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Operating Companies of Birmingham District

Total Annual Pig Iron Capacity of 27 Furnaces in District nearly 2,000,000 Tons. Steel Corporation Controls Half of Entire Output

BY JOHN LEGGETT PULTZ*

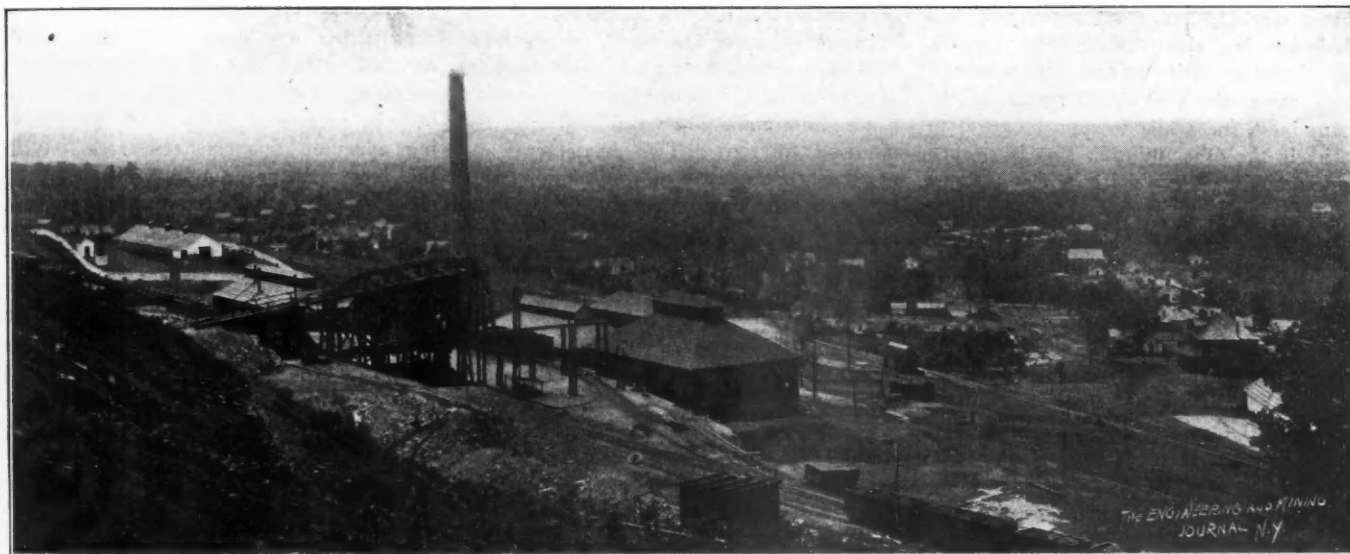
There are 27 furnaces within the limits of the Birmingham district proper. Although the combined annual capacities of these furnaces exceed 2,000,000 tons, the largest production of pig iron for Alabama amounted to 1,651,533 tons in 1907, while owing to the recent depressed condition of the iron market, it was reduced in 1908 to 1,397,014 long tons. There are eight furnaces located in Birmingham, six at Ensley, five at Bessemer, three at Thomas, three at Woodward, and two at Oxmoor, while the Southern Iron and Steel Company, and the Central Iron and Coal Company have

THE UNITED STATES STEEL CORPORATION

In 1907, the United States Steel Corporation acquired the Tennessee Coal, Iron and Railroad Company, comprising extensive holdings of coal and iron lands in Alabama, Tennessee, and Georgia and a number of furnace, steel and coke operations in the Birmingham district. The company owned 327,784 acres of coal territory in Alabama and Tennessee. This large acreage is equivalent to over 500 square miles and is more than double the acreage of coal properties held by the Steel Corporation in the northern fields. Of this acreage, there are approxi-

500,000 tons by the purchase of the Tennessee company, the output of which amounted in 1908, to 3.2 per cent. of the total production of pig iron in the United States, 4.4 per cent. of the country's production of open-hearth steel, and 2.5 per cent. of the entire production of open-hearth and bessemer-steel ingots. The company produced 1,576,757 tons of ore from its red and brown ore mines in Alabama in 1907 and 1,533,402 tons in 1908.

The red-hematite properties are situated on Red Mountain. They consist of the Muscoda group of five active and one in-



TENNESSEE COAL, IRON AND RAILROAD COMPANY'S TIPPLE AND POWER HOUSE ON ROUND MOUNTAIN, NEAR BESSEMER, ALABAMA

furnaces just outside the district at Trussville and Holt respectively.

The principal steel- and iron-producing operations of the district are those of the United States Steel Corporation, the Republic Iron and Steel Company, the Sloss-Sheffield Steel and Iron Company, the Woodward Iron Company, the Birmingham Coal and Iron Company, and the Southern Iron and Steel Company. Owing to the depressed condition of the iron market and the strike in 1908, I give the outputs of the different operations for 1907 as being more nearly characteristic of their actual capacities.

*Consulting engineer, 165 Broadway, New York, N. Y.

mately 100,000 acres owned in the Warrior coalfield in the vicinity of Birmingham and Bessemer, while large tracts are located on the Southern and Frisco systems some distance northeast of Birmingham. It owns a large acreage of red-hematite property located near Birmingham and Bessemer, operates extensive brown-ore deposits in the vicinity of Woodstock, and several limestone quarries near its numerous furnace plants.

The blast furnaces of the Steel Corporation in the Birmingham district have an annual capacity of more than 1,000,000 tons of pig iron which is 50 per cent. of the total output of the district. The steel capacity of the corporation was increased

active mine openings, the Fossil group of four active mine openings, the Ishkooda group of four active mines, and one inactive mine at Green Springs. The company owns, jointly with the Republic Iron and Steel Company, the red ore of the Potter estate. The greater portion of the ore supplying the furnaces of the corporation comes from these mines. Extensive improvements in the development of new mines were made last year, among them the opening and equipping of the No. 7 and No. 9 slopes of the Fossil group, and the No. 13 and No. 14 slopes of the Ishkooda group.

The brown-ore deposits occur at Greely about 30 miles southwest of Birmingham,

where there are three active mines in the Greely group and one active mine in the Champion group, the latter opened during 1908. The mines at Greely produced 132,088 tons of brown ore during 1907. Brown-ore pockets are also owned in Georgia.

The coal properties comprise a very large acreage in the Warrior and Cahaba coalfields, and in Tennessee, but those in the Warrior coalfield are the only ones lying within the limits of the Birmingham district. In 1907, the Alabama mines of the Tennessee Coal, Iron and Railroad Company produced 3,362,649 short tons of coal or over 23 per cent. of the entire output of the State for that year. This tonnage comprised the combined outputs of twenty-two mines. Four of these mines are located in the Cahaba field and their production amounted to 393,689 short tons. The greater part of this coal was sold in the open market for domestic and steam purposes. Thirteen mines worked the Pratt seam and produced 1,918,446 short tons of run-of-mine; three mines on the Blue Creek seam produced 690,486 short tons, while the Henry Ellen and Gamble mines produced 38,997 and 80,931 short tons from the Mammoth and Big seams respectively. Of the thirteen mines working the Pratt seam, one is a shaft opening, eight are opened by slopes, and four are drift mines. In seven of these mines the average thickness of the seam is 48 in., while it runs from 36 to 46 in. in the other mines. The Blossburg mines consist of two drifts and one slope. In the slope mines working the Blue Creek seam, the coal is about 9 ft. in thickness.

The company has 3304 coke ovens in Alabama including 240 Semet-Solvay ovens at the Ensley plant and produced 852,788 tons of coke in 1907. The 1907 output of coke amounted to over 30 per cent. of the total production of the State and was chiefly made from Pratt seam coal.

The furnace plants and steel operations belonging to the Steel Corporation are located at Birmingham, Bessemer, Ensley and Oxmoor. The output of these plants consists of foundry pig, forge, mill, basic, ferromanganese, spiegeleisen and numerous steel products. The total annual capacity of the steel plants is estimated at 670,000 long tons of open-hearth steel ingots, about 10,000 tons of steel castings, 600,000 tons of steel rails, and 60,000 tons of finished iron and steel products.

FURNACE AND STEEL PLANTS OF THE STEEL CORPORATION

The Alice furnace plant is located at Birmingham. It consists of one stack 75x18 ft. and six Whitwell stoves. The furnace is run on a mixture of red and brown ore and Pratt coke and has a capacity of over 70,000 tons of foundry and forge pig iron.

The plant at Bessemer has five stacks and a capacity of about 288,000 tons of foundry and forge pig iron. Two stacks are 75x16 with eight stoves, two 75x17 with eight stoves, and one 60x12. The stoves are all of the Whitwell type. The plant has a plate mill producing light and heavy plates up to 65 in. and two mills producing merchant bar, hoop and cotton ties. Light rails are also turned out. The annual capacity of the plant is rated at 60,000 tons.

The Ensley operation is the largest in the South. It has six blast furnaces with a capacity approximately of 600,000 tons. There are four stacks 80x20, one 85x20, and one 86½x20¾. Furnaces No. 1 and 2 have each four Gordon-Whitwell-Copper stoves; Nos. 3, 4 and 5 have four Massicks and Crooke stoves, and No. 6 furnace has four Kennedy two-pass stoves. The casting department of the Ensley plant was constructed in 1900 and has a capacity of about 10,000 tons. It has one basic open-hearth steel furnace of 15 gross ton capacity. Car couplers, gears, rolls, engine parts and other steel castings are turned out.

The steel-works division at Ensley secures its metal from the furnaces in connection with the plant. The equipment comprises eleven basic open-hearth furnaces of 50 gross tons each, one coal reheating furnace, five 4-hole soaking pits, one blooming mill, and one rail train with a roughing mill. The rail mill was remodeled in 1907. Two bessemer converters are operated in conjunction with the open-hearth steel departments and are used for desiliconizing and decarburizing molten iron for the open-hearth furnaces. The company expended \$1,441,335 in 1908 in connection with the installation of a new open-hearth steel plant, the improvements of the blooming and rail mill, and the erection of two new 60-ton open-hearth furnaces, all of which construction work was started in 1907.

The Oxmoor furnace plant consists of two alternate stacks 75x17 and is rated as having a capacity of 120,000 tons per annum.

By the purchase of the Tennessee Coal, Iron and Railroad Company, the Steel Corporation more than doubled its acreage of coal territory held in the northern fields and added greatly to its iron resources; its capacity of pig iron was increased by 1,000,000 tons annually, equivalent to 6¾ per cent. of its present total capacity of pig iron. In the past, the extensive acreage of undeveloped mineral lands held by the Tennessee company necessitated high fixed charges and prohibited the attainment of as high an economic efficiency as is possible with furnace operations having a reserve tonnage of raw materials based on the probable life of the plant. This condition could only be relieved by an increase in production

which, in turn, required the expenditure of large sums for the development of new mines and the construction of additional furnace equipment. After the Steel Corporation acquired the southern properties, the improvements necessary to increase the production were immediately commenced. During 1908 \$3,460,933 was expended in connection with the Tennessee company and was distributed as follows: Manufacturing plants, \$2,399,266.83; ore, coal, and limestone properties, \$831,474.41; Birmingham Southern Railway, \$139,737.57; sundry real estate, \$90,514.19; total, \$3,460,993. It is probable that this amount will be increased in the future, owing to the fact that an increased production means a proportional reduction in the fixed charges per ton of pig iron.

The coal reserves undoubtedly exceed the actual fuel requirements necessary for the treatment of the large tonnage of ore reserves. It is therefore to be supposed that the open coal markets will be entered on a larger scale than in the past.

The purchase of the Tennessee company by the Steel Corporation will be a great advantage to the Birmingham district. The fact that such a large acreage of mineral lands had been held in an undeveloped state, naturally retarded the rapid growth of the region. The necessity for further development has been demonstrated and the large expenditures necessary for these improvements can only be accomplished by a company having adequate financial resources. With the increased production will come the necessary extension of the now somewhat limited market for Birmingham products. This in itself can only be undertaken by an efficient organization with a systematic and far reaching sales department for the marketing of its output.

In the past, American coal, iron and steel were only exported during periods of extreme depression in the home markets. This intermittent process was not conducive to securing the confidence of foreign consumers. Within the last few years, however, the Steel Corporation has endeavored to establish a permanent export trade; in 1908 it amounted to 12.4 per cent. of the entire shipments of rolled and other finished-steel products of that company. An important factor in maintaining a successful position in highly competitive markets is having advantageous transportation facilities. In the North the policy of the Steel Corporation has been to own its own roads for the transportation of raw materials. The Birmingham district has the advantage of the low water transportation to the Gulf. The initial cost and the maintenance of this river service will be moderate compared to the construction, equipment and operating costs of one of the Steel Corporation's ore roads in the North. It has already been shown, in my previous article on "Economic Features of the Birmingham

ham District," that low ocean rates on pig iron should be had from the Gulf and Atlantic coasts to foreign ports, and there is good reason to believe that the Birmingham district will become a powerful factor in this trade.

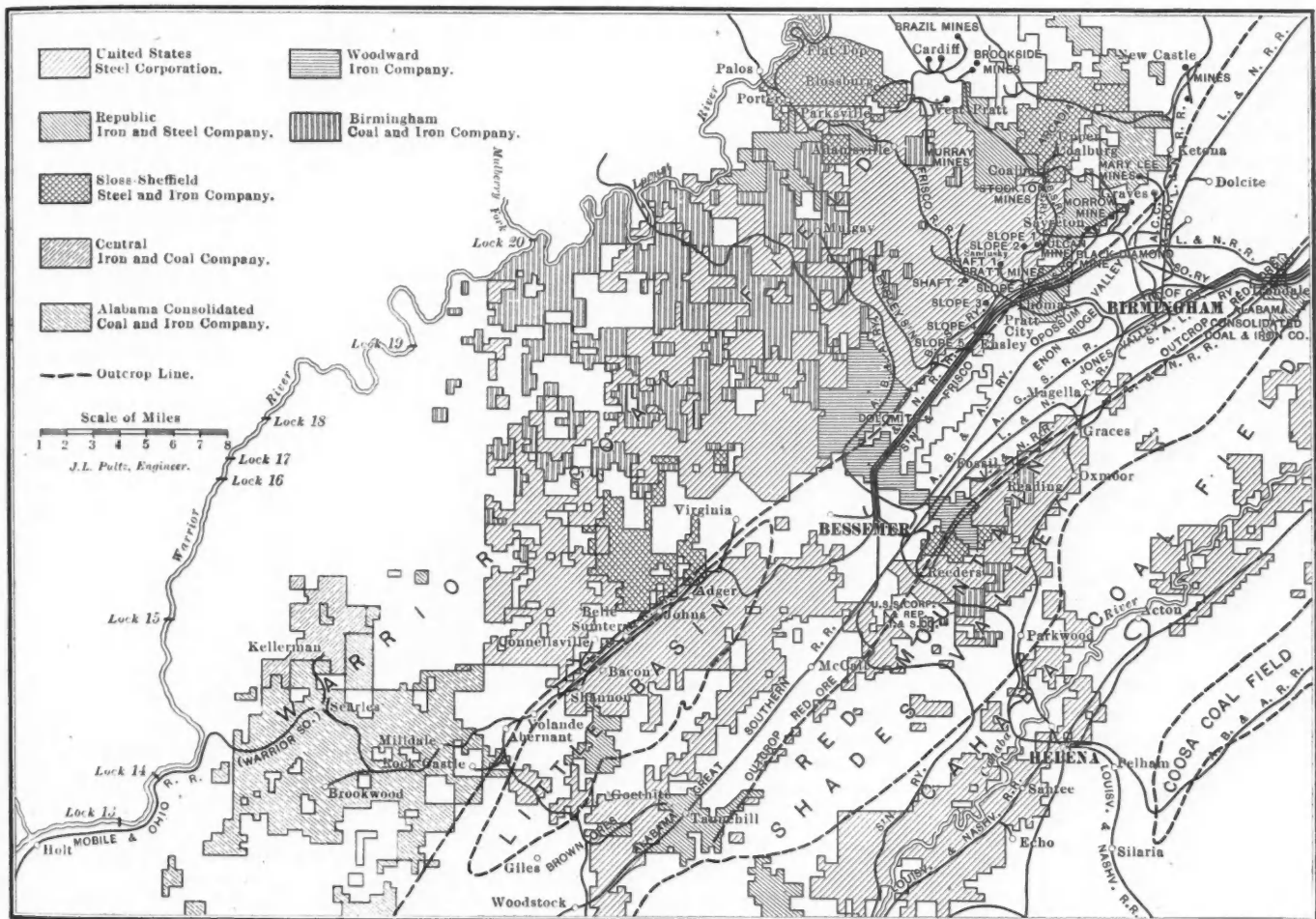
The active interests which the Steel Corporation has assumed in the South will mean much for the future development of the Birmingham district. In 1908, the Steel Corporation expended \$18,733,841 on its Gary, Ind., plant, while the total expenditure made by the subsidiary companies during the year for additional property, construction and improvements, including outlays for account of the Gary

THE SLOSS-SHEFFIELD STEEL AND IRON COMPANY

The holdings of raw materials comprise a large acreage of ore, coal and limestone properties in Alabama. The total annual capacity of the seven furnaces owned by the company is 435,000 tons of foundry and forge pig iron, which is divided about equally between the furnace plants located at Birmingham and at Sheffield in the extreme northern portion of the State, in conjunction with which the company operates the Russellville brown-ore deposits.

The Birmingham plant consists of four stacks, furnaces Nos. 1 and 2 are 82½x18;

ties. They have been developed by 14 mines, the outputs of which are tributary to the Southern and Frisco railroads. The 1907 coal production of the twelve working mines amounted to 1,237,499 short tons of run-of-mine. Of this tonnage 679,620 tons was produced from the three mines working the Big seam, 470,659 tons from the eight openings on the Pratt seam, and 97,220 tons from the mine on the America seam. The Big seam averages 9 ft. in thickness, the Pratt seam ranges from 3 to 4 ft., and the America seam where it is worked averages 4 ft. The coking plants consist of 1438 ovens and the output of coke for



SKETCH-MAP OF THE BIRMINGHAM DISTRICT, SHOWING SOME OF THE MINERAL LANDS HELD BY THE PRINCIPAL COMPANIES

plant and for the Tennessee Coal, Iron and Railroad Company, amounted to over \$60,000,000. It is probable that in the future a substantial amount of the funds set aside for these expenditures will be directed toward the southern properties. The general policy of the Steel Corporation with respect to the Birmingham district, appears to be aimed more at the development of the present resources than at the absorption of new operations, a policy which if carried into effect should stimulate the wholesome and widespread development of the district and create a more far reaching market for Birmingham products.

No. 3 is 73x17½; and No. 4 is 8½x17½. There are twenty stoves, thirteen being of the Whitwell-Cowper types. Recently the No. 3 is 73x17½; and No. 4 is 82½x17½. repairs and improvements, including the erection of three new stoves, etc. Additions were also made to the No. 4 furnace.

The red-ore mines are on Red mountain near Irondale. The company also owns a large acreage on the Big seam, on Red mountain opposite Bessemer. In 1908, a new slope was opened on the Irondale seam and should become an important producer.

The coal properties are in the Warrior field in Jefferson and Walker coun-

ties. The 1907, amounted to 503,705 tons; the company ranked third in the production of coal and second in the production of coke for the entire region.

THE REPUBLIC IRON AND STEEL COMPANY

The red- and brown-ore properties of this company include four slopes known as the Alfretha group, three on the Raimund group, and also mines at Houston, Tannehill and Spaulding. A half interest in the Potter Ore Company is held jointly with the Tennessee Coal, Iron and Railroad Company.

The limestone quarries are operated

near Birmingham, the lands being owned in fee simple.

The coal properties are in the Warrior and Cahaba coalfields. The output of the mines operated by the company amounted to 759,865 short tons in 1907, which was the fourth largest output in the State. The mines are at Warner, Sayreton and Thompson in the Warrior field. The Warner operation consists of one slope and six drifts. The seam worked is the Pratt and averages 4 ft. in thickness. This mine produced 405,847 short tons in 1907, of which 10,475 tons were nut and steam coal. The Pratt seam is also mined by a single drift opening at Thompson, where it has about the same thickness. In 1907 the output of this mine was 48,241 short tons. The Mary Lee seam has been opened by a slope at Sayreton. The seam is about 84 in. in thickness and produced 305,782 tons in 1907. The Warner and Thompson mines are situated on the Southern and the Birmingham Southern railroads respectively, while the Sayreton workings are reached by the company's private railroad. There are 1010 coke ovens of the beehive type, 910 of which are located at Thomas and 100 at Warner. The capacity of these ovens is 606,000 tons per annum.

The furnace equipment includes three stacks 90x18½ each, with twelve Massicks and Crooke stoves. The capacity of the plant is 250,000 tons of pig iron which is equivalent to about 28 per cent. of the total production of the Republic company. The company ranks among the leading iron-producing operations of the Birmingham district. At the Gate City works bars, bands, hoops, rails, angles and light channels are turned out. This plant has an annual capacity of 24,000 tons. The Birmingham mill has an output of approximately 70,000 tons. It produces iron and open-hearth steel bars, plates, sheets, angles, fish plates, railroad spikes, light rails, etc.

THE SOUTHERN IRON AND STEEL COMPANY

The furnace operations of this company are at Chattanooga, Gadsden, Rising Fawn and Trussville. It has an annual capacity of 320,000 tons of pig iron. The only furnace operation in the Birmingham district is at Trussville, about 12 miles northeast of Birmingham. The company operates a mill at Ensley. The annual capacity of this plant is about 100,000 tons of rods, 130,000 tons of wire, and 1,000,000 kegs of wire nails. This operation was acquired from the Alabama Steel and Iron Company.

THE BIRMINGHAM COAL AND IRON COMPANY

The Birmingham Coal and Iron Company has one 75x15¾ stack at Birmingham, and an 85x20 one at Bowles. The latter stack has four Whitwell stoves

85x20. The annual capacity of the operation is 134,000 tons. The company owns red-ore property on Red mountain and a large acreage of coal lands in the Warrior field. At Mulgay, about seven miles northwest of Ensley, a shaft has been sunk and the Pratt seam is being developed on an extensive scale.

ALABAMA CONSOLIDATED COAL AND IRON COMPANY

The Alabama Consolidated Coal and Iron Company has extensive holdings of coal lands in the Warrior field. Its red-ore properties are on Red mountain near Irondale, and in the northern portion of the State. The company has an annual pig-iron capacity of about 300,000 tons. The furnaces are situated at Iron-ton and Gadsden. It is one of the largest producers of coal, coke and iron in the State. Its coal mines are located at Cordova, Mary Lee, Brookwood and Searles, and in 1907 the company produced 688,048 tons from the Brookwood, Milldale and Mary Lee seams.

THE WOODWARD IRON COMPANY

The Woodward Iron Company, considered with respect to its furnace plant and raw-material resources, has probably the best situation in the country. Its ore properties are situated on Red mountain just north of Bessemer, and the holdings of the company extend in an unbroken chain across the valley to its coal territory in the southeastern edge of the Warrior field. The distance in an air line from the outcrop of the Big seam on Red mountain to the coal measures is about 4½ miles. The furnace plant is located in about the center of the valley and is connected with the sources of supply of raw materials by the company's own railroad. The distance by rail from the furnaces to the ore and coal is not greatly in excess of three miles. The proximity of the furnace to the raw materials and the favorable mining conditions, together with the character of the ore, has enabled this operation to attain a very high economic efficiency.

The furnace plant has three stacks. No. 1 stack has four Whitwell stoves; No. 2, one Whitwell and four Foote stoves; and No. 3, five Whitwell stoves. The capacity of the operation is 250,000 tons of basic, foundry, and forge pig iron. Transportation facilities are afforded by the Louisville & Nashville, Alabama, Great Southern, Southern, and Frisco lines.

In 1907, the company mined 424,032 tons from its two slope openings on the Pratt seam, which at one of these workings is about 52 in. thick. The battery of 674 beehive ovens produced 213,201 tons in the same year.

PROSPECTS OF THE REGION

In anticipating the future development of the Birmingham district, the fact that

the reserve tonnage of coal is far in excess of the reserve tonnage of red hematite, is an important consideration. It has been estimated (Ernest F. Burchard, *Bulletin* 340, U. S. Geological Survey) that the red-ore reserves in the district, workable under present conditions, amount to over 380,000,000 short tons and that this tonnage is probably 90 per cent. of the workable red ore of the State. On the basis of the present output of red ore, Mr. Burchard estimates the reserves will last for 75 to 100 years. The production of pig iron will probably be increased to some extent, principally by the larger output which conditions appear to show the United States Steel Corporation will attain. The Warrior coalfield has a known area of 3000 square miles and is capable of furnishing many times its present output for centuries to come. The Cahaba field has also a large reserve tonnage and will have a constantly increasing production. The reserves of iron ore are comparatively small considering the estimated life of the workable coal seams. Consequently it appears that the future development of the natural resources, within the limitations of the Birmingham district, will be most actively carried on in the coalfields.

The coals mined on an extensive scale in the Warrior and Cahaba fields are excellent domestic, steam, and furnace fuels. The low initial cost of transportation to the Gulf and South Atlantic ports must necessarily make these fuels strong competitors in a market which promises an outlet for a constantly increasing production.

It seems to be settled that the War Department is powerless to stop work on the big debris-settling basin being built at Hammonton, Cal., on the Yuba river, though the farmers are making a determined protest against it. Nothing short of new legislation by both State and Federal governments can prevent the California Débris Commission from going on with the work now under way. The money was appropriated by the State and Federal governments jointly. The engineers consider that the objections brought against the plan are frivolous and not based on any proper understanding of the subject.

While the United States company's lead smeltery at Bingham Junction, Utah, is running at nearly full capacity, little smoke is emitted from the large stack and the noxious fumes are practically eliminated. The farmers of the district who annually carried their crop of damage suits to the United States courts are no longer able to reap their former harvest from this source. The baghouse system is making a commercial saving of products which were formerly carried away.

The Theory of Blasting with High Explosives

Important to Ascertain Grain of Rock; Greatest Efficiency by Placing Bore Holes Parallel to Fracture Planes; Underhand Stopes Preferable

BY H. MUSSON THOMAS*

Until the fundamental principles of efficient breaking are ascertained, I do not think much progress will be noticeable in breaking ground by first determining the burden, length and diameter of hole, and quantity of dynamite for a particular stope width. The real crux of efficient breaking is to discover the tendency of the conglomerates and the country rock to break more easily in one direction than in any other; in other words (expressed in miners' phraseology), to find the grain of the rock. Although the illustrations show benches for machines, the principles apply with equal force to hammer benches. They also apply more particularly to stopes in which the dip is less than 40 deg. A very common question is: Should a particular stope

direction is determined entirely on that consideration. The full significance of the local occurrence of fracture planes is not generally appreciated and has not, to my knowledge, been thoroughly investigated in any of our mines.

The tightness of rock or the resistance to breaking is due to the following causes, in their order of importance: (1) Drilling across fracture planes or lines of weakness; (2) Rolls or irregularities in the footwall and hanging-wall; (3) A tight or frosted hanging and footwall; (4) The toughness of some rock as opposed to the brittleness of other rock.

DRILLING ACROSS FRACTURE PLANES OR LINES OF WEAKNESS

It will be found on examination in

nounced after blasting, and they naturally run parallel to the fracture planes. I have also noted two other series of planes which strike at approximately 45 deg. to the fracture plane on either side of this plane, but, fortunately, they are not so well defined nor so universal as the fracture planes. Faulting planes which throw the reef, but do not necessarily run parallel with each other, must not be confused with fracture planes.

In rock breaking these fracture planes may be used to produce increased efficiency. Not taking them into consideration, their existence will undoubtedly hinder efficiency.

In a stope, of the six sides of a bench, four are bound and the other two are free. The section at right angles to the

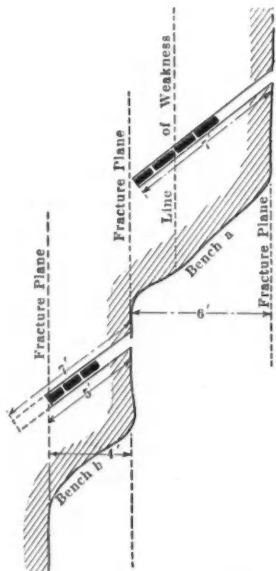


FIG. 1. CONDITIONS UNDER WHICH MAXIMUM BREAKING WOULD OCCUR IF LOCAL CONDITIONS WERE GOOD

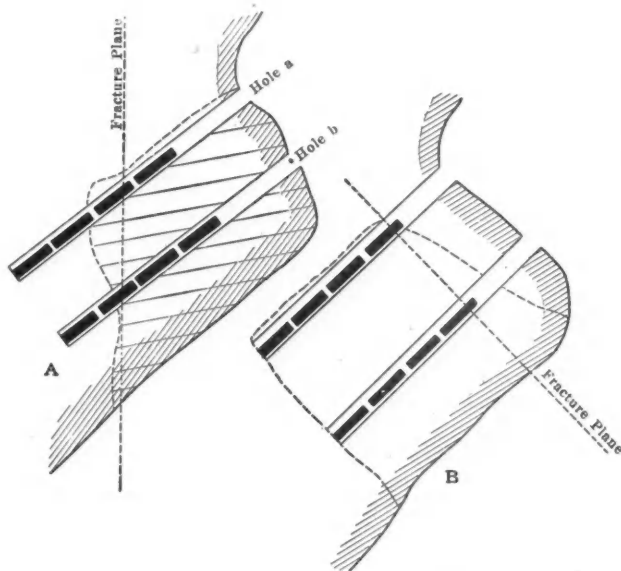


FIG. 2. HOLES DRILLED ACROSS FRACTURE PLANES BREAK INEFFICIENTLY

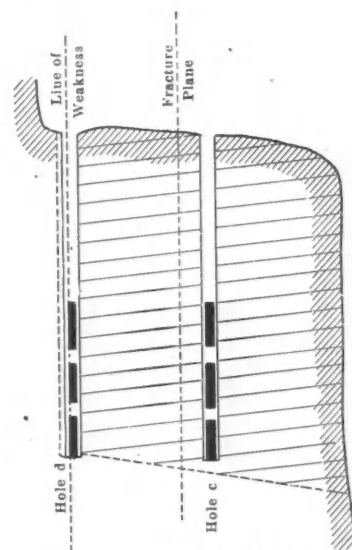


FIG. 3. HOLES DRILLED PARALLEL TO LINE OF FRACTURE GIVE BEST RESULTS

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face be laid out for overhand, underhand, or breast stoping, or a combination? I aim to answer this query.

It is generally accepted that the direction of the face should facilitate shoveling, and this point is allowed to weigh so heavily in the mind of the overseer, that it not infrequently happens that the

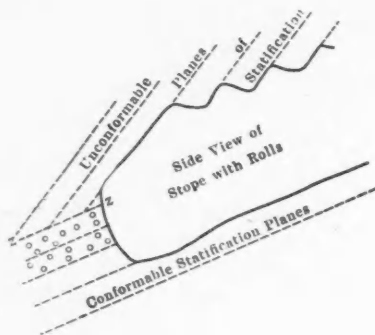
NOTE—Abstract of paper published in *Journ. Chem., Met. and Min. Soc. of South Africa*, December, 1908, under discussion of E. M. Weston's paper of the same title. Although this paper deals with operations on the Rand the principles evolved will be found to apply in many other mining districts.

*Manager, Jumpers Deep, Ltd., Johannesburg, S. A.

mines on the Rand that there is a series of vertical parallel planes which cut right through the reef and waste, but do not throw the reef, and run more or less north and south, at right angles to the strike of the strata. For terms of reference, these planes might be called "fracture planes." The conglomerates have not been tilted up uniformly throughout the Rand. The tilting varies from a vertical dip to a very low dip. These lines consequently having been subjected to unequal upheaval forces, cracks or fracture planes have been formed. Lines of weakness are well pro-

direction of the holes, which produces the greatest line of resistance, is at the base of the bench, where the whole of one side and the part of two sides have to be sheared, and part of one side has to be rendered. Consequently the greatest force is required at the bottom of a hole. If the bench could be so arranged that the fracture plane coincided with the base of the bench, this plane would thus be made to help blasting to the greatest extent. Fig. 1 shows bench a arranged in the ideal way. Unfortunately there are two non-existent conditions which are essential for the successful carrying out of this

principle. The first essential is that the rock should have a massive structure. It should be like putty, with no cleavages at all, but just one homogeneous mass. On the other hand, our rock is, apart from bastard slips, intersected with invisible lines of weakness, which, although not so definitely cracked as fracture planes, are still cracked to a smaller degree to such an extent that if microscopically examined

FIG. 4. NORMAL HANGING-WALL $z z$

they would show a distinct cleavage. The resultant action, when under the influence of an explosive charge, would be similar to that of the fracture plane. If one of these lines were located as shown in Fig. 1, bench *a*, cutting through just above the bottom cartridge, the base of the hole would undoubtedly be held up.

The second essential is that, besides the rock being a homogeneous mass, the lines of cleavage should be spaced at equal distances, say, 6 ft. apart. This condition is also non-existent, with the result that although the hole could be put in the correct distance of, say, 7 ft. in bench *a* there would be a greater chance of the fracture plane on the next bench appearing as in bench *b*, when either the last 2 ft. of the hole would be lost or this hole would only be able to be put in to a distance of 5 ft., which would at once spoil the system of the benches. I consequently consider that these planes should be made use of as in Fig. 1, which would appear to produce the greatest efficiency.

Before explaining Fig. 2, I shall demonstrate how inefficient breaking will result, if these planes are not taken into consideration.

The holes in Fig. 2 run in one case diagonally across the fracture plane and in the other case at right angles. In Fig. 2, *A*, practical knowledge will agree that holes *a* and *b* will be held up at their bases, the reason being that as the fracture plane intersects the second cartridge in the hole *b*, this breaks up the total effect of the explosion into the largest force above the plane and the smallest below the plane. The dynamite above the plane has to perform two duties. It has to push out the rock above the plane, and also to help the explosive force of the

dynamite below the plane by exerting a pull on that portion of the rock. There is, therefore, no beneficial pull produced by the excessive dynamite above the plane on the rock below the plane, since a cleavage destroys the action, and the one and a half cartridges have not sufficient force to push out the burden on the bottom of the hole by their own agency. Similarly with hole *a*. The resultant bench

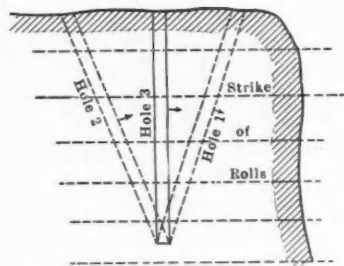


FIG. 5. ARRANGEMENT OF HOLES

would be represented by the dashed line. In Fig. 2, *B*, there is a line of fracture near the collar, which produces an easy "let-go," and there would probably be a line of weakness near the bottom of the holes, so that the resultant bench would be as shown by the dashed line, and the collar would be left intact, causing a bull-ring.

In Fig. 3, hole *c* is put in parallel to a fracture plane, and there would likely be a line of weakness running parallel with the fracture plane in or near hole *d*. In this case the direction of the hole and fracture plane being similar, it follows that there is an equal cohesion of the rock all along the length of the hole, which produces a constant burden and assures that equal quantities of explosive will bear similar burdens on all benches so placed.

If a hole is put in along the fracture the explosive does not have to rend the rock along the plane, since the rend has been produced by the fracture, and therefore it might be assumed that a certain amount of dynamite would be saved. It has been proved that gelatin creates a pressure on explosion of about 20,000 lb. per sq. in. and it is not hard to contemplate that with this huge pressure there would be a leakage of force along the crack although the sludge in a wet hole would act as tamping. Another objection is that the fracture would cause the chisel bit to fisher. I see no reason why three cartridges should not only break as much as the four in Fig. 2, but more, since the broken bench would be represented by the dashed line, and the bench would approximate the much desired square instead of the narrow rectangle.

Hole *d* shows no fracture plane before it is broken, but if the hole is put in parallel to the direction of the visible

fracture plane it will be found, as a rule, that there is a line of weakness which, after breaking, looks similar to the fracture plane. It follows, when a fracture plane cannot be found, look for a line of weakness on the broken bench and they will be found to be more numerous than fracture planes. I do not mean to infer that, even if the above suggestions are minutely carried out, every bench so drilled will break efficiently. Besides these planes there are bastard slips running in no particular direction, but which nevertheless can be seen on benches which show well defined fracture planes. These bastard slips must also be taken into consideration, and if more pronounced than the fracture planes, would naturally be followed in the place of the above-mentioned planes.

I think the reason why it has been found necessary to give a lift on the bottom of holes, i.e., to have less burden on the bottom of a hole than at the collar, will be explained by Fig. 2, *a*, and that if the hole is directed as in Fig. 3,

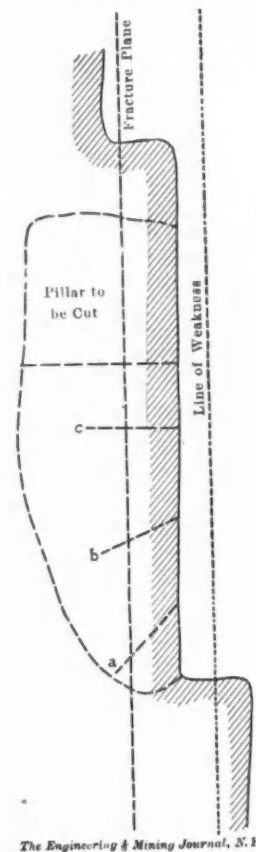


FIG. 6. WRONG METHOD OF UNDERCUTTING PILLAR

a lift will be unnecessary, and an equal burden can be placed on the bottom and the collar. I, also, do not think it will be found necessary to drill the two back holes, say 6 in. deeper than the two front holes. It would appear that the necessity of the extra 6 in. being drilled comes from drilling across the fracture planes, as shown in Fig. 2, *a*. Stopping, according to Fig. 3, will also produce fewer misfires

and accidents, as not so many bottoms of holes will be held up.

As to whether a stope should be run in an overhand, underhand or breast direction the answer is to make the bench faces parallel to the fracture planes, or in a few cases to the bastard slips, and the stope faces will shape themselves accordingly. It is obvious that if the stope is run in an underhand instead of an overhand direction the shoveling costs will be increased. Let us assume that this system produces an increase in the shoveling costs of 25 per cent., and a decrease in the stoping costs of a similar amount. If 1s. 6d. per ton is taken as a fair charge for shoveling and tramming the proportionate shoveling cost will be about 1s. Four shillings and six pence might be cited as a fair cost for stoping. There would thus be a net gain of 10½d. per ton, by underhand stoping which on a 200-stamp basis, mining 40,000 tons per month, represents £1750. The desired end to be attained is the maximum duty in the minimum stope width. Experience teaches us that when a miner drills in the same direction as the dip of the stope there is less likelihood of the bottom of the holes being projected into the hanging or foot. This fact is generally proved when undercutting a pillar when, as a rule, the foot is ploughed up. Since the fracture planes and lines of weakness run north and south the direction of drill holes will be south, or in the same direction as the dip, which will produce the minimum stope width.

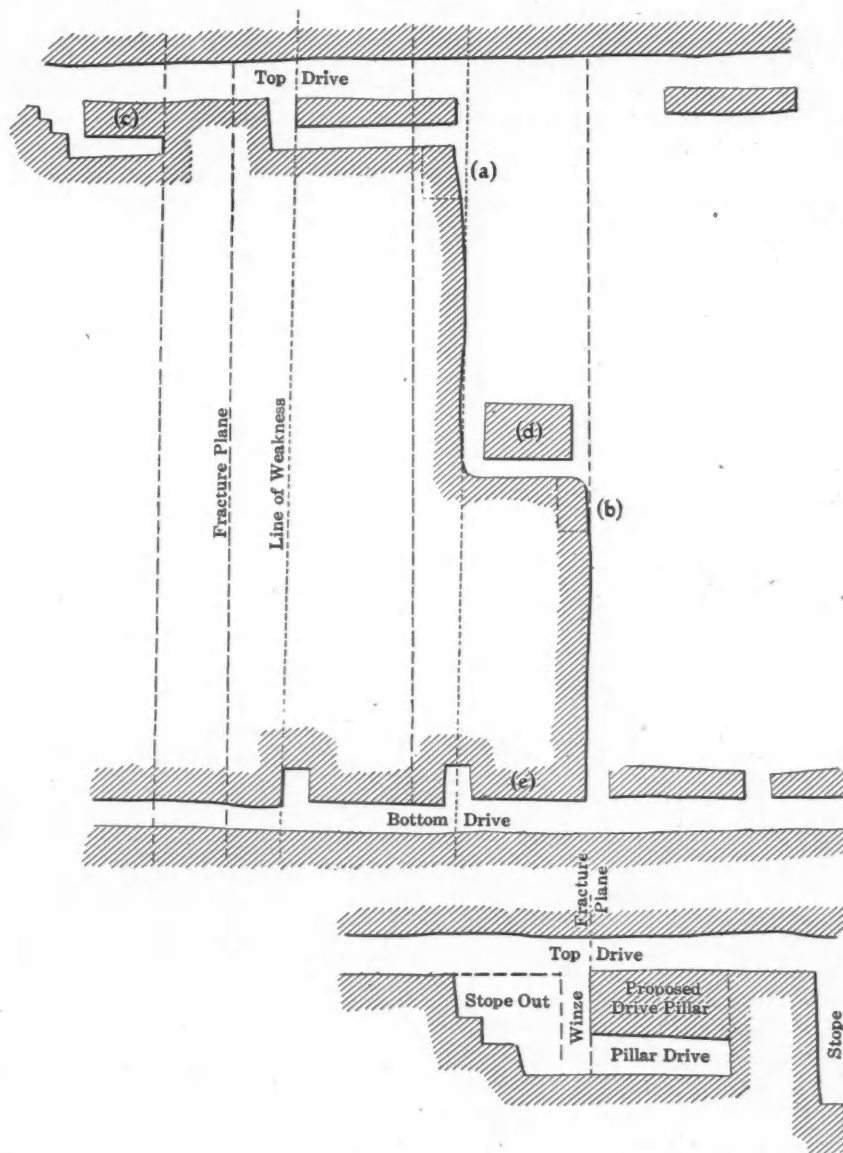
It is interesting to note how fracture planes help in development work. The average drive is extended in a direction which is at right angles to these planes, so I am afraid that no benefit can be derived from them in drives running east and west. In raising, sinking winzes, and incline sinking, they are, however, of distinct advantage (Fig. 8). Since they run north and south, a winze should be started on a well defined fracture plane, provided this plane can be found at approximately the desired point. The winze would be arranged so that the plane coincided with the east face in order to not cramp the hammer boy, which would be the case if the west face and the plane coincided. This plane, if there were a well defined foot, would fulfill the functions of two sides of a cut; and the starting hole would be drilled at an angle to the planes so that its base would just touch, or nearly reach the planes. Similar remarks apply to a raise.

Since most of the inclines are sunk at an angle to the dip it is more difficult to use them, but it will be conceded that if, say, an 8-ft. winze were always kept ahead of the main face of a 26-ft. incline by small machines, and the other 18 ft. were benched out parallel to these planes, an increased footage would be obtained.

ROLLS OR IRREGULARITIES IN THE FOOT- AND HANGING-WALLS

In Fig. 4 the dashed line ZZ represents the normal hanging, but the wall has been broken up by unconformable rolls. Fig. 5 represents a plan of these rolls showing their strikes. If hole No. 1 were divided as shown, there would be a tight end and it would not break efficiently. Holes 2 and 3 would not form wedges at their bottoms and would break more easily. Hole 2 would

poses, I do not know of any method of producing greater efficiency by altering the system of breaking ground. Knotted ground also hampers breaking; it appears to have a spherical structure. I might illustrate this by directing attention to those lumps of ground which prove so difficult to break by the native wielding a 12-lb. hammer at the grizzly of a main orebox. These are three natural conditions of tightness which we always have to contend with, but the other two



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FIG. 7. TOP DRIVE PILLAR

perhaps give the greatest efficiency. The fracture planes on the Rand generally run at right angles to the rolls, the latter of which strike east and west. Therefore, hole 3 would suit both the fracture planes and the rolls.

TIGHT OR FROSTED HANGING-WALL OR TOUGH ROCK

In the case of a stope with a tight or frosted hanging, as opposed to a loose let go, and also when the rock is tough, as opposed to brittle, for breaking pur-

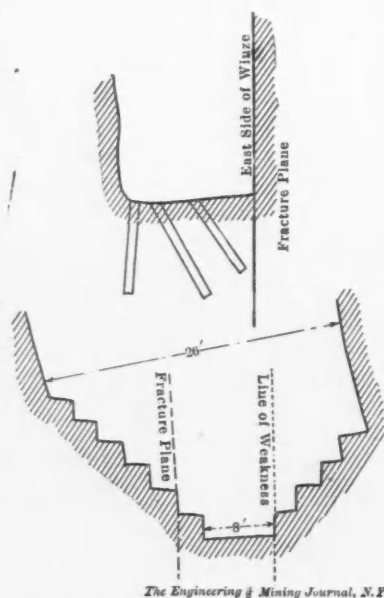
conditions can be made to help the breaking of ground.

SUMMARY

There are machine drills on the Rand which may justly be termed foolproof in their mechanism, and with increased air pressures, single shift working, clay tamping cartridges, and by sharpening drills underground, there is only one other factor to be made foolproof as far as possible, and that is, the actual breaking of the rock. It is natural that, if a miner

who is learning to break rock were instructed to put his holes in one direction only, and that direction was parallel to the fracture planes and the lines of weakness, he would soon be able to judge the least amount of explosives for the largest burden. But if he is called upon to cut a pillar he will have to put in the holes across the planes which are running north and south, and he will be surprised that his holes have not broken efficiently in bench *a*, Fig. 6. His confidence in himself will begin to waver, and by the time the pillar is undercut all confidence in his ideas on burden will have departed. Then again the stopping machines are supposed to be used for stopping only, therefore they should not be called upon to do what might be called development work in cutting pillars and boxholes, where such are necessary instead of waste packs.

It is now essential to find some method



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FIG. 8. WINZE AND INCLINE HAMMER WORK

of obtaining a uniform direction of hole, and also to keep the machines continually stopping. Fig. 7 represents the method which I would recommend wherever possible.

The fracture planes and lines of weakness are striking north and south. In order to keep the machines continually stopping, and to enable the machines to always put their holes in parallel to the fracture planes, it is necessary to cut pillars and boxholes by some outside agency. The top drive pillar should be sunk through and cut under by hammer boys. The stope pillar should be undercut by hammers and sunk through by a machine, as hammer boys would take too long to sink through the pillar winze, thereby hanging up too much broken rock. The bottom drive pillar would be raised through by an independent machine or by hammer boys. The top pillar winze and

the bottom pillar raises would be put up in advance of at least one pillar ahead. As soon as the hammer boys had undercut the top drive pillar and the stope pillar, the stopping machine would break into it and start drilling benches *a* and *b*, and no holes would thus be put in at an angle to the fracture planes. I would suggest that where a bench face is not parallel to the grain, burden should be sacrificed on the front holes, and they should at once be directed parallel to the grain and not wait to procure the grain direction by gradually beating back, say, half a dozen benches. Consequently, if the learner is only asked to do elementary breaking of rock in one direction, I maintain that breaking rock is also reduced to such a simple process as to merit the distinction of being called foolproof, as well.

It might be said that there is an increased cost in undercutting the two pillars by hammers, but if the increased efficiency of the machines be taken into account, I feel satisfied that, when the system is working satisfactorily, a fair proportion of the stopping machines might be stopped, to produce the same amount of ground, and if such be the case, the gain of shutting down such machines will far outweigh the extra cost of undercutting pillars—if there be any. This system has now been in operation for about two months, and in every case where the miner has been able to follow the principle, a marked advance has been registered in breaking footage. I can consequently claim that these contentions have been removed from the realms of theory and have been fully demonstrated in actual practice.

In conclusion, I would refer back to a statement in the earlier pages that, until the grain of the rock, which will assist or retard breaking in a particular direction, has been ascertained, it is useless to make experiments to prove what the length of hole, diameter of hole, quantity of explosive, burden, etc., should be.

The Proposed Meldrum Tunnel in Colorado

SPECIAL CORRESPONDENCE

Colorado reports state that negotiations are under way in New York, having in view the raising of capital for the purpose of building what is known as the Meldrum tunnel, between the Telluride district of San Miguel county, and Ironton, in the Red mountain district, of Ouray county. As the project is one of considerable magnitude, a description of the proposed work may be of interest. The tunnel has an almost east and west course and would be from $4\frac{1}{2}$ to 5 miles in length, about 3000

ft. having already been driven at each end. The elevation is about 10,000 ft. above tidewater. The chief series of veins which it will intersect are those which have their outcrops and workings in Savage basin, on the San Miguel side, at elevations of 12,000 to 12,500 feet.

These will be intersected in the following order: First, the vein on which are the Columbia, Pay Rock, Champion and others, owned by the Mines Finance Company, of which John B. Farish is managing director; next, the lode on which are the Cincinnati, Argentine, Red Cloud and others, owned by the Tomboy company, of London, David Herron, manager; then the Flora, Japan, Climax, IXL and others, owned, it is believed, by the Mines Selection Company, of London, of which A. G. Brownlee, Denver, is resident manager; next, the Tomboy vein proper; then the Barstow vein in Commodore gulch; and the vein on which is located the Camp Bird mine; as this mine is about $2\frac{1}{2}$ miles north of the line of tunnel, it is extremely problematical whether the vein extends that distance—probably not.

The only one of the group then that is paying dividends is the Tomboy company, and while nearly all of the Savage Basin mines have been rich on the surface, it remains to be proved whether or not the deposits persist to the depth of the tunnel level, say 1500 to 2000 ft. But as these claims are all patented, and, therefore, owned by their respective companies, as deep as human ingenuity can work them, the only revenue for the tunnel therefrom would be as a drainage and transportation enterprise, and whether the revenues from this source would pay a dividend on the outlay is what has to be figured on.

In any event, the first thing to be secured from the companies on the surface would be contracts for drainage and haulage. But where mines are fully equipped on the surface with hoisting and pumping plants, and mills to treat their ore, it is always a question whether they will care to first sink their shafts to great depths to the tunnel level, then perhaps have to drive long laterals to connect; and then abandon their surface workings and move their mills to the tunnel portal, where they would have to acquire ground by purchase for their plants, even supposing such ground to be suitable for the purpose, which is not always the case. A company working along comfortably from the surface and paying dividends, would require very large inducements in the way of decreased cost of production to warrant them in making such a change; and a company not paying a profit could hardly afford to. The history of transportation and drainage tunnels throughout the State is well known, and is not an encouraging one, as most of them have been a loss to the original investors.

The Alaska-Yukon-Pacific Exposition

Mineral Exhibits from the Northwestern States, Alaska and Canada.
 Work of United States Geological Survey Plays Prominent Part

B Y E . J A C O B S

The minerals on exhibition at the Alaska-Yukon-Pacific Exposition, at Seattle, Washington, serve to convey an idea of the increasing value of the mining industry of the northwestern portion of North America.

The following notes will convey a fair idea of the mineral exhibits as a whole. They should be premised with a word of

thus largely offset and the industry worthily presented to the public.

UNITED STATES GEOLOGICAL SURVEY

The exhibits of the United States Geological Survey form one of the chief features in the mineral department of the exposition. From an educational point of view they are decidedly of greatest im-

portance, though from a spectacular standpoint the Alaskan placer-gold exhibit attracts more public notice. There are two exhibits, the larger being in the Government building, and the smaller in the Alaska building. Special attention is given to investigations of the mineral and water resources of the United States and Alaska; to test work in the laboratory;

MINERAL RESOURCES OF THE UNITED STATES

The distribution of the mineral resources of the United States, especially



UNITED STATES GOVERNMENT BUILDING AND THE COURT OF HONOR

praise to the Federal Government for its contribution to the success of the exposition, in giving mining prominence among its large and valuable exhibits. Through the U. S. Geological Survey, and in small measure in other ways, the value of the mining industry is being demonstrated in keeping with its importance. The shortcomings of others in this direction are

of coal, oil and gas, is indicated on a wall map 12x16 ft. It also shows the important mining districts throughout the United States, Alaska, Cuba, Porto Rico and the Philippines. Large show cases contain samples of coals and other fuels, and ores, the distribution of which is illustrated on the map. The 70 samples of coal exhibited

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range from lignite of lowest grade, to the best steam and coking coal, with anthracite samples containing fixed carbon up to 87.23 per cent. Coke, coal briquets and crude petroleum are given an important place. Samples of rocks and minerals of economic value fill several cases. Other exhibits in this section are rocks used in making cement; also samples of concrete in connection with experiments to determine the compressive strength of cement, concrete, etc. Information is given relative to educational collections of rocks, each containing 156 specimens illustrating the various types of rocks, distributed by the Survey throughout the United States to universities and colleges.

WORK OF SURVEY

Illuminated transparencies show members of the Survey—topographers, geologists, hydrographers, etc.—at work in the field. A Hoe map-printing press is in

SPECIAL FEATURES

Chief among these are, undoubtedly, the large and very effective panoramic views of (1) Crater lake, in southern Oregon, and (2) the cañon and falls in Yellowstone National Park, Wyoming. Both are impressive and attract much notice among visitors, most of whom are better informed as to the latter than the former. Crater lake, crater of an extinct volcano, is seven miles in diameter, its water is remarkably clear and its depth of 2000 ft. gives it a wonderful blue color; its banks are precipices rising 2000 ft. above the water.

There is also a wall map, illustrating the general geology of North America, prepared by the Survey with the coöperation of the Geological Surveys of Canada and Mexico; topographic maps, specially prepared for use in schools by being mounted on millboard under celluloid, be-

Incidentally, it may be mentioned that Mr. Rodgers is one of comparatively few individual mining men who went out of their way to make the mineral exhibits worthy of the occasion; he supplied three separate exhibits—one each to the Mines, Alaskan, and Canadian buildings.

A tall pyramid of cubes of coal exhibits the progress, in five-year periods, in coal production in the State of Washington, from 5474 tons in 1860 to 3,722,433 tons in 1907. There are also a number of large blocks of coal, the largest one from Roslyn mines, Kittitas county, Wash., weighing 17,000 lb. It is 7 ft. 5 in. long, 5 ft. 3 in. wide, and 4 ft. 6 in. high. Coal and coke are exhibited from other Washington mines: a model of the Carbon Hill Coal Company's mine at Carbonado, Wash., showing "longwall retreating and timbering after coal is taken," and another of the north workings of the Seattle Electric Company's coal mine at Renton,



MINES BUILDING



CALIFORNIA BUILDING

operation, printing maps for free distribution. In a testing laboratory, Walton Van Winkle gives demonstrations of physical and chemical tests, illustrates and explains to inquirers methods and results, and shows in operation a grinding machine for polishing rocks and preparing thin sections for microscopic study. Willard S. Robbins, who is in local charge of the Survey exhibit, is kept busy giving information relative to his department. A complete collection of the Survey publications is on exhibition and available for reference. A demonstration is made under Mr. Robbins' direction, of the way the Draeger apparatus of the compressed-oxygen type is used in mine-rescue work, a chamber having been constructed in the Mines building in which to produce noxious gases and illustrate the rescue of supposed victims. Two sets of the apparatus are shown to all interested, and the way it is put on fully explained.

ing thus made sanitary as well as serviceable; and models showing, respectively, the complex geology of the Appalachian mountains, and the striking relief features of the Yosemite valley region, California.

The whole exhibit of the Survey reflects great credit on Prof. J. S. Diller, geologist in charge in Washington, D. C., under whose immediate direction it was prepared.

EXHIBITS IN THE MINES BUILDING

The most prominent exhibits in the Mines building are those connected with coal mining in the State of Washington, and the large display of ores, and models of mine-surface works of the Cœur d'Alene mining district, Shoshone county, Idaho. Others, also creditable, but less pretentious, are those of the Tacoma smelter and of M. K. Rodgers, of Seattle.

Wash.; and numbers of photographs of coal-mining scenes are representative of the industry.

The Cœur d'Alene district's exhibit is in two parallel sections, each about 50x10 ft. At one end of each section there is a headframe with ores and mining tools arranged about it, and at the other is a model of a mine-tunnel portal with much ore about it. A number of large blocks of ore, and piles of smaller lumps, together make a comprehensive exhibit of ores, chiefly silver-lead and zinc, from the Cœur d'Alene.

The Tacoma smelter exhibit includes ores from all the northwestern States, Alaska, British Columbia, Mexico, and South America; various smelter products, from flue dust and slag to bullion, from both copper and lead furnaces; briquets, fluxes, concentrates and slimes, and blacksmith coal from the smelter company's coal mine at Fairfax, Wash. There is

also a large photograph of the Tacoma smelter.

Many mining camps in Washington and elsewhere are represented by varied and miscellaneous collections of ores. Other exhibits are iron ores and diamond-drill cores from Ishpeming, Mich.; magnetite concentrates and chromite from the sands of Cape Flattery, Wash.; a considerable quantity of molybdenite, from Lake Chelan, Wash.; bog-iron ores, from Snohomish county, Wash.: a model of the "Welcome" nugget of gold, found at Bakery hill, Ballarat East, Victoria, Australia, on June 11, 1858 (the discoverer of this nugget, Francis Webster, died recently at the Ballarat Benevolent asylum, whence he went three years ago, poor and friendless), and which weighed 2195 oz., and was valued at £8780; a model of a platinum nugget, weighing 21 lb., found in 1827 in the Ural mountains, Russia; talc from Skagit county; infusorial earth, from Adams county; mineral paint, clays, shales, limestones, silica and other economic nonmetalliferous minerals, from various parts of Washington; a block of pale-green, polished marble, from Stevens county; a slab of "natural flexible sandstone," 12 ft. 3 in. by 4 ft. 7 in. by 1 in., and a block of sandstone 10 ft. by 4 ft. 6 in. by 4 ft. 6 in., weight, 38,000 lb., both from Tenino, Wash.; a block of granite, 17 ft. by 24 in. by 24 in., weight, 11,000 lb., from Index, Snohomish county, and other products, metallic and nonmetallic, of the State.

EXHIBITS FROM CALIFORNIA AND UTAH

California has on exhibition a varied display of minerals, but many of them are not conspicuous owing to being crowded together on shelves against a wall, while fruit and other food products fill more accessible floor space. At the main entrance to the building the contents of two fancy show cases, one filled with rich gold specimens, chiefly gold in quartz, from Siskiyou county, "the Gateway of the Californian Goldfields," and the other with stones, rough and polished, from San Diego, "the Gem City of California," are much admired.

California's ores are represented by numerous specimens, while building and other economic materials are also shown in considerable number and variety. Oils, too, are on exhibition, mostly crude. Several exhibits, for which floor space was not found, are outside the building. One of these is a stack of about 100 pigs of Heroult electric iron, smelted by electricity at Heroult, Shasta county, where iron is being turned out in commercial quantity. Especial interest attaches to this exhibit, since it is claimed that this product is from the first electric iron-smelting enterprise established on the Pacific coast. Another exhibit is a 4-ft. cube of fuller's earth, from Santa Barbara, where, it is stated, this material

occurs up to 6 ft. in thickness without a seam in it.

Utah's display of minerals, while not large, is an excellent one. All the chief metalliferous minerals are represented, some by large specimens, while coal and coke, rock salt, gypsum, onyx in various colors, a case of hydrocarbons from Utah county, and others combine to make an attractive exhibit. Many photographs of mining scenes are also exhibited. In a rear room is a concentrating mill, part of the equipment of the Utah State School of Mines, Salt Lake City, shown in operation.

PHILIPPINE MINERAL EXHIBIT

The exhibit of minerals from the Philippine islands is not large, but that country being a comparatively new possession of the United States, its natural re-

sources are of interest. These include coal, gold, sulphur and salt, all of which are well represented, together with much valuable information regarding the deposits.

MISCELLANEOUS MINING EXHIBITS

At the entrance to the Government building, the International Bureau of the American Republics has an exhibit in which there is a case of ores from Chile, Bolivia, Ecuador, Peru, Mexico and Santa Domingo. Elsewhere are to be seen mine timbers treated with creosote or other preservative preparation, after having been in use underground in coal mines for a number of years, and others not treated,

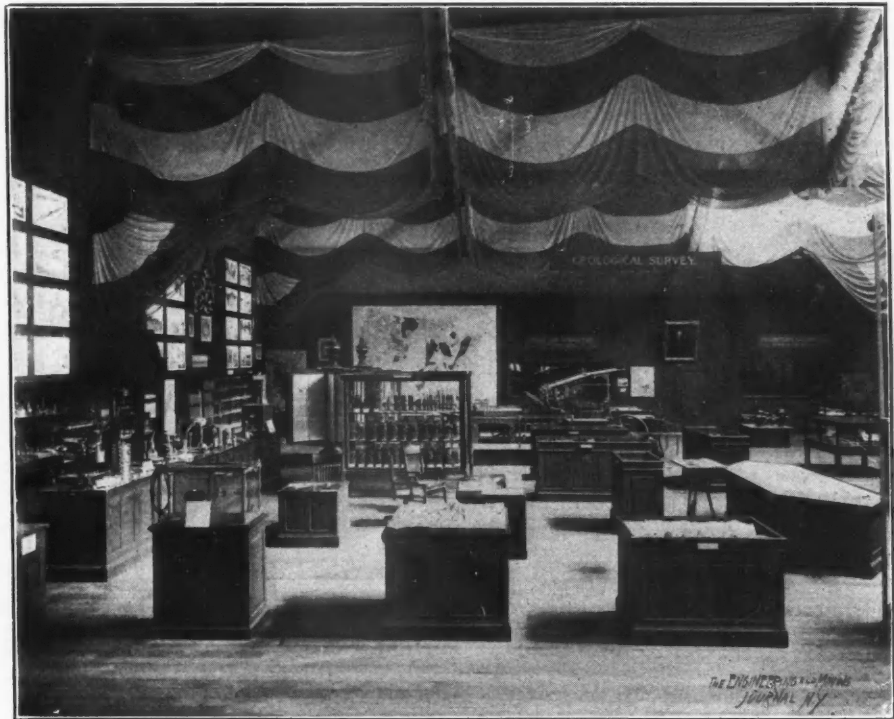


EXHIBIT OF THE UNITED STATES GEOLOGICAL SURVEY

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UNITED STATES ASSAY OFFICE

The Seattle branch of the United States Assay office has an interesting exhibit in the Government building, where there is a daily demonstration of melting and assaying gold. There are two melting furnaces, one with a capacity of 1600 oz. and the other of 500 oz., but it is not customary to make bars of gold bullion of heavier weight than 1200 oz. The process of melting the gold and cleaning the bars prior to assaying is watched daily by as many people as can get near the caged compartment in which operations are

conducted. The scales used for weighing the heavy bars of gold were made at the Philadelphia mint and are sensitive to 1/1000 of an ounce. There are two sets of assay balances used by the assayers. The Seattle office is equipped for melting \$500,000 worth of gold a day, that is if the gold comes in the right sizes. C. E. Vilas is assayer in charge.

EXHIBITS FROM FOREIGN COUNTRIES

Canada is the only foreign country making a mineral exhibit of much importance. Japan has a small collection of rock and ore specimens sent by the Imperial Geological Survey of Japan. Each country has its own separate building and staff.

Canada's mineral display merits the praise it receives from most visitors. It is comprehensive, adequately illustrating the varied mineral resources of the Dominion; is well arranged, so that it can be conveniently examined; the individual exhibits are clearly labeled, showing the

main facts of the progress of the mining industry of the country. There are well-posted officials always in attendance while the building is open to visitors.

In assembling and arranging the Canadian exhibits, Col. W. M. Hutchinson, commissioner in charge of Canada's exhibition branch, has kept in view the desirability of giving prominence to western Canadian mineral products, the exposition being primarily to exploit the resources of the Pacific northwest. Thus it is that British Columbia occupies a leading position in the mineral department of the Canadian exhibit as a whole. Gold, silver, lead, copper and zinc ores, from British Columbia mines, and coal and coke from its collieries, are on exhibition in considerable quantity; also metallurgical products, from both copper and lead furnaces, shown by the Consolidated, Granby, British Columbia Copper, and Tyee companies.

Eastern Canada and Ontario are well represented, chiefly in cobalt-nickel arsenides and silver; nickel ores and manufactured products; corundum, with wheels made in different countries from same; mica, asbestos, graphite, hydromagnesite, and mineral pigments, all with manufactured products from these respective materials.

A metallurgical collection sent by Dr. Eugene Haanel, of Ottawa, director of the mines branch of the Department of Mines of Canada, includes samples of pig iron made from magnetite and pyrrhotite in an experimental furnace at Sault Ste. Marie, Ontario. Building stone, limestone, cement and other materials applicable to common or decorative construction, are exhibited in great variety.

Altogether the Canadian mineral exhibit constitutes to mining men one of the attractions of the exposition. The western exhibits were collected by R. L. Broadbent, of the Geological Survey of Canada. He and W. D. Dalglisch are in constant attendance to give information concerning Canada's minerals and the progress of its mining industry.

Dredge and Hydraulic Mining in California

SPECIAL CORRESPONDENCE

Inyo county, California, has just started its first hydraulic mine, though more or less placer mining has been going on there for the past 50 years. The claims are known as the Birch Creek and are six miles southwest of Big Pine, where ordinary placer mining was carried on years ago with pans, sluices, etc. Coarse gold and some nuggets were found, but at a depth of about 50 ft. paying diggings gave out where work had to be done by hand. J. S. Armstrong, J. B. Woods, A. N. Bell

and C. A. Curl, the latter the superintendent, began work in that section early this year and have built a dam to store the waters of a lake at the head of Birch creek, with three miles of ditch and flume. This gives them about 1000 miners' inches of water with a fall of 250 ft. Only one giant is in use as yet. The mines cover about 300 acres. There is no debris question in that section and the tailings run where they may. The gravel mined runs from 20c. to \$2 per cubic yard.

A. C. Fulton, of San Francisco, and Chas. Paulsen, of Redwood City, are about prospecting possible dredging ground near Gas Point, 17 miles from Cottonwood in Shasta county. The ground is the Shuffleton ranch on Cottonwood creek. The acreage in the tract is not large and it has been found impracticable to bond adjoining ranches where gold is found, because the owners prefer to continue to work them as ranches. It is intended, if dredging is carried on, to build a restraining dam to prevent the debris getting to the Sacramento river or the ranch lands below.

Certain claims located east from Hamonton, on the Yuba river, and between that place and Smartsville in Yuba county, have been bonded to Robert E. Cranston and associates, of Marysville, in order to determine their availability for dredging purposes. Included are the river claims of the Marysville Quartz Tunnel Company, the Archimedes Gold Dredging Company, and the Montclair Mining Company. Boring by Keystone drills will begin at once to determine values. The lands in question are in a favorable location for dredging work.

On Aug. 15 the Trinity River Mining Company will turn the waters of Trinity river through the new two-mile tunnel above Lewiston. This will leave about 1½ miles of the river channel bare for mining purposes. Electric machinery is being installed at the mouth of the tunnel, where 1800 h.p. will be generated. This power is to be used for operating electric cranes for removing any large boulders met with, and will also lift the gravel into the sluices. This is the largest river-bed mining scheme started in California in recent years.

BY PRODUCTS OF GOLD DREDGING

The new rock-crushing plant of the Natomas Consolidated Company between Folsom and Fair Oaks, Sacramento county, has been started up. The object of the plant is to crush the cobbles piled up by the stackers of the gold dredges of the company, during the mining operations. These cobble piles have caused much adverse comment on gold-dredging enterprises owing to their unsightly appearance. Now they are being utilized by being crushed into seven sizes and used for road-building material. The old cobble-crushing plant at this point was capable of crushing about 10,000 tons monthly,

but the new one will handle 50,000 tons. Large bunkers have been erected in which to store the crushed material. The stones are handled by steam shovels which deposit them in cars, which in turn carry them to the crushing plant. As fast as the cobbles are removed, the soil surface is being replanted with fruit trees, etc., so that the land can be again utilized. The crushed rock is a valuable by-product of gold-dredging operations, its profits lessening the cost per cubic yard of the mining operations. Moreover, it is sold so cheaply that excellent roads may be built at much less cost than formerly. The dredging companies are also utilizing this crushed rock in the manufacture of cement, etc., and will manufacture cement pipes at the plant.

Sulphur Deposits in the Transcaspian

The *Tifiser Zeitung* states that in the neighborhood of Kyrk-Tschulba in the Transcaspian district of Aschabad, near Schjich, there are ore deposits which are very rich in sulphur. These deposits could be very readily worked, as they form hills 90 to 125 ft. high and often one to two miles in circumference. The ores on the surface contain 58 to 62 per cent. sulphur. The amount of ore in these hills, on the surface, is estimated at several hundred million poods. (A pood is 36.07 lb.).

Attempts to work these sulphur deposits have been devoid of success, because, according to the correspondent of the paper in question, there has been a lack of proper means. At present, all these deposits have been bought by a company under the name of "Sulfur." The new company intends, in a short time, to work the deposits in a thorough manner.

The iron works at Hanyang, China, are situated near the city of Hankow, 600 miles up the Yang-tse-kiang, which is navigable to that point by vessels drawing nearly 20 ft. of water. The plant comprises three blast furnaces, with a combined daily capacity of about 500 tons of pig iron; four open-hearth furnaces, each of about 60 tons daily capacity; rolling mills for bars, rails, plates, etc.; bolt, nut and spike machines. Nearly 4000 Chinese laborers are employed, controlled by 20 foreign engineers, electricians and foremen. These works are being extended, and it is proposed to erect a new plant a few miles further down the river, just below Hankow, for the manufacture of steel bridge and structural material, and railway cars, trucks, and other equipment. It is also intended to put up a plant for making cement from the blast-furnace slag, which is now waste.

Reminiscences of the Early Rand*

By J. S. MACARTHUR†

After a stormy voyage to Capetown, a pleasant trip through Cape Colony to Kimberley, and a wearisome coach journey to Johannesburg, I arrived there in April, 1890. Happily I forget much of the unpleasantness of the journey associated with the good old coaching times. I do remember, however, that a coach which would have been well filled with six passengers had to carry a load of twelve. We had to "sit tight" and be good natured—or be thrown out. The monotony of tight sitting was varied by an occasional walk where the dust was too deep for seven pairs of horses to pull through, and when we came to a sluit the passengers jumped over and helped the horses.

Fares were high, about £8 to £12 for Kimberley-Johannesburg stage. In modern days the train carries baggage at a less rate than the human passenger, but the coach charged more per pound for luggage than for humanity. The coach was the first-class conveyance, used principally by those who traveled at the expense of others. Those who traveled on their own account generally bargained to be conveyed with "urgent" goods by fast mule wagon for a modest fee of, say £2, each passenger supplying himself with food, and co-operating with the transport riders in the toils and adventures of the trek. Probably these mule-wagon passengers had a pleasanter time than their coaching friends.

JOHANNESBURG IN THE EARLY DAYS

At that time Johannesburg was certainly the premier gold camp, but the glamor of Barberton had not quite faded, and Klerksdorp was also the center of a gold industry, very promising if not very thriving. There were many who shook their heads wisely and said that Johannesburg was only a passing fashion, and time would show that Barberton was the place; others, with a knowing look and a grave whisper assured their acquaintances that they positively knew that Klerksdorp was the key to the situation.

I spent a few days at Klerksdorp and saw several batteries "just ready to start but"—there was no capital to develop the mine, or the mine manager had not arrived, or a barrel of lubricant had been lost on the way. There was always some good reason for the silence of the mill.

At Johannesburg some mills were going, but many were silent. The boom had passed and the blight had come. As the possibility and opportunity of speculation

had dwindled, the crowd of irresponsibles who dubbed themselves brokers also dwindled till few were left. The whole mining industry was in a precarious state, the rich surface patches had been exhausted, the average grade of ore was falling, working expenses remained high, and the dread of the blue ground under the oxidized zone deterred fresh capital and discouraged new enterprise. At least one-third of the houses and stores were unoccupied and gloom was general. Families were leaving, offices were being closed, cheap sales of pianos and safes blocked the Market square.

THE FIRST CYANIDE PLANT

There were many processes in the air—fine crushing by wonderful machines was one type of the infallible cures, amalgamation, where contact was induced by mechanical and electrical agencies, was another; chlorination with pressure or without was another; and some inventions included all these, so that whatever gold escaped one trap would surely fall into the next. Two or three years before this period the cyanide process had, with labor and pain, been evolved into existence in Glasgow under the brothers Forrest and myself, and was being brought into worldwide use by the Cassel Gold Extraction Company, which controlled the patents. Late in 1889 this company sent an expedition of a few skilled men, under the leadership of Alfred James, to erect a cyanide plant, for demonstrating the applicability and commercial value of the process in South Africa. This pioneer of the huge cyanide plants now in existence on the Rand was erected in the Salisbury battery, and many little troubles were avoided and difficulties smoothed by the manager, R. A. Michell, who was truly hospitable in his kindness to the little band of enthusiasts who bothered him with their cranks. The directors of the Cassel company, recognizing the importance of the ordeal, decided to send the ringleader of the inventors to take command, and thus came about my first visit to the Transvaal. By the month of June, 1890, the cyanide plant was ready for work. It was composite, available for agitation and for percolation. It had a vacuum attachment for hastening filtration, and provided everything but a filter-press, a piece of plant already tried and found wanting in its then design. It is a very different appliance now.

After a little preliminary work on our own account we prepared for a demonstration of the process and consignment; on the challenge of a celebrated metallurgist, now almost forgotten, who jeered at the bare idea of cyanide being a commercially useful gold extractor, we decided to work on the Percy concentrates. These were ordinary underground pyritic concentrates containing 20 oz. gold per ton.

THE DEMONSTRATION

The representatives of the gold industry were invited to check us at every point, and they came prepared to be very exacting, but when afternoon became evening and evening became night, refreshment, recreation and rest became necessary, so with most of them watching became whist and whist became sleep. One of them, however, Hennen Jennings, was not to be tempted; he attached himself to me like an old friend, and I am glad to say he has not shaken me off yet. He took nothing for granted, measured every vat and every pipe, sampled the water, the lime, the cyanide and the zinc to make sure there was no humbug. For two days and two nights the trial lasted until late on the third day, when a small ingot of gold was turned out of the little kerosene smelting furnace.

The industry is not now called on to deal with rich concentrates, in fact, the concentrates are not much in evidence since cyanide became dominant and this Percy lot was most exceptional; so in deference to the wishes of my colleague and other technical friends we used a 2 per cent. solution, though in our ordinary work in the laboratory we used solutions as weak as those now in general use. I must admit that my friends had good reason for their wish to use a comparatively strong solution, for cyanide was not in those days the pure salt of reliable composition that it is now. In the solid, its true cyanide contents were erratic; in solution, it was without sufficient reason, considered uncertain and cranky, and, after all, they said that the extra strength would not hurt if it did not help.

Probably W. A. Caldecott, who was our first South African assistant, remembers many of the incidents of this period; his scientific acumen was then as now, an invaluable guide in a new field of industry. The demonstration was over, the gold extracted to the extent of 98 per cent., but the industry was not convinced.

THE DOUBTING THOMAS

Those who knew most were perhaps incredulous but not contemptuous; those who knew least had to be contemptuous to maintain their dignity. One gentleman, who had been an expert telegraph operator and knew all about batteries, "chemicals and things," condemned it roundly as the result of his accumulated wisdom. Once, coming as an unknown passenger in the Pretoria coach, I heard the process discussed as "bound to be a failure," "all about it known long ago," "positively ridiculous," and myself as "an honest sort of fellow but knows nothing," and "all right in the laboratory but no good outside it." The temptation was too great, and to the consternation of the critics I disclosed myself in the last mile.

**Journ., Chem., Met. and Min. Soc. of South Africa*, December, 1908. Discussion of M. H. Coombe's paper of same title.

†*Metallurgist*, 6 Broad Street place, London. E. C.

In these days the professions of journalist, mining engineer and metallurgist were frequently combined in the one person—generally it was an unhappy coalition. One of the gentlemen was shown over the works by me, everything was fully explained and understood, at least so I flattered myself, but as he was about to go he said, "now, my dear fellow, you really cannot fool me as you fooled the others; what is it you have up your sleeve?" I have always regretted the loss of this magnificent opportunity for telling some wonderful fairy tale.

Another type of man whom I dreaded was the "practical man," who reveled in shirt sleeves turned up to the elbows and concealed his ignorance in a fluent jargon of weird science and torrid profanity. Fortunately he is now relegated to his proper sphere and bosses the Kafirs, and well trained scientific young fellows have taken his place and discharge responsibilities the "practical man" never dreamt of. A type of man whom I admired then was the clerk, stockholder, sugar-planter or storeman who, by force of circumstances, found himself in charge of a mine. Many of these men, who started by knowing little or nothing of mining and metallurgy, quietly went on learning and working. In the end most of them had to give their place to better trained men, but they served their day and did their share in founding the industry.

OTHER VISITS TO THE RAND

By 1891 the African Gold Recovery Syndicate, into whose hands the control of the MacArthur-Forrest patents have passed, had made some profit from the treatment of 10,000 tons of Robinson tailings and had arranged for the treatment of a similar parcel of tailings at Fever creek. As profits had actually been made, leaders of the industry were convinced that the process was good and, as the process was at the booming stage, I again visited the Rand in 1891. Everything was changed; every house was occupied, every store was filled, every merchant was busy, there was a distinct feeling of confidence in the future, fresh enterprises had been taken up and were being initiated every day and the Rand industry, as it stands now, was clearly foreshadowed. Of course, wise men were at it again, and each wiseacre took credit to himself, saying he knew from the very beginning that there was something in that MacArthur-Forrest patent, and each one took credit for the encouragement that he had given to the inventor.

By the introduction of cyanide the gold industry everywhere, but particularly on the Rand, became really an industry—which science, combined with good business management, has changed from a mining speculation into a safe investment.

I was again on the Rand in 1895-96,

at the time of the Jameson raid. My occupation was then the defence of the patents that protected the process which, next to the existence of the main reef series, was the most important factor in the development of the wealth of the South African Republic. Unfortunately, since that time I have had no interest calling me to the Transvaal, but I still regard Johannesburg and the many friends that I met there with affection, and the episodes of that period form a series of pictures in my mind, which I trust may never fade.

Iron Ores of Nova Scotia

BY PHILLIPS THOMPSON

A report just issued by the Mines Branch of the Dominion Department of Mines, and prepared by Dr. J. E. Woodman¹, gives a comprehensive survey of the iron ore resources of Nova Scotia, with full descriptions of the localities where iron ore deposits are known to occur, a history of such development as has taken place, analyses of ores, statistics as to output, and much other information calculated to aid the development of the Canadian iron industry. The geographic relations of the deposits are fully set forth. While the ores are widely distributed only a few really important bodies are known, the largest of which are within easy reach of transportation and sufficiently near fuel and limestone to make smelting possible under favorable conditions.

Commencing at the west detached small deposits are found along the south side of the Bay of Fundy, from Brier island to Cape Blomidon, and on the south shore of Cobequid bay toward Truro. Behind or south of this line of deposits are the more persistent and important ores of the Clementsport and Nictaux-Torbrook fields. On the north side of the Bay of Fundy are many small isolated occurrences and a persistent and probably connected line of orebodies from the western part of the Cobequid mountains east into Pictou county. Detached deposits occur eastward through Pictou and Guysborough counties, north of the region occupied by the granites and gold-bearing rocks. In Antigonish county is the large field of Arisaig, on the coast south of which are numerous small occurrences. In Cape Breton island the iron ores are found in widely separated localities and some deposits promise to be of commercial importance. The coalfields of the Province are numerous and so widely distributed as to supply fuel at a number of smelting centers, should it be required.

¹"Report on the Iron Ore Deposits of Nova Scotia," Part I. Canada; Department of Mines, Mines Branch. By J. E. Woodman; pp. 226, 9 1/2 x 6 1/2 in.; paper; illustrated. Ottawa, Canada, 1909; Government Printing Bureau.

FUTURE PROSPECTS FOR THE INDUSTRY

In view of the fact that so many of the iron ore deposits are small and scattered, with but few of considerable size, Dr. Woodman points out that if the question of additional centers for iron and steel manufacture arises, there are very few localities possessing the requisite qualifications, adequate supplies of suitable iron ore, flux and fuel, cheap transportation for these raw materials to the furnace, and shipping facilities. The cost of labor being even throughout the province it is not a factor in determining position. From this standpoint the following may be taken as a natural grouping (1) A western section in Digby and Annapolis counties with its industrial center at Annapolis; (2) a west-central section draining Kings, Colchester and Cumberland counties with Londonderry as its center; (3) an east-central section, embracing Pictou, Antigonish and Guysborough counties with a focus in or near the Pictou coalfield; (4) an eastern division including Cape Breton with its centers at Sydney and Sydney mines.

Dr. Woodman does not consider that there is any probability of Nova Scotia developing an iron industry from its own ores that will compete extensively with the American and Ontario products in their own markets. Its success must result from the comparative isolation of the Province, which diminishes the intensity of competition in the home market. So far as now known there are no deposits in Nova Scotia comparable in size, quality and low cost of treatment with those of Bell island, Newfoundland, or the Lake Superior ores. But there appears to be a possibility that the Province may be able with its own ores to supply eastern Canadian demand, as every ton of iron or steel that can be made to meet existing trade conditions can be sold. A characteristic of many of the ores is that they are highly silicious, phosphorus being also a common constituent. They are usually comparatively free from sulphur. So far no deposits of importance of uniformly bessemer grade have been discovered.

Dr. Woodman, in speaking of the policy to be pursued for the encouragement of exploitation, points out that the disposition to ask exorbitant prices by landowners, leaseholders or others concerned in booming iron ore properties has been a serious drawback to development. Large capitalizations are not justifiable under existing conditions. Small deposits could advantageously be developed if the owners should work them and contract for the sale of the ore to the smelters, instead of holding them for sale at high prices. The bounty system, he urges, should be altered, the government paying the bounty direct to the miner upon raw iron ore at a sliding scale, according to quality, when that ore is accepted at the furnace and converted into pig iron.

Concrete Linings in Shaft Sinking

An Oklahoma Coal Company Put down a 9 ft. Circular Shaft, 330 ft. in Depth, with a 6 in. Concrete Lining, at a Cost of \$27.56 per Foot

B Y R. H. R O W L A N D *

During the past few years the adoption of concrete in practically all industries has developed with wonderful rapidity, insofar that today almost every variety of structure designed by an engineer or architect consists, in part at least, of concrete, either reinforced or otherwise, and its use is constantly increasing

As a structural material, where economy, durability and fire-resisting qualities are important factors, concrete construction is universally adopted and the great number of structures in which concrete has been successfully applied is conclusive proof of its safety, economy and permanence. Its fire-resisting qualities have been fully demonstrated on a large scale in many great and destructive fires.

Several large and uptodate coal- and metal-mining companies, recognizing the material advantages of reinforced concrete over lumber, adopted this construction in their entries and slopes for props, caps, etc., to maintain these roadways in condition; while the initial cost of this construction is higher than that of lumber, it is not necessary, as is often the case with lumber, to replace the material from time to time, owing to roof strain, rotting timbers, etc., and a permanent roadway is thus established. Consequently, while the initial cost of concrete is somewhat higher, its efficiency is much greater, its durability unequalled, and its permanence an established fact; it has, therefore, proved a justifiable and economical outlay in regard to the maintenance of permanent roadways in coal and other mines.

Another unsatisfactory condition mine operators have to contend with is the growing scarcity of lumber suitable for road timbering, the difficulty in procuring and transmitting, and the prohibitive price in many parts of the country.

One of the largest coal-mining companies operating in the Southwest decided to experiment by sinking an air and escape shaft 330 ft. in depth at one of their mines in the State of Oklahoma. The construction of this shaft was designed by me and the work carried out in the following manner:

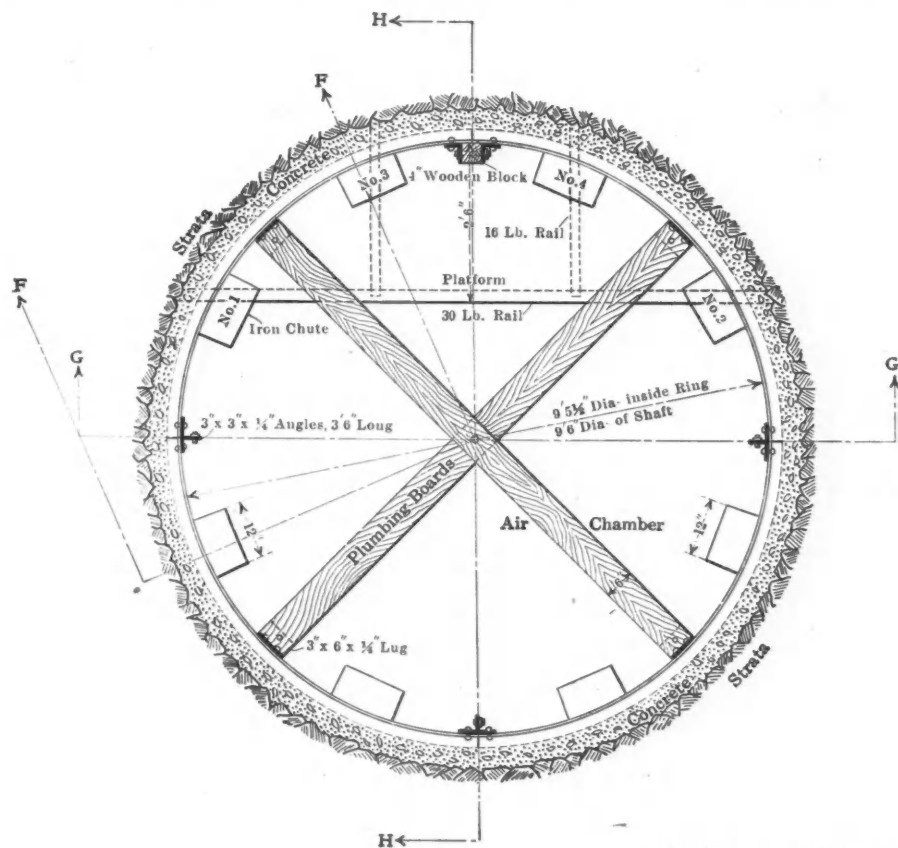
The shaft was circular in shape, 9 ft. 6 in. in diameter and lined with a 6-in. lining of concrete. The thickness of the lining was not uniform owing to the nature of the excavation, the minimum being about 6 in. and the maximum about 10 in. Three rings, A, B, C, were made of 1/4-in. steel plate in four quarter sections, each

3 ft. 6 in. in depth, making a total depth of 10 ft. 6 in.; to these rings upright supports were attached, consisting of 3x3x1/4-in. angles, 3 ft. 6 in. high, as shown in Figs. 1 and 5.

These rings could have been constructed of either wood or steel. Although the steel rings are heavier to handle than wooden rings, they have proved more efficient in many respects, and little difficulty was experienced during the entire operations in detaching them from the concrete when set. Three wooden blocks

desired cross-section can be used in the process and inserted while the concreting is in progress. If bad ground is met with, the crib method adopted in brick-lined shaft-sinking can be applied, and the concrete lining could be accordingly increased in thickness.

At the bottom of each quarter section of these steel rings A and B, circular angles were riveted as shown on the diagram. These angles were tapered to a fine edge in order that they might be easily detached from the concrete when suffi-



The Engineering & Mining Journal, N.Y.

FIG. 1. PLAN EE SHOWING RINGS SET FOR CONCRETING

4x4 in. were used and bolted between angles, as shown in the illustration, these blocks being adopted for the purpose of detaching the steel rings from the concrete when hardened and set in place.

Owing to the fact that the strata sunk through in this particular district consisted principally of black shales, no reinforcement was considered necessary, although the platform supports shown in Figs. 2 and 3 essentially formed a reinforcement.

If reinforcement is considered necessary, perpendicular or circular bars of the

sufficiently set. Circular angles placed on the outside of the rings, so as not to enter the concrete at all, could be used and might serve the purpose, but it was found that angles embedded in the concrete with tapered edge proved more suitable, and no difficulty whatsoever was experienced in removing them from the concrete.

THE STEEL SUPPORTING RINGS

The weight of each ring with angles attached was approximately 1500 lb., and these rings were raised and lowered when necessary by an engine located on the sur-

*Civil and mining engineer, 202 Alexander avenue, New York.

face. Lifting lugs were provided for 4x4-in. Norway iron which were riveted centrally on each quarter section of the steel rings, as shown in Fig. 5. The construction of these rings is shown in Fig. 5.

Excavation was carried on for a depth of 10 ft. 6 in., the ground at this point leveled up and the steel ring C placed in position. From Fig. 5 it will be observed that there are two 12-in. openings in each quarter section of this ring, making a total of eight. These openings were intended for the use of flat iron plates 12x9x1/4 in., which were inserted at an angle of 45 deg., and wedged in in the manner shown in the illustration, Fig. 4, in order to prevent the freshly applied concrete from running out.

After the ring C had been filled with concrete, ring B was placed immediately above and filled in the same manner; then ring A was placed immediately above ring B. The iron chutes shown on the ring A, Figs. 4 and 5, were constructed in exact relation to the openings of the ring C. This was done in order to facilitate the work of concreting, as will be seen on reference to the illustration. A wooden chute of suitable capacity was adopted for concreting, the opening of which was

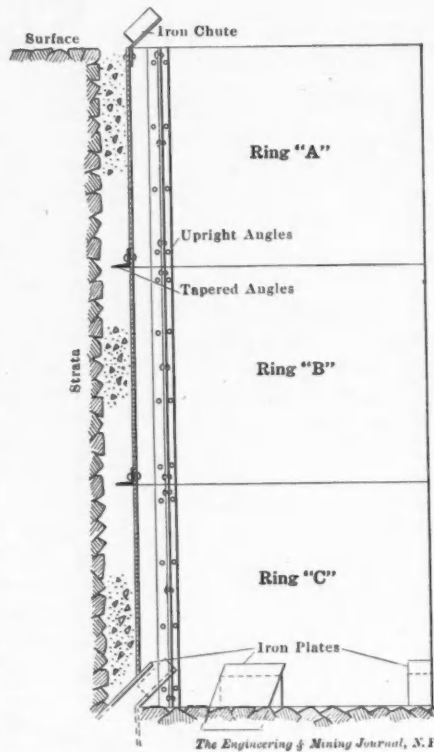


FIG. 4. SECTION FF SHOWING RINGS IN POSITION

plumbing boards, and were placed centrally on each quarter section, as shown in Fig. 5.

PLATFORMS

The platforms shown in Figs. 2 and 3 were installed 10 ft. 6 in. apart, being constructed in the following manner: A 30-lb. rail was inserted (base upward) at the openings marked Nos. 1 and 2, and grouted in with pure cement. From this 30-lb. rail two 16-lb. rails were run at right angles and grouted in at the openings marked Nos. 3 and 4 in the same manner. The platform itself consisted of 1 1/2-in. boards supported by the rails above mentioned and attached to same by means of bolts. The platforms could have been made of concrete also, and this would have made an absolutely fireproof shaft, but this construction necessitated more labor and conditions hardly justified such a project.

Openings were made in the platforms, as shown in Fig. 2, and perpendicular iron ladders were adopted, placed alternately at each opening and attached to the 30-lb. rail platform supports. The apertures in platforms were constructed to the dimensions shown in Fig. 2, in order to allow

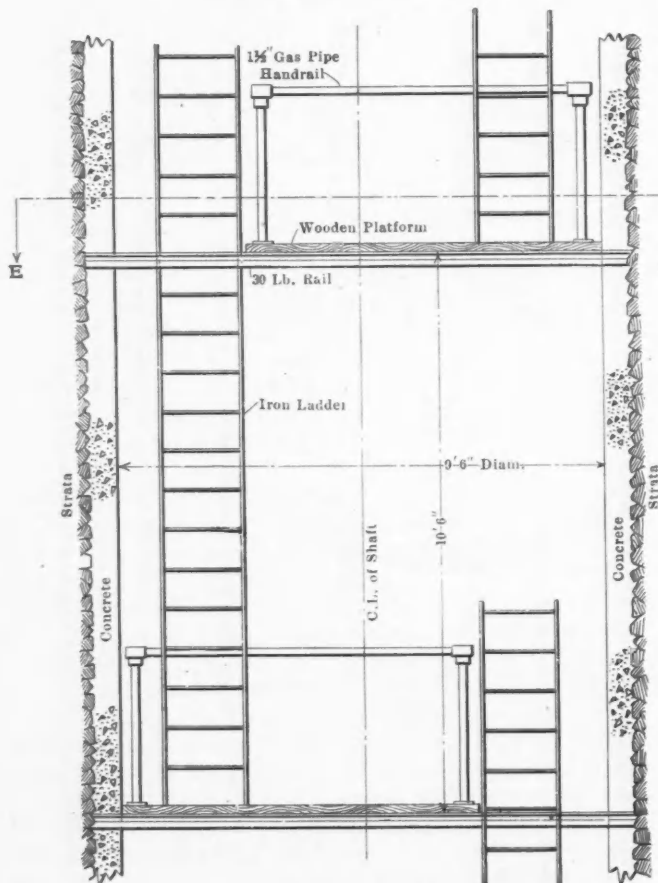


FIG. 2. SECTION GG SHOWING PLATFORMS AND LADDERWAY

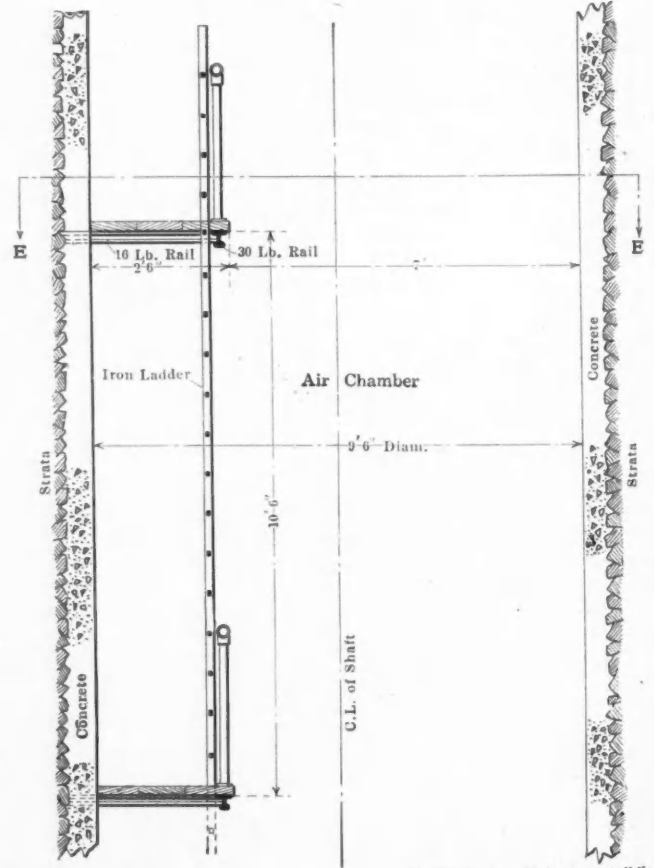


FIG. 3. SECTION HH SHOWING PLATFORM AND LADDERWAY

exactly 12 in. in width, in order to slide or chute the concrete in the apertures above referred to.

The perpendicular angles (3x3x1/4 in., and 3 ft. 6 in. long) were used in order to keep the quarter sections of the rings

in position, and also to act as strengtheners. By adopting a 4-in. wooden block it was only necessary to release one quarter section each time, and the entire ring was then raised or lowered by the engine.

Iron lugs were provided for resting

sufficient clearance as a manway. In this way danger from falling any great depth was eliminated, as it would thus be impossible for a person to fall down the shaft, or, in fact, to fall any greater distance than 10 ft. 6 in. to the platform

below. A gas-pipe handrail was provided to insure safety as a traveling way, and placed as indicated in the sectional view, Figs. 2 and 3. These ladders were placed alternately in order to facilitate the means of travel and also as stated previously, to insure greater safety.

A concrete mixer was used, and materially facilitated the progress of making concrete; the complete work of excavation, concreting and installing platforms and ladders, occupied about 90 working days of two 10-hour shifts. Owing to the small diameter of the shaft, only a limited number of men could be employed in sinking operations, consequently rapid progress was somewhat retarded. While the concrete was hardening in each section, and the rings were held in position, excavation was continued to the necessary

Peat in Canada

SPECIAL CORRESPONDENCE

The Mines Branch of the Canadian Department of Mines is devoting much attention to the question of rendering available for fuel the extensive peat resources of the country. With the purpose of presenting all attainable information as regards the latest processes of peat manufacture successfully pursued abroad, the branch last year issued a comprehensive report on "Peat and Lignite, their Manufacture and Use in Europe." This has now been followed up by the present publication,¹ giving the results of an examination by experts of some of the bogs most favorably situated as regards trans-

Bog:	Area, Acres.	Peat, Cu. Yd.	Dry Peat, Tons.
Mer Bleu.....	5,004	38,442,494	3,844,250
Alfred.....	6,800	70,270,260	7,027,000
Welland.....	4,800	30,796,480	3,079,600
Newington.....	3,800	46,666,500	4,666,600
Perth.....	3,800	38,445,200	3,844,500
Victoria Road..	67	402,440	40,250

From these few bogs, examined, it is apparent that the quantity of peat available for use is very large.

PRESENT CONDITION OF THE INDUSTRY

The report also gives an account of the present status of the peat industry in Canada by which it appears that it is at a very low ebb. Only one small peat plant was in actual operation last season, that of Dr. J. McWilliam, at Dorchester, Ont., which made a few hundred tons of peat fuel. The large amount of dust is the principal defect with all the peat briquets so far produced, and up to the present time this difficulty has not been overcome.

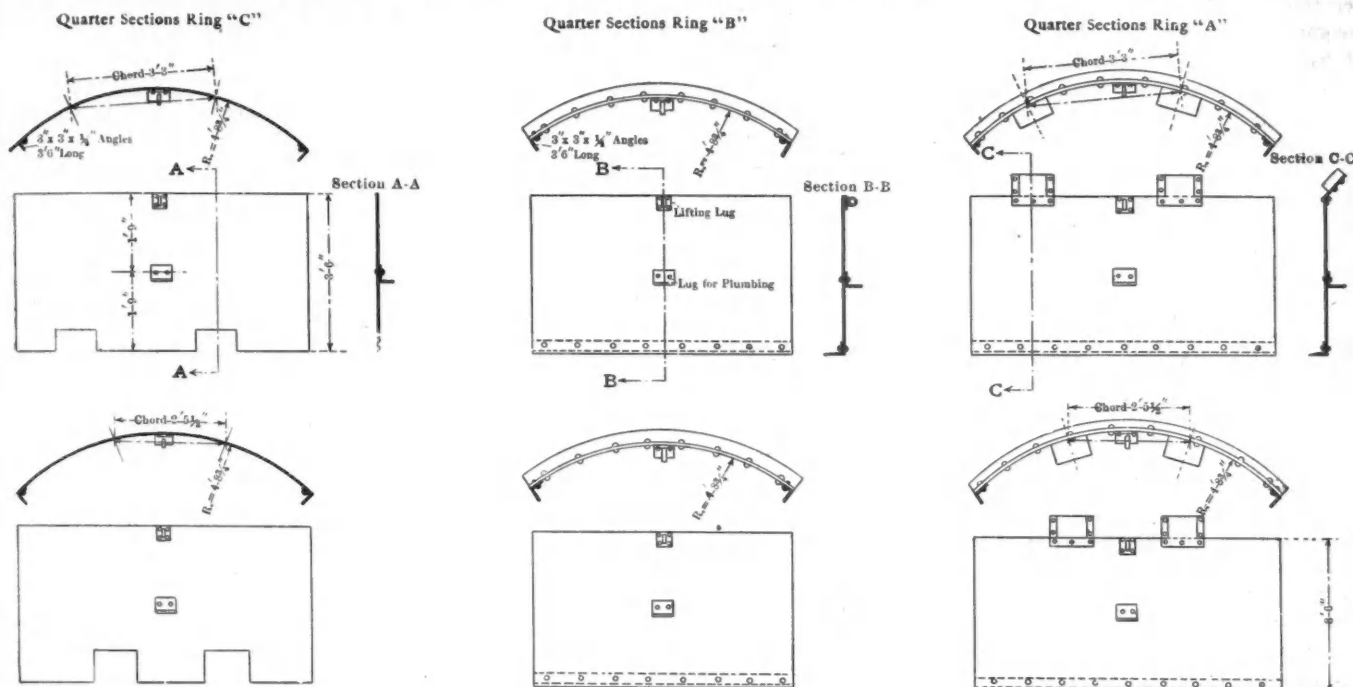


FIG. 5. DETAILS SHOWING CONSTRUCTION OF RINGS

depth, and the rings then removed and re-inserted for the next operation.

The cost of operation per foot, worked out at the rate of \$27.56, which cost included all labor and material in excavation, concreting, rails, platforms, ladders and steel rings, with an allowance for concrete mixer and hoisting engine on hand, and general superintendence, or a total expenditure of \$9095 for sinking 330 ft. in depth.

At this time when many of us are estimating the quantity of available coal remaining unmined throughout the world, it may be interesting, if not satisfying, to recall that in the last report of a Royal Commission, appointed to examine the question, it was shown that the final and up-to-date estimates of available coal gave a total world supply 12 per cent. greater than was reported by a similar commission 30 years earlier.

portation and market facilities. The investigation was conducted in a very thorough manner, the surface of the bogs being mapped out, lines run at intervals generally 1000 ft. apart, and drillings made in each of these lines at intervals of 500 ft., samples of the peat being collected at different depths. The following estimates of the amount of fuel contained in the bogs investigated will give some idea of the peat resources awaiting exploitation. The calculation of the amount available in each case is based on the assumption that 1 cu.yd. of drained bog will furnish 200 lb. of dry-peat substance. The following table gives the results obtained from the investigation of several bogs, all of which are within reach of transportation:

¹"Investigation of the Peat Bogs and Peat Industry of Canada during the Season 1908-9." Canada, Department of Mines, Mines Branch. Bulletin No. 1. By Erik Nystrom and S. A. Anrep. Pp. 25; 9 1/2 x 6 1/2 in.; paper, with maps. Ottawa, 1909; Government Printing Bureau.

The report attributes this to the fact that the moisture in the peat collected from the bog is not uniform, and considers that the method pursued of collecting the raw material in thin horizontal layers is not in most cases as good as where the peat is dug vertically to the bottom of the bog and the different layers mixed. In most cases the companies that have erected plants have never produced any quantities of fuel worth mentioning. This is due principally to lack of knowledge of the properties of peat, which has led to the employment of impracticable methods or unsuitable bogs. Extensive experiments have been made by E. V. Moore at the Victoria Road bog, but the plant constructed was found to be too complicated in design and not practicable. Operations have recently been started at the Guelph peat plant by the Imperial Peat Company, Ltd., but no data are yet obtainable as to the results obtained.

Rope Strains in Hoisting

By C. W. BEERS*

The calculation of rope strains for hoisting purposes, on any pitch, for service in and about a coal mine, involves some features and methods that are not thoroughly understood by mine foremen and others who have to do with such problems. To place within the reach of such persons, a quick method of solving such problems for various rope strains, the accompanying curve has been prepared. For practical purposes this curve will be found sufficiently accurate.

The quantities used in determining the curve are: L =weight in lb. of loaded car; 35 =car friction in lb. per ton; 2000 =lb. per ton; F =distance car travels; W =weight in lb. per ft. of rope. The pitch of haulage or hoist is ϕ deg. which may vary from 0 to 90 deg. The value of 35 lb. running car friction per ton is the average of experiments conducted on cars at a certain mine and is assumed to be fairly accurate for other mine cars. With the load on the pitch

$$L \sin. \phi = \text{load on rope due to } L,$$

$$\frac{\cos. \phi L}{2000} \times 35 =$$

load on rope due to running friction of load L .

$$L \sin. \phi + \frac{\cos. \phi L}{2000} \times 35 =$$

combined load on rope due to the above when load is at top of pitch.

Reference to a table of cast steel ropes, which are the kind commonly employed in the anthracite field, shows that the weight per foot of rope is equal to about one quarter the working load in tons, i.e., a rope designed for a working load of 10 tons would weigh about $2\frac{1}{2}$ lb. per ft. Therefore, to obtain the average weight per foot of rope, reduce the above load to tons, and divide the result by four, or

$$\frac{L \sin. \phi + \frac{\cos. \phi L}{2000} \times 35}{2000} \div 4 = W =$$

weight per ft. of rope in lb.

And if F =distance car travels on pitch of ϕ deg., then

$$\frac{\sin. \phi F \left(L \sin. \phi + \frac{\cos. \phi L}{2000} \times 35 \right)}{2000 \times 4} =$$

additional load due to rope.

Hence, when the car is at the bottom, the total load on the rope, neglecting rope friction, is:

$$\begin{aligned} & \left(L \sin. \phi + \frac{\cos. \phi L}{2000} \times 35 \right) + \\ & \sin. \phi F \left(\frac{L \sin. \phi}{8000} + \frac{\cos. \phi L}{57.2 \times 8000} \right) = \\ & \left(L + \frac{\sin. \phi LF}{8000} \right) \left(\sin. \phi + \frac{\cos. \phi}{57.2} \right). \end{aligned}$$

*Electrical engineer, Lehigh Valley Coal Company, Wilkes-Barre, Penn.

When $\phi = 0$ deg., or for a level road, the rope friction may be taken as 10 per cent. of the nominal pull on the rope, and, of course, as the pitch increases, this friction will vary as the cosine of the pitch. Hence

$$\frac{\cos. \phi}{10} \left(L + \frac{\sin. \phi LF}{8000} \right) \left(\sin. \phi + \frac{\cos. \phi}{57.2} \right) =$$

rope friction,

and the

$$\begin{aligned} \text{total rope strain} &= \left(L + \frac{\sin. \phi LF}{8000} \right) \\ & \left(\sin. \phi + \frac{\cos. \phi}{57.2} \right) + \frac{\cos. \phi}{10} \left(L + \frac{\sin. \phi LF}{8000} \right) \\ & \left(\sin. \phi + \frac{\cos. \phi}{57.2} \right) = \left[\left(L + \frac{\sin. \phi LF}{8000} \right) \right] \\ & \left(1 + \frac{\cos. \phi}{10} \right) \left(\sin. \phi + \frac{\cos. \phi}{57.2} \right). \end{aligned}$$

PRACTICAL USE OF TABLE AND CURVE

To use the curve the procedure is as follows: Suppose the pitch of the slope is 30 deg., and the load L , is one loaded car = 8000 lb.; the distance the car moves is 500 ft.; speed on slope, 400 ft. per min. Here, $L = 8000$ lb., $\phi = 30$ deg., $\sin. 30$ deg. = 0.5, and $F = 500$ ft. Substituting the proper quantities in the formula

$$\left(L + \frac{\sin. \phi LF}{8000} \right),$$

the value 8250 lb. results. Then on the vertical line at left of curve find 30 deg., and follow a horizontal line across the figure till it cuts the curve, and at this point, drop a vertical line until it intersects the base line, which point will be

TABLE II. SIZES OF VARIOUS SINGLE-DRUM HOISTING ENGINES ARRANGED ACCORDING TO ROPE STRAIN AND ROPE SPEED.

Usual Approximate Horsepower.	Diameter of Cylinder.	Stroke of Cylinder.	Diameter of Drum.	Face of Drum.	Feet per Coil.	Average Rope Speed.	Average Rope Strain, Lb.
3	5	6	8	10	56	65	600
6	5	6	10	12	69	65	1,000
4	5	8	10	15	82	130	1,000
6	6½	8	10	15	67	130	1,500
12	6½	8	23	22	200	250	1,500
8	5	8	14	14	85	135	1,650
10	7	10	12	16	71	140	2,000
20	7	10	29	23	225	275	2,000
12	6½	8	14	15	77	150	2,500
15	8½	10	14	18	80	150	3,000
30	8½	10	41	39	440	350	3,000
30	8½	10	27	30	249	500	3,000
30	8½	10	34	30	314	500	3,000
20	7	10	14	19	85	157	3,500
35	8½	12	34	30	314	450	3,500
35	8½	12	42	38	464	450	3,500
40	8½	12	47	42	500	375	4,000
50	10	12	53	42	550	400	4,500
50	10	12	37	38	425	600	4,500
50	10	12	42	38	374	600	4,500
50	10	12	48	42	474	600	4,500
50	10	12	54	42	494	600	4,500
20	8½	12	16	26	116	110	5,000
65	11	14	48	42	474	575	5,000
65	11	14	54	42	594	575	5,000
25	10	12	16	26	116	146	6,000
30	8½	10	16	26	116	175	6,000
75	12½	15	59	54	775	450	6,500
75	12½	15	48	42	474	550	6,500
75	12½	15	54	42	540	550	6,500
75	12½	15	60	48	574	550	6,500
100	14	18	65	63	975	450	7,500
100	14	18	54	42	540	500	7,500
100	14	18	60	48	547	500	7,500
110	14	20	60	60	688	450	8,500
110	14	20	66	60	754	460	8,500
40	8½	12	16	24	110	150	10,000
150	16	18	65	63	900	450	10,000
50	10	12	16	24	95	150	12,000
200	18	24	72	70	1,160	550	13,000

Solving the expression

$$\left(1 + \frac{\cos. \phi}{10} \right) \left(\sin. \phi + \frac{\cos. \phi}{57.2} \right),$$

by substituting the value of the natural sines and cosines for each 10 deg., from 0 to 90 deg., the values shown in the accompanying table are obtained:

TABLE I. VALUES FOR EXPRESSION

$$\left(1 + \frac{\cos. \phi}{10} \right) \left(\sin. \phi + \frac{\cos. \phi}{57.2} \right).$$

Degrees.	Result.	Degrees.	Result.
0	= 0.01925	50	= 0.82720
10	= 0.20959	60	= 0.91843
20	= 0.39208	70	= 0.97804
30	= 0.55971	80	= 1.00495
40	= 0.70646	90	= 1.000000

Plotting the various values of the expression as above obtained, as abscissas, and the angles as ordinates, and connecting the points of intersection thus obtained, the curve reproduced herewith is obtained.

0.55971; then multiply the value 8250 by 0.55971, and the result, 4600 lb. is the required rope strain.

In case it is desired to use an air or steam engine to handle the load, the size of the same may be readily determined by reference to Table II., which gives the various sizes of engines and drums commonly used about the mines. Since the rope strain is 4600 lb., and the rope speed is 400 ft. per min., by referring to the table, and looking under columns headed "Average Rope Strain" and "Average Rope Speed," it will be found that a 10x12-in. engine, with a 53-in. diameter by 42-in. face drum is listed to do the work.

The proper size of rope to use for any rope strain, may be easily determined by the aid of the table on "Rope Data,"

The Vermont Copper Company

BY ALBERT H. FAY

The property of the Vermont Copper Company is in Orange county, Vermont, 2 miles east of South Strafford, and 12 miles northwest from Pompanoosuc, a station on the Boston & Maine railway. A good wagon road connects the two places and only recently two preliminary surveys were made for the construction of a railroad to the mine.

HISTORY

The copper mines of this county are of historical interest inasmuch as they

ORE

The ore occurs in lenses in what appears to be a fissure vein. It consists largely of pyrrhotite in which is a small amount of chalcopyrite, finely disseminated through the orebody so that in previous concentration methods a large percentage was lost. The wallrock, both hanging and foot, is a micaceous schist. The strike of the vein is approximately north 20 deg. east with a dip varying from 70 to 50 deg. as depth is gained. An average analysis of the ore is as follows: Fe 40; Al_2O_3 6; Cu 2 to 3; CaO and MgO 2; and SiO_2 15 to 20 per cent.; $1/3$ of the silica is free and $2/3$ is combined. The problem of handling ore of this character is more of a metallurgical one than mining.

the drift level a large amount of ore has been removed. From the junction of the adit and the drift an inclined shaft is being worked which is in ore at a depth of 200 ft. below the adit.

MINE EQUIPMENT

The mine is furnished with power from a hydroelectric plant which was recently installed $10\frac{1}{2}$ miles from the mine. The normal capacity of the plant is 800 h.p. which is transmitted at 6600 volts and is transformed to 550 volts before entering the power house motors. A 14-drill Sullivan compressor is operated by a 150 h.p. three-phase induction motor. The machine shop is equipped with pipe and thread cutters, emery wheels, lathes, drill presses and other machinery and is



SMELTERY, VERMONT COPPER COMPANY

were the largest producers of copper prior to the opening of the Lake Superior mines. The first work done here was in 1793, when sulphide ores, pyrrhotite and some pyrite, were mined, roasted, and leached for copperas. Between 1820 and 1830 at least 300 men were employed at the mines in the production of copperas, the finished product being hauled to Boston by wagon. At this time it became known that the ore contained a low percentage of copper and during ten years following 1830 the mine was worked for copper, the ore first being roasted and then smelted. About 1860 some of the oxidized surface ores were mined and sold for paint.

DEVELOPMENT

The orebody is 10 to 25 ft. thick and the management estimates that about 400,000 tons of ore are now developed. During the last few months two diamond drills have been used in prospecting; the orebody has been encountered 200 ft. below the present working level at a number of places both north and south of the old workings, as well as directly underneath. The old work consists of a large open cut on the side of the hill as shown in the photograph, and an adit 1400 ft. long which extends from the power house and taps the vein at a depth of about 400 ft. Work has been done along the vein approximately 1800 ft. and above

capable of handling any ordinary work connected with the mine. All of the ore is transported from the mine to the smelter by electric motors operated on 220 volts, direct current.

SMELTER

A furnace 16 ft. by 44 in. was built last year. The building, covering the furnace was constructed entirely of wood, and as a result the building caught fire soon after the furnace was started and was destroyed last February. The damage was not only confined to the building, but the 250 h.p. gasoline engine and blower were badly damaged. The blower has been repaired and will be

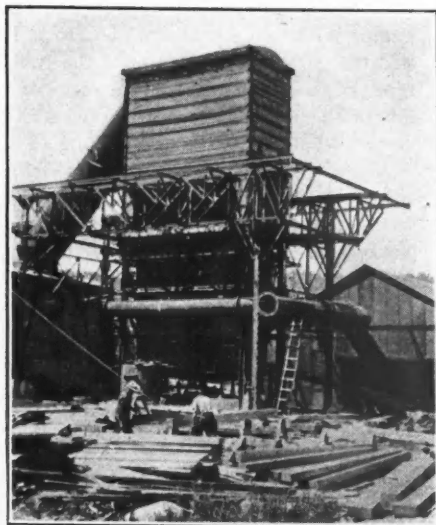
operated by two 100-h.p. induction motors connected in parallel. The motors and blowers are now inclosed in a fire-proof steel building. The furnace itself will be inclosed in a steel building also. During this reconstruction the furnace has been altered so that it is now one-half its original size, that is, 8 ft. by 44 in. with 8 tuyeres on one side and six on the other. It is the intention to use the smaller furnace experimentally on pyritic smelting. In case this method of smelting is successful the furnace will be enlarged to its original capacity. No concentration of the ore will be attempted prior to smelting.

A flow sheet of the ore from the mine to the smeltery is as follows: By electric motor to a crusher; then by belt conveyer to a Vezin sampler; then to storage bin; then to car and tram about 1500 ft. to storage bin at the furnace; from these bins it is loaded into an automatic weighing car and charged direct to the furnace. In the early days a large amount of heap roasting was done and now there are many thousands of tons of ore in the old heaps which will be used eventually, although it has lost some of the copper content by leaching during the last few years. The mine is under the

The Los Angeles Oil Industry

BY PERCY E. BARBOUR*

When Los Angeles began producing crude petroleum in 1894, the total annual production of California amounted to only 600,000 bbl. In 1895 Los Angeles pro-

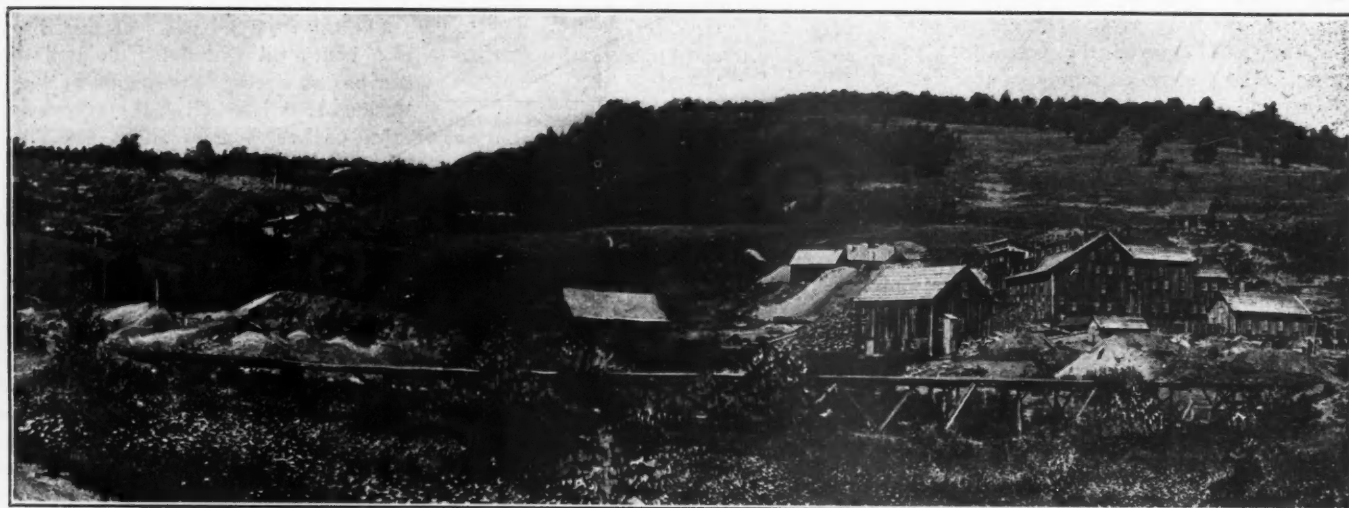


BLAST FURNACE, VERMONT COPPER COMPANY

by pumping wells, and, in some instances, the unsightly derricks stand on either side of the stately palm trees that embellish most of the lawns. The city of Los Angeles consumes almost the entire oil production of the Los Angeles district. There are very few pipe lines and these are unimportant. The local refining industry has grown to considerable proportions and is wholly in the hands of independents. The price of Los Angeles oil is, for reasons to appear, almost invariably far above the average price for the State's production.

DEPOSITS OF BREA

The existence of oil-bearing formation in or around Los Angeles was known to the early settlers. There are several places where the oil sands outcrop, and in these places the oil oozing out has had its more volatile constituents evaporated, thus leaving a residuum, mixed with more or less earthy impurities, which is known as "brea." This brea was used by old-time Mexican residents for fuel and for waterproofing the roofs of their adobe houses, and not inconsiderable amounts have been shipped away in former years. More recently some interesting discoveries of perfectly preserved remains of prehistoric animals, including the mammoth and the sabre-toothed tiger, have been made in



OPEN CUTS, POWER HOUSE AND SAMPLING WORKS, VERMONT COPPER COMPANY

management of Charles Of, to whom I am indebted for much of the above information.

It turns out that the Producers' Transportation Company, formed by the independent oil producers of the San Joaquin valley, had the backing of the Union Oil Company of California in securing the proposed new pipe line to the coast. The independent union has about one-half of the commercial oil produced in California. When the new pipe line is finished, a greater production will be made. The State is now yielding 160,000 bbl. per day, of which 30,000 are consumed by the railroads, and 30,000 by the refiners. The other 100,000 bbl. are for the open market.

duced 729,695 bbl., which amounted to 60 per cent. of the total production of the State. Owing to the rapid development of other new fields in California which made it in 1907 the first oil-producing State in the Union (in 1908 it was forced to second place by Oklahoma), the Los Angeles district, although still showing steady and important increases in production, furnished only 8.7 per cent. of the State's total in 1907 and 11.4 per cent. in 1908.

The Los Angeles oil industry is unique in several ways. The oil belt extends through one of the best portions of the residential part of the city. Here costly residences are confronted or surrounded

*Consulting mining engineer, Salt Lake City, Utah.

these brea deposits. About four miles west of the city is the largest deposit of brea in the county, which gave the name of Rancho la Brea to the vicinity where are now the important wells of the so-called Salt Lake field, named from the first company operating therein.

EXTENT AND HISTORY OF THE LOS ANGELES OILFIELDS

The Los Angeles fields are in an oil belt extending from Santa Barbara on the northwest, to Puente on the southeast, a distance of more than 100 miles, all of which is more or less productive and which is of growing importance in the California oil industry. The "geological formation is of Middle Eocene age and

has the form of a flat anticline, though somewhat broken."¹

Doheny and Cannon, who dug two wells with pick and shovel, are given credit for having discovered commercial crude oil within the city limits, in a well only 150 ft. deep. This was in 1892. It was not until 1894, however, that the oil excitement began. A well put down near Second street park in a residential section yielded a good quantity of oil and the boom was on. Other wells were rapidly drilled in the neighborhood, the total number in five years amounting to about 1500. Wildcatting was rife and picturesque, but, as usual, was confined more to stock selling than to wildcat drilling. This period passed, the industry settled down to healthy increasing production, amounting in 1908² to 5,138,853 bbl. of 42 gal. each. Of this, the so-called Salt Lake field produced 4,535,667 barrels.

FOUR FIELDS IN THE DISTRICT

The Los Angeles oil district is commonly divided into four fields: three are in the city proper, and the fourth, by far the most important, is on the Brea ranch, just west of the city limits. The Central or Old field, including the first commercial wells, extends from Victor street on the east to Miramar and Bonnie Brae streets on the west, thus reaching a point almost opposite Westlake park. The exploitation of this field covered the years 1892 to 1895. The eastern extremity of this field is marked by a local fault, and quicksand and water seemed to have put a limit to development in this direction, but subsequent prospecting opened up an entirely new field extending from the Old field eastward almost to the Southern Pacific tracks. This is known as the Eastern field, and by the end of 1897 both these fields were thickly dotted with wells, sometimes not more than 30 ft. apart. In 1899 prospecting to the west of the Old or Central fields opened up what is known as the Western field, which extends from the Central field west to the city limits. These three fields cover a territory nearly 3 miles in length, and varying in width from 500 ft. to ¼ mile. In 1901 development of the oilfields of the Brea ranch was begun by the Salt Lake company, which gave its name to the fields, and since that time the development of this field has been most rapid, and it is now the most important part of the Los Angeles oil district. The storage capacity in this field is large, and there are several short pipe lines, the longest of which extends 4 miles to the Southern Pacific tracks in the city. The oil is conveyed through these lines under a pressure head of 600 pounds.

APPARATUS AND MACHINERY USED

The standard "California Rig" is almost

¹Bulletin 32, California State Mining Bureau.

²By courtesy of the California State Mining Bureau.

wholly used in the district. This rig is the standard ordinary reel known as a "calf wheel," which is necessary to handle the casing required by the formation of this district and California oilfields in general. The derrick is 82 ft. high by 20 ft. square on the ground, and the rig complete contains about 17,000 ft. of lumber, and about 4 tons of ironwork, exclusive of the engine and boiler. The engine generally used is a plain slide-valve, link reversible engine with two eccentrics, of 12 to 30 h.p., and the customary boiler is of the tubular type, 15 to 40 h.p. The larger sizes of engine and boiler are, of course, for the deeper wells. The cost of drilling in Los Angeles averages about 63c. per ft. for 1000-ft. wells, and the total cost of a well, including machinery, rig, and surface appurtenances, varies from \$3500 to \$8000.

LOS ANGELES OIL PRODUCTION.(a)

Year.	Barrels.	Average Price, Los Angeles Oil, Cents per Bbl.	Average Price, California, Cents per Bbl.
1895	729,695	....	....
1896	900,000	....	....
1897	1,072,000	....	....
1898	1,168,000	....	....
1899	1,032,036	....	....
1900	1,500,000	....	....
1901	2,500,000	....	....
1902	3,074,000	....	....
1903	2,468,000	....	....
1904	2,102,892	58.9	27.9
1905	3,469,433	26.8	24.5
1906	3,449,119	45.9	28.9
1907	3,477,235	50.3	37.0
1908	5,138,853	....	....

(a) Figures compiled from bulletins of California State Mining Bureau and bulletins and Mineral Resources of U. S. Geological Survey.

LIST OF REFINERIES IN THE LOS ANGELES OILFIELDS.

Name.	Number of Stills.	Capacity in Bbl.
Southern Refining Co.	2	100
Densmore Stabler Refining Co.	6	250
British California Oil Co.	6	150
Union Consolidated Refining Co.	2	100
Asphaltum and Oil Refining Co.	1	200
Hercules Oil Refining Co.	5	225
Amalgamated Oil Co.	2	250
Chas. Victor Hall.	1	35
Jordan Oil Co.	1	50
	2	150
	1	200
	2	600
	2	300
	4	120
	3	250
	2	200
	3	400
	1	100
	3	400 (a)

(a) Total capacity.

In the Western field productive wells may not be over 300 ft. deep, but in the Eastern field some are over 1500 ft. deep.

PUMPING MACHINERY

All the wells in this district have to be pumped, although in the Salt Lake field most of the wells have produced some gas and some of the wells have come in as gushers, one having been reported as producing 18,000 barrels per day for a few

days. The wells within the city limits have no gas.

Very few of the wells are pumped singly by a walking beam. The wells are so close together that they are pumped in groups of from 6 to 12 from a single power plant, which is generally a gasolene engine. Power from the engine is transmitted by belt to a shaft outside the power house, which, in turn, drives a short vertical shaft by means of bevel gearing. The top of the vertical shaft carries a bell crank revolving in a horizontal plane. The crank pin carries a horizontal disk to the periphery of which are attached, by means of clevises, the wire cables which reach to the jacks at the wells. When a larger number of wells are to be pumped, a large eccentric is added. This eccentric is placed on the shaft below the crank, and the pumping cables attached to the eccentric strap. If the location of the wells is such that the cables connecting them to the disks cannot be placed so as to approximately balance the load, a cable is run to a counterbalance jack loaded with rocks. Pumping is done at the rate of 12 to 17 strokes per minute. The oil is pumped to small storage tanks at or near the wells, and a large proportion of the total production is delivered by tank carts to the refineries and to consumers in the city, where crude oil is the common fuel.

The oil from all parts of this district is a heavy oil with an asphaltum base, and has an average density of 13 deg. B. Various tests have given the average fuel value of Los Angeles oil as 3½ bbl. of oil equal to 1 ton of soft coal. The average yield per well per day is 10 to 15 bbl. This low productive average is due probably to overcrowding the wells.

PRODUCTION AND PRICE OF LOS ANGELES OIL

Owing to the fact that this oil is actually produced in its own market, or within four miles at the farthest, transportation thus being largely eliminated, the price obtained for Los Angeles oil is almost always in excess of the average price obtained for the total California production. When oil was first produced in Los Angeles, it sold for \$1.25 per bbl. Later when the price fell to \$1, it was termed "ruinously low." In May, 1909, a Los Angeles municipal contract for crude oil for street sprinkling purposes was let at 70c. per bbl., and for asphaltum for road building at \$1 per barrel.

The Los Angeles refining industry has grown to considerable proportions and is entirely in the hands of small independent refiners. The Standard Oil Company has no refinery here. The products of these refineries include gasolene, benzine, gasolene engine distillate, illuminating, neutral, lubricating and fuel oils, lubricating stock and asphaltum.

There are more than one hundred oil companies doing business in or from the city of Los Angeles.

Peroxidation of Iron in Blast Furnaces

BY ANTENOR RIZO-PATRON*

Although I see that very little attention, if any at all, is given to the possible formation of iron peroxides during the raw smelting of certain pyritic ores in blast furnaces, I have come through practical experience to duly appreciate the deleterious effect that the actual existence of that chemical condition during the process will produce on the running of the furnace. I attach so much importance to this condition in the blast furnace that I believe some negative results in pyritic smelting may be attributed to no other cause, and that the same phenomenon, in other cases, originates a large amount of trouble that is not satisfactorily explainable in any other way.

UNSATISFACTORY WORKING OF FURNACE

The liquation of sulphides will no doubt leave a more or less infusible matter inside the furnace on account of lack of the necessary FeO if, in the calculation of the charge, insufficient allowance was made for the replacement of the iron subtracted by the too low-grade matte formed. This, however, will be apparent to any one experienced in the smelting of ores, and the remedy of adding to the charge the necessary amount of extra fluxes required to make a good slag should be immediately applied. The same could be said about the amount of carbonaceous fuel used to obtain the required temperature in the furnace.

In any case, the experiment could be considered a failure both on account of the production of a too low-grade matte and the excessive consumption of coke, unless these factors could be adjusted later during the actual operation of the furnace. It might be possible to do this by regulating the volume of blast and the weight of charges, or by such other method as good practice might suggest in any particular instance.

But the case to be considered now is the one in which the furnace entirely fails to work in spite of the fact that all these apparent causes of failure had been removed. I have myself met with exactly this case in practice and the same seems to have occurred at a Canada smelter, working with Sudbury ores, as described by Mr. Beardsley, and so fully discussed by other metallurgists.

RUNNING ON RAW SULPHIDE ORES

In a certain instance I attempted to run a blast furnace on raw sulphide ores while the roasting plant of the works was

still unfinished. The ores were a mixture of gray copper, chalcopyrite and pyrites, and a very little zinc blende in a silicious gangue. Their chemical composition is given by the following analysis: silica, 27.6 per cent.; iron, 25.75; zinc, 1.07; lime, 0.67; lead, 0.63; copper, 6.13; sulphur, 31.49; antimony, 6.34; total, 99.68. Although the furnace was making a matte containing only 15 to 20 per cent. Cu, and every combination of fluxes to form fluid silicates was tried yet it was impossible to obtain a single pot of fluid slag. The analysis of the thick mass, obtained as slag and showing magnetic properties to a greater or lesser extent, showed the relative properties of its elements to be as required to form a fusible and liquid slag if they had been present as the regular slag-forming silicates of the protoxide of iron and the other bases of the charge. However, it is hardly possible that this could have been the case to a great extent, and the true composition of the slag could better be described as a greatly peroxidized magma containing in addition to these compounds enough ferric silicates and magnetic oxide of iron, associated with calcium sulphide, to form a mass only partially fusible at the temperature of the furnace. Although the amounts of coke in the charge were varied from almost nil to 20 per cent., and the volume of blast from 350 to 470 cu.ft. of air per min. per sq.ft. of hearth area in the furnace, yet, on the assumption of Fe being present as FeO, it was impossible to secure a slag within the following limits: silica, from 34.9 to 43.5 per cent.; iron oxides, 46.8 to 35.3; lime, 12.5 to 21.2. The experiment was repeated seven times under different conditions at each trial, and it was never possible to keep the furnace hot for a longer period than 24 hours.

The same ores, partially roasted in kilns and in a mechanical furnace of the Edwards type, were smelted without difficulty, making mattes containing about 35 per cent. Cu and regular fluid slags, notwithstanding the fact that the roasted ore contained a heavy proportion of the magnetic oxide of iron. If the roasting was carried far enough most of the iron in the ore was converted into that oxide.

Upon calculating the amounts of S and Fe contained in a 20 per cent. copper matte, it was seen that only 3.87 lb. of S and 5.72 lb. of Fe for every 100 lb. of ore had escaped oxidation; i.e. 86.7 per cent. of the S and 77.6 per cent. of the Fe had been oxidized in the stack. This is without taking into consideration the Fe₂O₃ which goes into the matte, lowering its value beyond the point due to the unburned sulphur and causing in the furnace the cooling and hardening of the matte-tap.

Under these conditions it could not be properly said that the furnace failed to

oxidize, notwithstanding the low grade of the matte. It did exactly the opposite in a certain respect, for it oxidized too much of the iron in the charge. This excess of oxidation, however, did not seem to be caused by conditions in the furnace, at least by conditions under the immediate control of the metallurgist during the experiment, as no difference could be observed with varying proportions of coke and blast, with heavier or lighter charges, nor with different heights of the ore column (from 2 or 3 ft. to 12 ft. above the tuyeres). Everything must have depended upon the nature of the ore, and this assumption would be confirmed by its property, not common to all natural sulphides of iron, of being easily converted into Fe₂O₃, even at the low temperature of roasting.

It may be noted that the results obtained in this case were almost identical with those of the Canadian smelter, although no nickel or Al₂O₃ in appreciable quantity was present. The ore to be treated and the fluxes at hand were especially clean, thus making any difficulty in the technical treatment of the ore entirely unexpected.

SIMILAR RESULTS WITH CONCENTRATES

Although I made these observations about the time the articles on "Negative Results in Pyritic Smelting" came to my hand and thought at that time that something similar could have occurred with the Sudbury ores, yet I did not consider the matter any further until recently, at another place, I observed very much the same phenomena while treating ores of a somewhat more complicated composition. I had been running a blast furnace for several years on high-grade copper ores which were treated at the highest profit by roasting in mechanical furnaces and making mattes of over 60 per cent. cop-

ANALYSES OF CONCENTRATES.

	Per Cent.	Per Cent.
Silica.....	30.52	21.80
BaSO ₄	10.16	5.20
Iron.....	14.70	13.40
Zinc.....	8.00	12.40
Alumina.....	1.69	4.00
Lead.....	11.61	20.30
Arsenic and antimony.....	1.25	trace
Copper.....	3.72	0.50
Sulphur.....	18.20	22.95
	99.85	100.15

per in one operation. Later, the principal supply of ore to the smelter became a very silicious silver ore containing but little copper. These ores were concentrated by water to free them of the excess of silica, and the raw concentrates were mixed with the wasted copper ores. The mixture was briquetted and smelted. The composition of the concentrates is shown in the accompanying table, corresponding to different grades of the original concentrating ore.

*Engineer, La Fundicion, Peru (Establecimiento Mineral de Huaracaca).

INCREASING PROPORTION OF CONCENTRATES

For commercial reasons it was desired to increase as far as possible the proportion of concentrates smelted, diminishing at the same time the amount of copper ore. Everything worked right until the ratio of raw concentrates to roasted copper ore became about 4 to 1. As soon as this ratio was exceeded, the furnace began to work poorly; the slags becoming thick and cold, the capacity of the furnace diminishing from $3\frac{1}{2}$ to $2\frac{1}{2}$ or less tons of charge smelted per square foot of hearth area, and freeze-ups occurring after exceedingly short runs sometimes most suddenly. Any change in the composition of the charge between the limits already known as forming good slags, did not give results in the direction of improving the condition of the furnace, even though the analyses of the slags showed almost the same proportions of the elements as when the furnace worked well with the same amounts of fuel and blast. The slags were more or less magnetic and refused to flow. The question of the formation of iron peroxides inside the furnace had no doubt newly arisen.

SLAGS

The accompanying analyses give the composition of some of these magnetic slags which caused the furnace to work poorly and finally to freeze. The iron is always considered as protoxide.

COMPOSITION OF MAGNETIC SLAGS.

	Per Cent.	Per Cent.	Per Cent.
SiO ₂ (a).....	38.00	41.80	39.50
FeO and MnO.....	25.00	31.80	30.00
Al ₂ O ₃	6.50	6.00	7.00
CaO.....	18.15	11.21	10.40
MgO.....	4.60	2.90	4.48
ZnO.....	5.20	3.60	6.30
PbO.....	1.20	1.10	0.50
Cu.....	0.30	0.40	0.30
Silica(b).....	38.00	41.80	39.50
Iron oxides(b).....	31.50	37.80	37.00
Lime(b).....	18.15	11.21	10.40

(a) The weight of SiO₂ includes some BaSO₄.
(b) Daily slag reports. The Al₂O₃ is included in the weight of iron oxide; no determination being made every day for the other elements.

I quote these analyses to enable a comparison to be made with the following monthly averages of slags producing no trouble at all in the furnace:

Silica.....	38.07	39.17	39.14
Iron oxides.....	35.01	32.28	35.94
Lime.....	18.26	17.20	14.22
Copper.....	0.34	0.27	0.47

The mattes made with the above slags contained about 50 per cent. Cu with a concentration of 12 to 1, corresponding to an oxidation of 80 per cent. of the sulphur in the charge.

Crusts taken from inside the frozen furnace, analyses of which are shown in an accompanying table, were entirely magnetic. The iron is recorded as protoxide although it was not totally contained as such.

These slags do not differ from one another in their elementary composition to an extent that will explain their opposite behaviors in the furnace. Moreover, the thickest ores and those which look to be most infusible, will, if charged again into the furnace, flow perfectly fluid. From this it seems evident that the degree of oxidation in the one is quite different from that in the other. If the iron is contained as protoxide, the slags are fusible and fluid; if it is peroxidized to a greater or lesser extent they do not flow, as ferric silicates are almost as infusible as the silicates of alumina. If the peroxidized materials are again charged into the furnace, a rapid reduction takes place and

ANALYSES OF CRUSTS TAKEN FROM INSIDE OF FURNACE.

	Per Cent.	Per Cent.
SiO ₂	27.50	35.70
FeO.....	26.20	20.50
MnO.....	2.10	2.70
Al ₂ O ₃	5.00	6.00
ZnO.....	8.00	5.00
CaO.....	16.90	25.00
MgO.....	2.20	3.10
PbO.....	0.60	trace
Cu.....	5.40	0.20
S.....	2.45	0.00
BaSO ₄	1.60	1.60
	97.95	99.80

the qualities of infusibility and thickness disappear.

CHARACTERISTICS OF SLAGS AND CRUSTS

All these slags and crusts, like the other ones with which I have had to deal, will, if pulverized and strongly calcined in the muffle furnace, take the appearance of earthy matter and become strongly magnetic, if they were not so originally. Is it a decomposition the silicates undergo in this operation? They also increase in weight more than could be attributed to the peroxidation of the iron contained, and afford at the same time a certain amount of sulphates, soluble in dilute acids. The calcination being carried on at a high enough temperature to decompose any sulphate of the heavy metals (PbSO₄ being disregarded as contained in too small proportion), the extra increase of weight cannot be ascribed to any cause other than the conversion into sulphates of the calcium (and magnesium) sulphides contained in the slag. A certain relation seems to exist between the proportions of Fe₂O₃ and CaS contained in the slags, as the originally magnetic ones increase the more in weight through calcination, and afford at the same time a greater amount of sulphates.

FORMATION OF MAGNETIC OXIDE

From all the observations stated in the preceding paragraphs, it can be deduced that the iron of certain pyritic ores is very easily converted into the magnetic oxide, Fe₃O₄, especially under the blast

pressure of a cupola furnace in pyritic smelting. Such a conversion taking place low down in the stack, where a powerful oxidizing atmosphere prevails, there is no chance for the reduction of the Fe₂O₃ to the ferrous oxide which easily forms slag by combining with the silica of the charge. At the same time and under the conditions prevailing, Fe₂O₃ is undoubtedly formed, too, this peroxide being capable of forming only infusible ferric silicates. Calcium sulphide, another infusible substance, does its share to make matters worse by associating with the magnetic oxide of iron to form those crusts which adhere to the bottom and sides of the furnace and block it up more or less rapidly, very much as cadmias would do in the upper parts of the furnace when treating ores containing much zinc.

EFFECT OF ORES ON FURNACE

If these reactions operate energetically, as seems to be the case with certain ores, the furnace will quickly fill with refractory materials incapable of subsequently reacting with one another. Consequently a block-up must necessarily take place in a short time, and the alterations in the charge or in other factors of operating which are made to regulate the run of the furnace under normal conditions, will be of no avail as the evil remains untouched.

When this kind of ore is fed into the furnace partially roasted, the peroxides already existing are subject to the reductive action of the upper parts of the furnace, and, furthermore, the reaction of the sulphates and oxides, formed in the roasting, on the remaining sulphides, has a chance to be accomplished early in the process. The subsistence of any peroxidized iron is very difficult under these new conditions. The same result will be attained if such ores are treated by mixing them with others, already roasted, whose oxides may react with the sulphides at the right moment to prevent their conversion into Fe₃O₄. This, to my mind, is a natural explanation of observed facts, as the preliminary roasting does away with all such trouble.

CONCLUSIONS

We should reach the conclusion, therefore, that certain pyritic ores, whose iron sulphides possess the property of being converted in a great degree into Fe₃O₄ through the action of oxidizing agents, cannot be raw smelted in blast furnaces, for the reason that to succeed in this operation it would be necessary to produce at the same time and in the same place (inside the furnace), two opposite actions: oxidizing, the one, to burn the sulphur and oxidize the iron; and reducing, the other, to convert into protoxides the peroxides formed.

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Coal Imports and the Duty on Coal

Some of our contemporaries appear to be very much exercised about the probable result of the reduction of 22c. per ton in the duty on bituminous coal made by the new tariff. One or two of them have gone so far as to predict heavy imports with a corresponding reduction in the trade of our own mines. It seems to us that this alarm is altogether needless, and that the lower duty is not likely to have any considerable effect upon the general coal trade. It is possible, of course, that in the East there may be a slight increase in the imports of Nova Scotia coal into New England territory, where it can be delivered by sea at a very low freight rate. The quantity of coal so imported, however, is not at all likely to be a serious menace to our own mines. The total present capacity of the Nova Scotia mines is very small in comparison with those of a single region in Pennsylvania—such as the Clearfield, for instance—which is now engaged in supplying Eastern territory. Moreover, the quality of most of the Nova Scotia coal is not such as to make it a formidable competitor of such coal as Cumberland, New River, Pocahontas or Clearfield. The probability is that the great majority of manufacturers will prefer one of these coals to Nova Scotia, even if offered at a lower price. Moreover, if the reduction in duty is to be considered as a limitation in price, its effect would be very much less in that direction than is the present competition between West Virginia and Pennsylvania coals. We do not expect to see any marked increase in coal imports on the Atlantic seaboard.

On the Pacific Coast, especially in California, the greater part of the demand for coal is already supplied from British Columbia and Australia. The reduction in duty is not sufficient to stimulate these imports to any great degree beyond the amount which they have already reached, and which is established by the existing demand and the absence of any strong competition from domestic coal. In recent years, in fact, the limiting agent in the consumption of foreign coal in California has not been the competition of domestic coal, but the use of fuel oil.

The only part of the country where the reduction in duty is liable to make any important difference is in the northwest-

ern States of Montana and Idaho; where the lower duty will probably help the consumption of the excellent coal from the Crow's Nest Pass district, a very considerable quantity of which already finds its way to this side of the line. This trade is of growing importance, but, after all, it owes its increase rather to the comparatively short haul and lower freight rates than to any tariff considerations.

The duty still charged of 45c. per ton will give domestic coal a certain advantage; but quality and freight rates will still remain the principal consideration, as heretofore, both in the East and the West.

Silver Prices and Silver Shipments to the East

We have, heretofore, noted the prevailing low prices of silver, which have now continued for considerably over a year. In 1908 prices were not high, the maximum monthly average for that year being reached in February when it was 56c. in New York, and 25.855d. in London. From that point the fall was almost unchecked, although gradual, until the metal reached its lowest point in December with a monthly average of 48.766c. in New York, and 22.493d. in London. From this low point there was a slight reaction, bringing up the average price in January about 1/4d. in London over that of December. Since then the price has remained remarkably even and steady. The lowest monthly averages for the present year have been 50.468c. in New York and 23.227d. in London in March, while the highest were 55.905c. and 24.343d. in May. The average for the six months ending with June was 54.834c. in New York and 25.239d. in London in 1908; 51.760c. and 23.831d., respectively, this year.

For quite a number of years past, as is generally known, the controlling factor in the price of silver has been the demand from the Far East, where silver constitutes not only the currency, but the main medium for hoarding by the people. For a series of years the East has absorbed about two-thirds of the yearly silver production of the world, a sufficient quantity to make its takings the dominating influence in price. India and China are the great absorbers of silver, and of these two countries India itself produces none of the metal. China does produce some, although the quantity is very difficult to

ascertain. The Malay Peninsula, which formerly took a very considerable quantity in exchange for its tin, has practically passed out of the line of silver buyers in the last three years, owing to the changes in its currency under British rule. Japan, also, ceased to be a taker of silver five or six years ago when it adopted the gold standard. India and China, therefore, are the mainstays of the silver market.

Owing to short crops for two or three years Indian buying has been comparatively small in quantity. China took less from the general market for three or four years, owing partly to the disturbance in trade due to domestic difficulties, and later to the heavy special disbursements made during the Japanese war, which were made mainly in silver and which were provided from other sources. With the revival of trade, however, Chinese buying has considerably increased.

For the first half of the present year, including the shipments from London—which remains the chief market where the East does its buying—and those from San Francisco direct to China, which are comparatively small, and reducing the values to their approximate equivalent in metal, the exports of silver to the East were as follows, in ounces:

	1908.	1909.	Changes.
India.....	40,400,000	31,743,000	D. 8,657,000
China.....	9,613,000	17,125,000	I. 7,512,000
Total.....	50,013,000	48,868,000	D. 1,145,000

It will be seen that the total decrease in the quantity of silver sold was comparatively small, only 2.3 per cent. Its direction, however, showed important changes. The decrease in shipments to India was 21 per cent., while this year China took 78 per cent. more than the comparatively small quantity which was purchased in the first half of 1908. These relative quantities furnish some explanation of the lower price on the comparatively small change in demand. Indian purchases are usually made at the going rate and are influenced more by the ability of the buyer than by the price, so long as the latter does not rise to an extraordinary level. Chinese bankers, on the other hand, are very shrewd buyers and well understand how to manipulate the market in their own interests, as has been notably shown during the present year.

No great change appears probable in the near future, although the tendency in price is to advance rather than recede. In addition to the actual shipments it is generally believed that the Chinese banks

control considerable reserve stocks in London, which might be utilized to make matters very interesting for speculators in the metal. This fact, or belief, has done very much to restrain London operators during recent weeks.

Black Sand Mining in California

Another attempt at saving gold from the black sand of the beaches is to be made in California. This time the effort is to be made on the beach sands of the Big Lagoon on the ocean shore in Humboldt county. The tract on which the sand occurs is owned by Robert D. Johnson, and has been leased by him to C. W. Fox, of San Francisco, and associates. The exact process to be used has not been described, but it is understood that the sands are to be concentrated before washing them for gold. Gold was discovered at this place as long ago as 1851, and ever since that time more or less work has been done trying to make the sands profitable. Numerous gold-saving machines have been tried there, and once a dredge was installed and operated on the lagoon, which is a lake of brackish water about 3½ miles long by 2 miles wide, separated from the ocean by a sandbar.

Unlike most of the beach sands of the California coast, there is very little iron sand in this vicinity. There is, however, a large amount of low-grade auriferous sand, but the gold in it is very finely divided and difficult to save. It remains to be seen whether the present attempt will be more successful than its predecessors.

This black-sand mining has always been attractive to men of little experience in mining affairs or mining machinery. All sorts of experimental machines have been tried on the beaches along the Pacific in California, but generally with indifferent success. Speaking generally, there is no profit in the business. At certain times of the year, after storms have caused the waves to effect a rough concentration of the sands, day wages may be made at the work, but at other times the beaches will not even pay "Chinese wages." Where the attempt has been made to work on a large scale, failure has been the usual result. Probably the Big Lagoon—at any rate the Humboldt county beaches—has been the scene of more experiments in this direction than any other place in California. The result may be summed up in the statement that usually there is

not gold enough in the sand to pay a profit, or even pay expenses where machinery is used.

A Labor Condition in Montana

We have from time to time had occasion to remark respecting the extraordinary demands of the unionized artisans of Montana, whose greediness has led to frequent strikes and much exasperation. Consequently it was with no surprise that we noted recently in *The Evening Post* the following despatch:

"Great Falls, Mont., July 30—Because he was rich enough to buy an automobile and then used it to convey himself to and from his work, Otto Klessig, a journeyman plumber, got into trouble with his union and was arrested today for trying to whip the secretary of the local branch. After the purchase of the automobile Klessig was fined \$25 for using it to ride to and from work in alleged violation of the union rules."

A plumber in Great Falls or Butte ought, undoubtedly, to be able to ride in an automobile, but to use it in going to and from his work is certainly a thing to be severely penalized. The plumber counts his time from leaving his shop to return thereto. Of course, no automobile can be geared down sufficiently slow to preserve any plausibility of the usual charges for "time." Then what should the plumber of good standing do when he makes his daily discovery that he has forgotten his Stilson wrench and must go back to the shop for it on customer's time? The union is quite right to forbid its members from using their automobiles in connection with business.

The United States Steel Corporation does not seem to be quite keeping pace with the independent producers, if we can judge by the production of pig iron from its furnaces. In 1907 it made 44.3 per cent. of the total pig iron; in 1908 its proportion dropped to 43.5, and in the first half of the current year to 42.4 per cent. If we take the production of pig for use by the steel-making companies, the drop is larger. From 71 per cent. in 1907, the corporation's total fell to 68.3 in 1908, and 66.3 in the first half of 1909. These reductions, it must be observed, took place notwithstanding the operation for some months this year of a part of the great plant at Gary.

The Murex Magnetic Concentration Process

SPECIAL CORRESPONDENCE

At the general meeting of the Murex Magnetic Company held recently in London the chairman gave information as to the steps that had been taken to protect the invention by patents and as to the tests and trials that had been carried out at the experimental station. As pointed out in my letter published in the *JOURNAL*, May 22, the process has been introduced to the public in a rather mysterious manner. The official circular, in which the advantages of the process were set forth, failed to describe it in scientific language. It is true that an explanation was given that the foundation of the invention consisted in adding magnetite to the ore to be concentrated, which magnetite was made to attach itself to the valuable mineral, leaving the gangue alone. But the only explanation given as to the method of attaching the magnetite to the mineral was that it was effected by treating the ore with a magnetic solution—an unfortunate expression, more suitable for a quack medicine vendor than for a professional chemist or metallurgist. It is now made clear by the chairman of the company that oil, or some substance of a like nature, and magnetite are the main ingredients of the magnetic solution, because weight is placed on the advantage for smelting purposes that is secured by the mixture of iron and oil with the concentrates.

The use of oil in the process opens the question whether it infringes other patents for ore-concentration, especially that of the Elmore company. The advisers of the Murex company on the patent position are, however, confident that the new process cannot be attacked. Whether the patents will be questioned by rival ore-concentrating companies remains to be seen; but, having regard to the amount of litigation that has already taken place on the subject of ore flotation, it will be surprising if the Murex company does not have to defend the validity of its process in the courts.

As regards the operation of the process on a commercial scale it was announced that a contract had been entered into with the Van Roy Company in British Columbia for the erection of a plant. By arrangement with the Van Roy, this plant will be available for demonstration purposes so that managers and engineers in British Columbia will have an opportunity of seeing the process in actual work.

Several tests have been made on Broken Hill ores, both on the raw ore and on the tailings from wet-concentration mills, with satisfactory results, and a contract has been entered into with the Broken Hill Block 14 Company to treat their ore.

The process is also to be put to work at the Cordova mine in Spain. Tests made in London, according to the chairman's statement, showed a recovery of 89.3 per cent. of the copper from an ore averaging 2.8 per cent. The concentrates averaged 9.8 per cent. and the tailings 0.35 per cent. copper. Particulars were given of many other tests in London, that is, the assays of the original ore, of the concentrates and of the tailings; but the weights of the various products are, for some unexplained reason, omitted. A weak point in the statement was the omission of all figures of the cost of working, which are required in order to make comparison with other processes of concentration.

Recent Events on the Mother Lode in Amador County

SPECIAL CORRESPONDENCE

It has often been said that the career of a mine is much like that of an individual. It has its vicissitudes, its periods of prosperity and of poverty; days of opulence and times of ignoble non-production; finally, like the individual, it passes away and may soon be forgotten, or not, according to the magnitude of its influence during its life-time. Few mines illustrate the vagaries of life more completely than has the South Eureka, which is situated about a mile from the town of Sutter Creek, California.

The mine was opened in 1889 for the South Eureka Mining Company by the late James F. Parks, who at that time was also superintendent of the noted Kennedy mine. To the north, but a few yards away, lay the Eureka with a great record of production; to the southward, the Argonaut, Kennedy and Oneida, all of which were important producers.

With a large territory between, which was but little developed and almost unknown, Mr. Parks and his friends considered the probability of finding a mine in the South Eureka ground an exceedingly good gamble—for gamble it assuredly was. The surface was largely covered by the wash of an ancient river channel. Boulders and cobbles of andesite, which had been washed down the ancient stream from the distant Sierra Nevada, covered all the original rock outcrops in this section.

In his uncertainty as to the best place at which to sink a shaft, Mr. Parks had a survey of the neighboring mines made, projecting the lines of outcrop of the Kennedy northward and that of the Eureka southward. These lines passed each other in the South Eureka about 300 ft. apart and nearly parallel. Midway between these lines, the inclined shaft was

started and sunk rapidly. When bedrock was reached at the bottom of the gravel, the shaft entered black clay slate, which at that point showed little sign of mineralization. Neither quartz nor gouge was present, but it was believed that the fissure could not be far distant, so the shaft was continued downward in the slate and crosscuts run at intervals of a few hundred feet.

To the eastward, some distance from the shaft, a fissure was encountered and at the depth of 900 ft., a vein of good ore was found. A narrow strip along the footwall side of the vein was heavy with auriferous sulphides worth several hundred dollars per ton. A mill was built and for a time the South Eureka was a profitable mine, paying several consecutive monthly dividends. The little ore shoot was worked out and the workings were extended north and south in search of more ore. The shaft was sent down to the depth of half a mile or more and thousands of feet of prospecting work done in the search for ore. Occasionally an orebody was encountered, which would contribute something to the support of the mine, but assessments, not dividends, were the order of things through those long, tedious years of *borrasca*. For about 18 years, the South Eureka continued to operate, often on a greatly curtailed basis, it is true, for the management was obliged to conduct business with a view to available means.

This condition prevailed up to the latter part of 1908. Many old-time stockholders, tired of the continued drain, with slender promise of reward, had disposed of their stock, the price gradually sinking until it was but a few cents a share. At this time, it was decided to drive a crosscut into the west country for the purpose of exploring for a vein, which some contended lay out in that direction. The work was conducted leisurely, with no great hope of success, but at last about 200 ft. west of the shaft, quartz was found that prospected encouragingly and the crosscut was continued through it for 30 ft. Since then crosscuts have been run at four other levels, and other work is under way. The general result of this recent work is the development of a mass of typical Mother Lode rock from 4 to 30 ft. wide, averaging about 20 ft., which mills \$10 a ton or better. This shoot is opened for a length of 300 ft. and a height of 400 ft. or more.

In addition, to the southward of the large oreshoot, a small vein 2 to 4 ft. wide, which has been opened for a distance of 250 ft., carries ore assaying from \$60 to over \$100 a ton and in places it runs into the thousands. Some of the ore carries a large amount of visible gold. A fair idea of the general value of the ore now being mined in the South Eureka is suggested by the clean-up for June, which was nearly \$45,000, the output of 40 stamps during 30 days, and no particular

effort made to run the better grade of ore. The ore averaged about \$10 per ton. Extensive improvements are contemplated at the South Eureka and its success has given a stimulus to mining for miles along the Mother Lode.

Immediately south of the South Eureka is the Oneida, which a few years ago was operated by the London Exploration interests and finally closed. The company has sold some of its surface equipment, and, it is reported, intends to sell it all. Recently, a leaser has been mining and shipping high-grade ore from a vein discovered in cutting a railroad grade a few hundred feet south of the old shaft of the Oneida. This shaft is down about 2250 ft. and the mine has been extensively worked in years gone by. The new find is in a promising location, and the fissure is 3 ft. wide at present.

At the Keystone, in Amador City, the stamp mill is being overhauled. This mill contains 60 stamps, 20 of which are of modern type, the others being light and nearly worn out, the mill having been built in 1895. The battery frame and mortar blocks were found badly rotted and these are being repaired as rapidly as possible. This, however, is only a makeshift, as it is the intention as soon as possible to add 80 heavy stamps and make such other improvements as may be necessary to provide the Keystone with a first-class up-to-date mill. There is an abundance of low-grade ore in the mine, but it will not pay with the present old, light and much worn metallurgical equipment. A large quantity of sulphides are shipped monthly to the Selby smeltery. The Keystone is one of the properties recently acquired by the California Consolidated Mines Company.

The Original Amador is building a mill just north of the Keystone. The general impression is that this company is opening a valuable mine. The main vertical shaft of the Kennedy, near Jackson, has now reached a depth of 3400 ft., the lowest level being 3150, and at that depth a large amount of good ore is being developed. The shaft is now 2100 ft. below the level of the sea. This great mine shows no sign of impoverishment in depth, a fact which stimulates the managers of other mining companies in Amador to greater effort, with confidence in the successful result of deep mining here. The South Kennedy company (formerly Amelia), adjoining the Kennedy mine on the south, is clearing out and retimbering an 800-ft. inclined shaft, with the intention of exploring the vein known to lie in the east country on the old Muldoon property.

The iron mines on the river Tayeh in China now have an output of 1500 tons daily. The ore is of high grade, about 60 per cent. iron. It is carried by boats down the Tayeh and Yang-tse-kiang rivers 200 miles, to Hankow.

New Dredging Fields in California

SPECIAL CORRESPONDENCE

The newest dredging field in California is that in the Pozo basin in San Luis Obispo county, where tests of the gravel have been made, which have proved satisfactory to those interested. The field begins within half a mile of Pozo, which is 18 miles from Santa Margarita, and runs east to the foothills and a few miles up Adams cañon, covering about 11 square miles in all. Work will commence in the bed of the headwaters of the Salinas river. J. W. Adams, of Pozo, is one of the promoters and W. H. Wright represents the interests of the San Francisco men who have invested. Some placer mining in a small way has been done in this section, but it has never been known as a mining field of any importance.

Dredging men are also taking options on land along the Yuba river, both above and below Hammonton, where several dredges have been at work for some time. The lands bonded are to be tested with drills before final purchase. The Natomas Consolidated Company has secured options on certain large tracts of tule land in the Tule basin of Sutter county, which are to be reclaimed and possibly some dredging will be done. The Bear river section in the same county is also being bonded by other parties. At Trinity Center, Trinity county, and that vicinity, Mr. Cranston and some others, formerly dredging at Folsom, in Sacramento county, are testing ground with a view to purchase. The tests are being made on the wooded flats of the Sykes hydraulic properties, the ranch ground of a hotel man named Ellery, and the low portion of the Larsen property. This latter ground was at one time drifted. The Payne ranch near by has also been prospected, but the ground in the direction of the Coffee creek section is too heavy for dredging purposes, according to those who have examined it in the river bottoms above the Payne ranch.

Iron in the Transvaal

SPECIAL CORRESPONDENCE

In connection with the contemplated government assistance to establish an iron industry in the Transvaal, the government mining engineer has prepared a useful memorandum. After reviewing the accessible deposits, he concludes that were blast furnaces established, the bulk of the ore would be drawn from the magnetite beds of the Timeball range near Pretoria. Over considerable distances, the deposit averages between 40 and 45 per cent. iron, though some portions of the seams run up to 55 per cent., and higher. It may be remarked that the district in the Mid-

lands which claims to produce pig iron at the cheapest rate in Great Britain uses iron ore containing about the same percentages as the beds of the Timeball range.

The great difficulty to be encountered is the apparent absence of good coking coal in the country. The market for iron produced locally is put at about £800,000, but the government mining engineer does not consider that a local industry could figure on capturing enough trade to absorb the whole of the output, and he remarks that it would have to look to the South African market for its profits and to rely upon an external market without profit for disposing of a portion of the pig iron which it would have to produce in order to keep down costs by working on a sufficiently large scale.

From the many systems which have been tried for fostering infant industries he selects the bounty system as having experience in its favor and as being less burdensome on consumers than rival methods. In Canada the bounties are so arranged as to become automatically extinguished within a given period, yet under their nurturing influence the output rose from 37,829 tons in 1895 to 541,957 in 1906. The memorandum suggests that the bounty might commence at 15s. per ton produced, and be diminished by 1s. 6d. per ton per year, so as to extinguish the bounty in 10 years.

It is further suggested that 5 per cent. be guaranteed on the capital involved for five years. Such an industry should, it is also suggested, be insured a monopoly at the start, as there is no room for a competitor in this limited market. It is also recommended that the export of scrap iron and steel, which form valuable raw materials for working up into steel in the electrical furnace, should be prevented by the imposition of a prohibitive export duty or railway rate.

An example of large profits from a small blast furnace is given in an interesting history of Jefferson furnace in the Hanging Rock region of Ohio, which is given in the *Cleveland Iron Trade Review*. Jefferson was a charcoal furnace with a capacity of 10 tons daily. It was built in 1854, and run by the original company till 1891. During that time it paid a total of \$636,625 on \$34,500 capital stock, or 1845 per cent. In two years—1870 and 1872—the dividends were 200 per cent. The furnace was sold after 1891 to other parties, and was run for a few years. It is still standing, but it is now practically abandoned.

According to the *Queensland Government Min. Journ.*, May 15, 1909, the amount of gold retained on a plate in the form of amalgam scale is a variable factor, depending largely on the capacity of the millman and the discretion of the manager.

New Publications

TABLES OF STRESSES IN ROOF TRUSSES, INCLUDING TABLES OF COMPRESSION AND TENSION MEMBERS, AND EXTRACTS FROM THE BUILDING LAWS OF VARIOUS CITIES. By H. C. Hearne. Pp. 235. 7½x10¼ in.; cloth, \$4. New York, 1909: Hill Publishing Company.

This book covers, very thoroughly and systematically, a field that has been somewhat neglected heretofore, and it will be a useful addition to the library of every active engineer, architect and builder. It is often necessary for engineers, architects and builders to know the amount of material, wood or steel, that certain trusses require, yet they cannot afford the time necessary to design them. With this book at hand they can refer to the tables of the stresses in the various members without going into the theory of the subject.

If the trusses are built of wood, knowing the stress, they can tell the size necessary for the members immediately, as they generally know the allowable stress per square inch for the kind of wood used. If the trusses are of steel, they can pick out the sizes of the various members from the information in the tables for tension and compression members in the latter part of the book.

The tables of stresses in the different trusses cover the entire field of trusses thoroughly, from the smallest to the largest loads per square foot, for spans and distances of center to center of trusses that are generally used.

Another large field for the book will be in the designing and detailing offices of manufacturers and fabricators of steel, where time is so valuable that the theory of design is not studied except in special cases. In ordinary work reference is made to tables, which one or more men are likely to have, some of which are questionable and very few complete. If they are complete the owners are careful that they are not published. Many men, who are capable and have had years of experience detailing steel work, cannot design a tension member or a compression member of the simplest kind, but a good set of tables in their hands makes them very efficient men.

Mill buildings, and sometimes office buildings, are purchased by competitive designs, which are made by the steel fabricators, and the designs must be made accurately, in the shortest possible time, and in the most economical way. Tables of values of tension and compression members are absolutely necessary. Tables of angles for various radii of gyration for the different lengths in this book are arranged very nicely for engineers in this branch of the science.

The same tables can be used in the design of plate and angle columns, and angle and lattice columns. If the trusses,

columns, ties and struts of mill buildings are designed without the use of such tables it requires very competent men and it is very tedious and likely to cause error. With the present book at hand the design of the trusses can be made in the least time and with little actual knowledge of the subject.

The salient points of the various city building laws, as to steel design, are written with such a mass of information foreign to that subject that it is often impossible to find just the information wanted. Mr. Hearne's book contains the most important points of the building laws for the larger cities in handy form. C. J. McG.

THE MINERAL INDUSTRY: ITS STATISTICS, TECHNOLOGY AND TRADE DURING 1908. Founded by Richard P. Rothwell. Edited by Walter Renton Ingalls. Vol. XVII, supplementing Vols. I to XVI. Pp. 1073, illustrated. 9x8¼ in.; cloth, \$10. New York; published by THE ENGINEERING AND MINING JOURNAL. McGraw-Hill Book Company, selling agents.

Contents: Aluminum Sulphate and Aluminum. Alundum. Ammonia and Ammonium Sulphate. Antimony. Arsenic. Asbestos. Asphaltum. Barytes. Bauxite. Bismuth. Borax. Bromine. Cadmium. Calcium. Calcium Carbide and Acetylene. Calcium Chloride. Calcium Cyanamid and Nitrate. Carborundum. Cement. Chromium and Chrome Ore. Coal and Coke. Copper, Copperas, Corundum and Emary. Cryolite. Feldspar. Fluorspar. Fullers' Earth. Garnet. Glass. Gold and Silver. Graphite. Gypsum. Iodine. Iron and Steel. Lead. Lithia. Magnesite. Magnesium. Manganese. Mica. Mineral Wool. Molybdenum. Monazite. Natural Gas. Nickel and Cobalt. Petroleum. Phosphate Rock. Phosphorus. Platinum. Potassium Salts. Precious Stones. Quick-silver. Salt. Silica. Silicon. Silundum. Sodium and Sodium Salts. Sulphur and Pyrite. Talc and Soapstone. Tantalum. Tin. Titanium. Tungsten. Vanadium. Zinc. Zirconium. A review of the literature on Ore Deposits in 1908. Notes on Practice in Mining. Index to the literature of the Action of Noxious Gases on Vegetation. Progress in Ore Dressing and Coal Washing during 1908. Sampling and Assaying. Mineral Statistics of the United States and Foreign countries.

This volume deserves the descriptive qualification on its title-page, "Supplementing Volumes I to XVI." But it deserves much higher praise, as a wonderful summary of the latest details of progress, not less than an epitome of its results and a picture of its present condition. I have reviewed, in times past, a good many volumes of this series, but I never felt more keenly the difficulty of criticism in the presence of my profound admiration.

One of the most striking features of the book is the evidence which it furnishes of a new era in the dealing of the States

of the Union with their physical structure and mineral resources. At the present time, there are 33 State surveys, not to mention such bureaus as that of the State mineralogist of California, the chief of the Department of Mines, Pennsylvania, etc. Practically every State which possesses mines is engaged in measuring, studying and making known its treasures. And Mr. Ingalls has succeeded in getting from nearly all the chief State geologists or inspectors of mines contributions to this annual cyclopedia. It is an amazing symposium, exhibiting our national resources not only in minerals, but in men. A few years ago, it would have been scarcely possible to find either the material or the authors for such a presentation of such a theme.

Our multiplied technical schools also are represented by important chapters from leading American instructors. Professor Kemp presents his usual annual summary and review of the literature on ore deposits, in which, by the way, Americans seem to be still holding the advance. At least, the recent publications of the U. S. Geological Survey, the American Institute of Mining Engineers, "Economic Geology," etc., give much novel and suggestive material. Prof. Henry Lloyd Smith furnishes notes on mining practice, concerning especially the questions of dealing with coal dust in collieries, and the use of air-hammer drills in stoping. Prof. Robert H. Richards and Charles E. Locke furnish about 50 pages on the progress of ore dressing and coal washing in 1908; Prof. H. O. Hofman treats of recent improvements in lead smelting; Prof. L. S. Austin, of the Michigan College of Mines, gives a summary of the literature of 1908 on copper metallurgy; Professor Baskerville, of the College of the City of New York, writes on the metals titanium and zirconium; Professor Walker, of Columbia, describes recent progress in the electrolytic refining of copper bullion; Professor Peters, of Harvard, states, "Some Future Problems in the Metallurgy of Copper," and Prof. Henry M. Howe discusses the shape of the iron blast furnace. To these authors are added many distinguished practicing mining engineers and metallurgists, and the able staff of THE ENGINEERING AND MINING JOURNAL, headed by Mr. Ingalls himself, who contributes special articles on gold production and commodity prices; the cost of silver-lead smelting; and the mining, metallurgy and commercial relations of zinc.

The foregoing statement does not half exhaust the multifarious topics or the list of distinguished contributors represented in this volume. The extraordinary promptness of its appearance (the editorial work having been completed at the end of May, and the last proofreading in June) is an additional claim upon the admiration of the reader.

R. W. RAYMOND.

Details of Practical Mining

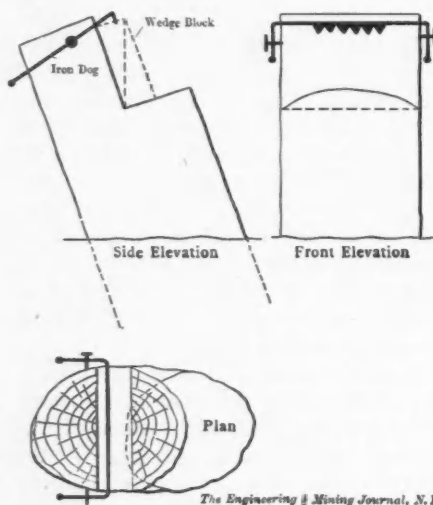
Notes of Interest to the Operators of Small Mines as Well as of Large Mines. The Things That Have to Be Done in Everyday Mining

REPORTS FROM EXPERIENCE

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Chopping Wedges

When chopping wedges with a broad-axe the device shown in the accompanying illustration will be found useful. Set a block deep enough in the ground to in-



sure solidity and at an angle from the perpendicular equal to the desired taper of the wedge. The iron dog holds the wedge block and one blow of the broad-axe should complete the wedge.

Distribution of Charges over Long Holes

"I am glad to find the author advocating the distribution of charges over long holes," writes J. Moyle-Phillips in discussing E. M. Weston's paper on "The Theory of Blasting with High Explosives."¹

"It was some time prior to the war that the idea occurred to me in conse-

¹Journ., Chem. Met. and Min. Soc. of South Africa, December, 1908.

quence of my long holes having a tendency to 'bull-ring.' I was working on machines at the time, stoping. I started off with inserting 3 in. of tamping in the center of the charge and, as I fancied this gave better results, I split the charge up into three portions as follows: (1) Two cartridges; (2) 3 in. tamping; (3) one cartridge; (4) 3 in. tamping; (5) two cartridges.

"I soon found that at times the bottom portion of the charge remained unexploded, so I reverted to my first experiment, gradually increasing the length of tamping to 4 in. At that time I was working on the idea prevalent among our miners today, that as gelatin is the strongest explosive, so also it must be the quickest. After some time came the thought that if loose ground requires the quickest explosive, why is dynamite used in preference to gelatin?"

"I then began to make inquiries concerning the manufacture and uses of high explosives, and found that the characteristic feature of dynamite is its intense rapidity of explosion, and that in big blasts, dynamite is often inserted along or among the charge to insure its perfect detonation.

"Working along these lines, I found that a charge composed of four cartridges of gelatin and one of dynamite gave equal results to one composed of five cartridges of gelatin only. I then distributed my charge as follows: (1) Two gelatin; (2) 4 in. tamping; (3) one dynamite; (4) 3 in. to 4 in. tamping; (5) two gelatin.

"This method distributed my charge over from 3 ft. 11 in. to 4 ft. of the length of the hole, thus leaving only 2 ft. on top of the charge. As I had a 3-ft. burden, I found that 18 in. of the hole was sometimes left, so eventually I distributed my charge as follows: (1) Two gelatin; (2) 4 in. tamping; (3) one dynamite; (4) 3 in. tamping; (5) one and one-half gelatin; (6) half dynamite for primer. This method gave me the best results, both as regards costs and quantity of rock broken.

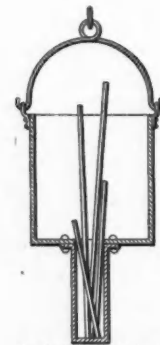
"These experiments extended over an interrupted period of more than two years, and as no dynamite was issued to machine men, and what was obtainable was only in the form of the ordinary $\frac{7}{8}$ -in. cartridge, I had to manufacture an $8 \times 1\frac{1}{4}$ -in. cartridge out of what I could beg, borrow or steal. I did not distribute the charges, but simply mixed the

explosives by replacing a given quantity (weight) of gelatin by a like quantity of dynamite. The results I obtained were apparently equal to that of a full charge of gelatin, but with the advantage of being cheaper by the difference of the price between dynamite and gelatin.

"I have not been able to continue these experiments, but to those who have opportunities I can conscientiously recommend a trial of the method. I am of the firm conviction that the reason why we do not get higher results from the charges we use is because of imperfect detonation; and that the insertion of dynamite in the center of the charge, and as a primer—replacing a like quantity of gelatin—will give the best results. The insertion of a primer and detonator in each portion of the charge will not overcome the problem of exploding the entire charge simultaneously unless exploded by electric fuses or 'volley' fuses. I have experimented with the ordinary safety fuses and find that with three fuses cut of exactly the same length and fired simultaneously, no two of them will explode their detonator simultaneously, and this under ideal circumstances."

Bucket for Hoisting and Lowering Drill Steel

The accompanying illustration, which shows a form of bucket used in the Joplin district for hoisting and lowering drill



DRILL-STEEL BUCKET WITH EXTENSION BOTTOM

steel, is self-explanatory. The bucket is of ordinary size, the only difference being the bottom extension as shown.

A Method of Mining in Heavy Ground

By W. L. FLEMING*

This method is used extensively in the soft slates and serpentines of California. It is also useful in running through caved stopes and slide rock on mountain sides.

Timbers are framed in the usual manner, but instead of being kept at a distance from the working face, each set is put in place as soon as room has been made for it. If blasting is necessary at all, the holes are drilled by hand and the light charge of powder required does little or no injury to the timber. Split lagging is mostly used though sawed plank is better if obtainable at a reasonable price. An assortment of widths from 3 in. to 8 in. is necessary. It is rare that face boards are needed to prevent running of the ground, but when occasion to use them arises, they are held in place by sprags from any available support, usually the nearest set.

TUNNELING

The ground will usually sustain itself until the drive is several feet under roof. Then the first two sets are placed and lagged as closely as is necessary, the lagging resting directly upon the collar set and upon a bridge on the breast set. Sets are placed 4 ft. center to center, and lagging 4 ft. 6 in. to 5 ft. in length is used.

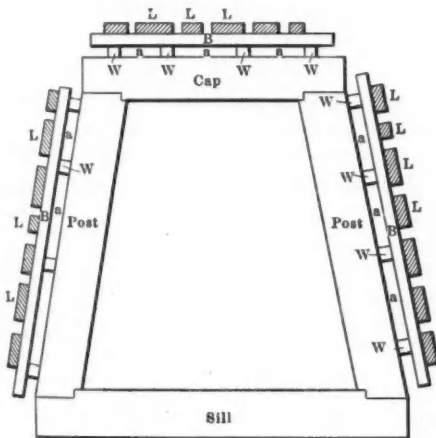


FIG. 1. DRIFT TIMBERING IN RUNNING GROUND

Sills are not used as frequently as they should be and the result is seen in the uneven appearance of many tunnels and the frequent repairs necessary.

Fig. 1 shows a set at a breast with the lagging *L*, resting on the bridge *B*, which is a piece of lagging or plank held from the timbers by the wedges *W*. In the spaces *a a*, the lagging for the next set is inserted and driven forward as the breast is advanced. Referring to Fig. 2, which

is a vertical section lengthways through the center of the tunnel, the operation is as follows. Suppose set *A* is in place with the breast at *MN*. Lagging *LL*, is pushed under the bridges on posts and cap of set *A* and driven up to breast *MN*. The breast is worked forward by pick or drill and each piece of lagging is driven forward as the ground in front of it is taken out. When the breast has reached *XY*, a false set *C*, of light, roughly

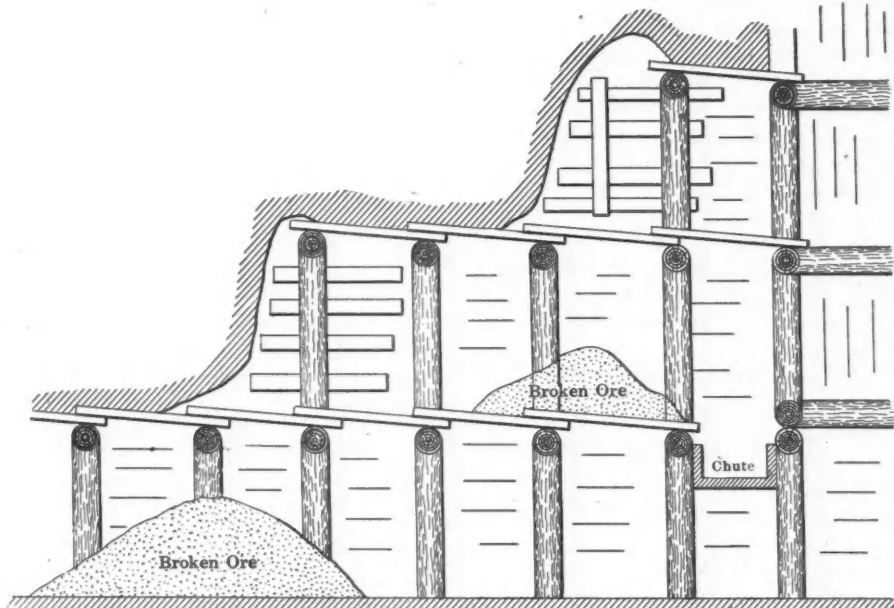


FIG. 3. TIMBERING IN OVERCAST STOPES

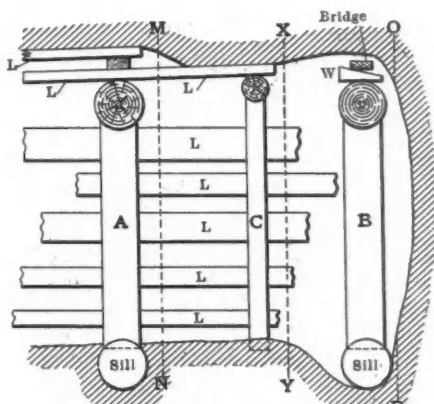


FIG. 2. SECTION ALONG DRIFT SHOWING METHOD OF PLACING SETS

framed timber, is set in place to guide and support the lagging as it is driven forward. When the breast reaches *OP*, the set *B* is placed and the bridges put on. Then *C* is removed allowing the driven lagging to rest on the bridges of *B*. The wedges sustaining the bridges on *A* are next withdrawn, allowing the lagging of the previous set to press the bridge evenly against the forward lagging which rests directly on *A*. New lagging is now driven under bridges on *B* to the breast *OP*, and the operation repeated.

RAISING

To start a raise, as much lagging is removed from the top of the drift as the ground will permit without running. A hole is made through this opening with a bar as high as convenient, and a face board (any piece of plank or lagging) is pushed up to the bottom of the hole and secured by a sprag from any support. More lagging is then removed and the hole is widened and lengthened until it

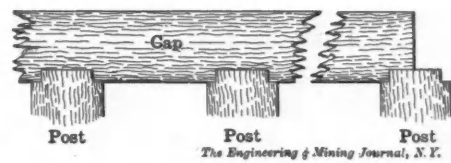


FIG. 4. METHOD OF JOINING CAPS AND BOLTS

will accommodate the first set of raise timbers, additional face boards being placed as needed. The raise should correspond to the size of the tunnel and spacing of tunnel sets so the first raise set may rest directly on the tunnel timbers. The first raise set is put in place as soon as room has been made for it, and lagging is started upward around the outside. Then the face boards are worked up,

false set placed, and the operation continued as in tunneling. The procedure in sinking is the same as in raising except that face boards are not needed.

STOPPING

In drifting through a vertical or very steeply inclined orebody where stopping operations are probable, daps are framed in the tops of the caps of the drift sets to accommodate the posts of the stopping sets. Thus each cap becomes also the sill of the set above. Otherwise stopping

*Mining engineer, Room 717, 93 Nassau street, New York, N. Y.

sets are the same as drift sets with no batter to the posts. A raise is put up in the ore at any point selected and in this raise the sets are spaced as far apart as possible, usually from 5 to 6 ft. cap to cap, the aim being to allow ample working room for each stoping cut. Starting from the raise (see Fig. 3) the first cut over the drift is worked down into the drift through spaces made by driving the lagging forward horizontally behind the raise posts. By keeping the back of the stope in a V-shape, the miner is generally able to avoid having to drive lagging overhead and has merely to lay them in position after the set is placed. The false set then becomes an upright piece held in place by light sprags. When the first cut has been taken out to the limit of the ore shoot or has advanced sufficiently far to allow another cut to be started, chutes are built in the drift, and the stopes worked up by successive horizontal cuts. The ore can seldom be advantageously sorted from the waste but all goes to the mill together.

Veins dipping more than 45 deg. from the vertical are stoped by working upward at right angles to the drift instead of parallel to it, and each cut has a width (lengthways to the stope) of 16 to 20 ft. Lagging is required only on the hanging-wall and at the ends of the stope. Space is worked out beside the drift to allow the placing of a long cap timber parallel to the drift supported by the drift sets and posts. Over this cap the lagging is driven. The false set consists of a long cap or stringer supported on sprags and the stoping sets are the same except they are supported at regular intervals by posts fitting in notches in the caps and are secured by hitches cut in the footwall. The method of placing this cap is shown in Fig. 4. Veins up to 25 ft. in thickness are worked by this method, it being often possible to sort the ore and use the bulk of the waste mined for filling.

A Three-deck Man-cage

The hoisting of men consumes a large amount of time and hence reduces the amount of ore that may be hoisted daily. Witherbee, Sherman & Co. recently constructed a three-deck cage for hoisting men from the mine. The capacity is 30 men per trip. The framework consists of channel and angle iron, while the sides are inclosed with $\frac{3}{8}$ -in. wire screen, 2-in. mesh. The front of the cage is inclosed by means of sliding screen doors. The cage is to be operated in an inclined shaft and for this reason is mounted upon wheels. It is built so that the floor of the cage is horizontal, while the sides conform to the slope of the shaft. When the cage is not in use it will be removed from the shaft by means of a block and pulley which operates on an I-beam track.

The cage will thus be carried to one side of the shaft house and entirely out of the way. The time required for making the change from the ore skip to the man skip is small. The present skip will hoist only 10 men so that with this new cage the men will be hoisted in one-third of the usual time.

Timbering Wide Stopes

H. L. Hancock, general manager of the Wallaroo & Moonta Mining and Smelting Company, of Broken Hill, South Australia, recently visited the principal mining centers of the United States in search of information which his company might profitably utilize in the mining and smelting of copper ore. In his report Mr. Hancock stated that, in his opinion, he observed no methods of mining at any mine visited which could be substituted to advantage at the Wallaroo mines.

The "stye" and filling system used at the Wallaroo mines is illustrated in the accompanying sketches. This method is

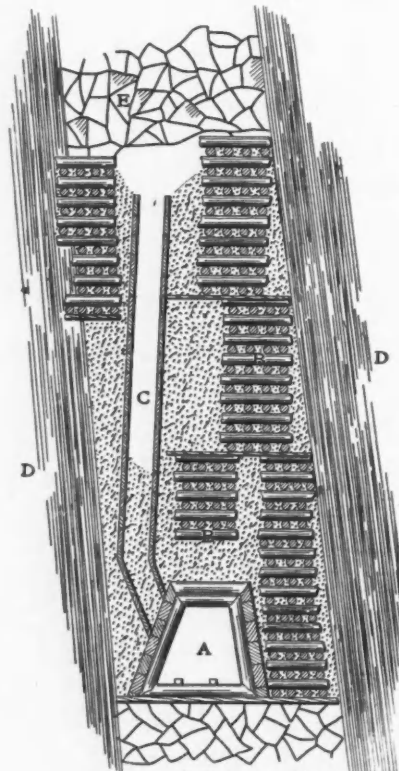


FIG. 1. END VIEW OF STOPE
A, main drive; B, pillars of firewood; C, "mill" or "pass"; D D, walls of lode; E, top of excavation in the quartz.

old, and is used in securing treacherous ground in wide stoping widths. Some of the old mines at Clunes and Edgerton, where some of the stopes were as wide as 100 ft., use firewood, as shown in Fig. 1, in building what are called "horses," when made of timber only, and "pigstyes" when an outer frame of timbers is filled with waste. The last kind of support is,

of necessity, much used where mining timber is scarce.

Fig. 2 shows the system used in timber-

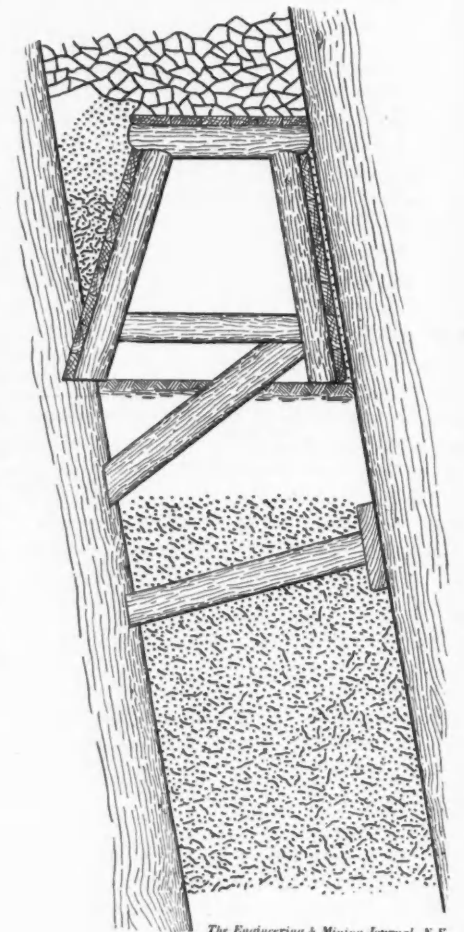


FIG. 2. TIMBERING NARROW STOPES IN TREACHEROUS GROUND

ing narrow stopes in treacherous ground, when approaching a level. The endeavor is made to dispense with "horses" or "styes" as much as possible where it is practicable to use filling.

Waste mined as such in the Cripple Creek district is seldom hoisted to the surface, but is dumped into worked-out stopes. All the ore is sorted by hand and the waste is washed before being thrown away. Many of the mines ship their waste out by railroad, but it is stored as far as possible in the hope that sometime it may be treated at a profit. The Portland elevates its waste by inclined conveyer to a bin from which it is drawn into electrically operated self-dumping cars which take it to the waste dump. Stratton's Independence loads the waste into ordinary tram cars which are then elevated by power to the top of the waste dump and trammed from there and dumped by hand. The Findley hauls a small car of waste up an incline by cable and electric hoist. The car dumps automatically at the top of the slope and forms a conical heap. The Last Dollar uses a vertical bucket elevator discharging into a chute from which the waste is trammed by hand.

Personal

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

S. A. Worcester has returned to Victor, Colorado.

C. D. Wilkinson, of Goldfield, Nev., is in New York on business.

James MacNaughton, general manager of the Calumet & Hecla, is in the East for a brief visit.

Quincy A. Shaw has returned to Boston after a brief visit to the mines of the Lake Superior district.

Alton T. Dickerman, of New York, has inspected a number of mining properties at Gowganda, Ontario.

Selwyn Goldstein has opened an office as mining engineer in the Edificio Olivarez, Culle de Tacuba, in the City of Mexico.

W. Spencer Hutchinson, consulting engineer for the Vulture Mines Company, is at the mine, near Wickenburg, Arizona.

Cyrus Robinson has returned to New York after two months spent in England, investigating new processes and mining machinery.

A. J. McMillan, managing director of Le Roi Mining Company, has returned to Rossland, B. C., after an absence of four months in England.

J. Cuthbert Welch has returned to Spokane, Wash., after an extended examination of mining claims in the San Poil district in Washington.

H. C. Cutler, of the firm of Cutler & Wilkinson, has returned to Goldfield, Nev., after examining mines in Grass Valley and Alleghany, California.

The Michigan board of geological survey has appointed Prof. Allen, of the State University at Ann Arbor, State geologist, in place of Albert C. Lane, resigned.

S. C. Hazelton has recently returned from Peru to resume charge as general superintendent of the United States Smelting Company's plant at Bingham Junction, Utah.

F. Colomer, of Paris, consulting engineer to the Canadian-American Coal and Coke Company, is at Frank, Alberta, inspecting the company's coal mine and plant.

T. W. Guthrie, president of the Republic Iron and Steel Company, has just returned to Pittsburg, from Birmingham, Ala., where he has been in the interests of his company.

Norman Carmichael, who for the past 2½ years has held the position of assistant general manager of the Arizona Copper Company, of Clifton, Arizona, has been appointed general manager.

A. H. Meuche, for some years past assistant State geologist of Michigan, has resigned and has accepted a position as representative of Longyear & Hodge, dia-

mond-drill contractors, in the Michigan copper country.

Francis L. Bosqui, of San Francisco, has accepted an engagement on the consulting staff of Wernher, Beit & Co., of London and Johannesburg, and will sail from New York, Aug. 28, for London, on his way to South Africa.

Rush T. Sill, chief engineer for the Great Northern iron ore lands, has resigned, to take up consulting work in Mexico. A. C. Oberg, formerly assistant chief, has been promoted to chief engineer. Basil F. Fitch is now assistant chief engineer.

Frank W. Morris, of Anniston, Ala., general superintendent of coal mines for the Woodstock Iron and Steel Corporation, has resigned to take effect Sept. 1, to accept a similar position with the Republic Iron and Steel Company, Southern district, with headquarters at Sayreton, Ala., succeeding H. M. Geismer, who, as previously announced, goes with the Southern Iron and Steel Company.

David H. Ladd, assistant superintendent of the Michigan smelter, has resigned to accept a position as metallurgist for the Wallaroo & Moonta Mining and Smelting Company, of South Australia. Mr. Ladd will leave Houghton, Mich., Sept. 15, and will spend two months visiting various Western mines and smelters before starting for Australia. Mr. Ladd has been employed with the Michigan company since the starting of the plant and at the conclusion of his work at the Michigan College of Mines.

Obituary

J. C. Beebe, superintendent of the Island Creek Coal Company, in Logan county, W. Va., died at Geneva, N. Y., Aug. 7. He had taken a prominent part in the development of the Logan county coalfield, in which he spent a number of years.

George Frazier was killed in Eureka Mine No. 2, near Montgomery, W. Va., Aug. 7, the motor on which he was riding having jumped the track. He was 55 years old and had been active in the Kanawha coalfield for many years. He was manager of the Eureka mine.

Robert Womack, a Colorado prospector who was the first man to find gold at Cripple Creek, died at Colorado Springs, Aug. 10, aged 66 years. He failed to make any use of his discovery, and claims were taken up by others. He was born in Kentucky, but had been a prospector and miner in Colorado for 50 years.

Truman Schenk died in Salt Lake City, Utah, Aug. 1, aged 63 years. He was born in Ohio, and went to Utah in 1877 in the employ of the Union Pacific. Some years later he resigned and engaged in mining at Park City and Eureka. He was for several years connected with the MacIntosh sampler at Park City, and

he also built one of the first ore-sampling plants at Butte, Montana.

Andrew Summer Braznell, of Pittsburg, died at Philadelphia, Aug. 10, aged 53 years. He was a son of Benjamin Braznell, one of the pioneer coal operators of the Pittsburg district. Andrew Braznell was active in the coal and coke industries all his business life. He was largely interested in the Stockdale Coal and Coke Company, Braznell Gas Coal Company, Dunkirk Coal Company, Allen Coal Company, Braznell Coal Company and East Connellsville Coke Company. He was also interested in many business institutions in and around Pittsburg, and had many mineral holdings in the West.

Dr. Joseph F. Whiteaves, prominent as a palaeontologist and for many years assistant director of the Geological Survey of Canada, died at Ottawa, Aug. 8, aged 74 years. He was born and educated at Oxford, England, and came to Canada in 1862. Shortly afterward he conducted deep-sea dredgings for purposes of scientific research in the Gulf of St. Lawrence. In 1875 he joined the staff of the Geological Survey department. He received the presidency of the geology and geography section of the American Association for the Advancement of Science in 1899, and in 1907 was awarded the Lyell medal by the Geological Society of London. Dr. Whiteaves was a member of a number of scientific societies and an extensive contributor to scientific literature.

Andrew Colville, who died on July 15, at Nanaimo, Vancouver island, was born in Blairtown, near Peterborough, Ont. For several years he was a teacher in that province. Leaving Canada in 1886, he proceeded to North Dakota, where he engaged in farming and railroad construction. In 1889, at Lethbridge, Alberta, he commenced coal mining, working there as a miner for four years. In 1897 he was appointed superintendent for the Electric Peak Coal Company, at Hoar, Mont. During 1898-9 he was in charge of the outside operations of the Diamond Coal Company, Diamondville, Wyo., and in 1900 of those of the Carbon Coal Company, Carbonado, Mont. In 1901 he went to the Crow's Nest Pass coalfield, in British Columbia, where he was made superintendent of the Crow's Nest Pass Coal Company's Coal Creek colliery. He filled that position satisfactorily for four years, when he resigned and went to eastern Canada for six months. In July, 1908, he returned west, going to Nanaimo, but ill health kept him from taking up active work.

Societies and Technical Schools

American Mining Congress—Official notice has been issued of the twelfth annual session, to be held at Goldfield, Nevada, Sept. 27 to Oct. 1 next. Details of the program will be given later.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Butte, Denver, Salt Lake City, Goldfield, Cobalt and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

Aug. 11—On the farm of Clarey, Payne & Keenan, a few miles above Trinity Center, Trinity county, on the Trinity river, a Keystone drill has lately been used in boring prospect holes to test the ground. The investigations have been so satisfactory that a Boston company has decided to take the property and work it on royalty. A small dredge had been used on the place for a year or two but the machine was not successful, as dredging to bedrock was not possible. A large dredge is now to be built.

The chairman of the recent dredge-mining convention at Sacramento, has appointed the following committee to investigate dredge-mining conditions in the Sacramento valley: William Beckman, Sacramento, Sacramento county; F. B. Edson, Knights Landing, Yolo county; Jesse Poundstone, Grimes, Colusa county; Dr. B. Caldwell, Biggs, Butte county; Louis Tarkey, Sutter City, Sutter county; and H. S. Dunning, Marysville, Yuba county. This committee is authorized by the convention to investigate dredge-mining methods and to "expostulate" if harmful methods are discovered and where this fails, to report to the Anti-Débris Association or to the California Débris Commission—neither of which bodies has any authority whatever in dredge affairs. The committee cannot report back to the body which created it, since that body adjourned *sine die*. It is not expected that the report of the committee will have much weight one way or another. None of the members are authorities on dredging affairs though some of them have given more or less attention to river conditions in an amateur way.

With the change in ownership of the Loon Lake Water and Power Company, El Dorado county—formerly the California Water and Power Company—C. M. Fitzgerald gives way to Herman D. Jerrett, of Georgetown, as general manager. The new company, controlled by W. P. Hammon, expects to make many changes in the water system of the Georgetown divide.

Mason W. Mather, for 14 years president and manager of the Croesus Gold Mining Company, operating the Plumbago mine at Allegheny, Sierra county, has resigned the management and C. M. McMeekin has been placed in the position. Colonel Mather retains the vice-presidency of the company. The mine has been a productive one for some years and so continues. The plant is excellent and the

mine is worked mainly through long adits, the lowest one being in 4000 ft. Colonel Mather is still manager of the Oriental mine in the same vicinity and will give most of his time to that mine.

Oil indications have been found in Shasta county, not far from Kennett, the smelting town. Seepages of oil have been found and some prospecting is to be started. At several places in the county oil indications have been found but no producing wells have thus far resulted. Most oil men consider that Shasta is too far north to be a good producing region.

It is expected that before long a consolidation will be brought about between the Standard Consolidated Mining Company and the Southern Mining Company at Bodie, Mono county. The former owns a number of claims and the latter has 14, including the Noonday, Red Cloud and Adanda, all opened to from 500 to 800 ft. A good many of the claims have not been worked for years, although those of the Standard company have been dividend payers for a very long period. This consolidation of interests and the resumption of work on a large scale is expected to cause a revival of interest in the old and famous camp of Bodie.

It was recently noted that an automobile service had displaced the stage line between Redding, Shasta county and Weaverville, Trinity county. Now an automobile service has been inaugurated between Sierra City, Sierra county, and Nevada City, Nevada county, passing through North San Juan, Camptonville, Mountain House, Forest City, Allegheny and Goodyear Bar. All of these are old-time mining centers and some of them are experiencing a revival.

Denver

Aug. 13—At Breckenridge, in Summit county, the Reiling dredge of the French Gulch Dredging Company has been formerly worked more or less successfully by the Evans elevator system. During the past winter, a dredge was moved from Clear Creek, near Golden, where it had been a failure, and put in the old pit situated in what is known to be the richest portion of the Breckenridge ground. This ground is owned by William Lennox, of Colorado Springs, and Mark Evans and H. J. Reiling, of Denver, the latter of whom supplied the dredge. It has been working about four months under the direction of Mr. Reiling, and it is reported that the profits of operation covered the cost of installation and cleared \$25,000

besides. About 2000 yards per diem were handled. This is the richest portion of the district and nuggets up to $\frac{3}{4}$ of an inch in diameter have been saved.

A story of a discovery and shipment of 100 sacks of ore to Denver, for which the owner received a check for \$21,000, has just come in, and that the owner was offered \$250,000 for a part of his one-third of the mine is also stated in the daily press. The claims are said to be in North park, on the Colorado-Wyoming boundary line, but as the statements as to location are very conflicting, the whole thing at this writing looks somewhat "fishy." At least, time and further details will be required to determine the value of the discovery.

In the Cripple Creek district the Mary McKinney Mining Company held its annual stockholders' meeting on Aug. 9, and the report for the year, ended June 30, shows receipts from ore sales and other revenue of nearly \$407,000, profit about \$68,000, as the mine is worked on the leasing system, and the leasers got about one-half of the entire receipts from ore sales. The cash balance on hand is \$68,821—altogether a very healthy state of affairs. The total production of the company's mine to date is given as nearly \$6,000,000. The Strong mine at Victor, which has paid about \$3,000,000 in dividends, has, it is said, discovered new and rich orebodies, above the water level, and is shipping from 7 to 10 cars per week.

The United Gold Mines Company's property on Ironclad and Bull hills, now being worked under the leasing system, is making a greatly increased production, and last month shipped 1200 tons of good grade of ore. The School Section Leasing Company, operating near Cameron, shipped approximately 900 tons of ore in July. The Gaylord mill, on Ironclad hill, sent to the Denver mint a gold bar worth \$5500, the result of the July cleanup from operations on the low-grade ore of the Jerry Johnson mine. In addition to this, it is stated that 32 cars of 1-oz. gold ore were shipped to a Colorado City mill.

"Bob" Womack, the discoverer of Cripple Creek, died in Colorado Springs a few days since, having lived in poverty for over 10 years, thus repeating the history of so many of the discoverers of great mining districts. It does seem as though there was something wrong in the laws of compensation when a man whose discovery has resulted in giving to the world

about \$150,000,000 in gold, should die in poverty.

A portion of the Denver mint has been closed, it is alleged, owing to shortage of bullion, and 100 men in the coining department are thrown out of employment.

Butte

Aug. 12—George H. Casey has instituted action in the district court in Butte against Joseph A. Coram to recover \$7000 for a 5/32 interest in the Thomas quartz claim sold to Coram. In the complaint it is alleged that Casey agreed with Coram to sell him the interest in the claim in consideration of 560 shares of stock in what afterwards became the Davis-Daly Estates Copper Company, and that Coram represented that the corporation would have \$2,000,000 in its treasury, on which basis the stock was valued at \$12.50 per share. It is alleged that Casey delivered the deed and received the stock but was deceived as to its value and that the consideration for the transfer therefore failed. Plaintiff asks for a vendor's lien upon the 5/32 interest in the claim and includes the Davis-Daly Estates Copper Company and the Davis-Daly Copper Company as defendants in the action, alleging that they claim some interest in the Thomas claim.

At the recent drilling contest in Butte, the first prize of \$1000 was won by Pickens and Page, of Globe, Ariz., who drilled 43 7/8 in. during the allotted 15 min. McNicholas and Ross, of Butte, were a very close second, having 43 27/32 in. to their credit. Carter and McLean, of Butte, won the third prize with 40 13/16 in. Other contestants were: Bradshaw and Frethey, Butte, 39 11/16 in.; Sodea and Sebla, Rossland, B. C., 38 13/16 in.; Rondo and Malerich, Butte, 35 1/4 in.; Duncan Brothers, Virginia City, 33 3/8 in.; Roberts Brothers, Butte, 32 3/8 inches.

At a meeting of creditors of the Kimberly Gold Mining Company, M. J. Walsh was selected as trustee in bankruptcy and his bond fixed in the sum of \$100,000. Creditors representing claims aggregating in excess of \$300,000 were present at the meeting.

The monthly report of the Butte Mining Exchange shows that 113,005 shares of stock were traded in during July. Alameda had the greatest number of sales with 37,000 shares, and North Franklin was second with 22,950. The estimated production of the Butte camp for the month of July was 26,580,820 lb. of copper, an increase of over a million pounds as compared with the output for June. The production for the first seven months of 1909 is approximately 183,000,000 lb., which is about 40 per cent. greater than last year's production for this period.

At the annual meeting of the La France Copper Company, held last week, the following were elected directors: W. A.

Kidney, R. A. Carnochan, David Gilbert and E. M. Brennan of Butte, and J. T. Williams of New York. No definite date for the resumption of operations at the company's Lexington mine was decided upon. The affairs of the Garnet Gold Mining Company of Madison county were placed in the hands of a receiver by Judge Hunt, last week. This proceeding was taken on the application of the holders of the company's bonds, payment upon which is in default. Charles E. Morris was appointed receiver.

John Stepan has instituted action against the Butte Northern Copper Company, *et al.*, for the purpose of having the Minnesota and Stepan No. 2 quartz claims restored to him. It is alleged in the complaint that the deeds for the claims were to have been put in escrow, but that without the knowledge of plaintiff the deeds were recorded and no money was ever paid for the same.

Helena, Montana

Aug. 6—For the last seven weeks much interest has been manifested in the suit of the St. Louis Mining and Milling Company against the Montana Mining Company, Ltd., which operated the Drumlummon mine. This is the third time of trial of the suit in which the St. Louis company claims that, by virtue of its denouncement of the apex, or part of the apex of the Drumlummon lode, the Montana Company, Ltd., has mined and profited from ore which was rightfully the property of the St. Louis company. The value of the ore in former suits was estimated at about \$500,000. In the present trial the St. Louis company is anxious to amend its complaint by fixing the limit of recovery for ore extracted at the 268-ft. plane instead of the south end line of the St. Louis claim. On Aug. 3, Judge Hunt gave the company permission to make the amendment and to change the complaint that it may conform with the views expressed in the decision of the Supreme Court of the United States, as interpreted by the attorneys of the St. Louis company. By reason of the vast quantity of expert evidence, given by leading engineers, on the geology of the district and the formation of the famous ore deposit, the case has throughout held the interest of the mining community.

[Later—Despatches of Aug. 11 announce that the court has awarded damages of \$203,192 to the St. Louis Mining and Milling Company.]

The following are the shipments of bullion from the various counties to the Helena assay office during the month of July: Fergus, \$58,556; Chouteau, \$45,325; Madison, \$28,725; Granite, \$2118; Jefferson, \$764; Lewis and Clark, \$5738; Missoula, \$4054; Meagher, \$225; Powell, \$4470; Ravalli, \$960; Silver Bow, \$744. A small amount was also turned in by Broadwater county.

Although nothing unusual has been met in the development of the reopened mines of the Corbin district, the activity in promoting new companies and in working the older properties continues. The Boston & Corbin company has installed new equipment at the Bertha shaft, and is pushing work on the 700-ft. level. The old Alta mine, close to the Bertha, which has lain idle for 14 years, is to be reopened by a new company.

The old silver-lead mining camps show signs of settling down to work on a quiet, conservative basis. The Radersburg, Clancy and Ophir districts are attracting careful investors by their shipments of fair-grade ore. The August mine in the Little Rockies, which shipped recently eight carloads of ore of unusual value, has been optioned for \$3,000,000. The price paid for the property some time ago was, it is said, about one-hundredth of this sum.

Salt Lake City

Aug. 13—Business in local mining circles has been exceedingly inactive during the Grand Army encampment which was held in this city last week. The attendance at the stock exchange has been light and the trading has been similarly affected. During the parade Wednesday all the mining offices closed their doors and little business was done throughout the entire week. The inactivity has been general throughout the State and no startling developments have been made in any locality. A number of mines closed during the week to allow employees to attend the encampment and excursions were run from all the mining camps to Salt Lake on the day of the parade. As a number of important matters are pending, next week is expected to be a notably active period in mining circles.

E. P. Mathewson, who is in general charge of the new plant of the International Smelting Company was in Salt Lake last week and states that the preliminary work for the power house and roaster building has been almost completed and the structures will be started at once. The steel work for the warehouse and office buildings is complete and the laying of brick has begun. The stack of the new plant will be 350 ft. high, 50 ft. higher than the stack of the Washoe smeltery at Anaconda.

The Iron Blossom of the Tintic district passed its monthly dividend for August and much discussion has followed. The company has advanced several reasons and local mining men are anxiously awaiting further developments. The Colorado posted the usual 8c. per share and the Sioux Consolidated its 7c. dividend, the former company checking out \$80,000 and the latter disbursing \$52,457. The orebody recently opened on the 2000-ft. level of the Grand Central mine at Tintic has been tapped on the 2100-ft. level. Gen-

eral Manager C. E. Loose gave out no other particulars concerning the strike other than that it was looking good. The information comes from unofficial sources that in addition to carrying a fair copper content, the ore went high in gold. The stock market gave unmistakable evidence that something unusual had happened at the Grand Central.

A large drain tunnel has been projected in the Park City district to pass through the Bonanza Flat section into the Mountain Lake region and a meeting of the stockholders of the Daly-Judge company has been called to ratify the proposition to convey certain claims to a new company, in which Jesse Knight and associates are interested and which proposes to construct this tunnel. Full drainage and working rights are to be reserved by the Daly-Judge company; its ground will be tapped at a depth of 2000 feet.

Cobalt

Aug. 13—The headframe over the main shaft of the Savage mine was destroyed by fire on Aug. 7. The fire also got down into the timbers of the shaft, destroying them for a considerable distance, and as all the ore was hoisted from this shaft, it will delay operations for a short time. Several months ago a new shaft was started to connect with the 75-ft. level of the main working. When the crosscut from the bottom is in another 30 ft. these workings will be connected and hoisting can be resumed.

The remainder of the mining lands of the Gilles Limit, amounting to 393 acres, which were not disposed of at the previous auctions, are again offered for sale. The Provincial mine is also offered for sale, although it has not much to recommend it except a diamond-drill core showing a new vein found recently. It is thought that the lots now offered will bring higher prices than were bid formerly on account of the good finds made on the Waldman and Young & O'Brien lots. It is understood that the Provincial mine is to be pumped out, so that those who are considering putting in a bid for the property may be able to make an examination.

The business of the smeltery at Thorold, for treating the high-grade ore from Cobalt, has increased so largely of late that the company has decided to increase the capacity. The smeltery is owned by the Coniagas Mines Company. George Taimt, who controls the Chesterfield and Lucky Boy mines in the Larder Lake district, has interested some English capitalists in the Harris Maxwell, which is situated in the same district. Considerable work has been done and the property is showing up well.

The shaft on the No. 3 vein of the La Rose at a depth of 100 ft. encountered the Keewatin formation, and it has now been sunk an additional 35 ft.; the ore contin-

ues to be of good grade. This same vein is being worked on the O'Brien property, and has been one of the company's best producers, notwithstanding the fact that it has been in the Keewatin all the way.

Further exploration in the new Lawson find shows that toward the north and south ends the vein splits at each place into two stringers making a total of about 12 in. of high-grade ore. It is important to note that this vein was found in the Keewatin. One of the stringers from the Lawson vein has been uncovered to within 50 ft. of the Foster line and is heading straight for it. The development of the Lawson has given a great impetus to the work being carried on at the Foster and adjacent properties.

One of the best discoveries in the Elk Lake district was made a few days ago at the Silver Alliance property. It was encountered at a depth of 25 ft. in the shaft, at which point the vein widened from a mere stringer to between 6 and 8 in. of high-grade ore. The Silver Alliance is a Montreal company, and the property is situated in Tudhope township about four miles from Elk lake. There have been two other promising finds made in this district lately. One was on the Haentschel claim in the township of Farr, where an 8-in. vein of calcite, carrying native silver, was found. The other discovery was made on the York claim, situated about $\frac{1}{4}$ mile from the Otisse Currie. The vein is about 6 in. in width and carries smaltite, niccolite and native silver.

Toronto

Aug. 14—For the past two seasons experts engaged by the Ontario department of mines have been examining the geological conditions of the area known as the Gillies Timber Limit, south of the Cobalt camp, with the view of ascertaining how far the mineralized portion extends. The sales hitherto made and immediately in prospect, including the Provincial mine, only embrace 900 acres in all at the extreme apex, whereas the entire limit covers an area of 64,000 acres. As a result of the investigations so far made the officials have reason to believe that the mineral deposits are more extensive than has been supposed, and a thorough exploration of the whole territory will be undertaken. Operations will be begun almost immediately under the direction of Prof. Willet G. Miller, provincial geologist. The exploration will require some time, as the limit is largely under timber. One strong reason why the government altered its policy in regard to the Provincial mine and decided to sell it instead of operating it was that Prof. Miller and other officials might be free to undertake this exploration. It is understood that the government has not as yet decided as to its future course, should the area prove to have rich silver deposits; but the opinion of the mining

officials is generally in favor of selling the land by public competition, subject to royalty and working conditions, rather than of direct operation by the government or through a commission. It is probable that before any decision is arrived at the question will be submitted to the legislature.

Important gold discoveries are reported from Night Hawk lake near Matheson station on the Temiskaming & Northern Ontario railway. A. J. McGee, secretary of the commission, states that that body has been notified as to the discoveries, but can make no official statement as to their character or extent.

Johannesburg

July 19—The results of the development in the Brakpan Mines, Ltd., now published for the first time, are encouraging to those who are interested in the huge reef-bearing areas of the eastern extension of the Witwatersrand. This development has been done at a depth of from 3500 to 4000 ft. Of the ore blocked out, 78 per cent. is reckoned to be payable, and this amounts to 449,000 tons averaging 6.4 dwt. in gold. Assuming 12½ per cent sorting, this is equivalent to about 390,000 milling tons having a gold content of 7.3 dwt. or, with 93 per cent. extraction, a recovery value of about \$7 per ton.

The indicated stoping width is 45 inches in the No. 1 shaft section, and 55½ inches in the No. 2 shaft section. It was originally intended to equip this property with a 100-stamp mill, but it is now proposed to erect a plant to treat 60,000 tons per month. There are only two companies on the Witwatersrand at present crushing that amount, namely, the East Rand Proprietary and the Simmer & Jack mines.

If one assumes the working cost to be \$4.25 per ton and the working profit \$2.80—which is the average of the whole Witwatersrand for the past six months—after allowing for the profit tax, etc., the present development indicates a net working profit of \$2.43 per ton. On the milling capacity contemplated this would be approximately \$1,750,000 per year.

The famous Robinson Deep has lately shown a serious falling off in grade, though still remaining one of the premier mines of the Witwatersrand. Their profit for June was £30,600 compared with an average of £46,500 last year. According to the consulting engineer's report the value of the ore reserves is 7.25 dwt.—a drop of 1 dwt. The average recovery for the last 18 months has been about \$8 and a fall of 1 dwt. would imply a yield of approximately \$7; with 57,300 tons put through in March, the working costs were \$3.84 per ton. The policy now proposed is to lower the grade of ore to the mill and increase the tonnage to the limit of 60,000 tons per month, if labor conditions will permit. Some reduction in working costs may follow the increase of tonnage.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

A despatch from Washington states that evidence has been obtained of extensive fraudulent entries of coal lands, involving over 100,000 acres. It is expected that hearings will be held in Seattle, next month.

Copper River & Northwestern—About 95 miles of this railroad is now in operation, and a force of between 3000 and 4000 men are employed on construction work. At present the road extends from Cordova to Copper river, and on the other side almost to the mouth of the Tasnuna river. Ferries convey supplies and passengers across the Copper river, but an 1800-ft. cantilever bridge is being constructed.

Ketchikan—The It mine is shipping 800 tons of copper-gold ore per month, which nets \$20 per ton. The ore contains bornite and chalcopryrite and carries \$2 to \$3 gold per ton. A gravity tram and railroad have been constructed from the Goodroe mine to the harbor at Karta bay. M. D. Ickes and W. L. Polson are developing a vein of lead-copper-gold ore at Mallard bay. A crosscut at a depth of 35 ft. has cut a 7-ft. vein of good shipping ore. The Victor Copper Mining Company, operating 12 miles southeast of Ketchikan, is driving an 1100-ft. crosscut adit, which is now in 600 ft. Three veins have been intersected. Patrick Heany is in charge of the work.

Arizona

COCHISE COUNTY

Copper Queen—The precipitation tower, near the Czar shaft, collapsed recently and is being rebuilt, this reconstruction having been in contemplation for some time.

Courtland—Since the completion of the Mexico & Colorado and the Arizona & Colorado railroads to this place, much lumber and machinery have been received. The Great Western company will begin shipments of copper ore as soon as the Mexican & Colorado railroad completes the spur to the dump at the Mary and Humboldt shafts. The ore will be sent to the El Paso smeltery instead of to the Copper Queen plant, as had been anticipated. It is not known when the Calumet & Arizona will begin the shipment of ore from their properties in this camp, but the company has ore on three dumps and can ship at any time.

Tombstone Consolidated—A large air compressor has been purchased and it is

planned to use power from same for unwatering the lower levels of the mine.

GILA COUNTY

Arizona Commercial—The pump station being cut at the 600 level should be completed before the end of the present month. The breast of the east drift on this level is now over 450 ft. from the Eureka shaft and continues in ore, much of which is of smelting grade.

Barney—This group of 28 claims in the Miami section of the Globe district has been purchased by P. J. Reardon, H. E. Hingston and other Boston men. Extensive development will be started next month.

Globe District—Early in September it is expected that the Miami section will have direct railroad connection with Globe. This branch will facilitate operations for four large properties, the Miami, Inspiration, Gibson and Warrior groups. As soon as the railroad is completed, material for the new Miami mill will be sent in and construction work begun in earnest. Among other properties which are developing orebodies in this section and which will be benefited by the extension of the railroad to the Miami terminal are the Live Oak, Cordova and Keystone. As soon as this line is completed, the Gila Valley, Globe and Northern Railway Company is expected to begin construction on a four-mile branch to the Copper Hill district, which will afford an outlet for the ores developed in the Superior & Boston and the Arizona Commercial properties. Other outlying properties in this section are the Iron Cap of the National Mining and Exploration Company, the Superior & Globe and the Centennial.

GRAHAM COUNTY

Arizona Copper—Production for the month of July was 2,400,000 pounds.

Detroit—The caving system of mining has been adopted in certain portions of this company's property at Morenci. The square-set system of timbering, however, is still in use in places where the caving system is not considered feasible.

PINAL COUNTY

Ray Central—The company has exercised its option on the Carrie Nation-Wedge group and also on the Juarez-Adventure group. The shaft on the Calumet claim is now down about 100 feet.

Ray Consolidated—President Sherwood Aldrich is quoted as saying that actual work on the 5000-ton concentrating mill

will commence Sept. 1. The mill will be built on the unit system and will have six 800-ton units, though it is expected that the nominal capacity of the plant will be exceeded in actual operation. The directors have also decided to build a smeltery with a capacity of 1000 tons per day, the work on this plant to be started soon enough to permit of its operating when the mill commences. The company expects to start production early in 1911. A small amount of concentrate has accumulated from the experimental work in the old mill already on the property.

YAVAPAI COUNTY

Rigby Mining and Reduction Company—The company is considering the installation of a lead furnace and blower to be operated from the power plant of the present works, near Mayer. The Bodie mine will be relied upon for the main ore supply.

YUMA COUNTY

New Planet Copper Mining Company—This company has been formed to operate the recently acquired group in the Harcuvar district. The new company is capitalized for \$4,000,000, divided into 800,000 shares, of which 240,000 will be exchanged for outstanding shares in the old company, and the remaining 560,000 shares will be held under option by the General Development Company. The officers are: Charles S. Barton, of Worcester, Mass., president; William G. Nickerson, Boston, vice-president; J. H. Sussman, New York, treasurer; O. J. Ashman, New York, secretary. The work at the property is in charge of Superintendent W. E. Upham, Planet, Arizona.

California

AMADOR COUNTY

Original Amador Mines Company—Since the new company commenced work under management of J. J. McSorley on this mine at Amador City, hoisting machinery has been installed, necessary buildings erected, and the grading for a 20-stamp mill has been finished. The mill will be running in about two months.

INYO COUNTY

Golden Siren—At this group of eight claims, north of Bishop, high-grade ore is being taken out.

Casa Diablo—A new generator, air compressor, and other machinery have arrived, for installation by this company.

LASSEN COUNTY

Milford District—There are signs of considerable activity in this district; Streik & McKechney have made a valuable strike and several other claims are showing up well.

PLACER COUNTY

Orpheum—At this mine at Ophir, Charles Peach, superintendent, a mill is being erected and will be run by electric power.

SACRAMENTO COUNTY

Channel—At this mine a mile east of Folsom, 90 men are now employed taking out gravel.

SHASTA COUNTY

Balaklala—Copper production, this year, at the Coram smeltery has amounted to 5,735,849 lb. distributed as follows: Jan., 342,028 lb.; Feb., 794,746; March, 1,263,667; April, 784,600; May, 820,193; June, 648,586; July, 1,082,629 lb. copper, 1844 oz. gold, and 49,670 oz. silver. The excess production in March was due to accumulation of matte from the two previous months.

Texas—The mine at Old Diggings, once a large producer but idle for some years, has again become productive and is shipping ore to the smeltery at Coram.

SIERRA COUNTY

Eastern Cross—The latest strike in Alleghany is in this mine owned by Bovee Brothers. The ledge was found in the tunnel after a shaft had been abandoned.

Twenty-One—The new plan of development in this Alleghany property includes the unwatering of the old shaft and its deepening. F. M. Phelps is manager.

Rainbow Extension—Men are at work clearing out the old tunnels at Alleghany to resume development. O. A. Harlan, of San Jose, is manager.

Boulder—The group of claims at Downieville has passed to H. T. Bragdon, J. R. Dorsch and M. I. Ish, of Goldfield. There are five quartz claims and three placers in the group.

Pacific—The gravel mine near Howland Flat is under bond to George Wingfield and associates of Goldfield, Nevada.

Kate Hardy—At the mine at Forest, rich ore is being taken out and it is intended to erect a new mill.

SISKIYOU COUNTY

Gardner & Weed—In this hydraulic mine, near Fort Jones, while piping the bank, a number of slabs of high-grade quartz were washed out, and search is being made for the ledge.

McKeen—The mine at Callahan is now being operated by 18 leasers and the mill and cyanide plant are kept busy on the ore they are extracting.

Colorado

CLEAR CREEK COUNTY

Spur Daisy—Vincent & Moore, of Central City, leasing on this group in the Eureka district, have opened a body of milling ore about 50 ft. from the surface.

Rockford—Lowe & Harris have let a contract for a new shaft house on this property adjoining the old Topeka group. Development work has disclosed both milling and smelting ore.

GILPIN COUNTY

Golden Glory Tunnel Mining Company—The company has under consideration the construction of a 600-horsepower hydroelectric plant on Clear creek, three miles below Georgetown.

Griffith Mines—Work has started on the construction of the new mill for this property. The Malm process will be used.

Crescent—The remodeled mill of this company has been placed in commission, the ore supply coming from the New Boston workings. G. D. Parks, Georgetown, manager.

LAKE COUNTY—LEADVILLE

Hibschle—At a distance of 200 ft. from the 450-ft. level a large stope of good iron ore has been opened in the western part of the property, from which 25 tons daily are being shipped; in the south drift, a good body of lead sand carbonate has been opened from which shipments are going out regularly. Harris & Bennett are leasing the property, as well as the Coronado, and have connected both properties by a drift. Ore is also being hoisted from the 450-ft. level of the Coronado.

Yak Tunnel—The breast of the tunnel is now nearing Resurrection No. 2 shaft and is in about four miles. At the three-mile mark a lateral has been started toward the New Monarch and will be driven 1000 feet.

Cleveland—With average and high-grade ore, this property in South Evans gulch is shipping 1500 tons monthly.

Iron Silver—The aerial tramway at the Tucson shaft is in working order and the output from this property is in the neighborhood of 300 tons daily. Prospecting in the Cambrian quartzite at a depth of 1300 feet is being carried on.

PUEBLO COUNTY

United States Zinc Company—This zinc smeltery of the American Smelting and Refining Company, near Pueblo, was closed two days last week as a result of a strike of the furnacemen who demanded the restoration of the scale of 1907. The company is at present running three of the four furnaces.

SUMMIT COUNTY

Breckenridge—Dredging is in progress in this section by a number of companies. The Reiling dredge of the French Gulch company is operating this season and is

said to have already cleaned up more than enough to pay for the dredge. The Colorado Gold Dredging Company is operating two dredges in Swan valley and in the Blue river near the mouth of the Swan. The Reliance company's dredge which has been equipped with a new bucket line is operating in French gulch in good ground.

TELLER COUNTY

El Paso Consolidated—A raise has been started at a depth of 740 ft. on block No. 22 of the Beacon Hill-Ajax claim. This raise will be carried to the surface and will later become the El Paso No. 2 shaft. John Nichols, superintendent.

Star of Bethlehem—J. L. Martin and H. C. Warmuth, leasing on this Stratton Estate property on Bull hill, have opened a body of smelting ore at a depth of about 40 ft. from the surface.

Drainage Tunnel—The bore has now been driven approximately 10,400 ft. and the breast of the tunnel is at a point near Arequa gulch, between Grouse mountain and Beacon hill.

Georgia

HALL COUNTY

Glade—A dredge is to be placed on this property which was recently acquired by J. H. Hunt, of Gainesville.

Idaho

ADA COUNTY

Spofford—This group of gold claims, covering 470 acres at the head of Cottonwood creek, 8 miles east of Boise, is reported to be under option to an English syndicate. A cyanide plant is contemplated. Judson Spofford, Boise, is manager.

Edna—The company has in contemplation the erection of a stamp mill and cyanide plant on the property between Idaho City and Banner.

Indiana

FOUNTAIN COUNTY

There is a prospect that the coal mines near Kingman will soon be opened and a large number of men employed. The Kelley people have a large tract of land near Kingman leased, and others have been in the field looking after leases. It is the intention to open up mines on these leases as soon as switches can be built for the transportation of the product. The Kelley Coal Mining Company of Kingman is the most active and will sink the first shaft.

GREENE COUNTY

August 10 was payday at all the mines in the Jasonville district and the miners received the largest payroll for several years. Three of the mines had worked every day, and the rest averaged five days a week.

Kansas**CHEROKEE COUNTY**

Childress & Hornaday—The mine on the Baker land is now a steady producer of average-grade zinc ore. The ground is being worked at a lower level than heretofore.

Hartford Zinc—Arrangements have been made for a supply of water from the city, the minimum expense being \$80 weekly. Present prices will make the working of a run of 3 per cent. zinc ore profitable.

Mascot—The company has installed new hoisting machinery at its mine on the Redeagle land. Drill records, now being verified by development, showed an extensive run of high-grade zinc ore at the 80-foot level.

Southside—The second electrical pump of 1300 gal. capacity has been installed on this famous tract, which has paid approximately \$1,000,000 in royalties. The pumps now in use will be sufficient to drain the 40-acre tract to the 140-ft. level. The company has placed a premium on deeper work in the form of lower royalty.

Ihlseng—Shaft sinking by this company on the Robertson and Ping tracts in new territory north of Galena is progressing at a rapid rate. It is a line shaft, 5x15 ft. in the clear, and of three compartments. The cribbing will be of 2x4-in. lumber and concrete. Three eight-hour shifts are employed, and the shaft will be sunk to 300 ft. Later two 250-ton capacity mills will be erected. The zinc ore found here is of exceptionally high grade. A. O. Ihlseng, Joplin, Mo., is manager.

Michigan**COPPER**

Quincy—The company has worked out a plan for remodeling the concentrating part of its mill, to take care of the increased tonnage of the stamping end brought about by the enlarging of its single heads, equipping them with 24-in. cylinders, which gave them a capacity of from 700 to 800 tons. The present changes are designed to further reduce the tailing losses and include the installation of four units of Woodbury jigs of 250 tons capacity each, rolls and mills for fine grinding. A head with its rolls, as planned by Superintendent Shields, will have four receiving screens, two oversize jigs, four classifying jigs, four concentrating jigs and eight middling jigs, all of the Woodbury type and capable of handling a product of about 1000 tons in 24 hours.

Winona—The stamp mill that is being erected by this and the King Philip company is to be equipped with two heads, one of the steeple compound type, and the other single with 24-in. cylinders, the same as used at the Quincy. The relative merits of the two heads can then be determined on this rock and the results will be of much interest.

Atlantic—The company continues sinking its Section 16 shaft; it is planned to put this shaft down to a depth of 2500 ft., and then crosscut toward the Superior company's boundary, a distance of about 600 ft. In starting the lateral opening at the 16th level, favorable looking ground was broken, but it has not been opened sufficiently to determine its extent.

Lake—The diamond drill to locate the site of the second shaft has been started. Developments underground at this property are continuing exceptionally fine; there are seven drifts extending from the shaft, all of them in fine ground with the lode averaging about 60 ft. in width.

Allouez—The company produced 643,650 lb. of mineral during the month of July, a yield of 30.36 lb. of mineral to the ton of rock, as against 24.26 lb. for the month of June, indicating a betterment as depth is being obtained. No. 2 shaft will soon be able to materially increase the production.

OAKLAND COUNTY

Detroit Salt Company—It is expected that salt production will be started during September from the new mine at Oakwood.

Missouri**JOPLIN—ZINC-LEAD DISTRICT**

Continental Zinc—The Little Pearl lease, west of Joplin, has just completed a shaft into rich ore, confirming a churn-drill strike. J. C. McDowell is president.

Fortune Teller—The company at Granby made a record-breaking shipment of silicate ore, consisting of 14 carloads, which brought an average of \$27 per ton.

Gallemore—A rich lead orebody has been passed through by a drill hole on this land near Seneca. Ore was struck at 21 ft. and continued for 38 ft. This camp is a southern extension of the Spring City district.

United Zinc—At Peacock, a rich strike has been made in the Cincinnati mine.

Old Judge—This mine, 300-ton mill and 40-acre lease have been sold for \$55,000 to Stover & Wonn, of Chicago.

Bull Frog—This large producer, west of Joplin, has sunk its shaft deeper and is now taking up a 10-ft. stope, insuring the life of the mine for a much longer period.

Montana**BUTTE DISTRICT**

Amalgamated Copper—The Boston & Montana company's Mountain View mine has been practically shut down for the past week owing to the breaking of the main driving shaft of the hoisting engine. A small amount of ore is being hoisted through another shaft on the property. It is expected that operations will be resumed within a week. At the Badger State mine of the same company a station

is being cut on the 1300-ft. level and when this is finished sinking will be resumed.

Butte & Superior—The shaft is now down 1525 ft. Drifting west is in progress on the 1200- and 1400-ft. levels. The management states that sinking will be continued to 1600 ft. when a station will be cut, and an electric pump installed to lift the water to the 1200 station, at which point an electric pump, already in place, will take the water to the surface. The company plans to erect a mill for the treatment of zinc ores on the property.

East Butte—During the first week of this month the production at the Pitts-mont smelter was 21,000 lb. of copper per day, or on a basis of over 600,000 lb. per month, which is much in excess of any previous record.

Tuolumne—It is expected that the company will begin shipping ore during September. High-grade ore has been opened in the lower levels, in addition to the body encountered some time ago in the drift from the 1000-ft. level.

CASCADE COUNTY

Barker—This mine, near Monarch, was recently inspected by George E. Gunn, of Salt Lake, and developments will be continued under the direction of Henry Teg-meier.

CUSTER COUNTY

New Crystal, Ltd.—This silver-lead mine, near Miles City, has been acquired by French interests, and will be developed under the direction of Capt. John Gray.

JEFFERSON COUNTY

Boston & Corbin—The compressors and hoists at this property will be operated by electric power about Sept. 1, or as soon as the pole line from Helena is completed. The company is developing at present the Bertha, the Bertha No. 2, and the Daphne No. 2. H. E. Emmerson, general superintendent.

Boston & Alta—Work of making room for the new machinery was begun at the Alta mine last week. The property has been closed down for 14 years. It is the intention to sink two vertical shafts and to rebuild the old concentrator. Electric power will be supplied by the Prickly Pear power plant, which belongs to the Boston & Alta company. C. E. Titus, Corbin, Mont., is in charge.

Nevada**ESMERALDA COUNTY—GOLDFIELD**

Grizzly Bear Lease—Since the installation of new hoisting equipment, sinking has been carried forward in an energetic manner. The shaft is now over 600 ft. in depth and is to be sunk to a depth of 1000 feet.

American Mining Congress—Exhibits are now being received from Goldfield and other districts and an elaborate dis-

play of Nevada products is expected for the forthcoming session to be held here, Sept. 27 to Oct. 4. James J. Hill and John Hays Hammond are among the speakers invited.

ESMERALDA COUNTY—LUCKY BOY

Chicago Exploration—This company, operating the Hubbard lease on the Mountain King property, ceased operations on Aug. 7, the lease having expired. During the life of the lease, the company produced a gross amount of \$900,000 and paid \$180,000 in dividends.

McCormack Lease—High-grade silver ore has been discovered in a winze from the 100-ft. level.

ESMERALDA COUNTY—RAWHIDE

King-Heisner—The amalgamation department of the new custom mill has been started and the cyanide portion of the mill will soon be ready.

Bovard Consolidated Mines Company—A 25-h.p. Fairbanks-Morse hoisting engine is en route for the development of this group, 18 miles south of Rawhide. The owners are George Graham Rice and associates.

NYE COUNTY—ROSE'S WELL

Diamond Queen—Leasers on this property are doing well; ore of smelting grade is being shipped.

HUMBOLDT COUNTY

Imlay—The new mill of this company has been completed and will shortly begin the treatment of the ore on a commercial basis. J. R. Turner, superintendent.

NYE COUNTY—RHYOLITE

Montgomery-Shoshone—Manager John G. Kirchen is quoted as stating that the company is now outputting about 6000 tons per month.

Crystal-Fullfrog—The small mill which the company has been erecting at "Mill junction," will shortly be ready for operation. Amalgamation, concentration and cyanidation departments have been provided.

WHITE PINE COUNTY—ELY

Giroux Consolidated—Developments by churn drills are said to have outlined orebodies suitable for mining with steam shovels. It is again reported that the concentrating and smelting of the Giroux ore is to be done in the Robinson district, or at some point in close proximity.

Nevada Consolidated—In July, the company produced about 3,520,000 lb. of copper, and it is expected that the August production will be the largest the company has yet made.

New Mexico

The Cole-Ryan interests have acquired several groups of gold claims in the Ocampo district and will consolidate

them into a new company to be known as the Sierra Mining Company.

GRANT COUNTY

Chino Copper—Ore developed in this property is estimated by A. Chester Beatty at 4,000,000 tons, and "partially developed" ore is given at 5,000,000 tons. Prospecting by churn drills is increasing the ore reserves at a rapid rate. At the recent meeting, the permanent board of directors was elected as follows: D. C. Jackling, A. Chester Beatty, Charles MacNeill, Spencer Penrose, Charles Hayden, Sherwood Aldrich, W. Hinkle Smith, J. G. Hopkins, Henry M. Whitney, Eugene N. Foss, B. Hochschild and Samuel Sloan. The first six are directors of the Utah Copper Company.

QUAY COUNTY

A rush has taken many prospectors to the arroyos of the Canadian river, about five miles from Logan, a station on the Rock Island railroad.

New York

ST. LAWRENCE COUNTY

Ontario Talc Company—On account of extended dry weather, the mill is not running at full capacity, it being dependent on water power. A new shaft is being sunk and is now about 135 ft. deep. The hoisting equipment from shaft No. 1 is being installed at the second shaft, and will be ready for operation within two weeks.

SARATOGA COUNTY

Empire Graphite Company—The plant at Porter Corners was destroyed by fire Aug. 13. It included a four-story mill for manufacturing graphite into various forms, besides a concentrating mill and some smaller buildings.

North Carolina

LINCOLN COUNTY

Piedmont Tin Mining Company—Diamond-drill operations have been started on this property near Lincolnton to prospect the orebody.

Oregon

LANE COUNTY

Kelso—The company has spent about \$10,000 in additional equipment for the mill. W. P. Ely, manager, Bohemia.

West Coast—Superintendent Ryan states that the 30-stamp mill on this property will soon be started.

Pennsylvania

BITUMINOUS COAL

Youngstown Steel Company—This company, of Youngstown, Ohio, has bought from J. V. Thompson, of Uniontown, a tract of 1500 acres of coal land located in the Dunkard creek section of Greene

county, the price being \$550 per acre, including the surface. The Youngstown concern also controls the Brier Hill Coal and Coke Company, which has 470 ovens at Brier Hill. The coal has been tested for coking and proves good, but as there is no railroad, the development will be deferred some time.

ALLEGHENY COUNTY

American Vanadium Company—President James A. Flannery, of Pittsburg, before departing for the mines in Peru announced that the reduction works at Bridgeville, Penn., would be tripled in size.

Utah

BEAVER COUNTY

Newhouse—Preliminary steps have been taken in the foreclosure of the mortgage, held by the Trust Company of America, as a part of the reorganization plans for resuming work on this property.

Majestic Mines—The Beaver River Power Company expects to have its pole line completed to the Harrington-Hickory mine by Sept. 1, after which electric power will be used exclusively. Development continues on the large orebody at the bottom of the incline shaft. A drift is being run from the 500-ft. level of the vertical shaft to cut this orebody. A. D. Moffat, superintendent, Milford, Utah.

SALT LAKE COUNTY

Utah Coalition—The tunnel at Alta, now in about 1000 ft., has encountered a body of silver-lead ore. Capt. Duncan McVichie is interested.

Prince of Wales—This company in the Alta district has increased its capital from \$10,000 to \$300,000. The new company will operate its lease on one-half of the old Prince of Wales mine and also develop six adjoining claims. Fred Schrott, president, 15 Wilfley apartments, Salt Lake.

SUMMIT COUNTY

Ore Shipments—The shipments from Park City during the past week were: Silver King, 1,333,740 lb.; Daly-West, 1,244,300; Daly-Judge, 549,000; Daly-Judge (zinc), 957,270; American Flag, 224,000 pounds.

Washington

KITTITAS COUNTY

Ellensburg—In the sands of the Yakima river near here, O. O. Felkner has obtained high pannings and is installing sluice boxes.

West Virginia

State Mine Inspector John Laing has announced the appointment and assignment of district inspectors as follows: First district, Karl F. Schoew, Bluefield; headquarters, Fairmont. Second, Frank

E. Parsons, Clarksburg. Third, L. D. Vaughan, Elk Garden; headquarters, Independence. Fifth, Earl A. Henry, Clifton. Sixth, Bonner H. Hill, Chelyan. Eighth, Robert Y. Muir, Gentry; headquarters, Thurmont. Ninth, Lane B. Holliday, Maybeury; headquarters, Beckley. Tenth, Arthur Mitchell, Stanford; headquarters, Bluefield. Eleventh, William Nicholson, Bluefield. Office and field assistant to chief, A. J. King, Rush Run; headquarters, Charleston.

The inspectors for the fourth, seventh and twelfth district will be named later.

Wisconsin

ZINC-LEAD DISTRICT

Big Dad—The Wisconsin Zinc Company has acquired and will reopen this mine, and commence milling. The Big Tom and Illinois are again active.

Benton—The Lucky Twelve company has purchased and will remove the Pine Tree mill.

Hazel Green—The Cleveland Mining Company has acquired the Scrabble creek and Murphy mines and will continue development under one management.

Pittsburg-Benton—Operations were resumed at this mine by the Wisconsin Zinc Company, which has taken it under release. The Drumm lease will also be developed.

Vinegar Hill—The company has started its mill at the Calvert mine.

Wyoming

CARBON COUNTY

United Smelters, Railway and Copper Company—Some changes have been made in the directorate of this company as a result of the entrance of some new interests. The directorate now comprises: I. N. Pennock, Cleveland, Ohio; Warner Moore, Richmond, Va.; W. E. White, Parkersburg, W. Va.; F. A. Baldwin, Grand Rapids, Mich.; Willard Pennock, Minerva, Ohio; A. L. Hawse, Clarksburg, W. Va.; Andrew S. Upson, Cleveland, Ohio; J. E. Haskell, Bradford, Penn.; E. M. Cobb, Chicago. The latter has been succeeded by I. N. Pennock as president. The company controls the Penn-Wyoming Copper Company and affiliated enterprises in the vicinity of Encampment.

Canada

BRITISH COLUMBIA—PHOENIX

New Dominion Copper Company—This company, which has succeeded the Dominion Copper Company, has been organized with a capital of \$1,250,000 (par value of shares \$5) and \$500,000 in 10-year, 6 per cent. bonds. The new directors are: H. Cook, J. H. Susmann, Judge Warren W. Foster, John A. Sleicher, W. J. Cull, N. Bruce McKelvie and H. H. Melville. Operations are to be resumed at the property as soon as

the engineers have completed their examination. As the General Development Company has a considerable stock interest in this company, and also in the British Columbia Copper Company, it is not improbable that the two properties may be consolidated.

BRITISH COLUMBIA—SOUTHEAST KOOTENAY

Crow's Nest Pass Coal Company—Official announcement has been made of suspension of dividends, owing to reduction in output of coal, consequent upon the caving of approaches to some of the mine workings. A change in mining methods is necessary to place the mines on as productive a basis as in the past, and attendant expenditure will temporarily absorb the profits of the company's other mines and coke ovens.

ONTARIO—COBALT

Ore Shipments—Shipments for the week ending, Aug. 7, were as follows: Buffalo, 42,250 lb.; Chambers-Ferland, 60,940; Coniagas, 91,790; Crown Reserve, 181,700; La Rose, 25,840; Nipissing, 128,690; O'Brien, 83,200; Silver Queen, 175,710; Silver Cliff, 63,000; Trethewey, 128,860; Temiskaming & Hudson Bay 64,000; total, 1,278,540 pounds.

Gifford—Contract work has been nearly completed, the main shaft being down 190 ft., and the shaft timbered for 172 ft. A station will be cut at the 200-ft. level and crosscutting commenced to tap surrounding veins. A plant has been installed and air leased from the Temiskaming to operate the drills.

Silver Lode—At this mine on the north side of Cross lake, native silver has been found in the calcite vein at the bottom of the 90-ft. shaft.

Nipissing—The company reports striking a new vein 3 in. wide, assaying high in silver. The vein has been named No. 128.

ONTARIO—DELORO

Deloro Mining and Reduction—On Aug. 11, fire destroyed the sluices and bullion rooms of the company. The cobalt plant was saved by great exertions.

ONTARIO—GOWGANDA

Morrison—The discovery is reported of a vein, 12 in. wide, which has been uncovered for 50 ft. on these claims.

NOVA SCOTIA

Spring Hill Coal Mines—The miners belonging to the United Mine Workers went out on strike Aug. 10. About 1200 men are affected. The principal question at issue is the recognition of the union, but other demands include a change in wage schedules amounting to an advance of about 10 per cent. The Cumberland Railway and Coal Company, which operates the mines, has decided to close

them down indefinitely. H. R. Drummond, the president, states that the mines have been operated at a loss for the last three years. The average daily output was about 2000 tons. Hon. Mackenzie King, minister of labor, states that as a board of conciliation has already been appointed which, after investigation, sustained the position of the company, the department will not interfere further in the matter.

Mexico

CHIHUAHUA

Palmilla Milling Company—James I. Long, general manager, Parral, has received telegraphic instructions to proceed at once with plans for the first 250-ton unit of the new mill.

Cherokee Goldfields, Ltd.—The company has completed the construction of its mill at San Julian. The manager, Gerald Hopkins, is at present in London.

Compania Metalurgica de Torreon—The company has acquired the lease and bond held by Charles M. Dobson on Las Cuadras mine in the Santa Barbara district. The ores of the mine are silicious and daily shipments of about 25 tons are sent to the Torreon smeltery.

COAHUILA

Monterey Iron and Steel—The company has acquired about 1000 acres of iron land in the Hercules district.

DURANGO

Lustre Mining & Smelting—Owing to pressure from Mexican creditors, with claims amounting to about \$139,000, it is expected that this company will be reorganized. The company owns the Magistral mine, stamp and concentration mills, and a 6-furnace copper smeltery near Santa Maria del Oro. The company is controlled by Pittsburg, Penn., capital.

MEXICO

Mexico Mines of El Oro, Ltd.—During July, the mill ran 29 days crushing 11,761 tons of ore, yielding bullion valued at \$106,110. Regular working expenses were \$37,620 and development expenditure was \$8700, leaving a profit of \$59,790; a net return of \$4800 was obtained from 43 tons, shipped during the month, but not included in the above milling operations.

SONORA

Virginia Development—Ore has recently been encountered in this property 16 miles south of Douglas, Ariz. The property comprises 19 pertenencias and a two-compartment shaft has been started under the direction of S. Grose.

Calumet & Sonora—A 250-ton mill from the Joplin, Mo., district has been purchased and will be removed to Cananea to handle the sphalerite ores of this property. James W. Norton, manager.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, Aug. 18—The bituminous coal trade in the East is improving. Demand is better and consumers are showing a disposition to put in winter stocks of fair amount. There is a prospect of some improvement in competitive conditions. It is understood that the New River producers, who have been heavy shippers and have been selling at extremely low prices, are making an effort to get together and see if something cannot be done to improve matters as to prices. This, of course, will involve some restriction of shipments.

The anthracite trade continues its usual course without change and without incident. The heavy rains of the present week mean better water supply and a consequent improvement in working conditions in a good many of the collieries.

Coal trade in the West continues its steady improvement. Demand for steam coal is better and dealers in the large cities and towns are beginning to take thought of their winter supplies, with a consequent improvement in orders. There is the usual tendency to over-shipment, which helps to keep quotations down. There is, indeed, not likely to be much increase in prices as long as the shipping capacity of mines is so much above their actual sales.

Central Pennsylvania Mine Wages—The miners of the Central Pennsylvania district, in a special convention called for the purpose, have voted to reject the proposal of the operators to reduce the mining rate from 66 to 55c. per ton; also to reject a second proposal to arbitrate the question. They will adhere to the existing contract, which runs to April 1, 1910. The operators claim that this refusal will make it necessary to close a number of mines.

Alaska Coal Locations—Under direction of the Secretary of the Interior, the General Land office in Washington has suspended a large number of claims entered on coal lands in Alaska. Charges of fraudulent entries are the reason given for this action. The suspension will be continued until the charges are fully investigated.

COAL TRAFFIC NOTES

Coal receipts at St. Louis, six months ended June 30, were 3,113,227 short tons in 1908, and 3,099,828 in 1909; decrease, 13,399 tons.

Coal passing Davis Island dam on the

Ohio, six months ended June 30, was 1,596,655 short tons in 1908, and 2,341,195 in 1909; increase, 744,540 tons.

Coal passing through the locks on the Monongahela river, six months ended June 30, was 4,136,820 short tons in 1908, and 4,864,000 in 1909; increase, 727,180 tons.

Coal shipments from Tacoma and Seattle, six months ended June 30, were 399,958 short tons in 1908, and 253,280 in 1909; decrease, 56,678 tons. These shipments are mainly to California and Alaska ports.

Receipts of domestic coal at San Francisco, six months ended June 30, were 147,757 short tons in 1908, and 236,762 in 1909; increase, 89,005 tons.

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, years to Aug. 7, short tons:

	1908.	1909.	Changes.
Anthracite	3,085,670	2,948,460	D. 137,210
Bituminous	19,462,584	21,311,086	I. 1,848,502
Coke	4,061,666	6,094,386	I. 2,032,719
Total	26,609,920	30,353,931	I. 3,744,011

The total increase this year to date was 14.1 per cent.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, six months ended June 30, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio.....	10,160,095	2,083,888	12,193,923
Buff., Roch. & Pitts.	2,938,538	227,916	3,166,454
Buff. & Susquehanna	702,231	162,615	864,846
Penn. lines, N. Y. C.	3,524,208	46,596	3,571,104
Pitts. & L. Erie.....	3,853,767	2,160,892	6,014,659
Norfolk & Western.	6,247,892	1,211,619	7,459,511
Ches. & Ohio.....	5,092,509	195,911	5,228,420
Total.....	32,489,180	6,039,737	38,498,917
Total, 1908.....	27,709,677	3,816,890	31,526,567

The total increase this year was 6.972-350 tons, or 22.1 per cent. Chesapeake & Ohio figures are for five months only, as the June report has not been received. In addition to the above, the Baltimore & Ohio carried 397,656 tons anthracite in 1908, and 418,924 in 1909; an increase of 21,268 tons.

Coal tonnage of railroads in Ohio Coal Traffic Association, six months ended June 30, short tons:

	1908.	1909.	Changes.
Hocking Valley.....	1,103,190	1,278,385	I. 175,195
Toledo & Ohio Cent..	498,056	540,994	I. 42,938
Baltimore & Ohio ...	668,101	602,098	D. 66,003
Wheeling & L. Erie .	1,243,275	1,395,246	I. 151,971
Cleve., Lorain & Wh.	1,129,777	1,054,152	D. 75,625
Zanesville & Western	486,121	503,122	I. 18,001
Toledo Div., Pen. Co.	750,686	837,617	I. 86,931
L. Erie, Alliance & Wh.	440,272	458,918	I. 18,646
Marietta, Col. & Cleve.	25,111	35,474	I. 10,363
Wabash-Pitts. Term.	.....	8,097	I. 8,097
Total.....	6,343,889	6,714,103	I. 370,214

The total increase in tonnage this year was 5.8 per cent. Only the Ohio lines of the Baltimore & Ohio are included above; the main line is given elsewhere.

Coastwise shipments of coal from chief Atlantic ports, six months ended June 30, long tons:

	Anthracite.	Bitum.	Total.	PerCt.
New York.....	7,764,227	5,077,040	12,841,267	63.0
Philadelphia	1,093,632	2,139,636	3,233,267	15.9
Baltimore....	129,212	1,643,812	1,773,024	8.7
Newp't News .....	.....	1,602,206	1,602,206	7.9
Norfolk.....	.....	922,914	922,914	4.5
Total.....	8,987,071	11,385,607	20,372,678	100.0
Total, 1908.	9,209,947	10,843,392	20,053,339	.....

Total increase this year, 319,339 tons, or 1.6 per cent. Shipments include bunker coal furnished steamships in domestic trade. New York includes all the harbor shipping points.

Coal receipts at Boston, seven months ended July 31, reported by Chamber of Commerce.

	1908.	1909.	Changes.
Anthracite.....	1,025,279	983,572	D. 41,707
Bituminous.....	1,838,791	1,933,731	I. 94,940
Total domestic....	2,864,070	2,917,303	I. 53,233
Foreign.....	247,550	152,504	D. 95,046
Total.....	3,111,620	3,069,807	D. 41,813

The foreign coal reported comes chiefly from Nova Scotia.

New York

ANTHRACITE

Aug. 18—The anthracite market continues very quiet and steady with only the usual current business forward.

Schedule prices for prepared sizes are now \$4.65 for lump, and \$4.90 for egg, stove and chestnut, f.o.b., New York harbor. For steam sizes quotations are: Pea, \$3.15@3.25; buckwheat, \$2.35@2.50; No. 2 buckwheat or rice, \$1.70@2; barley, \$1.35@1.50; all f.o.b., New York harbor.

BITUMINOUS

There is an actual improvement this week in the bituminous trade. Business for some time past has been coming in bunches; at the present writing there is quite a flush which dealers hope will continue. More orders are coming in, although prices are not improving simply for the reason that there is so much reserve capacity at the mines. The far East has been busying itself and sending in pretty good orders. The Sound is lagging a little still, but is doing fairly well. New York harbor is the quietest of all. All-rail trade is very good.

The improvement is in amount of business, not in quotations. Prices continue as they have been for some time. Good Miller vein steam coal can be had at a delivered price which nets \$1.30@1.35 at mines, while lower grades bring 90@95c. per ton at mines, and gas coal can be had at 60@65c. per ton at mine for run-of-mine.

Transportation from the mines is good, coal coming through about on time and sometimes a day or so ahead. Car supply is good, with limitation noted last week, that it is sometimes difficult to get special cars; that is, cars of special sizes which are required on some roads, chiefly in New England.

The attempt of the New River producers to come to some agreement is noted elsewhere. The Interstate Commerce Commission has supported the complaint made by the George's Creek operators, and has ordered that the differential of about 20c. in freights between George's Creek and Clearfield coal to tidewater must be done away. The railroads are given until Sept. 15 to adjust their rates. The commission held that the service from the two districts was about equivalent, and that the railroads were not justified in making a higher charge on George's Creek coal because of its better quality. This will not improve the temper of the Clearfield people, who have also failed this week to secure a reduction in the mining wage rate.

In the coastwise trade vessels continue in abundant supply and rates are unchanged. They are 60c. from Philadelphia to Boston; 60c. from New York to around the Cape and 30@40c. to Providence and the Sound. All are shaded 5c. or so occasionally to get good cargoës. Captains and vesselowners are looking forward hopefully to a rush for charters to the shoalwater ports a little later.

Birmingham

Aug. 16—There is a steady improvement in coal production and trade in Alabama. Some good contracts are being let in this section for fall and winter use, with some of the product being requested to be delivered at once. The railroads are furnishing all the cars needed for prompt handling of the coal and it will be some time yet before there is likely to be a scarcity of cars reported.

The coke production is increasing, as more ovens are put into operation. The Tennessee Coal, Iron and Railroad Company will soon construct a large number of ovens in this district. This company has recently been taking up options on a large tract of land in Jefferson county, on which development will take place, including the construction of a number of coke ovens. Good prices prevail for coke and the demand is strong.

Chicago

Aug. 16—The coal market grows stronger with the continuation of restricted shipments, so that waves of depression due to too great receipts on track are kept out. Lump coal especially is in better condition; run-of-mine has a firmer tone and screenings no longer lead the bituminous market. Everywhere the wholesale trade appears confident of con-

stantly increasing business for the last half of the month despite summer conditions. In part the betterment seems due to general improvement in manufacturing conditions; in part it is caused by the extraordinarily heavy harvesting trade, and something of it is to be accounted for by the tendency of retailers to lay in domestic stocks early. Except for smokeless, there is hardly any demurrage coal on the market. Shipments of smokeless run-of-mine still incline to bunch, with the result that prices are occasionally sacrificed to move the coal.

Illinois and Indiana lump brings \$1.75 @2.35; run-of-mine \$1.60@1.75 and screenings \$1.30@1.60. Smokeless holds up well on lump to \$3.40@3.50; on run-of-mine to \$2.95@3.05, these being list prices for Pocahontas and New River, with lower-grade smokeless 10 or 15c. less. Hocking coal is in very good demand and firm at \$3@3.15. Youghiogeny is steady and in light sale at \$3.15 for ¾-in. gas.

Anthracite shows no noteworthy change, with a fair sprinkling of sales in small quantities distributed among the city and country trade.

Cleveland

Aug. 17—Although the season is advancing, the Lake trade continues slow. Local demand is strong and steady; manufacturers are buying and dealers are stocking up. Prices are unchanged. Middle district coal sells at \$1.85@2 for lump, \$1.65@1.75 for run-of-mine, and \$1.15@1.20 for slack. No. 8 district is \$1.90@2.05 for lump, \$1.70@1.80 for run-of-mine and \$1.30 for slack. Pittsburg coal sells at \$2.15@2.25 for lump and \$2@2.05 for run-of-mine; Pocahontas at \$2.80 and \$2.35 for the two grades. Massillon lump for domestic use is \$2.70, Cleveland.

Indianapolis

Aug. 16—Improvement in coal mining is more manifest than for any period during the summer. The payrolls at the mines in several districts were the largest for two years. Orders have not been as heavy as the operators are accustomed to booking in August, but they have been steady and numerous. The large consumers are a little conservative, but they have shown a disposition to place their orders soon.

Thomas L. Lewis, president of the United Mine Workers of America, sat as umpire in a two days' hearing of the dispute between miners and operators, growing out of differences regarding the removal of slate and leaving pillars of coal, which occasioned a strike in the eleventh district. The first thing the international president did was to order the men back to work pending the hearing and his decision, which is to be announced in a few days. Both sides agreed to leave the decision with Mr. Lewis and abide by his ruling.

Pittsburg

Aug. 17—The coal market presents no change, demand being fair, with prices only fairly firm and active competition for what business is going. Nominal prices remain at \$1.20 to retail dealers and \$1.10 to manufacturers, for mine-run and 65c. for slack, at mines, these prices being generally shaded 5 or 10c. per ton, and sometimes a trifle more.

Connellsville Coke—The market has been relatively quiet as to new sales, but prices have firmed up further, particularly on foundry coke. The Connellsville region is suffering considerably from a scarcity of labor. Since the slump in operations late in 1907, common labor has been attracted to the region more than once on false reports of great activity in prospect, and the late genuine revival has not brought as many men as needed, as they had become suspicious. Standard Connellsville furnace coke is quoted at \$1.65@1.75 for prompt and \$1.75@1.85 for contracts running through the balance of the year; while 72-hour foundry coke is quotable at \$2@2.25 for either prompt or contract.

The Courier reports the production in the Connellsville and lower Connellsville regions in the week ending Aug. 7, at 295,664 tons, a gain of 10,000 tons. Shipments are reported at 4310 cars to Pittsburg, 7424 cars to points west of Pittsburg and 852 cars to points east of Connellsville, a total of 12,586 cars, no change from the preceding week.

Foreign Coal Trade

Spanish Fuel Imports—Imports of coal into Spain five months ended May 31 were 934,908 metric tons, an increase of 135,974 tons over 1908. Imports of coke, 123,059 tons, a decrease of 14,636 tons. These imports are chiefly from Great Britain.

Austrian Coal Production—Coal production in Austria-Hungary, six months ended June 30, metric tons:

	1908.	1909.	Changes.
Coal	7,006,009	6,818,446	D. 187,567
Brown coal.....	13,430,226	12,606,998	D. 823,228
Total mined...	20,436,229	19,425,444	D. 1,010,785
Coke made.....	946,163	905,128	D. 41,025
Briquets made...	72,416	86,217	I. 13,801

The increase in briquets is due to the larger use of brown coal, or lignite, in that form.

French Coal Production—Coal production in the Nord and the Pas-de-Calais, the two principal coal districts in France, for the six months ended June 30 was, in metric tons:

	1908.	1909.	Changes.
Nord.....	3,413,125	3,488,674	I. 75,549
Pas-de-Calais.....	8,932,823	9,353,127	I. 420,304
Total coal.....	12,345,948	12,841,801	I. 496,853
Coke made.....	878,987	915,688	I. 36,701
Briquets made....	632,261	722,513	I. 90,252

During the six months France exported

to Belgium 266,215 tons coal, 15,506 tons coke and 391 tons briquets; but imported from Belgium much larger quantities, 1,889,280 tons coal, 199,552 tons coke and 138,507 tons briquets.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of coal as follows, on Aug. 7: Best Welsh steam, \$4.20@4.26; seconds, \$4.08; thirds, \$3.96; dry coals, \$4.08; best Monmouthshire, \$3.60; seconds, \$3.48; best small steam, \$2.40; seconds, \$2.10. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Aug. 18—The iron and steel markets generally continue to show steady demand, though possibly less rush of business, as buying by manufacturers and first consumers has largely satisfied their requirements for some months to come. There are quite a number of inquiries from large consumers for the first quarter of 1910 which have not as yet resulted in much business, partly because producers are inclined to advance prices for such deliveries to a point above that which purchasers are willing to pay.

In pig iron the market in Eastern territory shows fewer large contracts, but a considerable run of small orders, both for foundry and basic iron; while the pipemakers are taking some forge and a good deal of lower-grade foundry. Prices are firm with a general tendency to ask advances wherever possible. Not much business is being done beyond next quarter, buyers being unwilling to pay more while there are still a number of merchant furnaces out of blast. In the Central West, pig iron is more active than in the East. Foundry and basic are being taken and there is some call for bessemer pig from the steelmakers.

In finished material conditions remain good. The absence of large contracts in structural steel is made up by a number of small orders. The demand for nails and other material which enters into general building is strong, indicating a good business condition. Plates, bars and shapes have been stimulated by the large orders for equipment which are coming in.

The railroads are coming into the market with quite a rush of orders for new equipment, and the number of cars for which contracts have been placed is large. Orders for locomotives are on the increase, though more slowly. The present year, apparently, will go out with only a moderate business in rails, but a number of companies are now figuring on rail orders for 1910 delivery, and it looks as if a considerable business of this kind would be placed. Light rails and trolley rails are active, as they have been for some weeks past.

Lake Superior Iron Ore—Shipments of iron ore from the Lake Superior region for the season to Aug. 1 are reported by

the *Cleveland Iron Trade Review* as below, in long tons:

	1908.	1909.	Changes.
Escanaba.....	754,293	2,016,505	I. 1,262,212
Marquette.....	845,789	870,961	I. 25,172
Ashland.....	592,939	1,061,187	I. 468,248
Superior.....	1,111,887	2,576,110	I. 1,464,223
Duluth.....	2,819,934	5,434,135	I. 2,614,201
Two Harbors.....	1,610,439	3,436,452	I. 1,826,013
Total.....	7,235,281	15,395,350	I. 8,160,069

Notwithstanding cloudbursts and wash-outs on the ranges which crippled Duluth and Ashland for a week in July, the ore shipments of that month were 6,693,025 tons, which is the second largest shipment of any month in the history of the trade. Shipments to Aug. 1 show an increase of 112.5 per cent. over last year, and are within 2,139,391 tons of the record shipments of 1907.

Baltimore

Aug. 17—Exports for the week included 983 tons steel rails and 532 tons rail joints to Mexico; 3,378,000 lb. steel billets to Liverpool; 847,565 lb. tin scrap to Rotterdam. Imports included 1681 tons manganese ore from Germany; 6000 tons manganese ore from Brazil; 15,990 tons iron ore from Cuba.

Birmingham

Aug. 16—Southern pig-iron manufacturers are holding firmly to \$13.50 per ton for No. 2 foundry, and do not appear to be willing to sell much at that price save to regular customers whose needs will be cared for right along. The production is being kept up; the estimate is made that the output in August will show as large an increase as compared to July as did the output in July over the month of June.

Much iron that has been stacked in furnace yards in this section, belonging to others than the producers, is beginning to be moved off. Reports have it that there will be a large percentage of the iron in the yards here shipped out in the next few weeks. The make is equal to the present demand, with the furnace companies not anxious to handle much future business. The larger companies, the Tennessee Coal, Iron and Railroad Company and the Republic Iron and Steel Company are practically out of the market for the balance of the year. The Sloss-Sheffield Steel and Iron Company, which has five furnaces in operation, is selling only to regular customers, or holding such trade as might become regular business in this district.

The Southern cast-iron and soil-pipe trade is still active. The smaller pipe companies are securing much business from municipalities where a few thousand tons of pipe at a time are needed. This is aggregating well, and is a profitable business.

The minor iron users throughout Southern territory are requiring more and more iron right along.

Chicago

Aug. 16—Sales of pig iron continue good in the aggregate, with the average melter taking lots up to 500 or 600 tons and the exceptional buyer going up to 1000 tons on last-quarter and 1910 business. The wide distribution of sales and the increase of inquiries for heavy tonnage point to increasing firmness. The upward tone, indeed, is apparent in many features of the market. Furnace agents hold out strongly for higher prices on 1910 deliveries, with good prospects of bringing the buying side of the market to their requirements. On last-quarter business Southern is quoted at \$13@13.50 Birmingham (\$17.35@17.85 Chicago) and Northern at \$17@17.50. A little iron sells at the lower prices for 1910 first-half delivery, but in general selling interests continue to get the higher. For Northern furnaces the situation is good because of the relatively high price of Southern and sales of Northern are increasing. The activity in demand for Northern for special purposes is notable.

Conditions of the market for iron and steel products are promising for continuation of the heavy demand that exists now in practically every line. Railroad and structural shapes are especially active. Coke is in good demand and steady at \$4.70 for the best Connellsville.

Cleveland

Aug. 17—The demand for merchant ore has increased so much that some of the selling agencies report that Old Range bessemer is almost cleaned out, while Mesabi bessemer is not abundant.

Pig Iron—Sales for the week have been moderate locally, but inquiries so numerous that furnaces are asking 25c. more for fourth-quarter iron. Bessemer is quoted \$16.50@17; No. 2 foundry, \$16.25@16.50, Cleveland.

Finished Material—Plates are doing well, and more contracts for structural steel are coming in from this territory. Bars are also in good demand, and there is more call for sheets.

Philadelphia

Aug. 18—The continued demand for basic, in most cases for more remote delivery, continues to be the feature of the market. Requirements now the subject of negotiation will probably be covered and followed by a quiet market for some time to come. Prices are 25c. per ton higher and makers figure out a further advance. The rush of work calling for basic continues. Today's quotations are \$16.75@17 per ton.

Some additional business has been done in Southern No. 2 foundry at \$17. Northern No. 2 standard makes are quoted at \$17.50. Sales of gray forge have been made at \$16. Some inquiries this week

are from consumers who are well supplied for 60 days. The tone of the market is strong throughout and there is a general disposition to look ahead. Bar-iron manufacturers are seeking options in some cases for iron at present selling prices for early winter delivery.

Steel Billets—On the surface nothing has been done in the closing of business owing to the higher prices asked by manufacturers. Buyers are fairly well supplied for the present.

Bars—Reports from mill offices show a further increase in distribution, generally made up of small orders. Manufacturers have knowledge of September requirements. Quantities and terms have not been considered but it is understood that less than current quotations will be agreed upon on account of the size of the expected orders.

Sheets—The week has been quiet so far as large mill orders are concerned. Manufacturers report a general increase in consumption.

Pipes and Tubes—This territory has absorbed its full share of pipes and tubes. All the smaller industries are active.

Plates—The rush of new business continues and mills are practically sold up. On large orders quotations are kept low. Railroad equipment orders are bringing considerable business to the plate mills.

Structural Material—The structural mill people give glowing reports of business in hand and in sight. It will soon be a matter of meeting demands for early delivery. Car builders' requirements are very heavy and general construction work has more than doubled its demands on the mills.

Steel Rails—Some overflow business from Western mills has reached eastern Pennsylvania mills. The calls for small lots of light sections are numerous.

Scrap—Demand for heavy steel scrap has again subsided and yardmen report very little business.

Pittsburg

Aug. 17—Prices of iron and steel products continue to advance by a very gradual, but well-sustained movement. The gain each week is slight, but there are no retrogressions. This week's news includes an advance of \$1 per ton in steel bars, an advance of 5c. per keg in cut nails and a firming up in iron bars in the Pittsburg market of about \$1 per ton.

Production continues to increase. The United States Steel Corporation made a new month's record in pig-iron production in July, which is the more remarkable from the fact that July and August are poor months for furnace operations on account of the humidity. The same furnaces would make a considerably larger tonnage in March or October. The corporation is not running as large a percentage of its blast-furnace capacity as

when the June record was made, as it has blown in some new furnaces. Neville island furnace will be blown in early next week, to be followed within a fortnight by Edith. These furnaces are in the Pittsburg district and were formerly owned by the American Steel and Wire Company, but some time ago were transferred to the Carnegie Steel Company. As soon as the sheet and tinplate labor matter is settled and the corporation gets up to its usual tonnage of sheets and tinplates the Columbus blast furnaces and steel works will be started. The prospect is that by October the Steel Corporation will be making a much larger tonnage than ever before in its history.

It is definitely given out that the American Sheet and Tin Plate Company will not sell any tinplate for next year at less than a 15c. advance over the current market, which is \$3.40 for 100-lb. cokes, and an advance in sheets is likely also. Meanwhile some of the independents are advancing prices, one independent, producing both sheets and tinplates, having made a general advance of 25c. per 100 lb. last Friday. Other independents are quoting 15 to 25c. advance on tinplate to buyers other than their regular customers.

Pig Iron—Pig iron has been relatively quiet. The tone of the market has possibly improved slightly in the week, but not at the rate of the preceding fortnight. In some quarters the failure of foundry iron to score an absolute advance is blamed for the halt. No. 2 foundry can still be had on the basis of \$15.25, Valley, for this year's delivery. There have been several sellers on this basis, including one Valley interest which is about to go in after a year's idleness, and a couple of detached furnaces in western Pennsylvania. It is a fact, however, that some sales of foundry iron have been made at higher than \$15.25, and sales at \$15.75, or higher, have been reported for next year. Bessemer iron has been quiet since the sales reported last week, aggregating about 25,000 tons to the Republic Iron and Steel Company and Youngstown Sheet and Tube Company, the market being firm at \$16, Valley, for large lots, while one lot of 200 tons for fourth-quarter is reported to have gone at \$16.50. Basic remains at \$15.25, Valley, and is firm at that price. A sale of 2500 tons for prompt shipment has been made during the week.

Ferromanganese—Sales in the past fortnight have been fairly large, for early delivery. While sales have been made in the past 10 days of a few carloads at \$40.75, Baltimore, more recent sales have brought \$41, and the market is quotable firm at that price, the freight to Pittsburg being \$1.95. An advance is generally asked for next year.

Steel—The market has been quiet, but prices are stronger, and it is difficult to secure any tonnage at the level lately prevailing, \$24 for bessemer billets, \$25 for

open-hearth billets and \$25.50@26 for sheet bars, all f.o.b., Pittsburg, plus freight to destination.

Sheets—The market is very strong, and some mills are quoting a premium over the regular prices, particularly on specialties. Regular prices remain at 2.20c. for black and 3.25c. for galvanized, with corrugated roofing at \$1.55 per square for painted and \$2.80 for galvanized. Some mills have refused to sell for delivery beyond Nov. 1 at these prices.

Sault Ste. Marie Canal Traffic

Freight passing through the Sault Ste. Marie canals for the season to Aug. 1 was, in short tons:

	1908.	1909.	Changes.
East-bound.....	8,759,790	16,213,999	I. 7,454,209
West-bound.....	4,330,684	4,610,034	I. 279,350
Total.....	13,090,474	20,824,033	I. 7,733,559

The total increase this year was 59.1 per cent. The mineral freights included in the totals were as follows, in short tons except salt, which is given in barrels:

	1908.	1909.	Changes.
Coal.....	3,869,451	3,945,217	I. 75,766
Iron ore.....	7,106,322	14,540,764	I. 7,434,442
Pig and man. iron.	121,065	209,811	I. 88,746
Copper.....	35,960	51,945	I. 15,985
Building stone.....	577	980	I. 403
Salt, bbl.....	261,978	364,142	I. 102,164

The total freight in July was 8,799,666 tons, which is the largest ever reported for a single month, with the exception of June, 1907, when the total was 8,865,442 tons. For this season iron ore was 69.8 and coal 18.9 per cent. of the total freight.

Foreign Iron

British Blast Furnaces—The average number of furnaces in blast and making pig iron in Great Britain for the second quarter of 1909 was 310; while there were 200 furnaces idle.

Metal Markets

New York, Aug. 18—The metal markets show some activity, and in some directions prices have advanced, while in others there are slight declines.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
July 1909..	\$16,661,782	\$ 3,269,885	Exp. \$13,391,897
" 1908..	4,845,272	2,949,179	Exp. 1,896,093
Year 1909..	80,496,119	23,405,477	Exp. 57,090,642
" 1908..	58,363,098	29,357,075	Exp. 29,006,172
Silver:			
July 1909..	5,049,366	3,926,117	Exp. 1,123,249
" 1908..	4,930,746	3,039,581	" 1,891,165
Year 1909..	34,409,082	26,798,145	" 7,610,887
" 1908..	30,445,291	24,180,929	" 6,264,362

Exports from the port of New York, week ended Aug. 14: Gold, \$19,580; silver, \$556,305, to London and Paris. Imports: Gold, \$169,458, chiefly from the West Indies and Central America; silver, \$115,560, from Mexico and South America.

Foreign commerce of the United States, seven months ended July 31, as valued by the Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1908.	1909.
Exports.....	980,997,089	897,425,504
Imports.....	609,896,648	830,287,488
Excess, exports.....	372,110,441	67,138,016
Add excess of exports, silver.....		7,610,887
Add excess of exports, gold.....		87,090,642
Total export balance.....		131,839,545

The gold and silver movement in detail will be found in the table at the head of this column.

Gold—There was no special demand for gold on the open market in London this week and prices continued at the standard, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. The Bank of England continues the policy of strengthening its reserve and took the greater part of the gold arriving.

In New York the only actual exports during the week were \$200,000 to Canada. Arrangements were made for \$3,000,000 gold for Japan, but it will not be shipped until September.

Platinum—There is little change in the market, demand continuing light. No change is expected before next month. Prices continue about \$21@22.50 for refined platinum; \$26 per oz. for hard metal; and \$17@18 for good scrap.

Our special correspondent reports from St. Petersburg, under date of Aug. 5, that nominal quotations both at Ekaterinburg and in St. Petersburg remain unchanged but on the whole the tendency has been toward lower prices. Crude platinum, 83 per cent. metal, is quoted at Ekaterinburg at 4.50 rubles per zolotnik; in St. Petersburg at 17,500@18,250 rubles per pood. These prices are equivalent on an average to \$16.92 and \$17.52 per oz., respectively.

Silver—The market has continued quiet and steady, without special features, closing at 23½d. bid in London.

SILVER AND STERLING EXCHANGE						
Aug.	12	13	14	16	17	18
New York.....	51	51½	51½	51½	51½	51
London.....	23½	23½	23½	23½	23½	23½
Sterling Ex..	4.8660	4.8645	4.8650	4.8650	4.8655	4.8660

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Aug. 5, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 5,175,493	£3,780,600	D. £1,394,893
China.....	816,400	1,465,700	I. 949,300
Straits.....	90,510	82,800	D. 7,710
Total.....	£ 5,782,403	£5,329,100	D. £ 453,303

Receipts for the week, £10,000 from Mexico and £194,000 from New York; total, £204,000. Exports, £251,000 to China and £44,000 to India; £295,000 in all.

Copper, Tin, Lead and Zinc

Aug.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
12	13¼	13	60½	29½	4.35	4.20	5.55
13	13¼	13	59½	29½	4.37½	4.25	5.57½
14	13¼	13	59½	29½	4.42½	4.27½	5.62½
16	13¼	13	59½	29½	4.37½	4.25	5.60
17	13¼	13	59½	29½	4.42½	4.27½	5.65
18	13¼	13	59½	29½	4.37½	4.25	5.62½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, of the transactions made with consumers, ingots and wirebars, and represent the bulk basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market throughout the week has been relatively quiet. During the recent buying movement, consumers here and in Europe had supplied themselves liberally, and they are now disposed to await developments before entering into new commitments. The close is steady at 13¼@13½c. for Lake; 13@13½c. for electrolytic in cakes, wirebars or ingots, and the average for casting copper during the week is 12¾ to 13 cents.

Copper sheets are 17@18c., base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15c. base, carload lots at mill. Business is very fair.

After the excited buying of last week had been satisfied, the standard market in London settled down gradually, and closes lower at £59 12s. 6d. for spot, and £60 11s. 3d. for three months.

For refined and manufactured sorts we quote: English tough, £63; best selected, £62@63; strong sheets, £74@76.

Statistics for the first half of August show an increase in the visible supply of 4000 tons.

Exports of copper from New York and Philadelphia for the week were 5239 long tons. Our special correspondent reports exports from Baltimore for the week at 1247 tons copper.

The Wolverine Mining Company reports the sale of 9,995,748 lb. of copper during the year ended June 30, 1909, at an average of 13.35c. The quotational average was 13.56c. for the same period.

Consumption of foreign copper in Germany, six months ended June 30, reported by Aron Hirsch & Sohn, Halberstadt: Imports, 80,061 tons; exports, 3913; approximate consumption, 76,148 tons, a decrease of 2942 tons.

Tin—Although consumers have continued in their policy not to cover beyond their near-by requirements, the bull faction in London has had no trouble in moving prices upward from day to day, and the market here has readily followed. At the close London stands £136 5s. for spot and £137 12s. 6d. for three months, while business locally is taking place at 30@30½ cents.

Visible stocks of tin on Aug. 1 are estimated by Ricard & Freiwald at 20,239 long tons, including 4953 tons in the United States. The total shows an increase over July 1 of 1850 tons.

Arrivals of Bolivian tin concentrates at Hamburg, Germany, in July are reported by Robertson & Bense as follows: Direct, 939 tons; by Liverpool, 352; other ports, 113; total, 1404 tons.

At the Banka auction in Amsterdam, July 29, about 2000 tons were sold at an average of 81 florins per pikul, equivalent to £134 17s. 6d. per long ton, or 29.3c. per pound.

Lead—The demand for this metal has increased from day to day and large transactions have taken place. The leading interests raised their price on Thursday last to 4.40c. New York, and outside sellers immediately followed suit. The close is firm at 4.25@4.27½c. St. Louis and 4.37½@4.42½c. New York.

In London prices have fluctuated erratically without showing any definite tendency. The close is undecided at £12 10s. for Spanish and £12 12s. 6d. for English lead.

Spelter—The market has again moved upward, under the same influences reported in previous weeks. The close is firm at 5.77½@5.82½c. New York and 5.62½@5.67½c. St. Louis.

New York quotations for spelter on Aug. 12 were 5.70@5.75c.; Aug. 13, 5.72½@5.77½c.; Aug. 14, 5.75@5.80c.; Aug. 16-18, inclusive, 5.77½@5.82½c.

The London market is unchanged at £22 for good ordinaries and £22 5s. for specials.

Base price of sheet zinc has been advanced ¼c., to 7½c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Antimony—The market is gradually settling down, but business is rather of a retail character. Prices are a little unsettled still, but those generally quoted are 8½c. per lb. for Cookson's; 8¼c. for Hallett's; 8c. for U. S., and 7¾c. for outside brands.

Aluminum—No. 1 ingots can be had at 20@23c. per lb. for large lots. The higher price is that asked by the American maker.

Quicksilver—New York prices are unchanged at \$13.50@44 per flask of 75 lb. A fair business is being done in this

metal. San Francisco, \$43@43.50 for domestic business, and \$2 less for export orders. The London price is £8 5s. per flask, with £8 2s. 6d. quoted from second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots, up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—Quotations for this metal are \$1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, \$1.40 per pound.

Cadmium—Current quotations are 75c. per lb. in 100-lb. lots at Cleveland, Ohio. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Zinc and Lead Ore Markets

Platteville, Wis., Aug. 14—The base price of 60 per cent. zinc ore was \$45@48 per ton; no premium was paid. The base price of 80 per cent. lead ore was \$56@57 per ton; the highest price paid was \$58.50 per ton.

SHIPMENTS, WEEK ENDED AUG. 14.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	448,760	333,770	
Highland	445,800		
Benton	370,760	80,500	
Hazel Green	240,000	80,000	
Harker	234,080		
Linden	191,420		
Cuba City	186,490	168,530	192,765
Rewey	119,500		47,400
Galena	88,000		
Mineral Point	83,000		
Strawbridge	55,000		
Total	2,462,810	329,080	573,935
Year to date	81,113,219	4,739,910	7,154,870

In addition to the above there was shipped to the American Zinc Ore Separating Company, 696,410 lb., and to the Joplin Separator Works, 197,300 lb. zinc ore.

Joplin, Mo., Aug. 14—The highest price paid for sulphide zinc ore was \$52.50 per ton, the base ranging from \$46 to \$50.50 per ton of 60 per cent. zinc. Silicate zinc ore sold as high as \$35 for 51 per cent. ore on a base of \$27 per ton of 40 per cent. zinc, the base ranging down to \$23. The average price, all grades, was \$44.54. The highest price paid for lead ore was a base of \$57 for 80 per cent. lead, with 83 per cent. lead selling at \$60. The week-end demand was heavy at this figure, though most of the sales were made at prices ranging from \$57 to \$59. The average price, all grades, was \$56.82 per ton.

Intense excitement prevailed in the zinc ore market. The fore part of the week was calm, and the storm broke slowly, beginning with an advance to a \$48 base immediately after noon Thursday, reaching a \$49.50 base by night, on 50c. advances, and Friday witnessed two more advances of 50c. each, the high base price at the week-end being \$50.50, which was bid on a number of car-lots.

Zinc silicate prices reached a point where importations can be made at a profit compared with local prices, it is

claimed by several smelters. It has touched a high point that is starting active prospecting in every silicate producing spot of the district, and in many of these locations it will be but a few weeks before the output of this ore can be increased a number of carloads each week.

As the price of zinc ore has inclined upward, mineowners who were previously selling lead and holding zinc, have reversed the order and all but two of the large bins of zinc ore have changed hands. Instead of a heavy stock of zinc, there is today perhaps the largest stock of lead ever held from the market. The week-end offerings have tended to transfer a large tonnage to the hands of the smelters, and this will be loaded out within the next two weeks.

SHIPMENTS, WEEK ENDED AUG. 14.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,793,130	857,160	\$113,566
Joplin	1,866,190	171,840	49,247
Duenweg	957,070	134,060	26,891
Miami	674,070	194,140	18,917
Galena	693,320	48,690	17,632
Prosperity	393,720	204,000	15,066
Badger	565,870		13,298
Aurora	469,160		8,067
Quapaw	283,490	52,040	7,034
Spurgeon	269,620	40,970	6,710
Jackson	149,370	86,000	6,142
Carthage	231,050		5,776
Oronogo	256,930	34,500	5,730
Alba-Neck	226,020		5,537
Granby	358,900	12,950	5,197
Sarcois	296,000		4,440
Saginaw	134,170		2,147
Cave Springs	82,790		1,987
Zincite	82,260		1,974
Stott City	70,380		1,619
Peoria	60,390		845
Totals	11,883,900	1,836,350	\$316,822

33 weeks.....373,282,280 56,257,140 \$8,584,502
Zinc value, the week, \$264,648; 33 weeks, \$7,065,859
Lead value, the week, 52,174; 33 weeks, 1,518,643

MONTHLY AVERAGE PRICES.

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January.....	\$37.60	\$41.25	\$35.56	\$38.46	\$46.88	\$52.17
February....	36.63	36.94	34.92	34.37	49.72	50.50
March.....	36.19	37.40	34.19	34.71	49.90	50.82
April.....	35.40	38.63	34.08	37.01	52.47	55.63
May.....	34.19	40.06	33.39	37.42	56.05	56.69
June.....	33.06	44.15	32.07	40.35	60.48	57.52
July.....	34.55	43.06	31.67	41.11	59.90	53.74
August.....	36.53		33.42		60.34	
September..	37.63		34.44		54.69	
October.....	35.95		33.28		52.63	
November...	39.13		35.02		54.63	
December...	42.75		39.63		49.68	
Year.....	\$36.63		\$34.31		\$53.93	

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Petroleum

June 16—Exports of mineral oils from the United States, seven months ended July 31, in gallons:

	1908.	1909.
Crude petroleum.....	55,498,746	71,902,786
Naphthas.....	20,545,914	42,620,960
Illuminating oils.....	687,171,637	595,991,394
Lubricating oils.....	82,240,088	81,429,108
Residium.....	39,713,873	58,206,640
Total.....	855,170,158	850,150,888

Paraffin is included in lubricating oils.

The total decrease in exports this year was 5,019,270 gal., or 0.6 per cent.

Chemicals

New York, Aug. 18—Deliveries on contracts continue on a fair scale, and new business is looking up a little.

Copper Sulphate—Prices continue unchanged at \$4.22½ per 100 lb. for carload lots and over; \$4.32½@4.47½ per 100 lb. for smaller parcels. Business is not especially active.

Arsenic—The market has settled down to what may be considered a steady basis, the tariff agitation being over. Quotations are 2¾@2⅞c. per lb. for white arsenic, with good sales.

Nitrate of Soda—A good business is being done in nitrate at current prices which are unchanged at 2.12½c. per lb. for both spot and future positions.

Mining Stocks

New York, Aug. 18—The general stock market has been without any special tendency this week. It has been, if anything, inclined to reaction and to profit taking on small fluctuations. The fact seems to be that the recent advance failed to call in the outside public to any extent, and the market has remained largely in professional hands. Under these circumstances and the further condition that nothing really affecting stock values to any extent has occurred, some such situation was to be expected. It is not unlikely that matters may continue in a sort of suspended state for some little time.

On the Curb there was more activity, especially in the copper stocks, which were largely traded in, some of them at a fair advance. The motive or excuse for this was the large reduction in unsold stocks, shown by the July report of the Producers' Association.

The Nevada gold stocks on the Curb were moderately quiet, with only small fluctuations. Trading in these stocks seems to languish a little. The Cobalt stocks were fairly active. There seems to be a considerable bull interest in these stocks, and they are being pushed from several quarters.

The Standard Oil dividend for the third quarter of the year, declared this week, is \$6, which is \$3 less than the June payment, but is the same as in the third quarter of last year. The dividend declaration had no effect on the market.

Boston, Aug. 17—Mining stocks have had moderate reactions, although there is still a good degree of buoyancy manifest in certain specialties. The Lake group, particularly Lake Copper, continues in strong demand and the above mentioned is selling at its highest, \$37.75, which represents an advantage of \$5.25 in the week.

The present bugaboo in the mining-share

market is the continued accumulation of copper abroad. Money is easy in this city, 2½ per cent. being the call loan rate, and the public is disposed to take the long side of stocks. North Butte still acts peculiarly and has had a market range from \$61 to \$56.25, with the final tonight above \$57. It is still believed that the stock is being accumulated by certain interests. Amalgamated, which touched \$89, is off to \$84.87½ tonight, following the New York list very closely. Superior touched \$62 again, but is off to below \$58. Utah Consolidated had a \$3.50 rise to \$48.50, but lost it, and Copper Range, after touching \$85, fell back to \$82.75: Parrot has been active up to \$34.25 and U. S. Smelting common up to \$57.12½, although both have had substantial reactions.

The news of the week included regular quarterly dividends of \$1 each by the North Butte and the Quincy Mining Companies; assessments of \$2 each by the Hancock and Michigan Mining companies and a \$1 assessment by the Winona Copper Company. As a result of its ownership in Hancock, King Philip and Winona, the St. Mary's Mineral Land Company will be called upon to pay \$124,747 assessment money during the next six months.

Curb trading has been animated and strong, while reactions have followed in the active stocks. Rhode Island Coal has risen over \$2 to \$9.50 on very active trading. New securities on the Curb are Yuma Copper, an Arizona proposition, and Champion Copper, also in Arizona.

STOCK QUOTATIONS

NEW YORK Aug. 18		BOSTON Aug. 18	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine.....	11	Adventure.....	7½
Amalgamated.....	86½	Allouez.....	46
Anaconda.....	49½	Am. Zinc.....	31½
Balaklala.....	12½	Arcadian.....	4½
British Col. Cop.....	7½	Arizona Com.....	44½
Butte Mines.....	3½	Atlantic.....	10½
Butte Coalition.....	25½	Boston Con.....	15½
Colonial Silver.....	5	Calumet & Ariz.....	109
Cum. Ely Mining.....	7½	Calumet & Hecla.....	684
Davis-Daly.....	6½	Centennial.....	35½
Dominion Cop.....	7½	Copper Range.....	89
Douglas Copper.....	2½	Daly-West.....	9
El Rayo.....	2½	East Butte.....	11½
Florence.....	3½	Franklin.....	16½
Foster Cobalt.....	1.32	Greene-Can.....	9½
Furnace Creek.....	1.05	Hancock.....	10½
Giroux.....	10	Isle Royal.....	28½
Gold Hill.....	6½	Keweenaw.....	3½
Goldfield Con.....	14½	La Salle.....	14½
Granby.....	1104½	Mass.....	8
Greene Gold.....	1½	Michigan.....	110
Greene G. & S.....	19	Mohawk.....	164½
Guanaajuato.....	1½	Nevada.....	24½
Guggen. Exp.....	215	North Butte.....	57½
Hanapah.....	115	Ojibway.....	11½
Kerr Lake.....	8½	Old Colony.....	60
McKinley-Dar.....	.95	Old Dominion.....	57½
Miami Copper.....	16½	Osceola.....	145
Micmac.....	3½	Parrot.....	33½
Mines Co. of Am.....	11	Quincy.....	92
Montezu. of C. R.....	27	Rhode Island.....	14½
Mont. Sho. C.....	2½	Shannon.....	16½
Nev. Utah M. & S.....	2	Superior.....	58½
Newhouse M. & S.....	4	Superior & Bost.....	16
Nipissing Mines.....	10	Superior & Pitta.....	17
Old Hundred.....	4	Tamarack.....	70
Silver Queen.....	1.35	Trinity.....	13½
Stewart.....	7	U. S. Smg. & Ref.....	55
Tennessee Cop'r.....	39	U. S. Sm. & Re., pd.....	52½
Tri-Bullion.....	10½	Utah Con.....	45½
United Copper.....	10½	Victoria.....	4½
Utah Apex.....	4½	Winona.....	6½
Utah Copper.....	52½	Wolverine.....	156
Yukon Gold.....	5½	Wyandotte.....	2½

†Last quotation.

†Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.....	48½
Am. Smelt. & Ref.....	101½
Am. Sm. & Ref., pf.....	115
Colo. Fuel & Iron.....	45½
Federal M. & S. pf.....	91½
National Lead.....	92½
National Lead, pf.....	113½
Pittsburg Coal.....	16½
Republic I. & S.....	38½
Republic I. & S., pf.....	105½
Siosa-Sheffield.....	65½
Standard Oil.....	1685
U. S. Steel.....	78
U. S. Steel, pf.....	126½
Va. Car. Chem.....	48

BOSTON CURB Low.

Ahmeek.....	195
Chemung.....	15
Chino.....	7½
Corbin.....	7½
Globe Con.....	4½
Gila.....	19
Ray Central.....	2½
Ray Con.....	19½
San Antonio.....	19½

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS Aug. 13

N. of Com.	High.	Low
Adams.....	.40	.30
Am. Nettle.....	.09	.07
Center Cr'k.....	1.80	1.70
Cent. C. & C.....	83.00	81.00
C. C. & C. pf.....	82.00	80.00
Cent. Oil.....	110.00	100.00
Columbia.....	9.00	7.00
Con. Coal.....	19.00	18.00
Doe Run.....	118.00	105.00
Gra. Bimot.....	.30	.25
St. Joe.....	12.00	11.00

LONDON Aug. 18

Name of Com.	Clg.
Dolores.....	£1 5s 0d
Stratton's I.L.d.....	0 3 3
Camp Bird.....	1 6 0
Esperanza.....	2 16 3
Tomboy.....	1 1 3
El Oro.....	1 5 9
Oroville.....	0 12 3

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Aug. 18.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
COMSTOCK STOCKS		Silver Pick.....	.17
Belcher.....	.72	St. Ives.....	.07
Best & Belcher.....	.49	Triangle.....	.01
Caledonia.....	.30	BULLFROG STOCKS	
Chollar.....	.21	Gibraltar.....	.02
Comstock.....	.26	Homestake King.....	..
Con. Cal. & Va.....	.80	Mont. Shoshone C.....	2 18½
Crown Point.....	.75	Tramp Cons.....	.04
Excelsior.....	.25	MISCELLANEOUS	
Gould & Curry.....	.17	Cumberland Ely.....	7.31½
Hale & Norcross.....	.36	Giroux.....	10.00
Mexican.....	.95	Greenwa'r Copper.....	.04
Ophir.....	1 22½	Nevada Con.....	24.50
Overman.....	.30	Nevada Hills.....	.75
Potosi.....	.40	Nevada Smelting.....	1.00
Savage.....	.48	Nevada Wonder.....	.35
Sierra Nevada.....	.38	Nevada-Utah.....	1.93½
Union.....	.45	Penn-Wyoming.....	..
Utah.....	.06	Pittsburgh S. Ph.....	.45
Yellow Jacket.....	.98	Ray Central.....	2.81½
TONOPAH STOCKS		Ray Con.....	20.25
Belmont.....	.88	Round Mt. Sphinx.....	.08
Extension.....	.62		
Golden Anchor.....	..		
Jim Butler.....	.09		
MacNamara.....	.30		
Midway.....	.20		
Montana.....	.75		
North Star.....	.02		
Tono'h Mine of N.....	6.87½		
West End Con.....	.31		

COLO. SPRINGS Aug. 13

Name of Comp.	Clg.
Adams.....	.01
Atlanta.....	.15
Blue Bell.....	.03
Booth.....	.12
C.O.D. Con.....	.11
Columbia Mt.....	.11
Comb. Frac.....	.65
Con. Red Top.....	..
Cracker Jack.....	.01
Dia'ldfield B. B. C.....	.02
Goldfield Belmont.....	.04
Goldfield Daisy.....	.23½
Great Bend.....	.07
Jumbo Extension.....	19
Kendall.....	.02
Lone Star.....	.02
May Queen.....	.04
Oro.....	.07
Red Hill.....	.07
Sandstorm.....	.07
Acacia.....	.08½
C. C. Con.....	.08½
Dante.....	.07½
Doctor.....	.11
Eikton.....	.75
El Paso.....	.64
Findlay.....	.11½
Gold Dollar.....	.13
Gold Sovereign.....	.04½
Isabella.....	.24
Jack Pot.....	.10
Jennie Sample.....	.07½
Jerry Johnson.....	.06½
Lexington.....	.02
Mary McKinney.....	.50
Pharmacist.....	.03½
Portland.....	.78
U. G. M.....	.07
Vindicator.....	.70
Work.....	1.06½

Assessments

Company.	Delinq.	Sale.	Amt.
Arcadian, Mich.....	Sept. 1	Sept. 31	\$0.60
Black Jack Con., Utah.....	Aug. 16	Sept. 2	0.01
Boulder Cr'k M. & M., Wash.....	Aug. 31	Sept. 30	0.01
Columbus Ext., Utah.....	Aug. 14	Sept. 4	0.01
Con. Virginia, Nev.....	Aug. 16	Sept. 7	0.25
Copper Mt. M. & D., Ida.....	Sept. 7	Oct. 4	0.003
Crown Point, Nev.....	Aug. 21	Sept. 17	0.10
East Buffalo, Ida.....	Sept. 10	Oct. 10	0.000½
Ely Con. Copper, Nev.....	July 16	Aug. 28	0.09
Excelsior, Nev.....	Aug. 16	Sept. 13	0.05
Golden Winnie Tungsten, I.....	Aug. 23	Sept. 15	0.001
Hypothek M. & M., Ida.....	Aug. 26	Sept. 25	0.005
Laclede, Ltd, Ida.....	Aug. 23	Sept. 21	0.003
Lady Washington, Nev.....	Aug. 31	Sept. 20	0.05
Massasoit, Utah.....	Aug. 21	Sept. 14	0.00½
New Hope, Ida.....	July 15	Sept. 25	0.002
Pittsburg Con., Utah.....	Aug. 20	Sept. 17	0.01
Seven Troughs Mon., Nev.....	Aug. 18	Sept. 8	0.00½
Springfield M. Co. Ltd, Ida.....	Aug. 13	Sept. 13	0.002
Tarbox, Idaho.....	July 29	Aug. 24	0.003
Utah Con. M. & M.....	Aug. 26	Sept. 7	0.001

Monthly Average Prices of Metals SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January.....	55.678	51.750	25.738	23.834
February.....	56.000	51.472	25.856	23.706
March.....	55.365	50.468	25.870	23.227
April.....	55.505	51.428	25.133	23.708
May.....	52.795	52.908	24.377	24.348
June.....	53.663	52.638	24.760	24.166
July.....	53.115	51.043	24.514	23.519
August.....	51.683	..	23.868	..
September.....	51.720	..	23.877	..
October.....	51.431	..	23.725	..
November.....	49.647	..	22.933	..
December.....	48.766	..	22.493	..
Total.....	52.864	..	24.402	..

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

Month.	NEW YORK.		LONDON.	
	1908.	1909.	1908.	1909.
January.....	13.726	13.893	13.901	14.280
February.....	12.905	12.949	13.098	13.295
March.....	12.704	12.387	12.875	12.826
April.....	12.743	12.561	12.928	12.931
May.....	12.598	12.893	12.788	13.238
June.....	12.675	13.214	12.877	13.548
July.....	12.702	12.880	12.933	13.363
August.....	13.462	..	13.639	..
September.....	13.388	..	13.600	..
October.....	13.354	..	13.646	..
November.....	14.130	..	14.386	..
December.....	14.111	..	14.411	..
Year.....	13.208	..	13.424	..

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January.....	27.380	28.060	July.....	29.207	29.125
February.....	28.978	28.290	August.....	29.942	..
March.....	30.577	28.727	September.....	28.815	..
April.....	31.702	29.445	October.....	29.444	..
May.....	30.015	29.225	November.....	30.348	..
June.....	28.024	29.322	December.....	29.154	..
			Av. Year.....	29.465	..

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January.....	3.691	4.175	4.025	14.469	13.118
February.....	3.725	4.018	3.868	14.250	13.318
March.....	3.838	3.986	3.835	13.975	13.438
April.....	3.993	4.168	4.051	13.469	13.297
May.....	4.253	4.287	4.214	12.938	13.226
June.....	4.466	4.350	4.291	12.600	13.081
July.....	4.744	4.321	4.188	13.000	12.563
August.....	4.580	..	..	13.375	..
September.....	4.515	..	..	13.125	..
October.....	4.351	..	..	13.375	..
November.....	4.330	..	..	13.538	..
December.....	4.213	..	..	13.156	..
Year.....	4.200	..	..	13.439	..

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January.....	4.513	5.141	4.363	4.991	20.563	21.426
February.....	4.788	4.880	4.638	4.739	20.875	21.568
March.....	4.665	4.757	4.527	4.607	21.075	21.430
April.....	4.645	4.965	4.495	4.815	21.344	21.631
May.....	4.608	5.124	4.458	4.974	19.906	21.975
June.....	4.543	5.402	4.393	5.252	19.000	22.000
July.....	4.485	5.402	4.338	5.252	19.031	21.969
August.....	4.702	..	4.556	..	19.350	..
September.....	4.769	..	4.619	..	19.653	..
October.....	4.801	..	4.651	..	19.750	..
November.....	5.069	..	4.909	..	20.875	..
December.....	5.137	..	4.987	..	20.625	..
Year.....	4.726	..	4.678	..	20.163	..

New York and St. Louis, cents per pound. London, pounds sterling per long ton.