elsewhere quoted, had the following range of prices during the week: (New York) Atlanta, .19½—.16½; Bamb. Delamar, 7; Comstock, .20½—.19; Gugg. Exp, 284½; Mont. Sho. Con. (New), 16—15¾; St'd Oil, 620—610. (Boston) Ahmeek, 80—79; Ariz. Com'l, 49—47; Black Mt., 9¾—9½; Cal. & Pitts., 31½; East Butte, 10½—9⅛; Keweenaw, 11; Lake S. & Pitts., 32¼; Majestic, 1⅝—1½; Pitts. & Dul., 20; Raven, 2½—1½; Shawmut, 1⅝—1; Superior Cop. 14—13; Troy, 3—2¼.

BOSTON.

Adventure	6½	5¾	6	120
Allouez	38¼	36	37	175
American Zinc	9½	9⅜	9½	
Atlantic	13¼	12¾	12¾	660
Bingham	32¼	29¾	30	2,810
Boston Consolidated	30	27¾	27¾	7,600
*Calumet & Arizona	112	111	111	185
*Calumet & Hecla	695	685	695	61
Centennial	23	21½	22	1,615
*Copper Range	76¾	74¼	76¼	3,971
*Daly-West	16¼	15⅜	15⅞	58
Franklin	18⅛	17⅛	18¼	1,865
Granby	12½	11⅜	11⅞	833
Greene Consolidated	25¾	24¾	25	3,474
Isle Royal	19¼	18	18½	400
Mass	8⅛	7¼	8¼	366
Michigan	12¾	10¾	11¼	545
Mohawk	67	63¼	64	1,341
Mont. Coal & Coke rcts.	3	2½	2¾	600
Nevada	19	17¾	18¾	1,590
*North Butte	91¼	87½	88¾	6,813
Old Dominion	41⅛	38	38½	1,011
Osceola	111	107	107½	1,429
*Parrot	28	27	27¼	1,355
Quincy	97	92	92	141
Rhode Island	6	4½	4½	245
Shannon	8¾	8	8¼	5,752
Tamarack	95¾	95	95	161
Tecumseh	12	10¾	11	997
Trinity	9	7¾	7⅞	3,540
United Copper, com.	64	61¼	61¾	4,075
U. S. Oil	11¾	11¼	11¾	445
U. S. Smg. & Ref.	69⅛	67	57¼	3,757
U. S. Smg. & Ref., pfd.	47	46	46	1,616
Utah Copper	61⅛	60¾	60¾	6,171
Victoria	8½	8	8	1,223
Winona	6½	6	6¼	280
Wolverine	137¼	136	136	56

PHILADELPHIA. June 19.

Name of Company.	High	Low	Clg.	Sales.
American Cement	7½	7⅛	7½	530
Cambria Steel	37⅛	35½	35⅝	10,489
General Asphalt	39	39	39	
Penn. Steel, pd	106⅛	106	106⅛	110
Philadelphia Co	51	50	50⅜	660
Tonopah Mining	19⅜	18⅛	19	3,685

PITTSBURG. June 19.

Crucible Steel	13¾	11½	11½	908
Crucible Steel, Pf.	80½	76¾	76¾	1,779
Harbison-Walker Ref.	11⅛	11	11	420
Ohio Tonopah	.27	.26	.27	3,950
Tonopah Ext	9	7⅞	8	2,025

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1905.	1906.	1905.	1906.
January	60.690	65.288	27.930	30.113
February	61.023	66.108	28.047	30.464
March	58.046	64.597	26.794	29.854
April	56.600	64.765	26.108	29.984
May	57.832	66.976	26.664	30.968
June	58.428	.....	26.910	.....
July	58.915	.....	27.163	.....
August	60.259	.....	27.822	.....
September	61.695	.....	28.528	.....
October	62.034	.....	28.637	.....
November	63.849	.....	29.493	.....
December	64.850	.....	29.977	.....
Year	60.352	.....	27.839	.....

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, .925 fine.

COPPER.

	NEW YORK.				LONDON.	
	Electrolytic.		Lake.			
	1905.	1906.	1905.	1906.	1905.	1906.
Jan	15.008	18.310	15.128	18.416	68.262	78.896
Feb	15.011	17.869	15.136	18.116	67.963	78.147
March	15.125	18.361	15.250	18.641	68.174	81.111
April	14.920	18.375	15.045	18 688	67.017	84.793
May	14.627	18.457	14.820	18.724	64.875	84.867
June	14.673	.....	14.813	.....	65.881	.....
July	14.888	.....	15.005	.....	66.887	.....
Aug	15.664	.....	15.725	.....	69.830	.....
Sept	15.965	.....	15.978	.....	69.667	.....
Oct	16.279	.....	16.332	.....	71.406	.....
Nov	16.599	.....	16.758	.....	74.727	.....
Dec	18.328	.....	18.398	.....	78.993	.....
Year	15.690	.....	15.699	.....	69.465	.....

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan	29.325	36.390	July	31.760	.....
Feb	29.262	36.403	August	32.866	.....
March	29.523	36.662	Sept	32.095	.....
April	30.525	38.900	Oct	32.481	.....
May	30.049	43.313	Nov	33.443	.....
June	30.329	.....	Dec	35.835	.....
			Av. year.	31.358	.....

Prices are in cents per pound.

LEAD IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan	4.552	5.600	July	4.524	.....
Feb	4.450	5.464	Aug	4.665	.....
March	4 470	5.350	Sept	4.850	.....
April	4.500	5.404	Oct	4.850	.....
May	4.500	5.685	Nov	5.200	.....
June	4.500	.....	Dec	5.422	.....
			Av., year.	4.707	.....

Prices are in cents per pound. The London average for January, 1906, was £ 16.850 per long ton; February, £ 16.031; March, £ 15.922; April, £ 16.859; May, £ 16.725.

SPELTER.

Month.	New York.		St. Louis.		London.	
	1905.	1906.	1905.	1906.	1905.	1906.
Jan	6.190	6.487	6.032	6.337	25.062	28.225
Feb	6.139	6.075	5.989	5.924	24.694	25.844
Mar	6.067	6.209	5.917	6.056	23.825	24.563
April	5.817	6.078	5.667	5.931	23.813	25.781
May	6.434	6.997	5.284	5.846	23.594	27.000
June	5.190	.....	6.040	.....	23.875	.....
July	6.396	.....	5.247	.....	23.938	.....
Aug	6.706	.....	5.556	.....	24.675	.....
Sept	5.887	.....	5.737	.....	26.376	.....
Oct	6.087	.....	5.934	.....	28.225	.....
Nov	6.145	.....	6.984	.....	28.500	.....
Dec	6.522	.....	6.374	.....	28.719	.....
Year	6.882	.....	5.730	.....	25.433	.....

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2,240 lb.) good ordinary brands.