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The Murray Smelter, Utah.*

BY O. PUFAHL.

This plant has been in operation since June, 1902. It gives employment to 800 men. The monthly production consists of about 4000 tons of work-lead and 700 tons lead-copper matte (12 per cent. lead, 45 per cent. copper). The work-lead is sent to the refinery at Omaha; the matte to Pueblo, Colo. Most of the ores come from Utah; but in addition some richer lead ores are obtained from Idaho, and some gold-bearing ores from Nevada.

For sampling the Vezin apparatus is used, cutting out 1/5 in each of three passes, crushing intervening, the sample from the third machine being 1/625 of the original ore; after further comminution of sample in a coffee-mill grinder, it is cut down further by hand, using a riffle.

The final sample is bucked down to pass an 80-mesh sieve, but gold ores are put through a 120-mesh.

The steps in the smelting process are as follows: Roasting the poorer ores in reverberatory furnaces and in Brückner cylinders. Smelting raw and roasted ores, mixed, in water-jacketed blast furnaces, for work-lead and lead-copper matte, the latter containing 15 per cent. lead and 10—12 per cent. copper. Roasting the ground matte, containing 22 per cent. of sulphur, down to ¾ per cent. in reverberatory furnaces. Smelting the roasted matte together with acid flux in the blast furnace for a matte with 45 per cent. copper and 12 per cent. lead.

*Translated from *Zeit. f. Berg-, Hütten- und Salinen-wesen im preuss. Staate,* 1905, LIII, p. 433.

Only the pyritic ores are roasted in Brückner furnaces, the lead ores and matte being roasted in reverberatory furnaces. Each of the 20 Brückner furnaces, which constitute one battery, roasts 8—12 tons of ore in 24 hours down to 5½—6 per cent. sulphur, with a coal consumption of two tons. The charge weighs 24 tons. The furnaces make one turn in 40 minutes. To increase the draft and the output, steam at 40 lb. pressure is blown in through a pipe; this has, however, resulted in increasing the quantity of flue dust to 10—15 per cent. of the ore charged. Ten furnaces are attended by one workman with one assistant, working in eight-hour shifts. For firing and withdrawing the charge five men are required.

The gases from the Brückners and reverberatory furnaces pass into a dust flue 14x14 ft. in section and 600 ft. long, built of brickwork, with concrete vault; in the stack (200 ft. high, 20 ft. diameter) they unite with the shaft-furnace gases, the temperature of which is only 60 deg.

There are 12 reverberatory furnaces with hearths 60 ft. long and 16 ft. broad. They roast 14 tons of ore (or 13 tons of matte) in 24 hours down to 3½—4 per cent. sulphur, consuming 32—34 per cent. of coal figured on the weight of the charge. There are 12 working doors on each side. The small coal (from Rock Springs, Wyoming), which is burnt on flat grates, contains 5 per cent. ash and 3—5 per cent. moisture. The roasted product is dumped through an opening in the hearth, ordinarily kept closed with an iron plate, into cars which are raised by electricity on a self-acting inclined plane. Their content is then tipped over into a chute and cooled by sprinkling with water. From here the roasted matte is conveyed to the blast-furnace in 30-ton cars. The roasted ore is tipped into the ore bins.

There are eight blast-furnaces, 48x164 in. at the tuyeres, of which there are 10 on each of the long sides. The hight from the tuyeres to the gas outlet is 20 ft., thence to the throat 6 ft.; the distance of the tuyeres from the floor is 4 ft. The base is water-cooled. The water-jackets of the furnace are 6 ft. high. The tuyeres (4-in.) are provided with the Eilers automatic arrangement for preventing the furnace gases entering the blast pipes. The blast pressure is 34 oz. The furnaces are furnished with the Arents lead-wells; the crucible holds about 30 tons of lead. The slag and the matte run into a brick-lined forehearth (8x3 ft., 4 ft. deep), from which the slag flows into pots holding 30 cu.ft., while the matte is tapped off into flat round pans mounted on wheels.

The charge is conveyed to the feed-floor by electricity. The furnace charge is 8000 lb. and 12 per cent. coke, with 30 per cent. (figured on the weight of the charge) of "shells" (slag). Occasionally as much as 230 tons of the (moist) charge, exclusive of coke and slag, has been handled by one furnace in 24 hours. During one month (September, 1904) 40,000 tons of charge were worked up, corresponding to a daily average of 166 tons per furnace.

The lead in the charge runs from 13 to 14 per cent. on an average. The limestone which is added as flux, is quarried not far from the works. The coke used is in part a very ordinary quality from Utah, in part a better quality from the East, with 9—10 per cent. ash. The matte amounts to 10 per cent. The slag contains 0.6—0.7 per cent. lead and 0.1—0.15 per cent. copper. The slag has approximately the following composition: 36 per cent. silica, 23 per cent. iron (corresponding to 29.57 per cent. FeO) 23 per cent. lime, 3.8 per cent. zinc and 4 per cent. alumina.

The work-lead is transferred while liquid from the furnaces to kettles of 30 tons capacity, in which it is skimmed, and thence cast in molds through a Steitz siphon. First, however, a 5.5-lb. sample is taken out by means of a special ladle, and is cast into a plate. From this samples of 0.5 a.t. are punched out at four points for the assay of the precious metals.

For the purpose of precipitating the flue dust, the blast-furnace gases are passed into brickwork chambers in which a plentiful deposition of the heavier particles takes place. From here the gases go through an L pipe of sheet iron, 18 ft. in diameter, to the Monie flues, which have a cross-section of 256 sq.ft. and a total length of 2000 ft. A small part of the flues is also built of brick. The gases unite with the hot roaster gases just before entering the 200-ft. chimney. In the portion of the blast-furnace dust first precipitated the silver runs 22 oz. per ton, while that recovered nearer the stack contains only 8 oz. The flue dust is briquetted with a small proportion of lime, and, after drying, is returned to the blast furnaces.

Iron Ore in Hong Kong.

According to a Reuter dispatch of recent date, a valuable discovery of iron ore has been made in the neighborhood of Three Fathom cove and the flank of the Ma On Shan mountain. In the service of Sir Paul Chater, two prospectors have been actively engaged for some time in prospecting the new territories for mineral deposits. The discovery of iron ore is the result of their investigation.

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

BY J. H. GRANBERY.

The magnetite that is worked at Mineville is found in the gneiss and as scattered grains and crystals in the gabbro. In the latter it carries titanium in the form of ilmenite and titanite. Near one shaft (the Smith mine) a band of pure ilmenite, about 3 in. wide, outcrops in the gabbro. Magnetite is worked only from the gneiss formation. In the gabbro, it is apt to contain too much titanium to be of commercial value. Apatite forms a large proportion of the gangue in the ore worked; the remainder is chiefly silica and hornblende.

The magnetite occurs in well defined crystals; some of these are large. The "Big Diamond," as one of the most perfect of these is called, is an octahedron, 1.25 in. on each edge, shown in its matrix, and beside it in Fig. 1. This was found, together with large numbers of equally perfect (but smaller) crystals in a portion of the Barton Hill workings known as the "Lover's Hole." From the same location there have been shipped about 60,000 tons, running 70 per cent. iron.

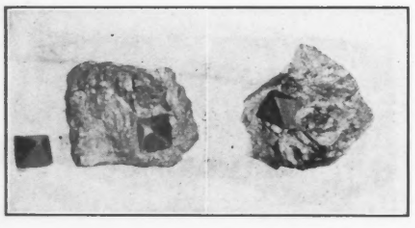


FIG. 1. THE "BIG DIAMOND."

On account of its granular character, the ore breaks readily, and this accounts for the good records per pound of explosive, and also for the comparatively small proportion of fines in the concentrate.

The portions of the ore body worked at present are the Harmony mines, the Old Bed mines and the Smith Mine. These workings require the entire available supply of power, and an additional power station is therefore planned for supplying the other workings. These are the Barton Hill, and New Bed workings shown on the map, Fig. 2, and geological sections, Fig. 3. They are not at present operated, but have been worked extensively in the past, and were undoubtedly found in following the outcrop; in all probability they were the original workings. The power plant is to be built on the shore of Lake Champlain at Port Henry. An 800-kw. turbo-generator, surface condensers and water tube boilers will be installed; and a 6-mile, 6600-volt transmission line will be erected between the station and the mines at Mineville. It will be of monolithic (concrete) construction, and a reinforced-concrete chimney will be erected

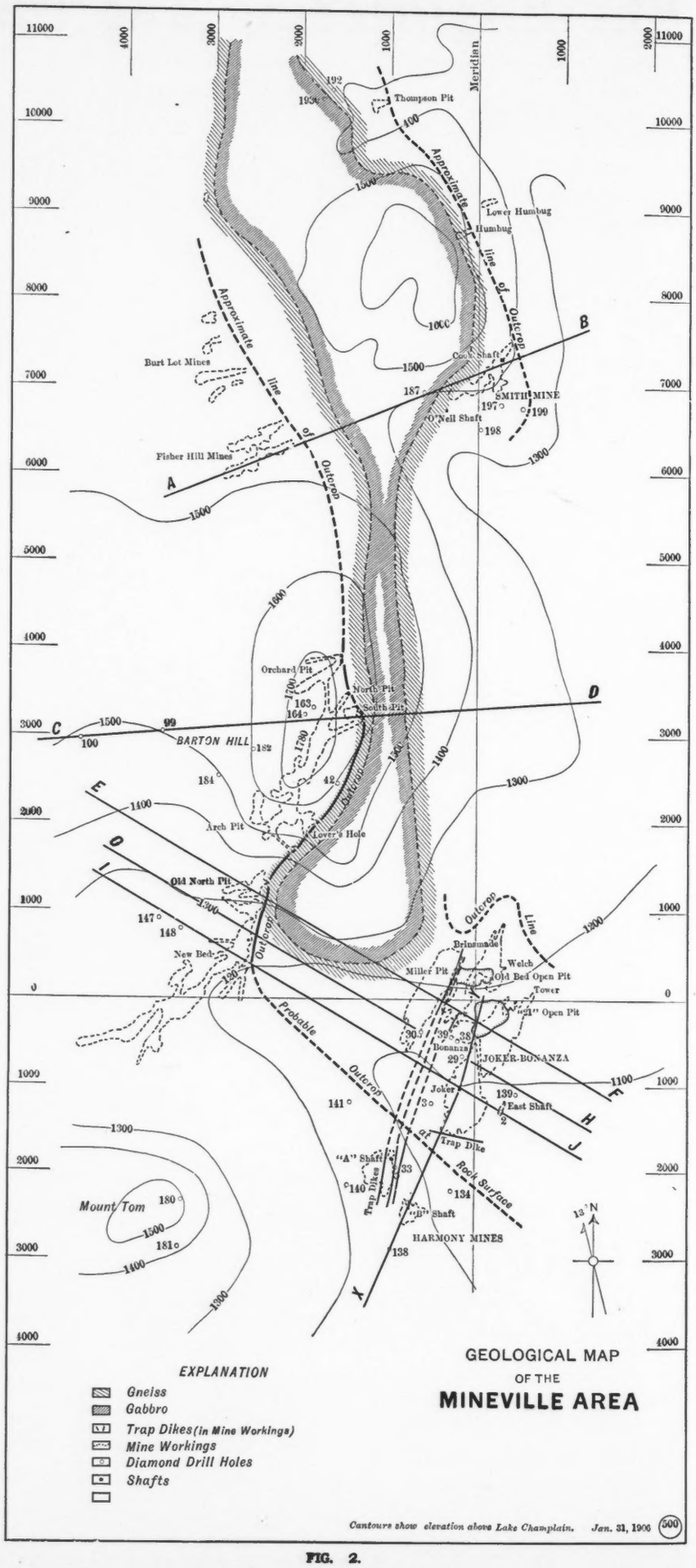


FIG. 2.

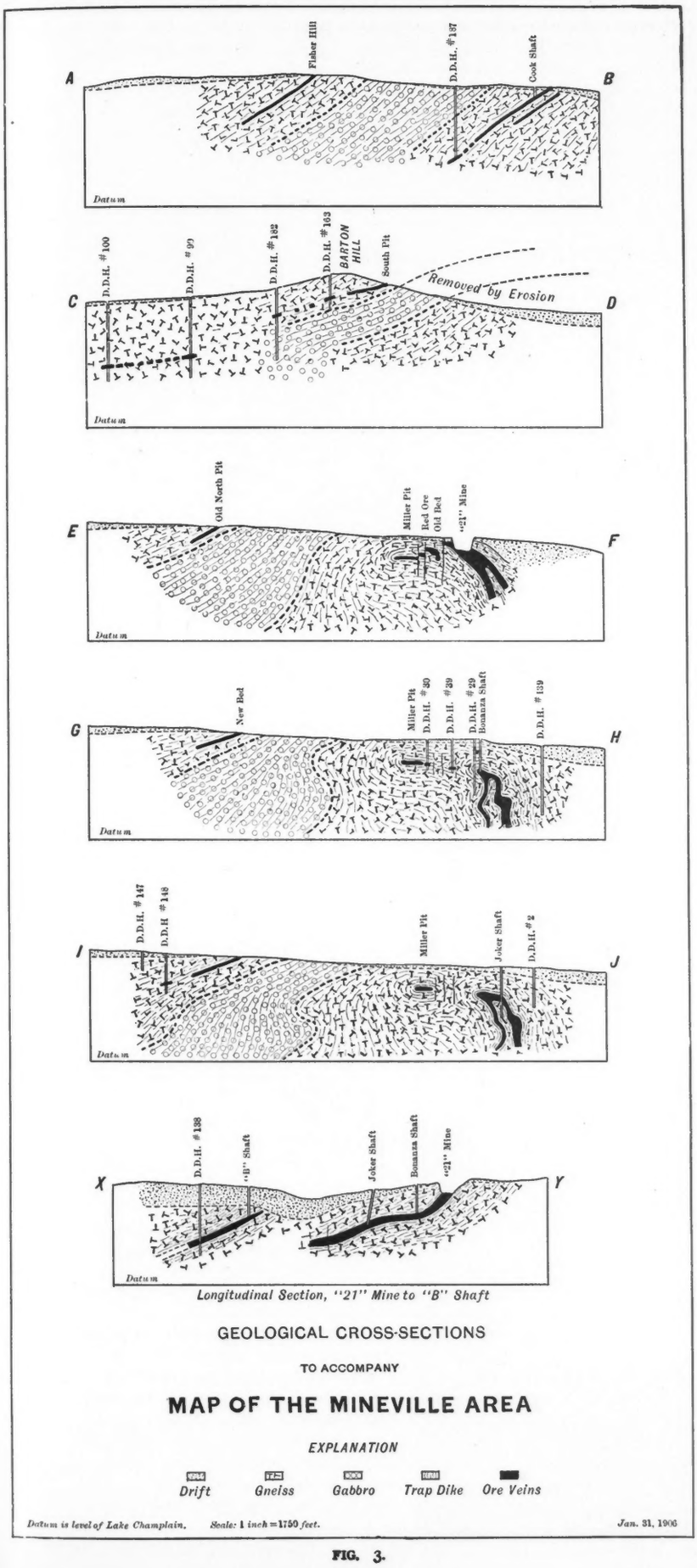
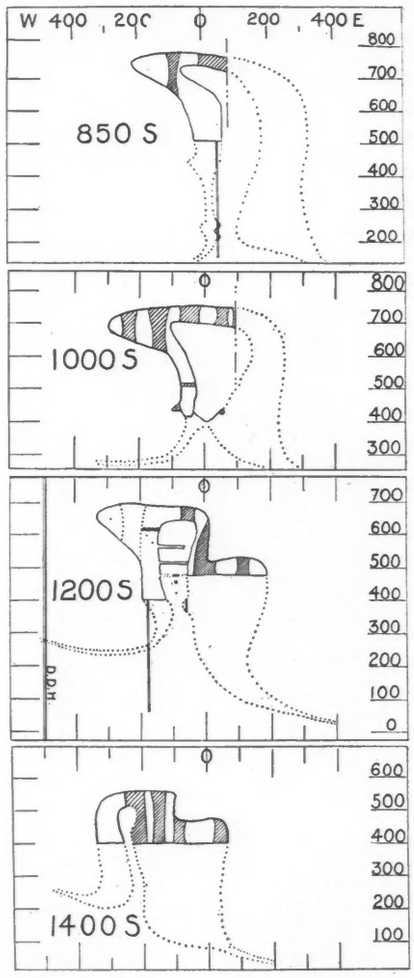


FIG. 3.

The ore body in the Old Bed mines (Joker and Bonanza shafts) presents a form that is of much interest; the division between the ore and the gneiss is sharp and well defined; the folded form in which the ore occurs is shown in the typical cross-sections Figs. 4, 5, 6 and 7. There is a central horse, or mass, of gneiss that is thus shown to have been originally the underlying strata. The characteristic form of this body is shown clearly by a built up scale section formed of glass plates of which an illustration is given in Fig. 8. In this the cross hatched portions represent the pillars left in working the ore. The mass of ore,



FIGS. 4, 5, 6, AND 7. TYPICAL CROSS-SECTIONS.

under the conditions of folding just noted, being naturally more plastic than the rock itself would in the preliminary stages of the movement, due to pressure, be pumped up as a small arch, keeping filled as the increasing movement formed a higher arch; it is at this period of the fold that the lower edges or branches of the arch began to pinch together; the resultant is best shown at the Joker and Bonanza shafts, where this effect is most highly developed. The form extends in a modified degree through all the workings now operated, though in varying stages of folding. It is suggested that the ore was deposited in the form of hema-

tite and was consequently softer at the time of folding; the later eruptions of gabbro produced the heat which metamorphosed the gneiss and changed the hematite to magnetite.

FIG. 8. FORM OF ORE BODY

The mining operations, as shown by the books of Witherbee, Sherman & Co., have produced about 15,000,000 tons since operation was begun on a commercial scale in 1849. The ore body of the "21" mine was discovered in 1825, but no practical development of the body was undertaken until 1846. The American Mineral Company, in 1853, erected here a magnetic separating works, probably the first ever built, and exported the apatite to England for use as a fertilizer. The ore was sold to S. H. & J. G. Witherbee, the forerunners of the present firm. The Port Henry Iron Ore Company, organized to develop this mine, subsequently purchased it, the separating process having proved a failure. Witherbee, Sherman & Co. have held an interest in the mine since this period and have for many years handled its output. The firm may thus be said to have continuously operated the Mineville mines since 1846; practically the only change of ownership in any of the Mineville properties took place in 1901, when the Lackawanna Steel Company purchased an interest.

The ore is shipped as far west as Columbus, Ohio, and as far east as Sydney, Nova Scotia. Two years ago a shipment of 50,000 tons was exported to Germany. It is used principally for puddling and as ore additions to the open-hearth process. Practically all of the mills east of the Allegheny mountains use it to more or less extent as the base of their mixture in the manufacture of foundry, mill, or basic iron. The "21" mine ore is high in phosphorus and the western furnaces use this ore in non-Bessemer pig-iron production. There is a string of old charcoal forges scattered along the Ausable river north of Essex County; and in Clinton County more of them are found along the banks of the Saranac River. From 1800 to 1850 most of the iron made and used in this country came from these, and it is probable that much of the output of the mines was formerly treated here.

support the roof. This entire body is high in both iron and phosphorus, but is low in silica.

The Smith mine. The pod-like vein in this locality is from 12 to 50 ft. thick. It covers a large area and is reached by an extension of the railroad from Mineville. About one mile beyond this point another outcrop has been located, and it is apparent that a large undeveloped area of the same, or a similar, ore is present.

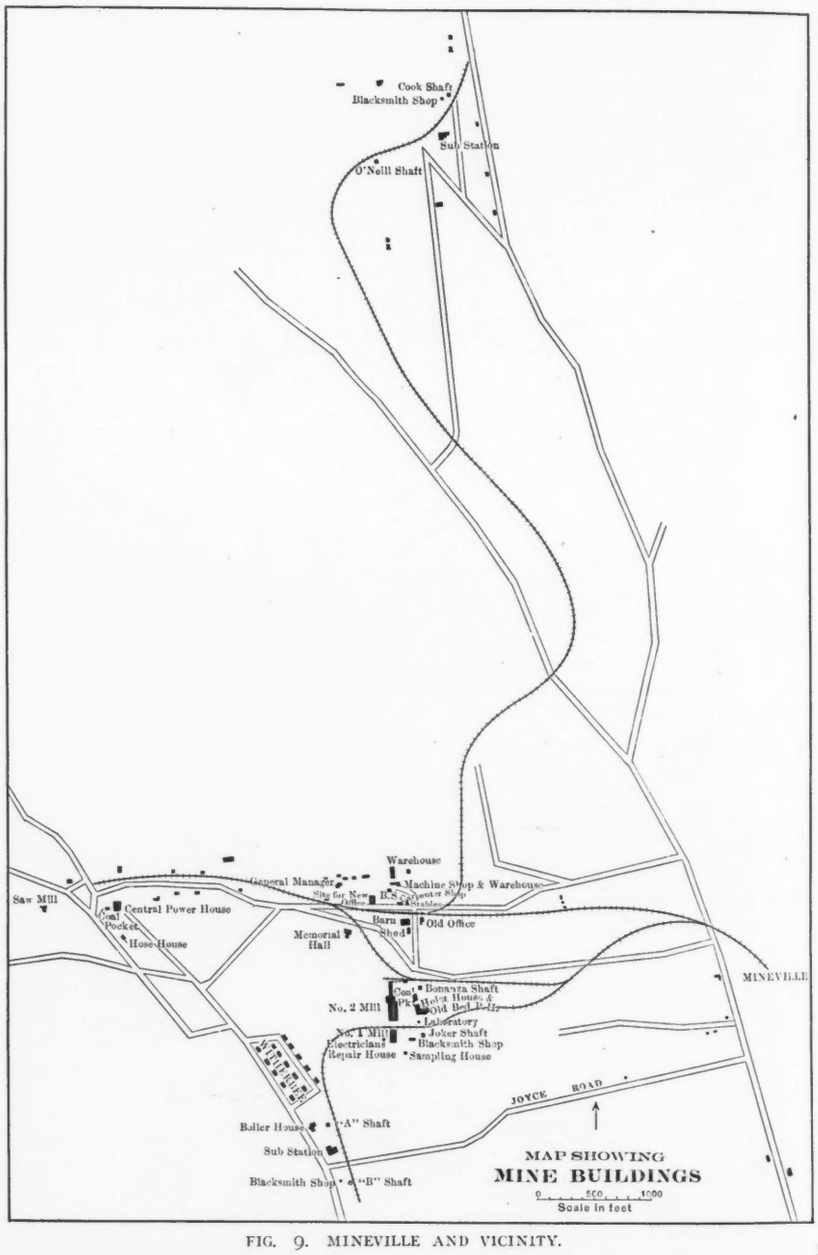


FIG. 9. MINEVILLE AND VICINITY.

The map, Fig. 9, shows the location of the mine and mill buildings, and in connection with Fig. 2, gives a good idea of the various workings. These are as follows: The Old Bed mine and the "21" mine. These are practically parts of the same body; the hight in places being as great as 400 ft. The extent of the workings may be appreciated from the illustrations, Figs. 10 and 11, which show a few of the enormous pillars of ore left to

The Harmony mines. The ore from here runs from 62 to 64 per cent. in iron, and about 0.12 per cent. phosphorus. The low-grade ore is sent to the separators, the purer ore being shipped directly from the cobbing plant. The cobbed ore shipped direct comprises about 33 per cent. of the output from these mines.

The New Bed mines consist of two underlying veins varying from 5 to 30 ft. in thickness, and the outcrop extends over

*See Note page 1132

a distance of two miles. This deposit is connected with the Barton Hill and Burt

FIG. 10. UPPER PORTION OF OPEN WORKINGS OF THE "21" MINE.

mines of Witherbee, Sherman & Co. and with the Fisher Hill mine of the Port Henry iron Ore Company. The ore is within Bessemer limits, and about one-quarter of the output of crude ore yields 60 per cent. iron. This is the deposit where the famous "Lovers Hole" is located. This was undoubtedly the richest pocket of iron ore known to have been worked in the United States, the ore being practically a mass of crystals of nearly pure magnetite.

Mining is carried on, except in the case of the "21" mine, by shaft work and stoping. Here an inclined skipway, shown in Fig. 10, operating two balanced skips; and three Lidgerwood cableways are installed. In the other opening of the same mine, on the other side of the railroad, an incline with one car is used. In 1872 the roof of this mine was blown off in order to expose the workings and enable open cut work to be carried on. This method is not found to effect sufficient economy to apply it throughout, and the stoping method is therefore followed in all other workings.

An idea of the extent of the ore-body (it is sometimes as high as 400 ft.) as well as of the magnitude of the operations, can be obtained from the illustrations, Figs. 10 and 11, which show the opening referred to. The extraction of ore by the methods used is believed to be absolutely peculiar to the mines of this district. The highest room in the Old Bed workings is 240 ft. high and the roof area supported between pillars is 280 x 60 ft. The great depth of the opening shown in the figures is apparent, even with the fore-shortening of the camera to lessen it. The small dark objects, that show against the snow about half-way down the opening in Fig 11. are planks, from 16 to 20 ft. long, and the opening at the upper right hand corner of the same figure is that shown in the lower left hand corner of Fig. 10.

FIG. 11. LOWER PORTION OF OPEN WORKINGS OF THE "21" MINE.

It is estimated that at least 800,000 tons of ore is left in the pillars of this mine alone; and from the natural arched formation of the top of the vein it has been suggested that it may actually be possible to remove the pillars without danger. Some individual pillars measure up 50,000 tons in ore contents.

Gold in Victoria.

James Esmond's discovery of gold in Victoria was made in July, 1851, and in two days he and his mate, Cavanagh, had won 600 oz. of gold. Hiscock's discovery followed in August of the same year. In the few months closing that eventful year, it was known to the authorities that gold to the value of about £1,000,000 had been unearthed by the diggers. In the next year 100,000 persons arrived from Europe and added their numbers to the many thousands already at work on "the diggings" Many, it is, recorded, were lucky enough in a few months to return to the Old World by the same ship that bore them to Australia.

Arizona and Sonora—II.

BY DWIGHT E. WOODBRIDGE.

Bisbee Camp.

The Bisbee ore bodies are irregular replacements in limestone. These oxidized deposits are inclosed by material grading from soft, limonitic clays, leached and water-altered limestone, into hard lime. Deposits are frequently connected by ore stringers which, if followed, lead from one rich pocket to another. In size they vary greatly; one continuous ore body more than 3000 ft. long, widening and narrowing from place to place, has been developed in the Holbrook ground of the Copper Queen mine. The greater part of Calumet & Arizona product since the beginning has come from one connected ore body. In hight these deposits do not frequently exceed 125 to 150 ft. Unoxidized sulphide ores may exhibit a change either to oxides or to metamorphosed limestones impregnated with pyrite. There has been profund transportation and enrichment of original ores, both in the oxide and sulphide deposits, and so far as development has proceeded the exploration of original sulphides, resulting from primary mineralization, has scarcely begun.

The oldest rocks in the district are schists, overlain by quartzites, and it is upon these that the limestones rest. These latter range from the Cambrian to upper Carboniferous, and above them are conglomerates, sandstones and shales, later limestones, then still more sandstones and other sedimentary rocks. Faulting, distortion, settlement and elevations, were followed by enormous intrusions of granite porphyry. These latter were responsible, in great measure, for the mineralization, which has been very extensive and important. A great mass of red prophyry, called Sacramento hill, rises through the older rocks on the north side the camp's mineralized area, and it was probably from this that there came the mineral solutions which ate their way through the bedded limestones and placed copper ores throughout their strata. But while the porphyry intrusion of Sacramento hill itself had so much to do with mineralization, there are series of great faults, in many cases, radiating from it, or cutting at right angles to the main Dividend fault, which extends in both directions from Sacramento hill, that have carried the solutions to considerable distances and have assisted in the general ore deposition in no small degree. It is only necessary to mention in this connection the magnificent mineralization of the Shattuck mine, on the 7th level. This ore body is opened on both sides the Czar fault, at a point on that fault one mile from its junction with the Dividend fault, and more than a mile from the nearest point of Sacramento hill. But, far distant as it is, for the amount of work done, the Shattuck shows as much ore as any mine in the camp. Its ore deposits lie on both sides the fault. Some are on the northwest side, like the original Queen open cut, others on the downthrown southeast block.

During the last few years there has been a marked change in opinion as to the extent of the Bisbee copper bearing area, both as to its lateral and horizontal confines. It was supposed, for example, that the depth of the copper-bearing rocks was not more than, say, 500 ft.; and up to a few years ago the Spray shaft of the Copper Queen Consolidated company was to the east of, and outside, the proved area. This was the case when the Calumet & Arizona company started its Irish Mag shaft, 650 ft. to the southeast of the Spray. Today both these shafts are known to be far toward the north part of the proved area, and if work now under way, and looking encouraging, proves up, there will be three times as much mineralized distance east and south of these shafts as north and west of them. When the United States geological survey published Mr. Frederick L. Ransome's report on the geology of the Bisbee district, in 1904, he likened the Bisbee mineralized area to a broken half saucer laid against a wall. The report, as usual delayed in publication, had scarcely been printed before this illustration was seen to be insufficient. It was not a half saucer, but a long trough, whose northwestern end curved up to surface above the town, and whose eastern and southern limit was unknown, but apparently pitched southeasterly. Mr. Ransome had pointed out the possibility of such a change in conditions on page 161 of his report. The southeastern end of this trough is still unknown. Explorations have carried it far beyond any wild dreams of earlier days, and today it is known that mineralized and promising ground reaches at least four miles southeast from the original gloryhole where the Copper Queen's work began, and three miles beyond the Mag shaft of the Calumet & Arizona, which was generally regarded, five years ago, as a wild and chimerical experiment.

It is difficult, therefore, to foretell the future of the Bisbee camp. That it is to be one of the very foremost copper sections of the United States is easy to say; it is that much today. Five years ago the camp produced about 38,000,000 lb. of copper during the year, and from a grade of ore far higher in copper tenor than is now smelted. This difference in the copper content of the ore produced is not due to a reduction in grades in the mines, but to the advanced price of copper, which permits the production of leaner ores at as large a profit as was formerly made with those of better percentage. Today the camp is making copper at the rate of 150,000,000 lb. per annum, and it need occasion no astonishment if it somewhat exceeds that total for this calendar year. Smelter enlargements are now under way that should increase the production during 1907 at least 2,500,000 lb. per month above present output. It is no question of supply of ores at Bisbee (that does not trouble the companies operating there); it is reduction capacity.

The Bisbee camp, or the Warren district, as it is called in deference to its best known discoverer, is to all intents and purposes a new field. It was found, to be sure, in 1877 by one Hugh Jones, whose very history is lost in oblivion. Relocated the following year by George Warren, he found only to lose by betting his claim against a faster runner, a pony, in a race held on some fiesta. Warren thought he could beat the broncho, and probably could have done so if his associates had not so filled him with red liquor that he was unable to keep his feet at the turn, which the uncivilized broncho was easily able to do. In 1880 Martin, Ballard and Reilley began work in what was afterward called the Queen ore body, which was a very rich deposit of copper oxides and carbonates on surface. The golryhole from which this ore was taken still remains across the gulch from the present town of Bisbee, in plain view from the porch of the Copper Queen's hotel. Martin and Ballard worked only a part of the ore in sight, their hearts grew faint, and they sold to the Copper Queen Mining Company. This company ran down an incline and also grew discouraged, and had it not been for a direct disobedience of orders on the part of a foreman who was told to suspend operations, might have ceased work at that time. Following the Queen the Prince company started work on its Atlanta claim. This lay southwest of, and joining the Czar, and was the claim in which Dr. James Douglas, of New York was originally interested.

The two companies joined issues when the Atlanta looked unfavorable. The Silver Bear claim, lying toward the present Pittsburg & Duluth, was then opened by another company, which became discouraged and sold to the combination of Atlanta and Copper Queen, which had been made under the name of Copper Queen Consolidated Mining Company The Hayes and Holbrook companies opened claims of those names, lying close together, and about 1000 ft. south of the Czar. They became disheartened after spending large sums, the Holbrook especially, having put a fortune into its work The Copper Queen Consolidated swallowed them also. The same was true of the Neptune claim, and still later, of the Lowell. Every one of these claims was either abandoned or was on the very point of abandonment by its original operators, but has since proved a rich and valuable mine. Development carried further showed all of them to contain rich deposits of high grade ores. This is no slight fact in the consideration of the Bisbee district.

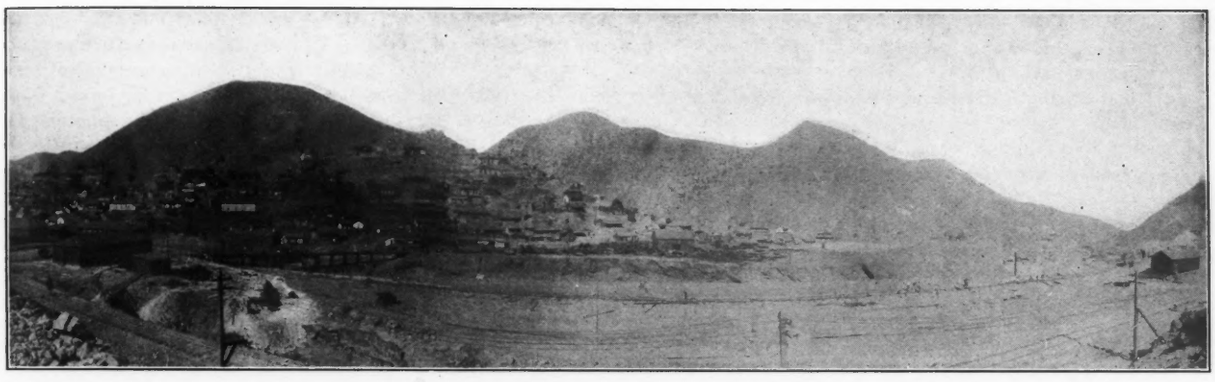
In 1881 the Copper Queen company erected two 36-inch water jacket furnaces

to smelt its rich oxides, and ran through them ores of an average tenor of about 23 per cent. This grade quickly ran down and in 1884 the copper tenor of the ores mined was about 12 per cent. It was some years before sulphides became evident, and it was then supposed to be impracticable to smelt these ores in that region, owing to local costs and conditions. So the future of the district looked black. But Dr. Douglas, as frequently both before and since, was a mainstay for the camp. He made investigations and in 1892 inaugurated the smelting of ores and bessemerizing of matte much as at present practised in the district, and modeled somewhat after methods then adopted at Butte.

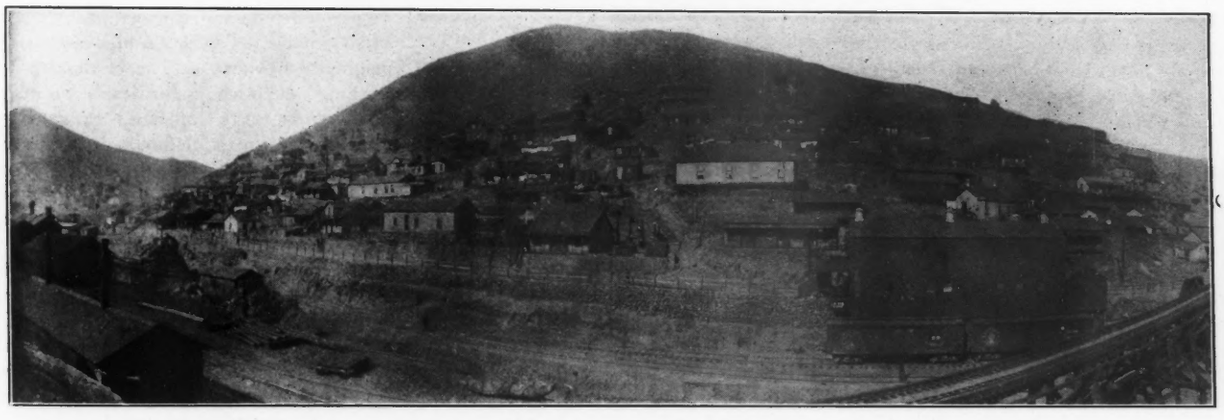
For many years the Copper Queen Consolidated, by the original amalgamation of Queen and Atlanta claims and the subsequent absorption of others as outlined above, worked along very quietly. Though making a large outturn of copper its relative importance was not generally recognized. Reasons for this are easy to find. The company was in no sense a public concern. Its stock was not listed on any exchange, nor were its earnings exploited through the press. It was distant from any other mines, off railway lines, reached only over the mountains by wagon road, and, later, by its own short railway touching the Southern Pacific system at Fairbank. It was contented to remain hidden and was seeking no notoriety. It was working out its own future in its own way and desired nothing more than to be let alone.

But in 1898 there appeared at the copper mining village of Calumet a certain John Graham, an old Butte miner, with beautiful malachite and azurite specimens from Bisbee, Arizona, which he wished to sell. He had been a fellow miner in Butte with Capt. James Hoatson, of the Calumet & Hecla, and sought out his old friend. Hoatson was much interested in the beautiful copper rocks, and was told that "there was just as good as the Queen at Bisbee." So Hoatson went to Bisbee. He found a group of claims belonging to Martin Costello, a saloon keeper at Tombstone, which had just passed through the United States courts, and whose title had been confirmed to Costello. They looked good to Hoatson, whose 26 years experience in mining and superintendence at Butte had shown him many things, not the least of which was that surface copper showings in a copper camp actually proven of value, were not so important as many regarded them. Hoatson was permitted to inspect the underground workings of the Holbrook mine situated about 2000 ft. from the side lines of the Irish Mag, which was the nearest of the Costello claims. There were at that time no adjacent workings; the Copper Queen was beginning to sink what has become its Spray shaft, 650 ft. from the Mag line, but was still using a windlass and bucket, and was in hard limestone. Hoatson and Costello quickly came to terms, the former willing to take a bond for a considerable sum, for he was used to large figures; the latter glad to dispose of his property to one who met him on the basis of the worth he felt that his property deserved. A longtime bond for the purchase price of $500,000 was immediately given and Hoatson returned to Calumet to raise money for development. He approached his associates and superiors in the local management of the Calumet & Hecla, who at first decided on carrying the enterprise, but soon after remained outside. So it was left for Hoatson to shoulder the burden. Scores of former mine laborers in Calumet and vicinity are today amply supported by dividends from the Irish Mag shaft, and owe their competence to the fact that they believed in "Cap'n Jim" Hoatson, and were willing to stake their small surplus in an exploration that he was pushing and was struggling to maintain. John Graham, whose very name is unknown to 90 out of every 100 C. & A. shareholders, is now living in affluence as the direct result of the copper specimens he took from Bisbee to his friend Hoatson, at Calumet.

Development of the Costello ground was carried on by means of a vertical double-compartment shaft, and it was sunk about 750 ft. before signs of ore were encountered. It took no little courage to make such a development, in the face of such a



BISBEE, LOOKING INTO TOMBSTONE CANYON.



BISBEE, CHIHUAHUA HILL IN FOREGROUND.

showing and against the advice of many among the best judges of the region. At times it looked as though the shaft would be abandoned for lack of funds, and it was during one of these periods of depression that help came from a somewhat unexpected source. Hoatson and Thos. F. Cole, who was then general superintendent of the Carnegie Steel Company's mine interests in the Lake Superior region, were brothers-in-law, and during a visit of Mrs. Cole to the Hoatson family at Calumet the captain told his hopes and fears, his belief in the Mag claim and his troubles to his sister. Cole became interested, told Hoatson that if the facts were as he believed there should be no difficulty in raising money, and presented the matter to his friends in the management of the Carnegie Company at Pittsburg. George E. Tener, their mining engineer, was sent to Bisbee with Hoatson, to investigate. To be brief, this resulted in ample funds, the development of the mine and the organization of the Calumet & Arizona Mining Company, in March, 1901. For the payment of the Costello bond and the development of mine and smelter $1,000,000 was then to be raised, and the Pittsburg interests wanted all of this amount. They were forced to be content with $600,000, while the Lake Superior parties connected with the enterprise took the remainder, and had a still larger share of the other half of the capital stock of $2,000,000. It is from this beginning that has come the investment of about seven millions of dollars by the "Cole crowd" so-called, which has already resulted in a market value of securities of not far from $50,000,000.

The Bisbee camp had produced, up to the close of 1905, 321,000 tons of copper and during the four months of this year 26,250 tons more. Profits of the Copper Queen Consolidated in the mining and smelting of its mineral are not generally known, but are supposed to be very high, perhaps as much as $10,000,000 for the calendar year. This is aside from commercial and railway earnings. The Calumet & Arizona, which began production Nov. 15, 1902, has paid in dividends $3,900,000. placed to surplus up to Dec. 31, 1905, $2,500,000 more and made smelter and other betterments charged against current production of copper, to the amount of, say, $600,000. Statistics show that during the life of the Copper Queen Company it has averaged about 7.5 per cent. recovery from its ores, and the Calumet & Arizona about 8 per cent. Neither mine is hoisting as rich ores as when copper prices were lower, and either could, for some time at least, very easily increase its outturn by 40 or 50 per cent. with no greater smelter capacity than is now in commission. About 6,000 men are employed in the camp and at the subsidiary smelters and the monthly payrolls of mines, smelters and of the railway transporting material to the camp, is close to $650,000.

Bisbee is the largest open camp in the West, and all efforts of unions to organize the district have so far met with most decided rebuffs. Reasons for this are not hard to find. The Copper Queen has been operating 26 years and has never shut down, except for three days when the smelter was undergoing changes. Wages in the early days, when costs of living were very high, were $4, and were three times cut when the price of copper was so low as to require it. But in each case they were voluntarily raised when copper prices permitted. Today wages and hours are on the Butte standard, $3.50 per 8-hour dav. By far the greater part of the labor is white; less than 10 per cent of the men about the mines are Mexicans. At the smelters this percentage is somewhat greater. The Copper Queen Company has been very liberal with its men. It maintains a large and splendidly equipped hospital, a good library, a natatorium, and has recently turned over to the Y. M. C. A. a beautiful gymnasium and auditorium, built some years ago for the free use of employees and others. It has constantly been at the front in the promotion of efforts looking toward the betterment of local conditions, and its money has been available for the public good. The Calumet & Arizona, and in this are meant all the several companies grouped with it, is a younger proposition, and its time has been abundantly taken up with getting into shape for the future. So for as it has been able it has followed the ethical policy of the Copper Queen, and now that its preliminaries are well in hand and its local management appreciates its power and assumes its responsibilities, it will doubtless find and fulfill its opportunities for good in a greater measure than ever before. The influence of both companies is wholesome, and their managements broad and skilled.

Temporary Repair for Steel Tapes.

The mending of a broken tape sometimes delays work for several hours, and to remedy this the device shown in the accompanying illustration has been devised by Clinton B. Alexander, Clearfield, Penn. It is a sleeve in which the broken

ends of the tape are inserted until they meet just under the sight-hole, where their proper position to prevent any alteration in the length of the tape can be observed. The screws are then turned down on the tape, and the breakage is repaired. The splices can be carried in the pocket without inconvenience.

The placing of caps or exploders for dynamite should not be done in the powder house or thawing house.

Tin in Southern Nigeria.

During the early part of the season 1904-1905, the officers of the Survey, John Parkinson and H. L. Huddart, discovered deposits bearing tinstone while making a traverse of the Uwet district. In view of the commercial importance of tin, it was considered advisable to examine carefully the stream deposits of this district, in order to determine their richness in tinstone. The district examined lies between Awai-Iku, on the north, the Ekpri-Ibami, on the south and along the route passing through Akwa-Ibami, Uyanga, Oyja-Ekankpa, Oyja-Nkorimba, and Ofunapa. The deposits met with along this route were panned and examined for valuable minerals, more particularly for tinstone. Eighty-seven concentrates were thus obtained, and, after preliminary examination, forwarded to the Imperial Institute for detailed investigation. Most of these concentrates consist principally of garnet, staurolite and ilmenite; monazite, cassiterite, columbite, rutile, tourmaline, zircon and hornblende are subsidiary constituents, while gold occurs occasionally in traces. Of this series of concentrates, only those from the Akwa-Ibami district are sufficiently rich in tinstone to be of importance from a commercial standpint.

The impurities in the tinstone concentrates of Akwa-Ibami consist of columbite, garnet, ilmenite and tourmaline, with a small amount of quartz and occasionally magnetite. Quartz can be eliminated by washing; the other impurities, being magnetic, can be fairly completely separated by the electromagnetic methods. In this way, the tin-bearing deposits of Akwa-Ibami could be made to yield a product containing, as a rule, the equivalent of 75 per cent. of metallic tin.

The conclusions to be drawn from this in investigation of the stream tin deposits of Southern Nigeria are by no means of a definite character. The best occurrences can only be described as poor, in comparison with the generality of alluvial tin deposits.

Chilean Nitrate Depoits.

According to a recent publication by Semper and Michels (Berlin, Ernst, 1904), the various theories hitherto proposed to explain the formation of the Chilean saltpeter deposits (microbes, varech, guanos, etc.) must give way to those formulated by the *salitreros*, or Chilean miners, who ascribe the formation of saltpeter to atmospheric electricity. There is a remarkable amount of mist surcharged with electricity in the Pampas, where the saltpeter is mined, so much so that telephones are deranged. Apparently the oxonized air disengages nitrate of ammonia, which combines with rock salt to form saltpeter. But as the region is rich in guanos and other organic deposits, says the *Mining Journal*, there might be reason to blend this theory with that of Ochsenius.

The Fault System of Eastern Santa Eulalia.

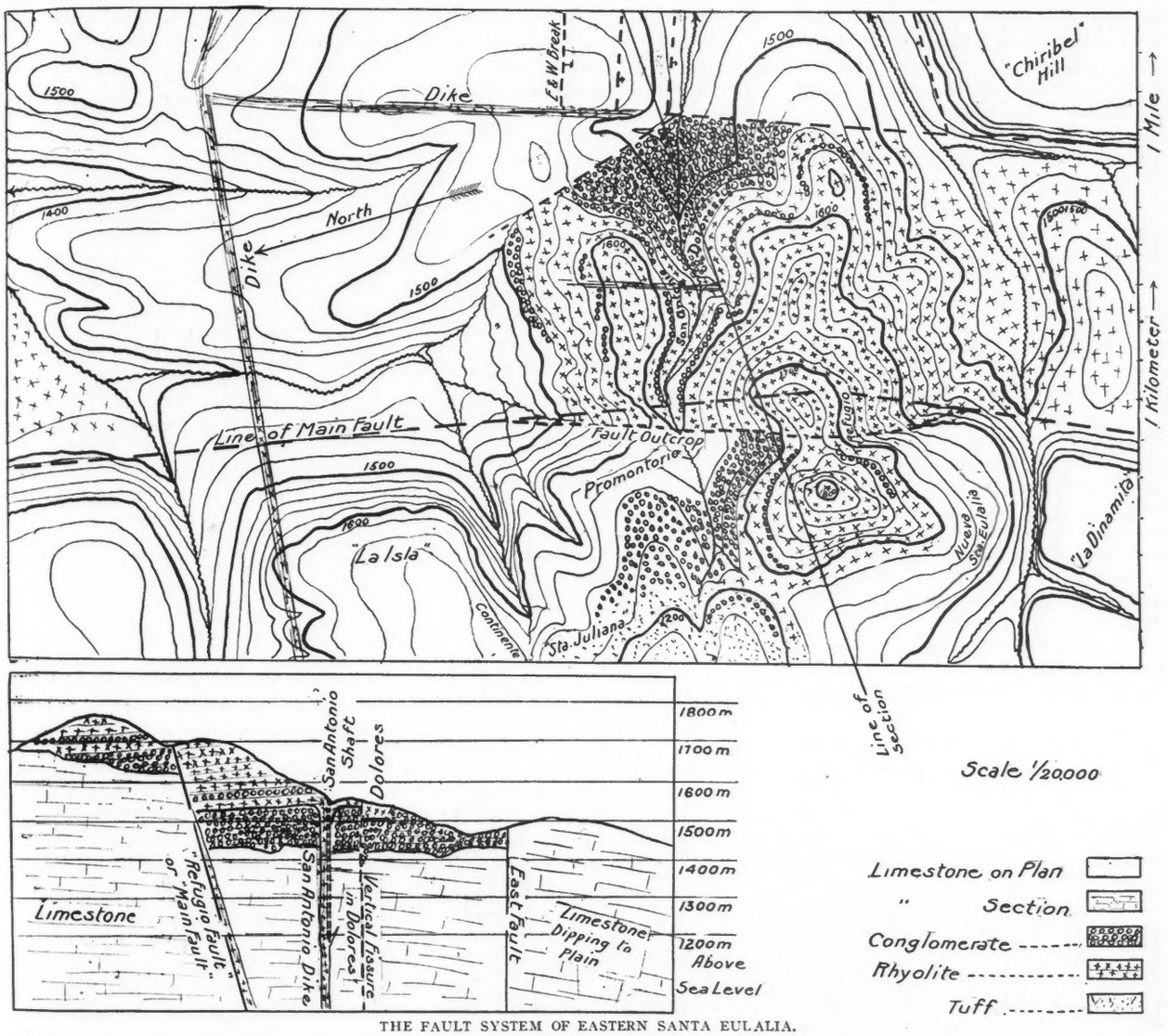
BY M. A. KNAPP.

The geological structure of the old silver-lead camp of Santa Eulalia, in the State of Chihuahua, Mexico, has been studied by many;[1] but most writers on the subject have confined themselves to the central region, where the principal mines occur, on the axis of the anticlinal uplift which formed the Santa Eulalia range. I wish to call attention to the formation of the eastern part of the camp, which differs markedly from that of the better known portion near the great mines of Santa Domingo.

The accompanying map shows the topography of a section of country (about one mile wide, by one and three-quarters long) on the edge of the plain on the eastern side of the camp. The main feature of the geology here is a normal fault-line, running about North 10 deg. East, and pitching 75 deg. East, with a throw of about 450 ft. in the neighborhood of the San Antonio mine, and growing less to the north. Its southern end is in the volcanic peak of Chihuahua Viejo, which lies two miles to the south of the ground covered by the map; it seems to have been the source of most of the tuffs which cover one-third the Cretaceous lime strata which form the body of the range.

The line of this fault is marked by bold cliffs for nearly two miles of its course, partly shown by the contours of the map. Near Chihuahua Viejo, the opposite Chiribel hill where, judging by the almost equal hights of the flat-topped hills of La Dinamita and Chiribel, it approximates that of the main fault.

In the cross section passing through the Dolores and San Antonio mines, is shown conclusive evidence of the existence of the main fault (and the amount of movement on it), by the difference in level, on either side of it, of the outcrops of a peculiar bed of lime conglomerate about 15 ft. thick, which is interstratified in the rhyolite flows from the San Antonio Dike.



THE FAULT SYSTEM OF EASTERN SANTA EULALIA.

faulting of certain heavy beds of conglomerate seems to show a movement greater than 450 ft.; but no definite horizon can be found to measure it.

Nearly parallel with the main fault, and about 1 km. to the east, there runs another which is almost vertical, with a downward throw to the west. The movement along this line is, in general, less than that of the main fault to the west, and is modified by the numerous east-and-west breaks in the strata which dip from here to the plain, as well as by many fractures of the limestone between the fault lines. The greatest movement seems to have been

The numerous breaks in the outcrop of this bed, show also the complicated fracturing that has taken place in the wedge-shaped blocks of lime strata that have settled down between the main fault and the east fault-line.

On the Dolores claim a small wedge of ground dropped some 65 ft. on the line of what must be a great open fissure below. As this minor movement was caused by the same forces which brought about the subsidence of the country between the main lines of faulting; and as the veins of the Dolores were faulted by the slipping of this wedge (no ore being found

[1] This JOURNAL, Aug. 1, 1903; p. 158; and Sept. 5, 1903; p. 350.

on the fault-planes on either side of it), we must believe, from lack, as yet, of any evidence to the contrary, that the deposition of the ore was prior to the faulting in this particular section.

As the conglomerate which forms the country rock of the workings of the Dolores, and of the upper portion of the San Antonio shaft, is almost entirely free from pebbles of volcanic rock, it would seem that the San Antonio was one of the first to break through to the surface in this region. This dike greatly antedates the tuff and rhyolite beds which later covered the whole range, and which underlie and were faulted along with the aforementioned conglomerates in the neighborhood of Chihuahua Viejo.

A dike runs along the line of the main fault in its southern portion, and ore is found in it in several places. About one mile to the south of San Antonio, ore was extracted from a shaft on the dike, which gave good value in silver, and a small assay in gold, the first gold production of the camp. If (as the workings on this plane seem to show) faulting was subsequent to ore deposition, it will have so crushed the ores here, and mingled them with broken rhyolite, that there will not be found any large workable deposits. The lime hanging-wall may, however, be a productive region. San Antonio dike is in a hanging-wall fracture of the main fault; and at the angle of the fault-line, there is a tongue of rhyolite of the same character as San Antonio. The dike of the fault plane here continues straight on, cutting the older rhyolite flows to the north.

The whole of the ground covered by the map is located, and valued (undeveloped) at from $100 to $2000, Mexican currency, per pertenencia (100 sq.m.). The only mines working in this area are San Antonio (of the American Smelting and Refining Company); the Dolores adjoining it; the Santa Juliana (of the Hearst estate) and the Continente. The last two are on the high ground to the west of the faulted section.

The San Antonio has sunk to a depth of 1100 ft. While in the conglomerate and the upper-line stratum, the ore lies in bodies along both sides of the dike; in the lowest levels, large orebodies have been found which tend to form in blankets, as elsewhere in the camp, by the replacement of certain lime strata in preference to others.

The Dolores workings (which reach some 200 ft. below the surface) are entirely in the conglomerate. The thickness of these beds is here estimated at 300 ft.; but as the solidified conglomerate is not easily distinguished from solid limestone in the mine, no notice was taken of the point at which the San Antonio shaft cut the contact.

No blanket formations are found in the Dolores, as no one layer of lime pebbles would be more favorable to ore-deposition than others. The ore lies in two parallel veins, cutting the conglomerate as well as numerous intrusive rhyolite sheets from San Antonio dike. A curious ore occurence here is a white, rotten rhyolite, including pebbles of limestone which have been altered to galena, and later to cerussite.

In further development of the region to the east of the main faultline, it would be well to bear in mind that many barren fissures will be met with (due to later movements of the strata), as well as some (notably, the main fault itself) on which the movement has crushed and probably rendered valueless the ore deposits.

A careful geological survey of the whole of Santa Eulalia, such as is made of the great mining camps of the United States, would enable operators to judge the trend of the ore bodies, and the most favorable ore horizons; it would greatly aid in the development of the camp. Lack of co-operation among the companies here, however, makes it unlikely that such a survey will ever be made of this district.

The Konomax Rock Drill.

According to the Johannesburg *Star*, this new drill (now working on the Village Main Reef) uses considerably less air per blow than any other rock drill, while the blow is more powerful. The blow is obtained from a piston stroke, during the whole of which the full air-pressure is maintained as the driving force, and, owing to the shortness of the exhaust passage, back-pressure is reduced to a minimum.

The economy in air is effected by utilizing the property of expansion on the return stroke. The degree of expansion is limited only by freezing difficulties. In the Konomax drill, however, an expansion of 3:1 has been attained, this being due to two facts: (1) To the simplicity of the exhaust arrangements, which allow any particles of ice which may form to be quickly and safely evacuated. The valve-box is situated at the front end of the cylinder, and allows a perfectly straight and practically unobstructed exhaust. (2) The apparatus is itself, to a great extent, a reheater.

The piston itself consists of two portions of different diameters, working in a corresponding double cylinder. The rear cylinder is considerably the smaller, and is in constant and uninterrupted communication with the maximum air-pressure in the mains. The front cylinder, in which the larger piston effects the return stroke, is under pressure as regulated by the admission and cut-off air controlled by the varying position of the piston. The cut-off is arranged so as to give the requisite expansion and economical use of the air.

No distributing device is employed in connection with the rear end of the cylinder, so that the operating valve may therefore be located at the cylinder head, and the ports governed by the valve can thus be made very short and practically straight. The weight of the drill compares favorably with that of any other of the same power.

Particulars of two trials of the drill are given as follows:

I. Length of run—16 min., 13.5 min., 14.75 min., 11.75 min. Strokes per minute—410, 420, 360-400, 410. Drill size—2¾ in., 2¼ in., 1 15-16 in, 1 11-16 in. Inches drilled—15½ in. 16¾ in., 19¾ in., 19 in. Total run was 56 min., and depth drilled 71 in. The air-pressure averaged throughout was 54.3 lb.

II. Length of run—14½ min., 14 min., 15 min., 6 min. Inches drilled—17 in., 11½ in., 16½ in., 17½ in. The total run was 49½ min., and depth drilled 62½ in. The pressure varied between 50 and 61 lb.

Vanadium Steel.

Willans & Robinson are now producing special vanadium steel alloys at the rate of 800 tons per annum at their Queensferry works, England. The ferro-vanadium used for the manufacture of these special alloys is obtained from the Llanelly works of the New Vanadium Alloys Company, in South Wales, and contains up to 30 per cent. of vanadium. The chrome-vanadium steels show the most remarkable properties. These contain from 10 to 20 per cent. vanadium. The vanadium steel industry is altogether an English industry; 80 per cent. of the production is taken by the motor car and motor omnibus manufacturers. In one case 150 axles of chrome-vanadium steel were ordered and are now running with satisfactory results, and a repeat order for 400 axles of the same alloy has been given. Chrome-vanadium steel has also been exported to France, although an import duty of £5 per ton has to be paid upon it.

The effect of vanadium upon ternary and quaternary steels is to increase the resistance to both static and dynamic tests. The highest test yet obtained from a chrome-vanadium steel, after special heat treatment, was a maximum breaking strain test of 193 tons per square inch: this steel showing at the same time great resistance to dynamic and torsional tests. This is a combination of properties which has never been obtained before, and is the peculiar feature of the chrome-vanadium steels. The nickel-vanadium steels are of great strength, but show much lower resistance to dynamic and torsional tests.

According to statistics published by the Sardinian Mining Association, the mines of Sardinia produced in 1905 approximately as follows: Calcined calamine, 100,000 tons, averaging 42.50 per cent.; blende, 24,000 tons, averaging 43 per cent.; lead ore, 40,000 tons, averaging 60 per cent.; copper ore, 95 tons, averaging 10.6 per cent.

The New Kleinfontein Conveyor System.

BY EDWIN H. MESSITER.*

An excellent example of the application of up-to-date methods of handling material above the surface is afforded by the plant of the New Kleinfontein Company, Ltd., in the Transvaal. With the exception of material which is water-carried, practically all of the great tonnage of the plant is now carried on belt conveyors. This includes ore, waste rock, coal and ashes. The extremely low costs which have been realized lend particular interest to the methods used.

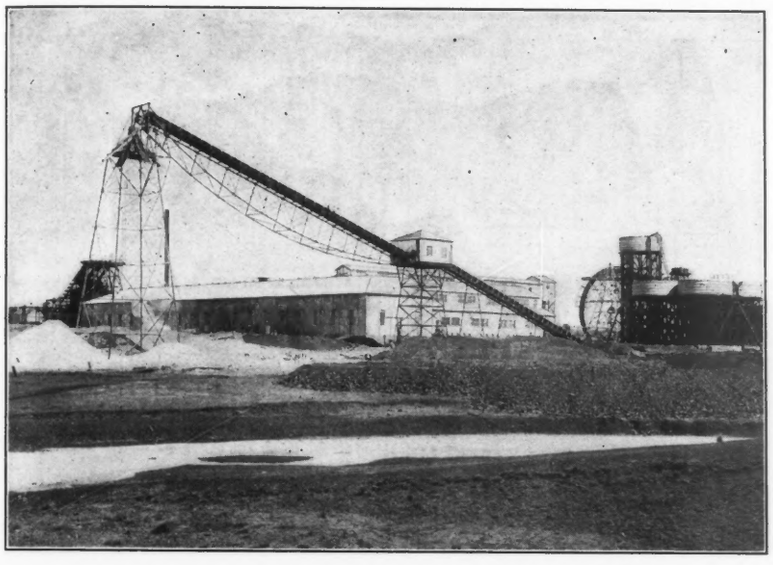


FIG. 1.

The ore is first carried on a 30-in. conveyor from the head gear to a trommel and grizzlies, after which four 36-in. sorting conveyors are provided for a preliminary separation of waste. The ore is then carried to the 200-stamp mill on a 24-in. conveyor, other conveyors being used for waste and for distribution in the mill. Through the mill the customary launders carry the ore. The sand tanks are served by 18-in. belt conveyors. The boiler plant is equipped with belt conveyors for coal and ashes. There are, altogether, nineteen belt conveyors, having a total length of 3345 feet.

The most distinctive feature of this plant is the arrangement for handling the waste. All material which must be disposed of on the dump is collected by the belt conveyors, the last three of which appear in the accompanying illustrations, in which Fig. 1 shows the tailings stacker a few weeks after the conveyors were started, and Fig. 2, taken 14 months after Fig. 1, shows the boom conveyor.

The 30-in. belts handle 300 tons per hour, and average about 2400 tons per day, of sand, waste rock and ashes. They are mounted on a steel structure, rising to a hight of 120 ft. The last conveyor of the system can swing through an arc of a circle about the end of the one which delivers to it, and serves to build the dump 100 ft. ahead of the supporting structure. In this way it is possible to extend the structure and stationary conveyor a corresponding amount when necessary, after which the boom conveyor will build a foundation for the next extension. This can be carried on while the boom conveyor is delivering to one side, so that when the change is made there will be no stoppage.

FIG. 2.

The total cost of disposing of the sands and waste with this plant is less than half of the cost at the next lowest mine on the Rand, and a little more than one third of the average cost at all the mines in that territory. The plant has been running over a year and the costs of handling material throughout the plant are gratifying.

The general designs for tailings handling, and for the conveyor installations throughout were made by the Robins Conveying Belt Company, of New York, whose conveyors are employed, in cooperation with Messrs. Fraser & Chalmers, Ltd., of London and Johannesburg. The engineering staff of the New Kleinfontein Company, includes E. J. Way, consulting engineer, C. Horst, manager, J. W. Forster, chief engineer, and T. Bertram, assistant engineer.

*Metallurgical engineer, New York City.

The Source of Alluvial Tin.

J. B. Scrivenor, official geologist, Federated Malay States, in his annual report expresses the opinion that if the question of the source of detrital tin deposits of the flat alluvial tracts be examined in the field a simpler solution can be found than that which derives the cassiterite from the big granite mountains. It is more probable that the bulk of the detrital tin has been derived from masses of pegmatite, lodes and stockworks, which take part in the formation of the low rolling country at the foot of the high ranges. That such possible sources exist is beyond a doubt.

"Near Tanjong Malim I have lately seen an excellent example of low hills traversed by tin-bearing lodes of various sizes, and in one place by schorl rock containing tin. Sudu is another case in point; while the land worked by the Bruseh Hydraulic Tin Mining Company in Batang Padang, Perak, is the best example of all. Here partially decomposed schists, traversed by numerous little veins containing coarse grained cassiterite, are being worked with monitors; a year ago a mass of crumbling pegmatite was partially worked with success; while it is also proposed to work in the near future a partly disintegrated mass of granitic rock containing disseminated grains of the ore."

Large vs. Small Drilling-Machines.*

BY FREDERICK T. WILLIAMS.†

The purpose of this paper is to discuss the relative merits of the large 3⅛-in. machine and the small 2¼-in. tappet machine in driving development-headings; although the data were obtained from cross-cut headings alone, experience has shown that the results are equally true in drifting, raising and winzing.

Recently we drove two parallel cross-cuts through the same formation, using a 3⅛-in. machine at the breast of one cross-cut, and a 2¼-in. machine of the same make at the breast of the other. The results of this work afforded an ideal comparison, since in both cases the headings were advanced through rock practically of the same hardness and breaking-properties; the amount of sludging was equal, and there was no difference in the condition of the steel or the machines, in the air-pressure or in the experience of the operating-crews.

Some operators in the Cripple Creek district contend that there is ground which cannot be handled with the small machine, the holes being too small to contain enough powder to pull the ground, etc. The results obtained in working the property of the Portland Gold Mining Co., however, show that the ground worked by them does not fall in this class. During a period of two years there have been driven, with the small machine, 4 miles and 308 ft. of development-headings, through a diversity of ground, including Pike's Peak granite (a coarsely porphyritic type of granite), highly indurated, andesitic or phonolytic breccia, true massive andesite, trachytic phonolyte, tuffas, and along dikes of decomposed basalt and hard phonolyte; in every instance a satisfactory record was made.

The headings here described were driven through highly indurated, andesitic breccia, having a hardness of from 5.2 to 7.2 and a sp.gr. of from 2.2 to 2.8. The action of the breccia under the drill was not materially different from that of ordinary red granite. The breccia was not as free-drilling as granite, and sludge accumulated very rapidly after a shallow depth of hole had been gained, but it broke better than granite.

Aside from the usual work of setting-up, drilling, and loading, the machine-men or helpers mucked back, cleaning the floor of muck 3 or 4 ft. back from the breast in order to position the column properly. If the "lifters" acted properly at the previous firing, the muck was fairly-well thrown back from the breast; but if either missed fire or were exploded before the other holes, considerable muck was left at the breast which required much additional labor. The usual time needed to muck back was 1.25 hour, but this varied considerably. Flat steel 48x96x⅜-in. sheets, were used, from which to shovel the material. These were placed in position 3 or 4 ft. back from the breast by the trammer just before going off shift. The ground broke fine enough to require little or no sledging. A cubic foot of breccia in place will average 154 lb. in weight as compared with 90 lb. on the muck-pile, giving an average of 42 per cent. of void space. All the waste was trammed to the shaft 800 ft. distant, and hoisted to the surface. No timber was used in either heading.

The following summary of the results obtained by using both large and small machines has been prepared from the data given in Tables I and II. Labor is the largest individual item. The wages of machine-men were $4 per shift, and the addition of the items given under the several heads of Table I shows the total cost of labor performed in each heading. The cost of operating the machines per

	Machine Men.	Machine Helpers.	Hand Miners.	Trammers.	Pipe and Trackmen.	Total Labor.	Cost of Labor per Foot.	Number of Machine Shifts Worked.	Cost of Operating Machines.	General Tramming Cost.	Explosives, Including Powder, Fuse, and Caps.	Cost of Explosives per Foot.	Cost of Pipe and Track.	Cost of Hoisting.	Cost of Supplies.	General Expense, Bosses, Assaying, Surveying, Etc.	Total Cost.	Cost per Foot.	Total Tons.	Cost per Ton.	Number of Feet Driven.	Feet per Shift.
Large machine (3⅛″). Cross-cut (5.5′ x 7.5′).																						
5 day run	$40	$35	.....	$22.13	$3.00	$100.13	$3.51	10	$37.00	$0.99	$66.22	$2.32	$11.69	$22.69	$0.79	$22.69	$262.20	$9.20	99.20	$2.61	28.5	2 85
8 day run	64	56	.....	31.13	3.75	154.88	3.33	16	59.20	1.42	90:20	1.93	19.07	32.57	1.14	32.57	391.05	8.41	142.40	2.75	46.5	2.91
7 day run	56	42	.....	28.13	.....	126.13	3.55	14	51.80	1.10	72.84	2.05	14.56	25.25	0.88	25.25	317.81	8.95	110.40	2.88	35.5	2.54
Averages and totals	160	133	.....	81.39	6.75	381.14	3.45	40	148.00	3.51	229.26	2.07	45.32	80.51	2.81	80.51	971.06	8.79	352.00	2.76	110.5	2.76
Small machine (2¼″). Cross-cut (4.5′ x 7.0′).																						
5 day run	40	.....	$0.75	17.25	1.88	59.88	2.49	10	18.50	0.63	36.55	1.52	9.84	14.46	0.52	14.46	154.83	6.45	63.20	2.45	24.0	2.40
8 day run	64	.....	.....	31.88	3.75	99.63	2.49	16	29.60	1.09	53.01	1.32	16.40	24.89	0.87	24.89	250.38	6.26	108.80	2.30	40.0	2.50
7 day run	56	.....	.....	30.38	3.75	90.13	2.69	14	25.90	1.10	36.71	1.09	13.74	25.08	0.88	25.08	218.62	6.53	109.60	1.99	33.5	2.39
Averages and totals	160	.....	0.75	79.51	9.38	249.64	2.56	40	74.00	2.82	126.27	1.29	39.98	64.43	2.27	64.43	623.83	6.40	281.60	2.22	97.5	2.44

TABLE 1. DEVELOPMENT REPORT OF THE PORTLAND GOLD MINING COMPANY FOR 20 DAYS ENDING OCT. 16, 1903.

	Lb. of Powder.	Lb. of Powder per Foot Driven.	Feet of Fuse.	Feet of Fuse per Foot Driven.	Number of Caps.	Number of Caps per Foot Driven.
Large machine (3⅛″). Cross-cut (5.5′ x 7.5′).						
5 day run	491	17.23	872	30.59	116	4.07
8 day run	669	14.39	1,179	25.35	158	3.39
7 day run	544	15.32	804	22.65	134	3.77
Averages and totals.	1,704	15.40	2,855	25.80	408	3.69
Small machine (2¼″). Cross-cut (3.5′ x 7′).						
5 day run	264	11.00	672	28.00	96	4.00
8 day run	378	9.45	1,129	28.22	151	3.77
7 day run	262	7.82	742	22.15	120	3.58
Averages and totals.	904	9.27	2,543	26.08	367	3.76

TABLE 2. EXPLOSIVES—DETAILED REPORT OF THE PORTLAND GOLD MINING COMPANY FOR 20 DAYS ENDING OCT. 16, 1903.

*A paper, entitled "The Relative Merits of Large and Small Drilling Machines in Development Work," published (subject to revision) in Bulletin No. 8, March, 1906, of the American Institute of Mining Engineers.

†Mining engineer, Victor, Colo.

shift was $3.70 for the large machine and $1.85 for the small machine; these figures, which vary from month to month, include the cost of everything connected with the operation of the machines: engineer's wages, blacksmith expense, new steel repairs to the machines, cost and repair of air-lines, etc. The cost of labor, per foot driven, by the large machine was $3.45, and by small machine $2.56.

The cost of explosives, a detailed report of which is given in Table II., shows that the 40-per cent. dynamite costs $0.127 per lb., the fuse, $0.0035 per ft.; and the caps, $0.007 each.

These figures, which include freight, unloading, wages of the powder-man, and one-third of the wages of the storekeeper, represent the entire cost of the material, as laid down at the station for the machine men. All fuse burned was in 7-ft. lengths. The number of feet of fuse burned and the number of caps used per foot are practically the same; but the cost of dynamite is $0.78 less per foot in the heading driven by the small machine than in that of the large machine.

The best record for a shift's run, made by the large machine, was 4.08 ft., as compared with 2.96 ft. for the small machine. In drilling these rounds it was found that the large machine had made 3109.56 cu.in. of hole, and the small machine 971.10 cu. in. Comparing these figures with the cubic feet of ground pulled, 1 cu.in. of hole drilled by the large machine broke 0.053 cu.ft. of breast, while the small machine gave 0.097 cu.ft. This comparison shows that too much work was done by the big machine on the breast for the amount of ground broken.

Figs. 1 and 2 show the number of holes drilled, the degrees of pitch from the horizontal, the depth drilled by the starters, seconds and thirds, and the order of firing. The cost of coal before the boilers was $4.40 per ton. Ordinary cross or square bits were used, and all the steel was sharpened by machine. At each sharpening the steel lost ⅛ to ⅜ in. in length. The general tramming cost includes repairs to tram-cars, tram-tracks and the greasing of the cars.

The cost of pipe and track is figured at $0.41 per ft., the 2-in. pipe costing, with connections, $0.10 per ft., the track, together with the spikes, plates and ties, costing $0.31 per ft. Lumber costs $20 per thousand feet.

Hoisting cost $0.243 per ton, which includes all accounts that can be charged to the maintenance of the hoisting engines—such as wages of the engineers, wipers, top-men and cagers, repairs, cost of steam, cables and repairs to shaft. The hoist used is a 500-h.p. Webster, Camp & Lane, first-motion hoist, size 20x48 in., having a capacity for a maximum depth of 2500 ft., using 5x⅜-in. rope to hoist an unbalanced load of 8000 lb. at an average speed of 1500 ft. per minute.

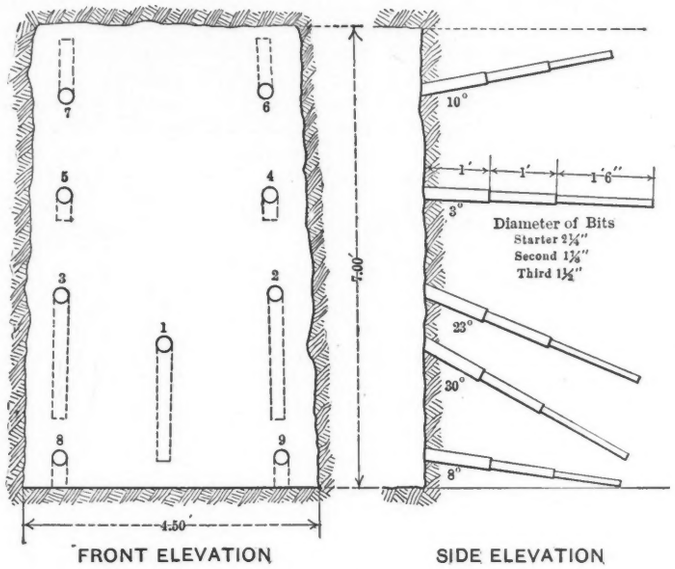


FIG. 1.

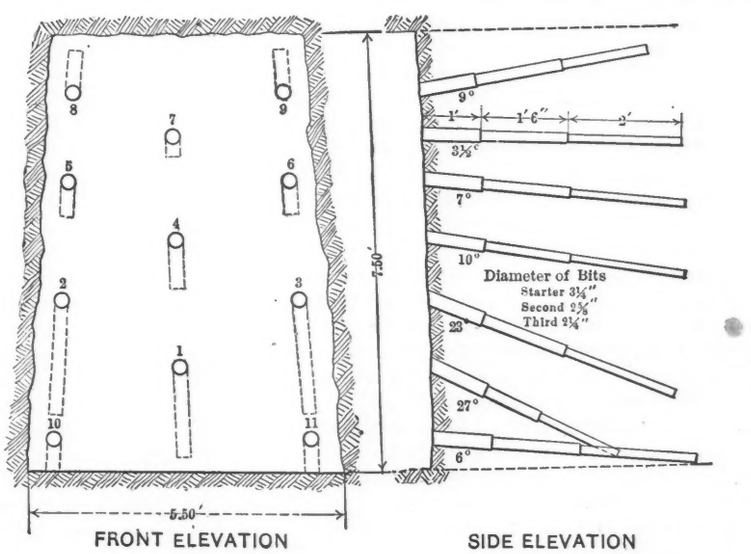


FIG. 2.

To supplies is charged the cost of picks and shovels. To general expense is charged the wages of foremen and shift bosses, assaying and surveying, pumping, lighting, including candles, office expense and general repairs on the surface.

The air was furnished by a 50-drill. cross-compound, Ingersoll-Sergeant compressor, having steam cylinders 24 & 44x48 in., and air cylinders 22¼ & 38¼x48 in. The air pressure at the receiver was 100 lb. and at the drills 85 lb. per square inch.

The bore of the large machine cross-cut is 5.5x7.5 ft., that of the small machine is 4.5x7 ft.; it is held that the increase of 1 ft. in width and 0.5 ft. in hight of the large machine cross-cut over that of the small machine cross-cut does not facilitate mining operations.

The merits of the work done by the two machines may be briefly stated thus: The use of the small machine saves 25 per cent. of the cost of labor necessary to operate a large machine foot per foot. The cost of operating a small machine is 50 per cent. less than that of operating a large machine, shift for shift. The general tramming-cost of the large machine cross-cut is lessened 20 per cent. by using a small machine. The cost of explosives per foot driven by the large machine can be reduced 37.7 per cent. by the use of the small machine. The cost of hoisting and general expense of the large machine cross-cut is lessened nearly 20 per cent. by using the small machine.

Greater speed, regardless of cost, can be obtained with the large machine, the small machine being from 10 to 20 per cent. slower. The cost of the large machine cross-cut was reduced 27 per cent. by using the small machine.

Aluminum should not be used in mixtures which are to stand pressure. A few hundredths of one per cent. of aluminum will cause metal valves to leak under pressure.

The Undeutsch Safety Catch.*

BY ERMINIO FERRARIS†.

Professor Undeutsch has described in this book his successful, theoretically and practically, solutions of the problems propounded by von Sparre. The problems considered the rational reconstruction of the safety-catches on cages; the attainment of maximum safety and efficiency of safety-catch appliances, and the elimination of the terrific shock caused by such arrangements; as well as the experimental testing, regulating and controlling of the catch action. The work further reports on the noteworthy results on hoisting-shaft ropes from statistics of the Dortmund mining district (compiled since 1872 by Mr. Hiltrop, engineer, of Breslau). The work also contains the author's experiments concerning the shattering of the lower portion of the rope from shock. Some space is given to the safety appliances of hoisting apparatus, the development of which is due in large measure to the stimulation of Mr. Wenzel, engineer of the Royal mining bureau of Saxony.

The aim of the work is the increased safety of hoisting apparatus, particularly of the cages; both by attention to the ropes, and by the construction, instalment and control of a very simple safety-catch which will prove effective, even in the case of falling bodies of great weight and velocity. Further, increased safety is to be obtained by the use of the Siemens-Schuckert safety-appliance for preventing the overwinding. Dangerous shocks are automatically registered by means of the Undeutsch indicator; next to the certain action of the safety-catch, this is the most important consideration.

Starting with statements that are obvious, scientific results are developed by means of a simple theory, and these results are elucidated by apt graphical illustrations.

The new safety-catch is constructed according to the Professor Undeutsch's theory and data on the arresting of falling bodies; it is modeled on the principle of the drag-brake (or from the manner of a mountaineer checking himself by pole climbers when sliding).The brake is built to conform to the law of arresting bodies (as formulated in the early seventies by Professor Undeutsch) as follows: The retardation and shock to the safety-catch on the brake is small, and is independent of the hight of fall (i.e., of the square of the final velocity of the descending mass), if the ratio of the hight of fall to the braking distance is small, constant and equal to the braking strength per kilogram of the load; or, the braking strength being small and constant, the arbitrarily large braking distance varies directly as the square of the (arbitrarily large) final velocity.

The Undeutsch brake has four characteristics, as follows:

(1), *The Brake Proper*—This consists of thin adjustable knife-catches, fastened to the cage itself; and so arranged as regards shape and so regulated that when the rope breaks they not only grasp the wooden guides, but cut down into them as well. It brings forth the strength of the catches (diminished by the load to be caught), the braking strength, and retardation (i.e., the absorption of kinetic energy from the arresting of the cage).

(2), *The Motive Apparatus*—This comprises two main parts. In case of the parting of the hoisting rope, the first part directs the action of those catches not connected with the king-pin nor with the attached cable-end, and carries them a small distance up to the guide-beams. The other part (with abundant available energy) drives the properly restricted catches into the guides. The first part comprises the king-pin (which is slightly pressed down by the safety-catch spring), and the movable catch-graspers; the latter with their free-ends press up, but never withdraw from the catches except when the ends of the graspers are removed from the catches at the same time that the king-pin is again raised within the cage by the hoisting rope. The second part consists of the descending load itself (through its downward kinetic energy) since the catches are revolvable (like the arms of a man) and are fastened directly to the cage itself. On approaching and grasping the guides laterally, the catches are forcibly driven into them by means of their energy, and are securely set therein by the joint-lever action.

(3), *The Safety Appliance*—This is composed, on the one hand, of lugs attached to the cage itself and fastened above the catches; the catches rest against these lugs after gripping the guides; also during the release of the brakes and the resting of the load. The load is supported (by means of these attachments) in such a manner that a release of the catches from the guides is possible only by an artificial lifting of the entire cage. Consequently the catches can suffer derangement, neither on approaching the guides, nor during the gripping, nor after the grip is complete.

(4), *Regulating Appliances*—The purpose of this piece of mechanism is still more accurately to regulate the position of the carefully constructed catches, with reference to the depth of penetration in gripping, the magnitude of the power of catches and brakes, and the strain (as determined by Professor Undeutsch's tests of free-fall, safety-catch, and indicator). This can be accomplished, with proper construction, by a small adjustment of the catch-pegs on the cage; but more simply by regulating the inclination of the catches by adjusting screws until the desired penetration depth of the catches, or the diminution of shock, has been obtained.

The inclination of the catches at the moment of touching (i.e., at the beginning of gripping) has been obtained mathematically by the author in his tests on maximum efficient penetration depth. In order to prevent any untimely action of the catches, the maximum spring strength (i.e., that exerted after complete compression of the safety-catch spring) must be a certain amount less than any possible minimum descending load. As the latter is in itself an important part of the new safety-catch, it is possible to minimize the weight and resistance of the few necessary additional parts. It must also be noted that, for the same reason, catch beams and requisite bedding, slides, etc., with their many defects, have been completely dispensed with.

Of special significance are the previously mentioned tests of free-fall, of safety-catches, and of indicators. They were introduced by Professor Undeutsch, not only for verifying his laws and testing and regulating the action of his new brake, but also for the experimental demonstration of the defects of other safety-devices and their inability to develop the necessary degree of safety. The progress of the special undertakings shows that the results of these investigations have greatly contributed to the elimination of errors, and to the simple and reliable construction of the new safety-catch and brake.

In this connection, Professor Undeutsch describes his experiments as carried out on a large scale and with many varieties of safety-catches. The results obtained from the Fontaine-Kley appliance, and from the similar Münzner apparatus, are of particular value in showing how their defects may be remedied.

The noteworthy results obtained in this important branch of mining mechanics—so intimately connected with the welfare of the miners—were brought to the attention of the mining profession, by presentation before the General German Exposition for Prevention of Accidents at Berlin, in 1889. The results were clearly set forth by means of extensive graphic illustration; as also by Professor Undeutsch's tract "Experimental Testing of the Dangerous Action of Brakes" (Freiberg, Craz & Gerlach, 1889); they were accorded great distinction.

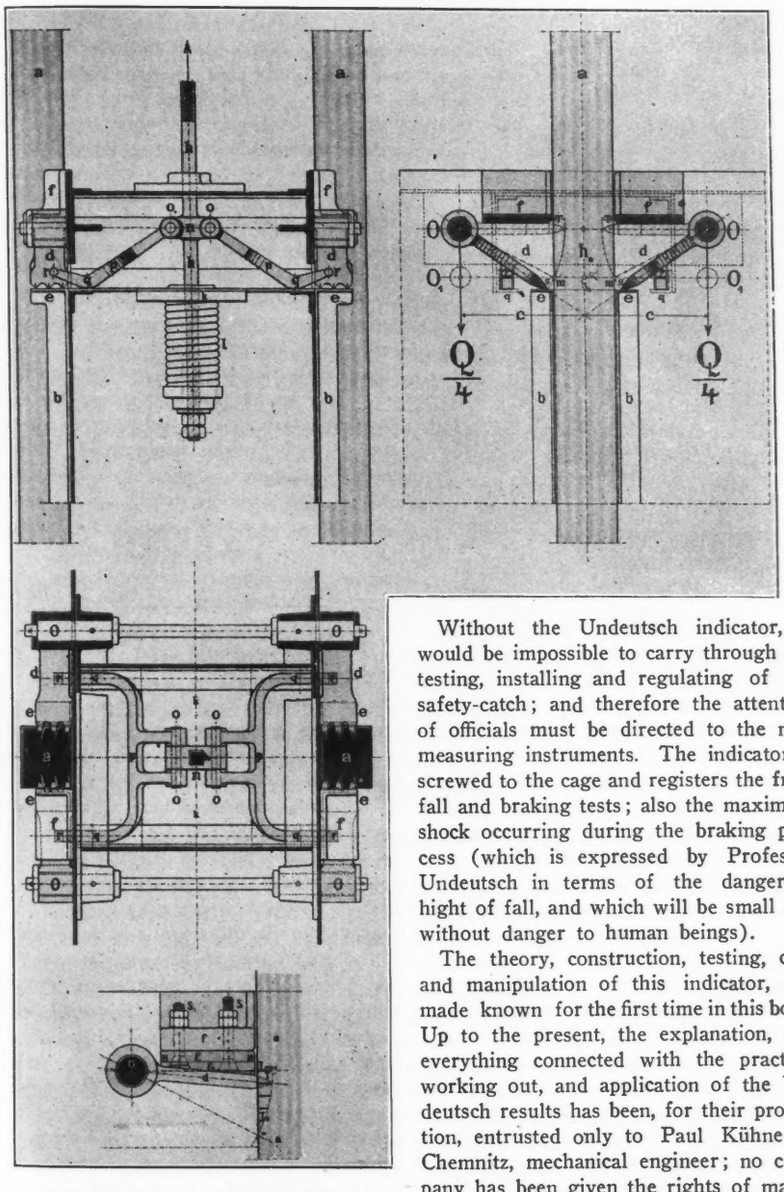
Professor Undeutsch had at that time, not only verified, in practice and on a large scale, the correctness of his law for safety-catches, but also the nature of the regulation of the knife-catches and the brake-action. He also always regarded highly the name of Karl Kley; but he discarded the Fontaine machine with all its related mechanism.

Professor Undeutsch intrusted to the

*"Theory, Construction, Testing and Regulation of Safety-catches." By Hermann Undeutsch (professor at the Freiberg Bergakademie). Pp. 243, illustrated. Paper. Leipzig and Vienna, 1905: Franz Deuticke. Price, $3.25.

†Director general, Societa di Monteponi, Monteponi, Sardinia, Italy.

F. A. Münzner Company (of Obergruna) his drawings of the safety-catch as well as the results obtained by his tests of free-fall, safety-catches, and indicators; with special reference to the knife-catches and motive apparatus. He gave in addition his so-called short-catch theory, and the article containing all his experimental results. Unfortnuately, the new appliance of the F. A. Münzner Company, provided as it was with the Fontaine-Kley (now the Münzner arrangement), could not completely fulfil the Undeutsch requirements.



THE UNDEUTSCH SAFETY CATCH.

Furthermore, it was subject to danger from the well-known "rope vibration" effect, inasmuch as the catches are only loosely connected with the cage, but directly with the unstable king-pin; and therefore every disturbance of the king-pin means a derangement of the catches.

It remained for Professor Undeutsch himself to complete the work constructively, and to give his discoveries their proper place in the interest of maximum possible safety. He plainly shows, therefore, in his present work, the main defects detrimental to a high degree of safety; and how he overcomes them by a simple contrivance which fulfils all the requirements, within technical practicability. In the interest of all miners making use of hoisting cages, it is to be hoped that the mining authorities will show a real interest in the new appliance, and for the sake of all concerned, that they will speedily introduce the new safety-catch.

Without the Undeutsch indicator, it would be impossible to carry through the testing, installing and regulating of the safety-catch; and therefore the attention of officials must be directed to the new measuring instruments. The indicator is screwed to the cage and registers the free-fall and braking tests; also the maximum shock occurring during the braking process (which is expressed by Professor Undeutsch in terms of the dangerous hight of fall, and which will be small and without danger to human beings).

The theory, construction, testing, care and manipulation of this indicator, are made known for the first time in this book. Up to the present, the explanation, and everything connected with the practical working out, and application of the Undeutsch results has been, for their protection, entrusted only to Paul Kühne of Chemnitz, mechanical engineer; no company has been given the rights of manufacture.

This indicator is a product of the Undeutsch laws of brakes, and the hoisting rope statistics. On the one hand, theory showed that with the determination of the critical hight of fall, the (otherwise unascertainable) brake-energy is unfavorable; on the other hand, statistics turned to the examination of the lower part of the rope, and showed the feasibility of considering it as a weighted suspended draw-spring to be tested for impact strain, a spring of known mechanical properties, from the elongation of which the magnitude of the shock might be calculated.

These conceptions, along with the minimization of friction, constitute the foundation of the indicator theory from which the other rules for constructing and testing of apparatus followed. One of the most important restrictions arose from the necessity of reducing the friction on the spring to a minimum; and in addition, the necessity of doing away with a disturbing rectilinear swing of the load. The first requirement was fulfilled by having a large spring-load (called trial weight), and by a construction as unstrained and frictionless as possible; and the second, by an initial stretch of the spring at rest. The requisite accuracy in measurement also demands a heavy trial weight and a small spring constant (i.e., unit increase of the spring per small load).

Large heavy indicators are therefore the best. Facility of transportation, however, as also adaptability of use with smaller loads and measurements, demand that the trial weight shall be small. Hence the necessity of diminishing, to a larger and larger degree, the spring constant and the total friction of the appliance. As this latter has definite limits, it was determined, experimentally, that split springs must be done away with, and no trial weights under 4 kg. be employed.

The treatise under consideration gives a complete numerical computation of the indicator; also its construction in sections and as a whole, and its testing in a safety apparatus specially constructed by Professor Undeutsch. There is also given the mathematically and graphically determined scale on which the curve traced by the indicator can be read in terms of the critical hight of fall.

But the new instrument is of value not only in testing and regulating the safety-catch, but also in determining all vertically directed strain in general; as for instance in the case of beams, and especially in determining the amount of strain on all hoisting ropes.

This brings the reader to that part of the work which distinctly sets forth both the general and the specific results of the hoisting-rope statistics.

It should here be remarked that Mr. Hiltrop (a mining engineer of Breslau, and formerly Royal Prussian mine inspector in Dortmund) vitalized the hoisting-rope statistics by an address at Essen before the meeting of the mining engineers; this address appeared in the *Essener Glueckauf* (Nov. 1871). The terrible discovery that at that time 20 per cent. of all hoisting ropes were destroyed by parting while in use, gave the great impetus to the intelligent efforts of Hiltrop upon his entrance into his position. He began his address in these words; "All mining industry depends on the

rope; the producer is lowered into the mine by the rope; and the product is raised by the rope, etc."

Professor Undeutsch writes that these "statistics" were built on a broad and liberal foundation; that they sought an indirect rather than a direct result; and that their remarkable success was due, not so much to a scientific treatment of accumulated material, but rather to the accumulation of the material itself. Supported by the Royal mining bureau of Dortmund, in 1876-77, he introduced the collection of "statistics" on the Dortmund plan, in Saxony.

Hiltrop worked until 1888 at the Dortmund material, with excellent results, tending greatly to increase the safety factors. Subsequently he worked on the Breslau material, after having put on exhibition at Brussels his Dortmund material, and having introduced his "statistics" in the mining district of Breslau. The great accomplishment of the statistics lies in the remarkable fact that the percentage of rope partings decreased in the course of those years from 20 per cent. to less than 0.9 per cent.

On one plate in his work, Professor Undeutsch presents an interesting graphical representation of the material collected in the Dortmund district during more than 36 years. This shows beyond question the immeasurable service of the "statistics." Professor Habermann in Leoben and Professor Kas in Pribram and others, in the interests of safety in the shafts, have repeatedly praised these in various publications.

Professor Undeutsch treats analytically and experimentally, the important dynamic consideration of the swing and impact strains in hoisting ropes; these are the more disturbing, the smaller the rope volume under strain. First of all these were exhaustively treated in his article, "Tension of Suspended Prismatic Bodies Due to Static and Dynamic Strain" (*Oest. Zeit.*, XI, 1892).

The last of the eight divisions of this book, so important for the safety of shaft-working, is composed of an abstract from the paper cited. This abstract contains graphic representations of the chief results, including a reproduction of the rope-strain testing-machine, constructed and tested by Professor Undeutsch, and fitted out with a small indicator for automatically registering the critical hight and the length of the rope under strain.

The close of the book again brings the reader back to the excellent qualities of the Undeutsch safety-catch. The statement is also made that the safety appliances of the Siemens-Schückert Company (for the prevention of overwinding) have been recognized as best by the Hoisting-Shaft Commission of Dortmund; and further that the royal mining officials have sanctioned a speed of 10 m. per sec. for passenger cages built at the Siemens-Schückert works and equipped with their appliance. This fact, together with the consideration that freight cages are permitted a speed of 20 m. per sec., demands imperatively the establishing of that condition which the Undeutsch safety-catch considers as its chief aim: namely, that following a cable break, the margin of safety be large, and the shock of the safety-catch be independent of the final velocity of the cage; and in addition, that it be, above all, without danger to men and apparatus.

As regards the permissible magnitude of the shock which the new safety-catch meets, Doctor Fischer, of Leipzig, and Doctor Paul Stolper, of Göttingen, sustain Professor Undeutsch in this regard. I am convinced of the great merit of the Undeutsch appliance. The new safety-catch and the related testing apparatus will bring safety to the miner, and honor to the inventor.

The Potter Flotation Process.

The Potter process derives its name from C. V. Potter, of Melbourne, who in 1901, took out a patent for the separation and recovery of sulphides from their ores by means of acid solutions. Any acid can be used with success in the working of this process, but on a commercial scale, chiefly on account of its low cost, the choice is confined to sulphuric acid, the limits of strength on a working scale being between 1 and 10 per cent. The success of the process depends almost entirely on the peculiar selective action and affinity of bubbles of carbonic acid gas for fine particles of zinc and other sulphides. The true cause of this adhesion of the buoyant gas to the heavy sulphides is as yet very imperfectly understood. The success of this acid process at Broken Hill is due, in a very large measure, to the fortunate coincidence of the Broken Hill sulphides being associated with calcite and other carbonates which when immersed in hot solutions of acid give rise to the generation of carbon dioxide gas.

The plant required is of simple design, resembling an ordinary spitzkasten, but in its action the results are the exact reverse of gravity settling. The heavy sulphides, which under ordinary conditions would fall to the bottom, in the Potter process, owing to the buoyancy of the associated bubbles of gas, assisted by the convection currents of the hot sulphuric acid liquors, rise to the top and flow off for collection. The underflow from the spitzkasten contains the residue which is commercially valueless, and in the Broken Hill mines is sent for disposal as underground filling.

The manipulation of the process is rather a delicate operation, as the adhesion of the bubble of gas to the sulphide particles is not by any means intense, and in fact is only maintained so long as the association is free from vibration; the slightest shock is sufficient to detach the gas and sink the sulphide. This fact is taken advantage of in the collection of the valuable material, the overflowing concentrate being dropped suddenly into collecting tanks. The gas bubble is thus disengaged, and the sulphide particles being no longer buoyant, sink immediately and are caught for further treatment. The then clear acid liquor, freed from the concentrate, is returned to the storage tank for use in the treatment of further quantities of tailings. The output of each spitzkasten is, comparatively speaking, very large, as the size ordinarily used is about 4 ft. 6 in. square and 5 ft. deep, and the output is approximately six tons per hour.

An Improved Dredging Appliance.

The New Zealand *Mines Record* describes a shaking sluice-box, which is intended to replace revolving screens on gold dredges, as applied to the Rising Sun Gold Dredging Company's dredge, Cromwell, Otago. The revolving screen is 30 ft. in length and 5 ft. in diameter. The annual cost for repairs and renewals is £200 per annum for material alone, not including labor and loss of dredging time, which may be taken to represent another £100, or a total of £300 per annum. In addition to the screen itself, the upkeep of the driving gear is costly, and requires considerable attention. The shaking sluice-box is expected, not only to fulfil all duties of an ordinary screen, but to give improved results in the treatment of the wash-dirt.

At the Rising Sun dredge, the box is 30 ft. in length by 3 ft. 6 in., made of steel plates and angle irons. The bottom plates are perforated so as to enable the gold-bearing sands to be treated on the saving-tables at present in use. Provision is made for large boulders being run off to the side, while the medium-size and smaller stones, forming the greater proportion of the tailings, will be carried to the elevator by the shaking action of the sluice-box, as with the screen. The wash-dirt is tipped into the head of sluice-box direct from the dredge buckets, and thoroughly washed by water delivered from one, or, if necessary, two pipes running the full length of the box. The box is placed at an angle of 1.25 in. to the foot (the same pitch as the screen), driven by eccentric cam, to give the required motion. The space occupied at the lower end of the screen by the blind plate, 8 ft. in length, is in the box fitted with riffle-bars, with matting underneath, thus giving an extra gold-saving surface.

The more oxide copper contains, the less malleable it is; the same is true of any of the copper alloys. The presence or absence of oxide of copper in sterling silver determines the quality of the sheet metal as far as its working is concerned.

Wet Roads as a Check to Colliery Explosions.

T. H. Deakin in delivering the recent presidential address before the South Wales Institute of Engineers (reported by the *Colliery Guardian*) drew attention to the danger which seems to be inseparable from the method of uniting a large area of workings into one connected underground system, and suggested that it might be found possible to limit the area affected by colliery explosions of this nature by dividing the workings into sections separated from one another by a definite length of thoroughly watered road. The influence of watering in dusty mines has been shown over and over again to have been beneficial not only in the prevention of explosions of coaldust, but also in checking their progress through the pit. Several examples quoted from different collieries were advanced in proof of the necessity for and advantage of the above suggestion.

Mr. Deakin's suggestion does not refer so much to the general watering of the colliery roads as to the more thorough treatment of certain lengths, whereby the different working places of the colliery might be separated from one another by wet spaces over which coaldust explosions probably would not pass. By this means, even if such explosions cannot be altogether prevented, they might possibly be so localized that their effects would be materially reduced. It has been a noticeable feature of colliery disasters that the greatest loss of life has often taken place at a considerable distance from the original source of the explosion. If, in such cases, a section of the main heading leading to each district had been made thoroughly wet, there is a possibility that the loss of life would have been considerably less.

At the same meeting of the South Wales Institute there was exhibited a new colliery watering spray which seemed to possess capabilities for producing a condition of thorough wetness over a limited area, such as Mr. Deakin had in mind. This apparatus is simple in character, and so inexpensive that the cost of installation would be negligible. It consists merely of a small fan which is fixed to the end of a hose-pipe, and made to rotate by the pressure of the water. The jet is thus broken up into so fine a spray that it is scarcely conceivable that any dust could remain suspended in its proximity. Since accumulated evidence has proven the truth of the coaldust theory of the propagation of explosions in mines, attention should be given to any method whereby a colliery might be effectively divided into compartments, each of which would be isolated from the others by a length of gallery through which a dust explosion could not penetrate.

Of course, this is a matter which cannot be readily put to the test of experiment on any but a natural scale. It is, however, to be hoped that the proposal will be given careful attention by mining engineers; for although in England and the United States the Courrières system of connecting together several pits is not adopted, yet with the increasing depth of shafts there will be a tendency to work larger areas, and to increase the magnitude of the result which an explosion might be able to produce.

Coal-Cutting Machines.

Before installing coal-cutting machinery in a mine, there are several important points to be carefully considered. J. S. Ward, in a paper read before the National Association of Colliery Managers, at Wakefield, England, March 28, says that in working thin seams, we should remember:

1. The cost of mining per ton will be higher than in a thicker seam.

2. Unless the seam is most favorably situated, an undue proportion of coal will be lost in holing.

3. For a given output the area worked will be larger than for a thicker seam, and for a given length of holing less coal will be turned out.

The actual method of mining the coal depends on:

1. The character of the roof, as to whether it will part easily from the coal, or necessitates actual chipping, besides blasting, to break it away.

2. We must consider the amount of pressure on the seam, for in cases of tremendous weight of the overlying strata, the hand-mining method is the only practicable one.

3. The best part of the seam must be selected for holing. This may be either at floor level or roof, or at any intermediate stage in the section of the seam.

4. The nature of the coal, as regards cleavage, and whether it is strong or tender.

5. What is the quality of the coal and its possible market value as slack?

Consideration of the above conditions should be given before deciding as to the installation of mining machinery, and the expenditure of large capital in the establishment of a plant, where repairs, depreciation, etc., are constantly going on; however, where the conditions are at all favorable, there is no doubt that machines will effect a saving in thin coal seams.

In considering the economies of machine practice, it may be stated that:

1. Fewer roadways are needed; due to the increased output from a given face, and the rapid advance of the workings as well as the increased working area. This rapid working also facilitates putting in cross roads, thereby reducing the cost of maintenance and repairs.

2. The larger output per man in a given time, and the reduced tonnage rate paid as starting or filling price, reduces the cost of holing.

3. The regular and systematic advance of the face, requires the use of less timber, and the rapid advance of the face hardly allows the weight to settle down, before it is required to move forward, and therefore the cost of broken timber is reduced. The straight line of face generally facilitates the breaking away of coal.

4. The proportion of round coal is substantially increased, and the saleable value is considerably enhanced, which in a thin seam, often means the life or death of the mine.

5. Last, but perhaps most important; the machine does the dangerous and laborious part of the miners' work, and as a consequence there is greater safety to life and limb. Nothing can be comprehended more dangerous than when in the old method of undercutting, a miner lay practically his whole length under a huge block of coal, supposedly wedged, but liable any minute to slip at the back and crush him.

As to the necessary requisites of a coal-cutting machine, the following points may be considered essential:

1. It should be simple in construction, so that any intelligent operator can remedy minor defects.

2. It should be as handy as possible, combined with strength and durability.

3. It should be restricted as to weight, width, and length.

4. It should clean its holings as much as possible, and should be able to cut its own way under the coal.

5. It should be so designed that the cutters can be changed easily and quickly, and should have an adequate reserve of power.

[The use of machines requires careful study, and all phases of the problem including the power to use in driving the coal-cutters, should be taken up in detail, and all peculiar local conditions carefully considered if the maximum benefit is to be derived.]

"Babcock & Wilcox" types and "Hornsby" are most in evidence in western Australia among water tube boilers. In Victoria, the British tramway companies owning concessions for supply of power, lighting and tramways at Bendigo and Ballarat, have installed Stirling boilers. In the greater number of Australian mining camps steam boilers of the old Cornish Galloway types are unlikely to be seriously reduced in numbers by more modern steam generators.

Season-cracks in tubing are the result of too heavy "pinches" in drawing. The initial strain thus produced superinduces crystallization which, when it commences, weakens the metal and the tension pulls the metal apart. As the tension on the metal is transverse, the cracks take place longitudinally.

Australian Marble Deposits.

Chas. F. Summers has furnished the Commonwealth Government with a report on the ornamental marble deposits of New South Wales. He states that as a result of his researches he finds that the marble resources of the States are both varied and extensive, and offer a profitable field for investment, there being a good demand for the best class of stone in Australia and Great Britain.

The Borenore quarry, in the Orange district is, he says, most easily worked without the use of any special mechanical appliances, giving large sized blocks of good quality. The marble is extensively used in Sydney, and the demand far exceeds the supply at present available. This marble would find a ready sale all over the Commonwealth, and would be suitable for furniture-makers' uses.

At Caleula, also in the Orange district, there are two qualities, the light and dark. The light variety is very beautiful, being of a delicate light body color, with light green and red streaks, and it has been most effectively used in St. James' Church, Sydney, and in the Burns picture gallery at Parramatta. The dark variety is more suitable for mural decorations, being of a more compact body color, but rather dead or heavy in tone.

The town of Molong is practically built on marble, marble being used for street curbing and road-making. There is a great variety of variegated marbles to be found in the Molong district. The deposits are most extensive and there are to be found in the vicinity marbles equal to some of the ancient marbles found only in the excavations of Rome, and not to be found in any quarry now being worked in Europe. The Gamboola, more especially, would be equal to the highly-prized Porta Santa Antica.

The Caloola quarry is situated about eight miles from Newbridge in the Bathurst district, and is the only white marble deposit being worked in the State. It is giving a fair quality white marble, which promises to increase in purity when the quarry is more extensively opened up. It is gradually coming into use for architectural and monumental masons' work, for which purpose it is highly suitable. This is the only quarry where a steam-driven drill is being used for cutting out the blocks.

Rosedale and Fernbrook quarries are situated 17 miles from Bathurst. The Rosedale quarry has been extensively opened up, giving good marble very similar to the ancient Africano, and several other varieties of variegated marbles closely resembling the ancient marbles. There is a richness and vividness of color to be found in these marbles, not found in any of the other quarries inspected.

There is a good deposit of variegated marble about midway between Cudgegong and Rylstone, on Carwell Creek, the deposit to the south of the main road being of a gray marble, with white streaks, and the deposit on the north of the road a gray with large pink streaks and patches. Both varieties are near the main road, and would give large quantities, in large blocks, of very useful marble.

The finest deposit of colored marble in Mudgee district is to be found at Bucharoo, where it has been extensively quarried. It is the only quarry that has been properly worked and regularly opened out in a practical manner, and from which large blocks could be easily obtained. A magnificent collection of polished specimens of Australian marble is exhibited in the Department of Mines, Sydney, and it is proposed, as the result of numerous inquiries made by marble users in Europe for information relating to Australian marble, to make up an exhibit to be forwarded for display in London.

The Late George Lansell.

Bendigo men have always backed their own mines with money, says a correspondent of the London *Mining Journal*, but the district owes a great debt to the late George Lansell, the wealthiest mine owner in that city. Other plucky investors stood by some of its mines in adverse days until fortune smiled once more on them, but this veteran mine owner was the persistent force moving the industry onward by deep sinking and explorations, until his advancing years called for rest. He passed away at the age of 83 years. Mr. Lansell was born in Margate, England, and went to Australia in 1853. Arriving in Bendigo, he engaged in the manufacture of soap and candles. Many are the stories told of his tenacity in clinging to certain of Bendigo's mines through many years of ceaseless call paying and hopeless-looking unproductiveness, and of the great rewards that fell into his lap from profits after those lean years were passed.

One portion of the New Chum line of reef, known as Victoria Hill, has returned fortunes to its many owners and explorers from the earliest days of mining in Victoria. Here he acquired 180 yd. on the line of reef, paying for a mine that was believed to be exhausted the sum of £30,000. In a few months afterward it had returned him a profit of £180,000. This is "the 180" mine, which as early as 16 years ago was the deepest mine in the State. Mr. Lansell offered rewards to those who should first push their shafts deepest. But no owners could compete with him at this work.

The best results in melting aluminum are obtained by the use of the so-called spelter kettle. The products of combustion do not come in contact with the aluminum and there are fewer pin holes in the castings. It is less likely to overheat the metal than in ordinary crucible melting.

Telephones in Mines.

BY E. F. ROTH.*

The principal points to overcome in installing mine telephones are dampness, induction, vibration, and difficulties of installation.

In overcoming the first it is necessary, where wires run down shafts, to use lead-encased rubber-covered wire. This should be run or enclosed in an iron pipe of sufficient size; it will be found from experience that the small lumps that continually fall from the cage or hoistway will in a short time wear the lead cover to pieces; hence the iron pipe. Often, after reaching the foot of shafts it is desired to extend the line some distance into the mines; by separating the wires a sufficient distance (2 ft. is good practice), using No. 12 rubber-covered wire, the induction effect is minimized. For work in mines where electric traction or power feeders are installed, the distance should be increased.

The chief trouble with the major part of telephone installations in the mines is the utter disregard of conditions that are required to be met. The constant dampness, and the movement of the roof, as well as other mechanical injury that is apt to occur, are too often lost sight of. In installing work of this character, I have found it a good rule to consult the inside foreman or mine boss, and to go over the ground with him; wherever there is any chance of the line coming in contact with the roof, have the spot plugged for an insulator; a ½-in. square wooden plug is usually sufficient. In addition to these places the roof should be plugged every 20 ft., with sufficient distance between the pairs of plugs to prevent induction.

The instrument should be secured to a solid plank in a place that is selected for its freedom from moisture as well as for its convenience. By using No. 12 rubber-covered wire properly stretched and bound to insulators, there will be little or no trouble. The average expense of maintaining a system of six instruments is about $40 per year. This expense is necessitated by the purchase of new batteries, repairing breaks, etc. In some slopes it is found more practicable to run wires on the roof, especially if it be level; in other cases it will be found more practicable to run them on the side. The cars in running down the slope sometimes jump the track, the rope becomes tangled, and the line wires are apt to be torn and otherwise damaged.

One of the largest uses for cadmium is in the manufacture of sterling silver. The addition of 0.50 per cent. of cadmium imparts malleability to the alloy and prevents, to a certain extent, the formation of blisters. Sterling silver manufacturers now use cadmium in making sterling for rolling or for sand or plaster casting.

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THE ENGINEERING AND MINING JOURNAL

Contents.

*Illustrated.

THE BOARD OF DIRECTORS of the American Institute of Mining Engineers has given the secretary authority to replace, at half the regular selling price, all publications of the institute belonging to its members and destroyed in the recent disaster at San Francisco.

The Bisbee Consolidation.

The consolidation of four of the newer copper companies operating in the Bisbee district in Arizona, which is announced in our news columns, has been foreshadowed for some time. The properties of these companies run together; their stock ownership is largely identical; three of them, at least, have just reached the producing stage; and their operation as one company will probably be for the best interest of all. It will make no difference in the general management or the course of development of the properties. The consolidated company will probably be a producer of much importance before the close of the current year. We may add that its ownership is largely in the Lake Superior county.

The World's Iron and Steel.

The accompanying tables give the world's production of pig iron and steel in 1904 and 1905, according to the statistics collected for THE MINERAL INDUSTRY, Volume XIV. In most cases the figures are official, but for some countries it has been necessary to estimate, since the collection of official statistics is a slow process in them. The figures are reduced to metric tons, as a common standard, for purposes of comparison.

The pig-iron production was as follows:

	1904.	1905.	Changes.
United States	16,760,986	23,360,258	I. 6,599,272
Germany	10,103,941	10,987,623	I. 883,682
Great Britain	8,699,661	9,746,221	I. 1,046,560
Three chief producers	35,564,588	44,094,102	I. 8,529,514
Austria-Hungary	1,369,500	1,372,300	I. 2,800
Belgium	1,307,399	1,310,290	I. 2,891
Canada	274,777	475,491	I. 200,714
France	2,999,787	3,077,000	I. 77,213
Italy	27,600	31,300	I. 3,700
Russia	2,978,325	2,125,000	D. 853,325
Spain	386,000	383,100	D. 2,900
Sweden	528,525	537,200	I. 8,675
All other count's.	633,000	655,000	I. 22,000
Total	46,069,501	54,060,783	I. 7,991,282

The total increase in 1905 was 17.3 per cent. The larger part of the gain was made in the United States, though Germany and Great Britain both showed large increases. The three leading producers in 1905 made 81.6 per cent. of the total; the United States alone making 43.2 per cent. The make of pig iron in the United States exceeded that of Great Britain and Germany combined by 2,626,414 tons.

The production of steel was as follows:

	1904.	1905.	Changes.
United States	13,746,051	20,354,291	I. 6,608,240
Germany	8,930,291	10,066,553	I. 1,136,262
Great Britain	5,107,309	5,983,691	I. 876,382
Three chief producers	27,783,651	36,404,535	I. 8,620,884
Austria-Hungary	1,193,000	1,188,000	D. 7,000
Belgium	1,069,880	1,023,500	D. 46,380
Canada	151,165	403,449	I. 252,284
France	2,080,354	2,110,000	I. 29,646
Italy	113,800	117,300	I. 3,500
Russia	2,811,948	1,650,000	D. 1,161,948
Spain	193,759	237,864	I. 44,105
Sweden	333,522	358,100	I. 24,578
All other count's.	415,000	426,000	I. 11,000
Total	36,148,079	43,918,748	I. 7,770,669

The total increase was 21.4 per cent. The three chief producers in 1905 made 82.9 per cent. of the total; the United States alone, 46.4 per cent. The ratio of steel to pig iron production was 91.6 in Germany; 87.1 in the United States; 60.9 in Great Britain; and 81.2 for the world.

The changes shown in these tables indicate the activity of the iron and steel trade almost everywhere during 1905. The great increase in the United States was practically all absorbed by an unprecedented demand; while in Germany and Great Britain there was a large export business, as well as an active home trade. The only producing country showing a large decrease was Russia, where political disturbances and unsettled conditions almost put an end to industrial activity for a large part of the year.

The large proportionate increase in Canadian output was due to the successful operation of the large plants lately built in that country. In most of the European countries the growth is limited by the capacity of existing plants.

From present indications, the current year will be another of large production and active iron and steel markets.

Lime Roasting of Galena.

The paper which is published on a subsequent page will become one of the classics of metallurgical literature, it being the first in which Huntington and Heberlein have communicated their own account of the process known by their names, and their views as to its future. The Huntington-Heberlein process has already attained a world-wide application, and has achieved remarkable commercial results, which have been previously outlined to our readers as fully as possible. It has led to the invention of similar, perhaps improved, methods, comprising a new system of desulphurizing lead sulphide ores, that we have classified as "lime roasting." In this it is recognized

that the metallurgy of lead has made the greatest advance in its recent history; possibly the greatest advance since 1871, when the metallurgists of Eureka, Nev., inaugurated the mechanical improvements and progress in furnace design and construction, and Eilers put the compounding of charges upon a scientific basis, which raised lead smelting from a primitive art to the high state of development that was fully attained about 1891.

During this period of rapid, even sensational, development in the smelting process proper, the art of roasting galena ore remained at a standstill, or to put it more harshly actually retrograded for a while when the wasteful process of slag-roasting was in vogue, and then reverting to the original practice remained up to five years ago a costly, laborious and extravagant part of the process of extracting lead from its sulphide ore. The discovery of Huntington and Heberlein removed all fear of loss of lead and silver by volatilization, showed the way toward reduction in the direct cost of roasting, and distinctly led to an important saving in the actual smelting of the ore in the blast furnace. But even if their invention had not achieved the remarkable commercial results which appeal most strongly to the heads and hearts of the captains of industry, it would have been hailed as a high contribution to humanitarian progress, because of its great reduction in liability to that dreaded affection—lead poisoning—of the workers in lead smelteries, and the lightening of the hardest labor in the works. There is no doubt whatever, from the statistical reports of works, wherein this process has been installed, that lead poisoning has been greatly reduced. And as to the character of the labor required of the men, a glance from the sweating roaster, working his heavy rabble in the old reverberatory furnace, to the comfortable attendant of the gently operating lime-roasting pot, is sufficient to impress even the tyro.

Huntington and Heberlein in originally describing their process (in their patent specification) did not fully understand its reactions. Possibly they do not yet understand them; at least, in their present paper, they do not throw much new light upon this phase of the matter; but it is doubtful if anyone does fully understand them. Nor did they anticipate the improvements which would quickly be made on their process; we are disposed to regard direct blowing as a more distinct improvement than they recognize. Moreover, there will be undoubtedly further improvements, possibly soon; the large amount of experimental work on lime-roasting that is now being carried on in the metallurgical laboratories may be expected to bear some fruit besides determining the chemistry of the process. But in all, it must be recognized that the original invention of lime roasting, its introduction into practice and its adaptation to various conditions came from Huntington and Heberlein, and to them belongs the credit for this important improvement in the metallurgy of lead.

The Anaconda Report.

Formerly the Anaconda Copper Company, under the inspiration of the late Hamilton Smith, used to publish an annual report which in the fulness and detail of the information communicated to its stockholders excelled the reports of most mining companies at that time. Since the Amalgamated Copper Company acquired control of it, in 1899, it has made no report until last week, when to the general surprise a considerably detailed statement of its operations in 1905 was made public. It is to be hoped that this will be the forerunner of a regular series of annual reports, not only of the Anaconda, but also of the other companies which are owned or controlled by the Amalgamated.

The production of copper during the year was 95,443,730 lb.; of silver, 3,116,880 oz.; of gold, 19,165 oz. In its output of copper, the Anaconda largely surpasses the Calumet & Hecla, but itself is probably surpassed by the Boston & Montana. The output was derived from 1,626,306 tons of ore and other material, which yielded an average of about 60 lb. of copper, and 2 oz. silver per ton. In 1898, the year of the last previous report, the averages for ore were 85 lb. of copper and nearly 3.5 oz. of silver. The average cost of mining, including development work, was about $3.50 per ton in 1905, against $3.77 in 1898—no great reduction, but in view of the deeper mining somewhat better than appears at first sight, while, moreover, an allowance is included for depreciation of plant. In 1897, however, the cost of mining was only $3.46 per ton. The cost of reduction in 1905 was about $2.50 per ton, including depreciation, and presumably rental of the works, leased from the Washoe Copper Company. In 1897, concentrating came to about 75c. per ton, smelting to $1.85, and converting to 76.5c., total, $3.365, but in this figure no allowance is made either for depreciation, or for the investment in plant, wherefore a comparison which would show just what has been accomplished by the new reduction works is impossible.

However, President Ryan throws some light on this subject by the statement that the Washoe works treated 1,626,306 tons of material, including ore from the mines, together with slags, slimes and flue dust from the old works at a difference, after paying rental, of $1.5886 per ton in decreased operating cost and increased metal extraction as compared with the old works in the last year of their operation. This saving amounted to $2,583,549 in the aggregate. Although the cost of the new works was about $8,000,000, their construction was plainly justified, the return on the investment being upward of 30 per cent. Also, although the first cost of the plant was high ($3 per ton on the capacity, or rather ore treated, in 1905) the benefit of the large outlay is clearly apparent in the high efficiency, which manifests itself largely in the increased extraction of metals.

The mines in 1905 produced 1,543,316 tons of ore, wet weight, of which 61,149 tons of smelting ore remained on hand at the end of the year, and 1,470,694 tons were treated at the works. The works treated for all companies during the year 2,650,868 tons of material, of which 1,626,306 was for the account of the Anaconda company. The great value of the recent discoveries of ore in the 2200- and 2400-ft. levels is frankly admitted, and it is considered that they assure the life of the mines for many years to come. On the whole the report is very frank and straightforward, and communicates more information as to the operations of the company than most companies do, which is highly commendable.

It is impossible to make any very useful comparisons, because corresponding figures for the previous year are unavailable. It is clear, however, that the cost of production per pound of copper is still relatively high, notwithstanding the great economies resulting from the new reduction works, which is to be attributed largely to the comparatively low grade of the ore. The cost of production in 1905 was upward of 10c. per pound of copper. In this respect the showing of the company is disappointing.

The Huntington-Heberlein Process.

BY THOMAS HUNTINGTON AND FERDINAND HEBERLEIN.

This process for roasting lead sulphide ores has now fairly established itself in all parts of the world, and is recognized by metallurgical engineers as a successful new departure in the method of desulphurization. It offers the great advantage over previous methods of being a more scientific application of the roasting reactions (of the old well-used formulæ $PbS + 3O = PbO + SO_2$ and $PbS + PbSO_4 + 2O = 2PbO + 2SO_2$) and admits of larger quantities being handled at a time, so that the use of fuel and labor are in proportion to the results achieved, and also there is less waste all round in so far as the factors necessary for the operation—fuel, labor and air—can be more economically used. The workman's time and strength are not employed in laboriously shifting the ore from one part of the furnace to another with a maximum amount of exertion and a minimum amount of oxidation. The fuel consumed acts more directly upon the ore during the first part of the process in the furnace and its place is taken by the sulphur itself during the final and blowing stage, so that during the whole series of operations more concentrated gases are produced and consequently the large excess of heated air of the old processes is avoided to such an extent that the gases can be used for the production of sulphuric acid.

With a modern well-constructed plant practically all the evils of the old hand-roasting furnaces are avoided, and besides the notable economy achieved by the H-H process itself, the health and well-being of the workmen employed are greatly advanced, so that where hygienic statistics are kept it is proved that lead poisoning has greatly diminished. It is only natural therefore that the H-H process should have been a success from the start, popular alike with managers and workmen once the difficulties inseparable from the introduction of any new process were overcome.

Simple as the process now appears, however, it is the result of many years of study and experiment, not devoid of disappointments and at times appearing to present a problem incapable of solution. The first trials were made in the smelting works at Pertusola, Italy, as far back as 1889, where considerable sums were devoted every year to this experimental work and lead ore roasting was almost continuously on the list of new work from 1875 on.

It may be interesting to mention that at this time the Montevecchio ores (containing about 70 per cent. lead and about 15 per cent. sulphur, together with a certain amount of zinc and iron) were considered highly refractory to roast, and the only ores approved of by the management of the works at this date were the Monteponi and San Giovanni first-class ores (containing about 80 per cent. lead), and the second-class carbonates (with at least 60 per cent. lead and 5 per cent. sulphur). It must be noted that a modified Flintshire reverberatory process was in use in the works, which could deal satisfactorily only with this class of ore, so that, as these easy ores diminished in quantity every year and their place was taken by the "refractory" Montevecchio type, the roasting problem was always well to the front at the Pertusola works.

It may be asserted that almost every known method of desulphurization was examined and experimented upon on a large scale. Gas firing was exclusively used on certain classes of ores for several years with considerable success, and revolving furnaces of the Brückner type—gas fired—were also tried. Although varying degrees of success were obtained, no really great progress was made in actual desulphurization; methods were cheapened and larger quantities handled at a time, but the final product—whether sintered or in a pulverulent state—seldom averaged much under 5 per cent sulphur, while the days of the old "gray slags" (1 per cent. to 2 per cent. sulphur) from the reverberatories totally disappeared, together with the class of ores which produced them.

During the long period of these experiments in desulphurization various facts were established:

(1) That sulphide of lead—especially in a pulverulent state—could not be desulphurized in the same way as other sulphides, such as sulphides of iron, copper, zinc, etc., because if roasted in a mechanical furnace the temperature had to be kept low enough to avoid premature sintering, which would choke the stirrers and cause trouble by the ore clogging on the sides and bottom of the furnace. If, however, the ore was roasted in a "dry state" at low temperature, a great deal of sulphur remained in the product as sulphate of lead, which was as bad for the subsequent blast-furnace work as the sulphide of lead itself. When air was pressed through molten galena—in the same way as through molten copper matte—a very heavy volatilization of lead took place, while portions of it were reduced to metal or were contained as sulphide in the molten matte, so that a good product was not obtained.

(2) That no complete dead roast of lead ores could be obtained unless the final product was thoroughly smelted and agglomerated.

(3) That a well roasted lead ore could be obtained by oxidizing the PbS with compressed air, after the ore had been suitably prepared.

(4) That metal losess were mainly due to the excessive heat produced in the oxidation of PbS to PbO, and other sulphides present in the ore.

It was by making use of these facts that the H-H roasting process was finally evolved, and by carefully applying its principles it is possible to desulphurize completely the ore to a practically dead roast of under 1 per cent. sulphur; in practice, however, such perfection is unnecessary and a well agglomerated product with from 2 to 2.5 per cent. sulphur is all that is required. During some trials in Australia, where a great degree of perfection was aimed at, a block of over 2000 tons of agglomerated, roasted ore was produced containing 1 per cent. sulphur (as sulphide); as the ores contained an average of about 10 per cent. Zn, this was a very fine result from a desulphurization point of view, but it was not found that this 1 per cent. product gave any better results in the subsequent smelting in the blast-furnace than later on a less carefully prepared material containing 2.5 per cent. sulphur.

In the early stages of experiment the great difficulty was to obtain agglomeration without first fusing the sulphides in the ore, and turning out a half-roasted product full of leady matte. Simple as the thing now is, it seemed at times impossible to avoid this defect and it was only by a careful study of the effects of an addition of lime, Fe_2O_3 or Mn_2O_3, and their properties that the right path was struck. Before the introduction of the H-H process lime was only used in the reverberatory process (Flintshire and Tarnowitz) to stiffen the charge, but as Percy tells us that after its addition the charge was glowing, it must have had a chemical as well as a mechanical effect. In recognition of this fact fine caustic lime or crushed limestone was mixed with the ore *before* charging it into the furnace and exposing it to an oxidizing heat.

It was thought probable that a dioxide of lime might be temporarily formed, which in contact with PbS would be decomposed immediately after its formation, or that the CaO served as *Contactsubstanz* in the same way as spongy platinum, metallic silver or oxide of iron. As $CaSO_4$ and not $CaSO_3$ is always found in the roasted ore, this may prove that CaO is really a contact substance for oxygen (see: W. M. Hutchings, the JOURNAL, Oct. 21, 1905, Vol. LXXX, p. 726). The fact that the process works equally well with Fe_2O_3 instead of CaO speaks against the theory of plumbate of lime. Whatever theory may be correct, the fact remains that CaO assists the roasting process and that by its use the premature agglomeration of the sulphide ore is avoided. A further advantage of lime is that it keeps the charge more porous and thus facilitates the passage of the air.

The shape and size of the blowing apparatus best adapted for the purpose in view occupied many months; starting from very shallow pans or rectangular boxes several feet square with a few inches of material over a perforated plate, it grad-

ually resolved itself into the cone-shaped receptacle—holding about a ton of ore—as first introduced together with the process. In later years and in treating larger quantities a more hemispherical form has been adopted, containing up to 15 tons of ore.

It is probable about eight years were employed in actually working out the process before it was introduced on any large scale at Pertusola, but by the end of 1898 the greater part of the Pertusola ores were treated by the process. Its first introduction to any other works was in 1900, when it was started outside its home for the first time at Braubach (Germany). Since then its application has gradually extended, proceeding from Europe to Australia and Mexico and finally to America and Canada, where recognition of its merits was more tardy than elsewhere. It is now practically in general use all over the world and is recognized as a sound addition to metallurgical progress. It is doubtless only a step in the right direction and with its general use a better knowledge of its principles will prevail, so that its future development in one direction or another, as compared with present results, may show some further progress.

The present working of the H-H process still follows practically the original lines laid down and by preliminary roasting in a furnace with lime, oxide of iron or manganese (if not already contained in the ore), perpares the ore for blowing in the converter. Mechanical furnaces have been introduced to the entire exclusion of the old hand-roasters, and the size of the converters has been gradually increased from the original one-ton apparatus successively to 5-, 7- and 10-ton converters; at present some for 15 tons are being built in Germany and will doubtless lead to a further economy.

The mechanical furnace at present most in use is a single-hearth revolving furnace with fixed rabbles, the latest being built with a diameter of 26½ feet and a relatively high arch to ensure a clear flame and rapid oxidation of the ore. The capacity of these furnaces varies, of course, with the nature of the ores to be treated, but with ordinary lead ores (European and Australian practice) of from 50 per cent. to 60 per cent. lead and 14 per cent. to 18 per cent. sulphur, the average capacity may be taken at about 50 to 60 tons of crude ore per day of 24 hours. The consumption of coal with a well constructed furnace is very low and is always under 8 per cent.—6 per cent. being perhaps the average. These furnaces require very little attention, being automatic in their charging and discharging arrangements.

The ore on leaving the furnace is charged into the converters by various mechanical means (Jacob's ladders, conveyors, etc.). The converter charge usually consists of some hot ore direct from the furnace, on top of which ore is placed which has been cooled down by storage in bins or by the addition of water. The converter is generally filled in two charges of five tons each, and the blowing time should not be more than 4 to 6 hours. The product obtained should be porous and well agglomerated, but easily broken up; tough melted material being due to an excess of silica and too much lead sulphide. Attention therefore to these two points (good preliminary roasting and correction of the charge by lime) obviates this trouble. This roasted ore should not contain more than about 1.5 to 2 per cent. sulphur, and in a modern blast-furnace gives surprisingly good results, the matte-fall being in most cases reduced to nothing, and the capacity of the furnace is largely increased, while the slags are poorer.

If the converter charge has been properly prepared, the blowing operation proceeds with the greatest smoothness and requires very little attention on the part of the workmen, the heat and oxidation rise gradually from the bottom and volatilization losses remain low, so that it is possible, if desired, to produce hot concentrated sulphurous gases suitable for the manufacture of sulphuric acid.

Besides the actual economy obtained in roasting ores by the process, a great feature of its success has been the remarkable improvement in smelting and reducing the roasted ore as compared with previous experience. This is due to the nature of the roasted material, which, besides being much poorer in sulphur than was formerly the case, is thoroughly porous and well agglomerated and contains—if the original mixture is properly made—all the necessary slagging materials itself, so that it practically becomes a case of smelting slags instead of ore, and to an expert the difference is evident.

Experience has shown that on an average the improvement in the capacity of the blast-furnace may be taken at about 50 to 100 per cent., so that in works using the H-H process—after its complete introduction—about half the blast-furnaces formerly necessary for the same tonnage were blown out. The matte-fall has become a thing of the past, so that, except in those cases where some matte is required to collect the copper contained in the ores, lead matte has disappeared and the quantity of flue-dust as well as the lead and silver losses have been greatly reduced.

Referring to the latest history of the H-H process, and the theory of direct blowing, it may be remarked—putting aside all legal questions—that the idea, metallurgically speaking, is attractive, as it would seem that by eliminating one half of the process and blowing the ores direct without the expense of a preliminary roast a considerable economy should be effected. Upon examination, however, this supposed economy and simplicity is not at all of such great importance, and in many cases, without doubt, would be retrogressive in lead ore smelting rather than progressive. When costs of roasting in a furnace are reduced to such a low figure as can be obtained by using 50-ton furnaces and 10- to 15-ton converters, there is very little margin for improvement in this direction. From the published accounts of the Tarnowitz smelting works (the JOURNAL, Sept. 23, 1905, Vol. LXXX, p. 535) the cost of mechanical preliminary roasting cannot exceed 25c. per ton, so that even assuming direct blowing were as cheap as blowing a properly prepared material, the total economy would only be the above figure of 25c.; but this is far from being the case.

Direct blowing of a crude ore is considerably more expensive than dealing with the H-H product, because of necessity the blowing operation must be carried out slowly and with great care so as to avoid heavy metal losses, and whereas a pre-roasted ore can be easily blown in four hours and one man can attend to two or three 10-ton converters, the direct blowing operation takes from 12 to 18 hours and requires the continual attention of one man. In the first case the cost of labor would be: One man at say $3 for 50 tons (at least), i. e. 6c. per ton, and in the second case one man at $3 for 10 tons (at the best), i. e. 30c., a difference in favor of pre-roasting of 24c., so that any possible economy would disappear. Furthermore, as the danger of blowing upon crude sulphides for 12 or 18 hours is greater as regards metal losses than a quick operation of four hours, it is very likely that instead of an economy there would be an increase in cost owing to a greater volatilization of metals.

These remarks refer to ordinary lead ores with say 50 per cent. lead and about 14 per cent. sulphur. With ore, however, such as are generally treated in the United States the advantages of pre-roasting are still more evident. These ores contain about 10 to 15 per cent. lead, 30 to 40 per cent. sulphur, 20 to 30 per cent. iron, 10 per cent. zinc, 5 per cent. silica, and lose the greater part of the pyritic sulphur in the preliminary roasting, leaving the iron in the form of oxide, which in the subsequent blowing operation acts in the same way as lime. For this reason the addition of extra fluxes, such as limestone, gypsum, etc., to the original ore is not necessary and only a useless expense.

In certain exceptional cases and with ores poor in sulphur, direct blowing might be applicable, but for the general run of lead ores no economy can be expected by doing away with the preliminary roast.

Bendigo (Victoria) lode mines appear to have entered upon a new era of prosperity. Production is steadily increasing, and prospecting new ground on old and well-known lines of reef keeps pace with the accession of popularity which this field enjoys.

Colliery Notes.

Care should be observed in placing direct-current motors where there is risk of gas; for the explosive may be ignited by sparking or heat.

Not only does moisture in coal cause it to crumble on exposure to the air, but each per cent. of moisture present, means 20 lb. less fuel for each ton of coal.

A coal that runs high in moisture, will usually break or crumble on exposure to the air; this slacking being due to a loss of moisture from the composition of the coal.

The safest cable to use for direct-current work in the mines, is the concentric cable with double galvanized iron wire armoring, and for three-phase machines, the three-core cable with similar protection.

Experience and careful observation have shown that the wear on a rope increases with the speed. It is therefore better, if more work is to be done, to increase the load and run at the same speed, than to carry the same load at a greater speed.

In the conveyance of compressed air, it should be remembered that the efficiency is diminished practically as the diameter of the pipes is decreased, which means, of course, that the pipes should be as large as conveniently practicable, with commodious receivers adjoining the air compressors.

The fixed carbon of a coal will not evaporate as much water as an equal weight of volatile combustible matter when properly fired, however, in practice, so much of the latter is lost that in determining the steam value of a coal, we may assume the carbon to be the only useful constituent.

At a mine where the generating plant is only of moderate size, direct current should be selected as the system of electric supply. The high efficiency, simplicity of its circuit, involving but two wires, and the ease with which motors are started with heavy loads are favorable points to be considered.

The points in favor of compressed air are: Immunity from danger; simplicity of working; assistance to ventilation. The quantity of air given to aid ventilation, however, is very small as compared with the volume of air needed. In the use of compressed air there is no danger of sparking, or cables being cut, as in electric transmission lines.

It is claimed that from 70 to 90 per cent. of the deaths resulting from an ordinary coal mine explosion, are due to the toxic influence of carbon monoxide, produced by the partial oxidation of coal dust ignited by the explosive combustion of the marsh gas. Therefore, if coal dust is the real producer of toxic gas, it follows that this dust must be removed, if the dangers from explosions are to be reduced.

In electric lighting of underground workings, where 500 volts are available, it is best to use a motor generator and transform down to 110 volts. In a very large mine, in order to not be obliged to employ too large a cross section of cable, 220 volts may be used. If 220 volts alternating current is used it should be remembered that this voltage has proved dangerous, and many accidents have occurred (some fatal) due to touching the wires of such installations.

It is of vital importance to the mine manager, where coal-cutters are used, that he adopt the right size of cut. If conditions are favorable, the points to be considered are: Length of face, and yield in tons per cubic yard; number of gateways; quantity each man can normally fill; and number of men in face. The size of cut is very important, for in a face of stipulated length if an extra 6 in. be cut, it may cause a shift's delay in clearing the face.

Compressed air is placed at a great disadvantage when compared with electricity, due to the low efficiency of transmission. Under favorable conditions only 35 to 40 per cent. of the power expended upon the air-compressing pistons, is recovered as useful work by the air motor. The remaining 60 to 65 per cent. is lost in compression, transmission, and in the air motor. The efficiencies, no doubt, are often less than 30 or 40 per cent., but favorable conditions should give that as an average.

In deciding on the size of hoisting rope to install, allowance must be made for the shock and extra strain due to starting the load. Experiments have proven that the starting stress is about three times the actual load. The weakest part of the rope, after being used for some time, is that portion nearest to where it is fastened to the cage. Every few months, this three or four feet of rope nearest to the cage fastening, should be cut off, a little more wrap let out from the drum, and the rope reastened.

A coal that contains much iron usually gives a fusible ash and one which has a tendency to clinker. When such a coal is used for steam purposes where the heat is very high, the ashes will often fuse into a vitreous mass and accumulate upon the grate bars, thus excluding the passage of necessary air. The advisability of using any special coal is often decided by the clinkering character of the ashes. A coal whose ashes are nearly pure white and free from lime and silica is best to use when conditions prohibit clinkering.

In considering a turbine pump, it is impossible to fix any hard and fast rule about the relation of capacity to head, but, generally speaking, at ordinary speeds, to obtain the best results with a pump of moderate price, the number of gallons per minute should be about equal to the number of feet in total head. As an example, a pump designed to deliver 500 gal. per min. against a head of 500 ft. would give an efficiency of not less than 72 per cent., while the best efficiency possible with a pump designed to deliver 50 gal. against the same head would only be about 60 per cent. In the latter case where the efficiency is so reduced it would be more economical to install and use a good type of reciprocating pump.

The use of electric lights in gassy parts of a mine is dangerous for several reasons, viz.: (1) Fire from defective fittings or bad connections; (2) sparks from damaged cables; (3) risks from broken globes; (4) shock from line fittings or damaged cables. The following rules for making the installation safe should be observed: (1) Earth connections must be perfect; (2) leakage must be kept to a minimum; (3) fuses and circuit-breakers must be kept in order; (4) all electric wires must not touch signaling wires; (5) the lights underground should not be of more than 16 c.p., for the larger the film the slower it cools off and the more liable it is to ignite gas.

In running an outcrop survey for the purpose of plotting on a mine map, or for calculating the coal area, the workable cover line should also be carefully located. Twelve feet above the top of the coal is only a fair amount of cover to consider, and in some cases, more than this is required. Where the bottom of the coal seam is alone located, this does not give sufficient data either to calculate the workable coal area, or to allow the superintendent to know where the workings are approaching too near to daylight, and consequently too close to water, bad roof, etc. In reporting on a coal property, the total coal area and the actual workable acreage should both be given.

If we consider that an ordinary steel rope will last its normal life when running around a sheave or drum, whose diameter is 100 times the diameter of the rope (and this is practically true), then a rope running over a sheave whose diameter is 68 times the rope diameter, will last only three-fourths as long. Likewise by experiment if the rope runs over a sheave whose diameter is 48 times the rope diameter, the life of the rope is cut in half, and a sheave with 36 times the rope diameter will reduce the life of the rope to 25 per cent of what it was when the two diameters were to each other as 1 to 100. Interesting tables could thus be formed whose rules would be of much benefit although the number of strands in the cable, wires in each strand, kind of core, etc., as well as the speed of hoisting, determine the flexibility of any rules that may be formed.

Mineral Production of British Columbia in 1905.

BY E. JACOBS.*

The following information relative to the mineral production of British Columbia in 1905 has been taken from the Annual Report of the Minister of Mines for that Province:

Under the head "Progress of Mining" Provincial Mineralogist Wm. Fleet Robertson, remarks: "The gross value of the mineral production of the Province during the year 1905 was $22,461,235, the largest output ever made by the mines of the Province, and an increase over the immediately preceding year of $3,483,966, or 18.4 per cent., while it was an increase over the year 1903 of over 28 per cent. An analysis of the returns shows, however, that this increase was confined to certain districts—Southeast Kootenay, the Boundary, and Nelson and Yale mining divisions—the remaining districts having shown a more or less marked decrease. The greater part of the increase was in Southeast Kootenay and Boundary districts; in the former the tonnage of ore mined increased 121 per cent. and the value of the product 135 per cent. over that of 1904, while in the Boundary the tonnage increased 20 per cent. and the value of the output 53.6 per cent. Slocan district showed the most marked decrease, its output having been little better than half of that of 1904. Rossland camp about held its own; its tonnage of ore increased about 5 per cent., but the values per ton diminished somewhat on the average, owing to the working of low-grade ores by concentration methods. The tonnage of ore mined in the whole Province, exclusive of coal, was this past year 1,706,679 tons, some 245,070 tons, or 16 per cent., greater than in 1904, and 85 per cent. greater than in 1901. The number of mines from which shipments of ore were made in 1905 was 146, and of these only 79 properties shipped over 100 tons each—practically no change from the position in 1904. Some 38 mines each shipped in excess of 1000 tons, of which seven were in the Nelson division, four in the Slocan, seven in Trail (Rossland), and eleven in the Boundary."

The following table exhibits the quantities and values of minerals produced in 1905:

	Quantities.	Values.
Gold, placer.....Oz.	48,465	$ 969,300
Gold, lode.....Oz.	238,660	4,933,102
Total gold.....Oz.	287,125	$ 5,902,402
Silver.....Oz.	3,439,417	1,971,818
Lead.....Lb.	56,580,703	2,399,022
Copper.....Lb.	37,692,251	5,876,222
Coal.....Tons.	1,384,312	4,152,936
Coke.....Tons.	271,785	1,358,925
Other materials.....		800,000
Total value.....		$22,461,325

The number of men employed in 146 metalliferous shipping mines was 3596—2394 below and 1202 above ground—and in 24 non-shipping mines, 114—76 below and 38 above—making a total of 7310 men.

The tons used are long tons, of 2240 lb. A comparative table shows value of production for three years as follows:

	1903.	1904.	1905.
Gold, placer.. ...	$1,060,420	$1,115,300	$ 969,300
Gold, lode....	4,812,616	4,589,608	4,933,102
Total gold.	$5,873,036	$5,704,908	$5,902,402
Silver	1.521,472	1,719,516	1.971,818
Lead....	689,744	1,421,874	2,399,022
Copper.....	4,547,535	4,578,037	5,876,222
Coal.....	3,504,582	3,760,884	4,152,936
Coke.....	827,715	1,192,140	1,358,925
Other materials..	531,870	600,000	800,000
Totals.....	$17,495,954	$18,977,359	$22,461,325

The value of the production by districts and mining divisions is shown in the following table:

	Divisions.	Districts.
Cariboo District.....		$ 406,000
Cariboo Division.....	$ 300,000	
Quesnel Division.....	96,000	
Omineca Division.....	10,000	
Cassiar District.....		504,372
Kootenay, East, District.....		5,339,154
Kootenay, West, District....		5,421,859
Ainsworth Division.....	100,273	
Nelson Division.....	532,564	
Slocan Division.....	970,544	
Trail Creek Division..... ..	3,672,828	
Other parts.....	145,650	
Lillooet District.....		32,584
Yale District.....		6,483,504
Osoyoos, Grand Forks and Greenwood Divisions....	6,356,410	
Similkameen Division.....	1,533	
Yale.....	125,561	
Coast Districts (Nanaimo, Alberni, West Coast of Vancouver Island, Victoria)....		4,273,852
Total.....		$22,461,325

Comparing 1905 values with 1904, two districts showed large gains: East Kootenay, $2,128,581, and Yale, $2,293,223. Four showed decreases: The Coast, $428,827; West Kootenay, $384,211; Cariboo, $68,600, and the Cassiar, $54,201. The Lillooet was practically the same in both years.

Summarized from the comments of the Provincial Mineralogist are the following notes:

Coal—The collieries in the Province actually producing coal in 1905 were those of the Western Fuel Company at Nanaimo, and of the Wellington Colliery Company at Extension and Comox, all on Vancouver Island; and in the Crow's Nest Pass, Southeast Kootenay, those of the Crow's Nest Pass Coal Company at Michel, Fernie and Carbonado. The gross output of coal for the year was 1,825,832 tons, of which 1,202,971 tons were sold as coal, 441,520 tons used in making coke, and the remainder either sold locally or used under the companies' boilers. Vancouver Island collieries produced 993,883 tons and Crow's Nest Pass collieries 831,933 tons. Sales of coal in Canada totalled 529,271 tons, while exports to the United States were 673,700 tons. Coke sales in Canada were 150,454 tons, and exports to the United States 115,637, together 268,091 tons. The balance was added to stock.

Gold—The production of placer gold was the smallest in seven consecutive years, the falling off being attributable to a very dry summer preceded by a winter with little snow, with a resulting decreased supply of water for hydraulicking.

The increase in the quantity of lode gold produced—$343,494, or about 7½ per cent.—was due entirely to the larger tonnage of gold-bearing copper ore smelted in the Boundary district. The greater part of the lode gold produced was found in combination with copper; in fact, only 11 per cent. of the total produced in 1905 was from stamp mills, and even in these mills about half the values were obtained in concentrates, which were afterward smelted.

Silver—About 70 per cent. of the silver produced was found associated with lead, the remainder having been chiefly in conjunction with copper ores. The production of 3,439,417 oz., valued at $1,971,818, was the largest output the Province has made since 1901. The increase was due primarily to the extensive working in 1905 of the galena ores, low grade in silver, of the Fort Steele district of East Kootenay, which district showed an increased production of nearly 550,000 oz.; and secondly to the increased tonnage of the large copper mines in the Boundary and the working of smaller but higher grade silver-gold properties, these together resulting in an increased silver production of about 385,000 oz. in that district.

Lead—The production of lead was the greatest ever made in the Province with the exception of that of 1900. The increase over 1904 was about 54 per cent. The output from the Fort Steele district was 86.1 per cent of the whole; the Slocan produced only about one-half of its 1904 output, and one-third of that of 1901.

The bounty on lead offered by the Dominion Government was responsible for the production of lead in East Kootenay, but it apparently had no effect in stimulating production in the Slocan district.

Copper—The output of copper was the greatest ever made by the Province—an increase of 5½ per cent. over that of 1904. The increase was due entirely to the larger tonnage of the Boundary district, all other important districts having shown a falling off in production. The production of the several districts in 1904 and 1905 was as under:

	1904.	1905.
Boundary district.....	22,066,407 lb.	27,670,644 lb.
Rossland district.....	7,119,876 lb.	5,800,294 lb.
Coast district.....	5,960,593 lb.	3,437,236 lb.
Yale-Kamloops district	328,380 lb.	680,808 lb.
Nelson district.....	220,500 lb.	92,663 lb.
Other districts.....	14,372 lb.	10,606 lb.
Totals.....	35,710,128 lb.	37,692,251 lb.

The average copper assays of the ores of the several camps, based upon copper recovered, were as follows: Boundary, 1.52 per cent.; Rossland. 0.90 per cent.; Coast, 2.81 per cent.

Iron Ore—There was no iron ore mined in 1905. For the small quantity formerly used as a flux in smelting lead, an impure iron ore, carrying values in the precious metals, has been substituted.

*Editor *British Columbia Mining Record.*

Zinc Ore—In 1905, for the first time in the Province, there were sales of zinc ore important enough to be recorded. Approximately, 9413 tons of zinc ore and concentrates were sold, having a value at point of shipment of about $139,200. Almost all of this came from the Slocan district, but was not all mined in 1905, sales having included concentrates which had accumulated but for which there was no market before.

Plants for the elimination from zinc ores or concentrates of minerals undesirable in zinc smelting have been started at several places. These have rendered salable the ordinary zinc concentrates, which have found a ready market at prices varying, according to the zinc contents and freedom from impurities, from about $25 per ton for 53 per cent. zinc in a pure ore to about $10 per ton for a 40 per cent. zinc ore not so free from impurities. As yet most of the zinc ore sold has gone to the United States, but a zinc smelting plant having lately been erected at Frank, in Alberta, just east of the British Columbia boundary, in all probability much of the zinc output of the Province will in future be treated there.

A commission appointed by the Dominion Government, including W. R. Ingalls, of New York, and Philip Argall, of Denver, Colorado, spent the season of 1905 in investigating the possibilities of zinc-ore mining in British Columbia and methods of treating the ore, but its report has not yet been published.

Practical demonstrations of smelting zinc-lead ores by electricity were upon two occasions attempted at Vancouver, B. C. The Provincial Assayer, who was present, reported that these did not succeed, for reasons which he hopes may yet be overcome.

In comparison with the mineral production of all other Provinces of Canada, British Columbia made an excellent showing in 1905. Not including the production of Yukon Territory, which produced gold of an estimated value of $8,327,200, the position in regard to the values of the several minerals included in the following table is as under:

Mineral.	British Columbia.	All other provinces combined.	Dominion total.
Gold	$ 5,902,402	$ 257,231	$ 6,159,633
Silver	1,971,818	1,453,578	3,425,396
Copper	5,876,222	1,544,229	7,420,451
Lead	2,399,022	.....	2,399,022
Iron	.....	1,172,979	1,172,979
Nickel	.....	7,550,526	7,550,526
Coal	4,152,936	10,938,000	15,090,936
Coke	1,358,925	1,208,754	2,567,679
Total,	$21,661,325	$24,125,297	$45,786,622

The figures of other Provinces are taken from the Geological Survey of Canada's summary of production, excepting that the silver is calculated at the British Columbia valuation per ounce.

An excess of oil in the gas-engine cylinder often causes a deposit on the sparking plug. Poor oil will also produce the same result.

The United Engineering Building.

The corner-stone of the United Engineering Building, in West 39th street, New York, was laid May 8, with little or no ceremony. Both Mr. and Mrs Carnegie were present, and there were a few invited guests, besides the committee having the building in charge. The structural work of the building is already nearly completed and under roof. The corner-stone contains among other things records of the three societies which have charge of the building, together with a complete proof set of United States coin, which were struck at the Philadelphia Mint on Monday previous to the corner-stone laying, and a gold plate on which

was engraved the presentation letter from Mr. Carnegie. Mr. Carnegie made a brief address and Mrs. Carnegie laid the corner-stone. The trowel used in laying the corner-stone was of sterling silver, and was made by Tiffany & Company.

Lake Ore Rates.

The statistics compiled by the *Marine Review*, of Cleveland, Ohio, show that the average rate on iron ore from Lake Superior ports to the lower lake ports has been as follows for 10 years, in cents per ton:

1905	75.06	1900	120.70
1904	72.54	1899	79.40
1903	84.01	1898	59.00
1902	77.49	1897	63.80
1901	79.99	1896	97.70

The contract rate throughout the season of 1905 was 75c. The average given for that year shows how large a part of the ore business is now done on contract, and how the wild rates have almost disappeared as a factor in the lake trade.

An alloy of copper and tin, much harder than copper, was used by certain primitive people in cutting tools.

Lake Superior Ore Movement.

The stocks of Lake Superior iron ore on the Lake Erie docks, which are always reported on May 1, were this year the smallest since 1900. The stocks on Dec. 1, at the close of navigation, and those on May 1 were as follows, for three years past, according to the dock reports as compiled by the *Iron Trade Review*, of Cleveland:

	1903-4.	1904-5.	1905-6.
Dec. 1	6,371,085	5,763,399	6,438,967
May 1	4,534,103	2,271,631	1,791,090

Of the stocks reported on May 1 this year, 24,761 tons came down in April, so that the actual stock of last season's ore was only 1,766,329 tons. It may be added that the total shipments down the lakes in April were 1,447,386 tons; but of this only 24,761 tons went to the docks, the balance of 1,422,625 tons being unloaded from the vessels directly into cars for transit to the furnaces.

The winter movement of ore to furnaces from Lake Erie docks, with that for the whole year, was as follows, in long tons:

Stock on Lake Erie docks, Dec. 1, 1905	6,438,967
Stock on Lake Erie docks, May 1, 1906	1,766,329
Winter shipments to furnaces	4,672,638
Add shipments, May 1—Dec. 1, 1905	24,311,720
Total for year ending May 1, 1906	28,984,358

This total compares with 20,057,070 tons in the previous year, showing an increase of 8,927,288 tons, or 44.5 per cent., in the year just closed.

As the total shipments from the iron ranges of the Lake Superior district last year were 34,353,456 tons, it will be seen that 84.4 per cent. of it passed over the Lake Erie docks in its transit to the furnaces. The balance—5,369,098 tons—went from the Lake Superior ports, or from Escanaba, to ports on Lake Michigan, chiefly South Chicago; a comparatively small quantity going by rail directly to furnaces.

Iron and Steel in Sweden.

A preliminary statement of iron and steel production in Sweden in 1905 gives the following figures, comparison being made with the official report for 1904; the figures are in metric tons:

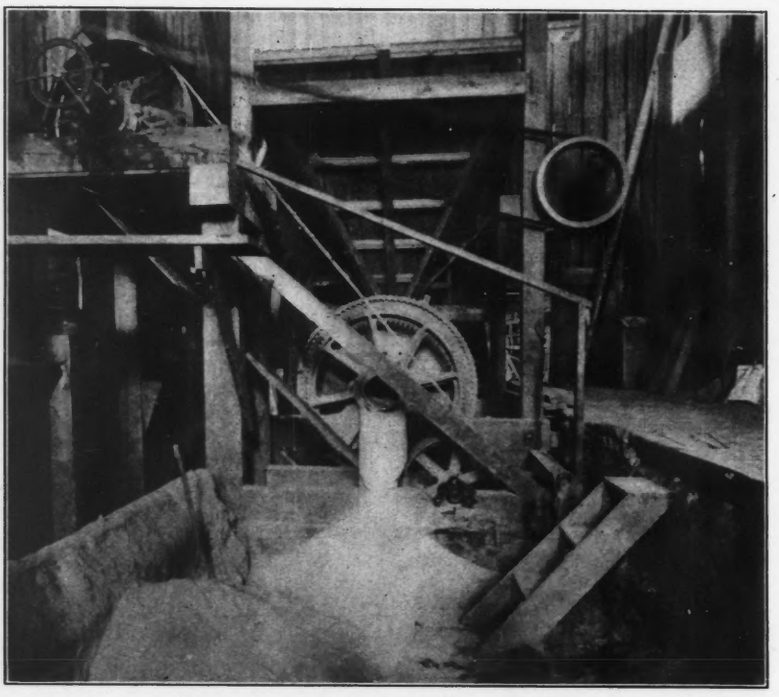
	1904.	1905.	Changes.
Pig iron	528,525	537,300	I. 8,775
Wrought Iron	189,246	178,700	D. 10,546
Converter-steel	78,577	77,900	D. 677
Open-hearth steel	252,832	280,200	I. 27,368
Total steel	331,409	358,100	I. 26,691
Bars made	181,775	192,200	I. 10,425
Other finished	151,921	195,400	I. 43,479
Total finish'd iron & steel	333,696	387,600	I. 53,904

Exports of pig iron in 1905 were 110,400 tons. Exports of iron ore were large, reaching a total of 3,316,200 tons. Of this total 1,072,000 tons were from the Kirunavaara mines, shipped through the port of Lulea; and 1,472,000 tons were from Luosavaara, and the mines in Swedish Lapland.

The First Tube-Mill in Metallurgy.

BY R. F. ABBE.*

In view of the extensive use of the tube-mill as a fine grinder at the present time, it is interesting to relate the history of this valuable and efficient apparatus in metallurgical practice. In November, 1894, the first tube-mill used in metallurgy was introduced into the works of the Moulton Mining Company at Butte, Mont. This mill was designed according to the patents of R. F. Abbé and was intended to be operated with an air discharge, i. e., by blowing air through the feed end, or by drawing it out from the discharge end, through or into a dust collector, the process being used only for dry grinding. For wet grinding a so-called overflow process was used; i. e., the discharge opening of the mill was set lower than the feed, and the material would thus flow out naturally at the discharge end as it was fed in at the feed end.



THE FIRST TUBE-MILL IN METALLURGY.

Senator W. A. Clark owned the works where this mill was installed, and his brother, J. K. Clark, conducted, personally, experiments with it. At the beginning these were somewhat disappointing, his first report stating that the material discharged from the mill and collected in the dust chamber would not carry more than one-tenth of the metal value in the ore. The original intention in designing this mill was to use it as a pulverizer, concentrator and amalgamator, it being contemplated that the gangue would be removed as soon as it was sufficiently fine for the air to take it up. In practice it was found that the air current, not being sufficient to lift the heavier material and the precious metal in the ore, did indeed cause the mill to act as a grinder and at the same time as a concentrator, as Mr. Clark found out.

The experiments were continued, using the mill for grinding, until success crowned the efforts of those engaged in its manipulation, and Fraser & Chalmers, of Chicago, applied for the agency for this mill, which they have since held throughout the United States and Canada. Since this time the tube-mill has gained ground in every place installed, and for fine grinding it is claimed to be the most economical device when used on material that is not sticky.

The use of air for discharging the material was soon abandoned and material was fed into the automatic feeder on one end and removed by a simple overflow on the other end, as shown in the accompanying illustration, which represents the first mill in position. The mill, which was 6 ft. in diameter and 8 ft. long, made 22 r.p.m. and ground ore at the rate of 15 tons per day, of which 99 per cent. would pass 125 mesh, and at 1000 lb. per hour of feed the product discharged was very fine. This was pyritic ore. In grinding wet, the same mill did 24 tons per day. These notes are presented in view of their historical interest.

*General manager, J. R. Alsing Company, New York.

The Diamond mining industry in British Guiana is reported inactive by Consul McMackin, of Georgetown. There were produced in the calendar year 1905, 86,096 stones. weighing 5315 carats, whereas, in 1904, the number of carats produced was 11,045. Recently a New York syndicate has sent out a working expedition, and the output will be shipped to New York.

Straits Settlement Tin.

C. G. Warnford Lock, in a recent interview at Brisbane, stated that the majority of the mines in the Straits Settlements are in the hands of small Chinese capitalists, who employ coolies. The bulk of these Chinese workings are simply gravel pits, the greatest depth being 40 ft. Everything is done in these operations by manual labor. The most shallow workings are almost exhausted, and if the revenue is to be maintained they must begin working lower-grade propositions and properties out of the reach of water supply, where water would have to be raised and cheaper methods adopted.

The methods at present employed lead to a great waste, not more than 60 per cent. of the tin being saved. Of the remaining 40 per cent., a little is recovered by Malay and Chinese women, who wash out the tailings in streams. If the price were to fall much, many mines would be closed down, because, owing to the increase of the dollar in value, more would have to be paid for labor.

Mr. Lock contrasted the conduct of the Malays and Chinese in the Dutch possessions and in the territory under British control. In the former they were made to keep in their proper place. In British territory, however, they did as they pleased, and the result is that the Chinese are gradually taking possession of the whole country, and driving the British merchants out.

Charcoal Iron.

There has been lately a scarcity of charcoal pig iron, the production of which has fallen to about 30,000 tons a month. Nearly all of this comes from the Michigan furnaces which use Lake Superior ore. The Hanging Rock region in Ohio has turned largely from charcoal to coke, and the South, which formerly furnished a considerable quantity, now makes little. At present there are no active charcoal furnaces in Alabama; but one, Gadsden furnace, is preparing to blow in in June. There is a demand for charcoal iron, chiefly for making bars and plates for special purposes. Formerly it was largely used in casting car wheels, but very little is now employed for that purpose.

The "statuary-bronze" fiinish on steel is obtained by giving the steel a light copper deposit in the usual cyanide copper solution. It is then changed to an acid copper solution and electroplated until a good heavy deposit has been obtained. Then oxidize in a solution consisting of ½ oz. of silver of sulphur to 10 gal. of solution. The surface of the metal after it comes out will be brown. If too dark, a weaker finishing solution must be used, and, after drying, the surface should be dry scratch brushed to bring out the luster and true color of the metal.

New Publications.

"Chemical Crystallography." By P. Groth. Pp. 123 + 16. 5x8 in.; cloth, $1.25. New York, 1906: John Wiley & Sons.

"The Journal of the Canadian Mining Institute." Vol. VII. Pp. 367; illustrated. 6x9 in.; paper. Montreal, 1905: Office of the Secretary.

"Proceedings of the National Fire Protection Association." Pp. 338; illustrated. 6x9 in.; paper. Chicago, 1905: Office of the Secretary.

"Shaft Governors." By W. Trinks and C. Housum. Pp. 40; illustrated. 3½x6 in.; boards, 50c. New York, 1905: D. Van Nostrand Company.

"Proceedings of the Lake Superior Mining Institute." Vol. XI, 1905. Pp. 200; illustrated. 6x9 in.; paper. Ishpeming, 1906: Office of the Secretary.

"Annual Report of the Interstate Commerce Commission." Vol. XIX. Pp. 207. 6x9 in.; cloth. Washington, D. C., 1905: The Interstate Commerce Commission.

"Some Croydon Gold Mines." By B. Dunstan, F. G. S. Pp. 36; illustrated. 6x9 in.; paper, with plans in accompanying case. Brisbane, 1905: Geological Survey of Queensland.

"Report of the International Committee on Analysis to the VIth International Congress of Applied Chemistry at Rome." By G. Lunge. Pp. 421. 7x9 in.; paper, $1.50. Zurich, 1906: Zurcher & Furrer.

"Records of the Geological Survey of India." Vol. XXXIII, Part 2. Pp. 92, illustrated. 8x11 in.; paper, $1. Calcutta, 1906: Geological Survey Office. London: Kegan Paul, Trench, Trubner & Co. Berlin: Friedlander und Sohn.

"Annual Report of the Michigan Bureau of Labor." Vol. XXIII; and "Annual Report of the State Factory Inspection," Vol. XIII. Pp. 471; illustrated. 7x10 in.; cloth. Lansing, Michigan, 1906; Wynkoop-Hallenbeck-Crawford Company, State Printers.

"Notes on Electro-Chemistry." By F. G. Wiechmann, Pp. 145. 6x8 in.; cloth, $2. New York, 1906: McGraw Publishing Company.

Contents—General Principles. Electric energy. Electro-chemistry. Electrolytic dissociation. Electro-analyses. Electro-technology.

The principal aim kept in view in the preparation of this book has been the giving of a clear and precise presentation of the general principles which underlie electrochemial sience.

"Annual Report of the Department of Mines, New South Wales, for the year 1905."

The Australian States are noted, without exception, for the excellence of their statistical reports, which are not merely statistical reports, but also are comprehensive reviews of the progress in mining, both commercially and technically considered. Among these excellent reports, that of the Department of Mines of New South Wales stands pre-eminent, and in the present volume the previous standard is not only well sustained, but is surpassed, a feature which reflects great credit upon the under-secretary for Mines and Agriculture, and the editor in direct charge of the preparation of this volume. The volume contains a wealth of well presented technical information, of which we shall make some excerpts in subsequent issues.

"Modern Steam Road Wagons." By William Norris. Pp. 173; illustrated. 6x9 in.; cloth, $2.25. London, New York and Bombay, 1906: Longmans, Green & Co.

Contents—Roads and Power Required. Boilers. Boiler Steam Pumps and Boiler Fittings. Wheels. Brakes. Steering. Springs. Description of Various Wagons. Tip Wagons. Lubrication. The New Board of Trade Regulations. Motor vs. Horse Haulage.

The object of this treatise is not to deal with the subject of heavy steam road vehicles from the scientific standpoint, nor to enter into calculations understood only by mathematicians, but rather to deal broadly with the question of generating and using steam for the propulsion of road wagons. So far as we are aware, this is the first work dealing especially with this subject, and as the author remarks in his preface, it is difficult at such an early stage of the industry to collect the fragmentary and widely scattered data. The book relates especially to British practice, but American readers will doubtless be glad to have it, as the first treatise dealing with a new thing.

"Industrial Study of Metallic Alloys, with supplement of Micrographic Illustrations. By Leon Guillet. Pp. 1170; illustrated. 6½x10 in.; paper; both, $10.50. Paris, 1906: H. Dunod and E. Pinat.

Contents: The industrial metals. General remarks on alloys. Treatment of alloys. Alloys of iron and carbon; steel; cast steel. Detailed industrial study of iron, steel, and cast-steel. Special steels. Alloys used in steel making. Other alloys of iron. Alloys of copper and tin; ordinary bronzes. Alloys of copper; special bronzes. Alloys of copper and zinc; ordinary brass. Special brasses. Copper aluminum; aluminum bronzes. Other alloys of copper. Alloys of tin. Alloys of lead. Alloys of cadmium. Alloys of zinc. Alloys of antimony. Alloys of bismuth. Anti-friction metals. Alloys of nickel. Alloys of cobalt. Alloys of Aluminum. Alloys of magnesium. Alloys of mercury; amalgams. Alloys of silver. Alloys of gold. Alloys of platinum and associated metals. Alloys of manganese. Various other alloys.

In the section devoted to this study of iron and steel the author has accomplished a great work. While the great portion of the text is composed of a resumè of the work of Messrs. Osmund, Werth, Tschernoff, Faraday, Le Chatelier and others, still the compilation of such data is very acceptable. The researches of the world's greatest students are corroborated by an invaluable series of photo-micrographs; 144 of the 403 are devoted to the iron section; these clearly illustrate, not only the constituents, ferrite, pearlite, martensite, cementite, and etc., but also the marked effect of the elements, nickel, manganese, silicon, chromium, tungsten, neolybdenum, vanadium, and titanium. These views are especially valuable because of the system which the author has followed in noting the effects of increasing quantities of imprities, other things being equal.

It is seldom that one sees so many clear and perfect photo-micrographs published in one work. In the text, Professor Gullet states numerous methods of preparing the specimens for the microscope, and gives formulas for attacking the polished surfaces in order to bring out the desired constituent. Each group of steels is exhaustively discussed, and the theories of prominent authorities are introduced.

Not only is metallography examined, but also the commercial manufacture of steel and iron is taken up. Four general heads compose the subject of iron and steel, viz: ordinary steels, special steels, cast- and malleable-iron, and ferro alloys. 450 pages of the text are devoted to discussion, being copiously illustrated with diagrams and containing numerous tables.

The rest of this bulky treatise covers the chief alloys of copper (including the bronzes, brasses, etc.), the anti-friction metals, and an extended series of other special and various alloys.

It is an ambitious attempt to try to cover so much ground in one volume; and of course all departments are not equally described; but considering the largeness of the subject, its enormous and rapid growth in recent years, and the limited scope of one volume of reading matter, and one volume of micrographic plates, one can but congratulate Professor Guillet on the abundant and systematic accommodation of statistical material. This material is particularly rich in descriptions of texts; and the author has attempted to cover not only the distinctively French bibliography, but also that of other countries, including England, Germany and America. Moreover, each section has its appendix of related bibliography.

The book is well written and printed; and it has one very interesting and valuable feature, which is not often found in French technical books—an alphabetical index of subject matter, and another of author's names. The book will prove a valuable manual of rich and reliable reference on alloys in their technical and commercial phases.

Professional Papers.

Pyrite Smelting, without Coke. Lewis T. Wright. *Min. and Sci. Press,* Feb. 24, 1906.

Portland Cement Plant, Report of a Test on. E. C. Soper. *Jour.* West. Soc. Eng., Feb., 1906. Pp. 8-34.

Centrifugal Pumps, Investigation on the Steinzeug. G. Schulze-Pillot. *Zeit. f. angew. Chem.,* March 9, 1906. Pp. 420-430.

Tungsten, in Colorado. H. R. Van Magenen. *Bull.* Colorado School of Mines, Jan., 1906. Pp. 138-169. Contains an extensive bibliography.

Coal, Formation and Occurrences of. L. Lemiere. *Bull. de la Soc. de l' Ind. Minerale,* serial: IV. (1905), 3, Pp. 851-917; IV., Pp. 1249-1383; V. (1906), I. Pp. 273-349.

Waste Gases from a Blast-Furnace Plant, Available Power and Cost of Operation of a Power Station for. H. Freyn. *Jour.* West. Soc. Eng., Feb., 1906. Pp. 65-89; illustrated.

Questions and Answers.

Hydrometallurgy of Nickel.

Is there any process for the treatment of nickel ore by lixiviation, similar to processes for the extraction of copper?

H. K. W.

Answer—So far as we are aware, there is no new process of this character; at least there is none in commercial use at the present time. Nickel formerly used to be extracted by a wet process, but at the present time most of the world's production of nickel is turned out by a dry process, i.e., a smelting process. Details as to the extraction of nickel in the wet way, as well as in the dry way, may be found in *The Mineral Industry,* Vol. III, pp. 459-467.

Separation of Blende from Barytes.

How can blende be separated from barytes? J. O. B.

Answer—Blende and barytes are so nearly of the same specific gravity that they cannot be properly separated by the ordinary methods of mechanical concentration, i.e., crushing, jigging, and tabling. Separation may possibly be effected by the electromagnetic, the electrostatic, or the flotation process.

The ability to effect separation electromagnetically would depend upon the magnetic permeability of the blende. If the blende contains sufficient iron to be attractable by a Wetherill magnet, a separation could doubtless be made; if, however, the blende were so low in iron as to be uneffected even by these magnets of high intensity, no separation of blende from barytes could be made in this way.

Similarily, if the blende proved to be a conductor of electricity, it may be separated from barytes by an electro-static method, barytes being almost always a non-conductor.

In some cases, blende might be separated from barytes by one of the flotation processes, the blende being floated to the surface of the bath by gas bubbles, while the barytes would remain unacted upon at the bottom.

The above processes accomplish some excellent commercial separation, but in all cases, their adaptability to any particular ore can only be determined by experiment.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ended May 15, 1906.

820,430. PROCESS OF TREATING METAL-BEARING MATERIALS.—Charles W. Merrill, Lead, S. D. Filed July 7, 1905.

820,483. APPARATUS FOR SEPARATING METALS AND OTHER SUBSTANCES FROM LIQUIDS. Leon Dion, New York, N. Y., assignor to The American Electro-Hermatic Company, New York, N. Y., a corporation of Arizona. Filed June 3, 1904.

820,518. COAL CRUSHER.—George W. Perry, Tuscarora, Pa. Filed April 29, 1905.

820,523. METHOD OF TREATING AND UTILIZING GASES.—Fred. W. C. Schniewind, Everett, Mass., assignor to The United Coke and Gas Company, Charleston, W. Va., a corporation of West Virginia. Filed Jan. 22, 1900.

820,530. ROCK DRILL.—William Sturm, Chicago, Ill. Filed March 11, 1905.

820,555. RECOVERY OF COPPER FROM SOLUTIONS CONTAINING IT.—Benvenuto Comba, Turin, Italy, assignor to Edward Casper, London, England. Filed Sept. 14, 1903.

820,559. PEBBLE MILL.—George S. Emerick, Philadelphia, Pa. Filed June 26, 1905.

820,560. ROTARY FILTER.—Frank A. Evans, Redwood Falls, Minn. Filed April 29, 1905.

820,565. MACHINE FOR LOADING COAL FROM THE TIPPLES INTO CARS.—Albert T. Goff, Montooth borough, Pa. Filed Jan. 4, 1905.

820,568. ORE SEPARATOR.—Hiram C. Groves, Woodward, Okla. Filed April 3, 1905.

820,574. ELECTRIC FURNACE.—James E. Hewes, Plattsburg, N. Y., assignor of one-half to Charles H. Boone, Baltimore, Md. Filed July 18, 1905.

820,614. METAL-SAVING MACHINE.—John B. Albers, Los Angeles, Cal. Filed Nov. 24, 1905.

820,810. PROCESS OF EXTRACTING PRECIOUS METALS FROM THEIR ORES.—Sidney T. Muffly, Philadelphia, Pa., assignor to Philadelphia Cyanide Process Company, Wilmington, Del., and Philadelphia, Pa., a corporation of Delaware. Filed Aug. 14, 1905.

820,811. APPARATUS FOR EXTRACTING PRECIOUS METALS FROM THEIR ORES—Sidney T. Muffly, Philadelphia, Pa., assignor to Philadelphia Cyanide Process Company, Wilmington, Del., and Philadelphia, Pa., a corporation of Delaware. Filed Aug. 14, 1905.

820,812. LIXIVIATOR.—Sidney T. Muffly, Philadelphia, Pa., assignor to Philadelphia Cyanide Process Company, Wilmington, Del., and Philadelphia, Pa., a corporation of Delaware. Filed Oct. 6, 1905.

820,829. AUTOMATIC DIGGER AND CONVEYOR.—Philip H. Stauch, Chicago, Ill. Filed April 9, 1903.

820,844. HOISTING APPARATUS.—Walter H. Baldwin, Chicago, Ill. Filed March 17, 1905.

820,859. PROCESS FOR THE MANUFACTURE OF ARTIFICIAL EMERY.—Adrian Gacon, Montval, near Marly-le-Roy, France. Filed Nov. 22, 1904.

820,872. TRAVELING HOIST.—Henry Japp, New York, N. Y., assignor to S. Pearson & Son, Inc., Long Island City, N. Y., a corporation of New York: Filed Sept. 21,1905.

820,884. APPARATUS FOR CONDENSING GASES.—Sidney T. Muffly, Philadelphia, Pa., assignor to Philadelphia Cyanide Process Company, Wilmington, Del., and Philadelphia, Pa., a corporation of Delaware. Filed Oct. 6, 1905.

820,898. PROCESS OF MANUFACTURING IRON DIRECT FROM ITS OXIDES.—Jas. N. Whitman, Philadelphia, Pa., assignor of one-half to Marcus T. Reynolds, Albany, N. Y. Filed Feb. 23, 1906.

820,906. DIPPER-TOOTH.—William Bodette, Toledo, Ohio. Filed Feb. 20, 1906.

820,934. CLASSIFIER.—Charles W. Merrill, Lead, S. D. Original application filed Nov. 25, 1904.

820,936. WELL-DRILLING MACHINE.—Claude E. McAfee, Waco, Tex. Filed Feb. 18, 1904.

820,939. HOISTING ENGINE.—James L. Pilling, Detroit, Mich. Filed Aug. 11, 1905.

820,945. VENTILATING SYSTEM FOR MINES, TUNNELS OR SUBWAYS.—Robert E. Booraem, New York, N. Y. Filed June 17, 1905.

GREAT BRITAIN.

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

Week Ended May 5, 1905.

28,992 of 1904. ROASTING ORE.—L. V. Atkinson, London. Removing the iron from auriferous pyritic ores by roasting at a temperature sufficient to change the iron sulphide into sulphate in an atmosphere of steam.

28,992 A of 1904. DUST FLUES AND CHAMBERS.—L. V. Atkinson, London. Improvements in chambers and flues used in recovering arsenic from refractory gold ores.

1916 of 1905. CYANIDE PROCESS.—W. A. Hendryx, Los Angeles, U. S. A. An electro-cyanide process for the treatment of gold ores, in which special means are provided for continuously aerating the pulp mixture.

1928 of 1905. CYANIDE APPARATUS.—W. A. Hendryx, Los Angeles, U. S. A. An improved electro-cyanide apparatus devised for carrying out the process described above.

9249 of 1905. UTILIZATION OF SLAG.—T. W. Ridley, Middlebrough. Improved molds for forming slag into blocks, and improved annealing furnaces for treating these blocks so as to make them suitable for macadam.

9464 of 1905. COAL RECOVERY.—C. W. and G. K. Craig, Dewsbury. Improved filtering apparatus for recovering fine coal from the water used in coal washers.

9548 of 1905. GAS WASHER.—P. Kestner, Lille, France. Removing the finest particles of solid matter from producer or blast-furnace gas by mixing the gas with steam and then rapidly condensing the steam.

16,929 of 1905. PURIFICATION OF SULPHURIC ACID.—The United Alkali Company, Ltd., Liverpool. Removing arsenic as chloride from sulphuric acid by passing hydrochloric acid gas through the sulphuric acid.

16,930 of 1905. RECOVERY OF ARSENIC. The United Alkali Company, Ltd., Liverpool. A method of producing arsenious acid from the chloride mentioned in the foregoing patent by introducing the chloride into strong solutions of oxide or carbonate of alkali or alkali earth metals.

17,887 of 1905. RECOVERY OF OXIDES AND CARBONATES.—The United Alkali Company, Ltd., Liverpool. An enlargement of patent 16,930, mentioned above, which includes many other oxides or carbonates for use in precipitating arsenious acid from chloride.

23,378 of 1905. DUST COLLECTOR.—B. H. Thwaite, London. Improvements in the inventor's apparatus for collecting dust from blast-furnace gases.

24,538 of 1905. ELECTRODE.—M. Kellner, Vienna. Improved electrodes for use in the production of sodium hypochlorites by the electrolysis of salt solutions.

24,590 of 1905. SAFETY CATCH.—G. Dunkelberg, Essen-Ruhr, Germany. A safety catch for miners' cages.

Personal.

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

Fred G. Farish is at present examining mines near Hailey, Idaho.

F. L. Harrington, a mine expert of Bisbee, Ariz., is inspecting mines in the Butte district.

Edwin E. Chase returned to Denver recently from a professional trip to California.

Samuel Newhouse was at Cherry Creek, Nev., recently, looking at some mining property.

A. P. Rogers, of San Francisco, is at present in New York, but will shortly return to California.

W. J. Elmendorf, Spokane, Wash., has returned from a professional visit to Vancouver Island, British Columbia.

J. Parke Channing is in Butte to inspect the property of the Lewisohn General Development Company.

S. B. Elbert returned to Colorado recently from a professional trip to Ecuador, extending over four months.

R. B. Watson, of New York, consulting engineer for the Shannon Copper Company, examined mines in Butte recently.

Foster Hewett, of the Pittsburg Testing Laboratory, has recently returned from a professional trip to South America.

Fred F. Sharpless, of Westbury, N. Y., is visiting a mining property in the interior of Vancouver Island, British Columbia.

William D. Thornton, vice-president of the Red Metal Company, returned to Butte May 10 from a five months' stay in New York.

John R. Stanton, president of the Atlantic and other companies, left New York last week on a visit to the Lake Superior copper country.

F. L. Ames, of Boston, a director in Butte Coalition, spent a few days in Butte recently inspecting the company's mines and also North Butte.

J. B. Tyrrell, geologist and mining engineer, has been engaged by Mackenzie & Mann as mining expert with headquarters in Toronto.

Frederick Hobart made an address May 19, on the "Minnesota Iron Ranges," at the monthly meeting of the City College Club in New York.

John Murphy has been appointed electrical engineer to the Canadian Department of Railways and Canals, and also to the Railway Commission.

W. G. Swart, superintendent of the Blake Mining and Milling Company, of Denver, visited Butte recently on business. He left for the West May 15.

Edward W. Sebben has left Denver, Colo., to make an extended examination of copper properties in Cochise, Pinal and Yavapai countries in Arizona.

James McEvoy, geologist and chief engineer for the Crow's Nest Pass Coal Company, left Fernie on May 2 on a business trip to St Paul, Minn.

W. M. Kirkpatrick, assistant secretary of the Pittsburg & Montana Copper Company, has returned to Butte, Mont., from a business trip to Pittsburg.

D. P. Rohlfing, manager of the Lulu and Frisco Contact mines in Beaver county, Utah, has gone to Europe. He will be absent about three months..

G. L. Parker, manager of the Brown-Alaska Company's mines in the Ketchikan district of southeast Alaska, has returned north from a visit to Seattle, Wash.

H. L. Frank, of Montana, president of the Canadian-American Coal and Coke Company, was at the company's coal mine at Frank, Alberta, Canada, early in May.

Herbert Haas, metallurgical engineer, having lost his office in the recent catastrophe, has his temporary office at the Union Iron Works, Potrero, San Francisco.

Samuel Price, of St. Thomas, Ont., has been appointed mining commissioner of Ontario under the new Mining Act, with judicial powers in cases of disputed mining claims.

Ben B. Thayer, representative of H. H. Rogers, is in Butte, having arrived there May 16, to inspect the mines of the Amalgamated. He expects to remain until the middle of June.

George W. Maynard has gone to El Plomo mine, Sonora, Mex., in behalf of the Illinois Development Company, of Chicago, for which company he is consulting engineer.

Dr. A. P. Coleman, of Toronto, Ont., has gone to the district lying east of Lake Nepigon, in New Ontario, where he will explore the iron ranges for the Ontario Bureau of Mines.

A. J. Heindl, a graduate of the School of Mines at Tomsk, and for some years engaged in mining in Siberia, is visiting mines on the Pacific Coast. He was recently in Ashland, Oregon.

H. Mortimer Lamb, secretary of the Canadian Mining Institute, who is just recovering from a severe attack of typhoid fever, sailed from Montreal, May 19, on a short trip to Europe.

W. B. Hoggatt, the new governor of Alaska, was sworn in as governor at Juneau, Southeast Alaska, on April 30. Governor Hoggatt left Juneau for Sitka immediately after the ceremony.

Percy E. Barbour, after spending two weeks in Boston and New York on business, is returning to New Mexico to look after the interests of the company for which he is consulting engineer.

Juan F. Brandes, of Denver, Colo., is visiting Europe on professional business relating to the transfer of mining properties in California, Colorado and Mexico. He left Berlin recently for Paris.

Dr. Robert Bell, of the Canadian Geological Survey has gone to London, England, to attend the meeting of the Royal Geological Society and receive the medal recently awarded him by that body.

Nick Treloar, manager of the Yampa mill and mines in Utah, and also the Britannia mines in British Columbia, spent a few days in Butte recently on his way from Utah to the Britannia property.

R. R. Bruce, manager of the Paradise mine and other properties in the Windermere mining division of Northeast Kootenay, British Columbia, has returned from a visit to Scotland and Eastern Canada.

Henry L. Slosson, of San Francisco, of the firm of Kincaid & Co., and who witnessed the recent earthquake, is in New York on professional business. He can be found with Peabody, Slosson & Smythe, 19 Liberty street.

H. W. Turner, of Portland, Oregon, has relinquished the management of the Omar Mining Company's mine at Kiam, Prince of Wales Island, Southeast Alaska. On his return to Portland recently he proceeded thence to Berkeley, Cal.

Frederic Keffer, of Greenwood, Boundary, B. C., resident engineer for the British Columbia Copper Company, has been examining some copper claims situated in Franklin camp, on the north fork of Kettle river, B. C., that are under option to the company.

Louis D. McCall, of Chicago, president of the Toledo Mining and Power Company, the property of which is in Madison county, Mont., is spending a few days in Butte. He has ordered a suspension of all development on the company's property for the present.

H. W. DuBois, of Philadelphia, has gone to Cariboo, British Columbia, where he will direct the prospecting of a placer gold mining property and, as well, continue his investigations commenced some time ago, into the occurrence of platinum in that district.

Warburton Pike left Vancouver for Cassiar, British Columbia, recently in charge of a party of men to carry on hydraulicking operations at the Berry Creek Mining Company's hydraulic mine on Thibert creek, in the Cassiar, northern British Columbia.

Maurice M. Johnson, of Salt Lake City, Utah, consulting engineer for Samuel Newhouse, was in the Boundary district of British Columbia two or three weeks ago in connection with projected additions to plant and machinery of Dominion Copper Company, in which Mr. Newhouse is largely interested.

Victor Nordberg, of the Nordberg Machinery Company, of Milwaukee, is back in Butte again after a trip to Rossland, B.

C., where he secured the contract for furnishing the Consolidated Mining and Milling Company with a 28x60 hoisting engine for use on the Center Star mine.

Keijiro Nakamura, chief metallurgist for the Besshi Mining and Smelting Company, operating copper mines and smelter on Shikoku Island, Iyo Province, Japan, has been visiting smelters in British Columbia. Mr. Nakamura is on a tour that will include the chief mining centers of the world.

C. S. Robinson has resigned his position as general manager of the iron and steel departments of the Colorado Fuel and Iron Company. Mr. Robinson has been connected with the Minnequa plant of the Colorado Fuel and Iron Company in Pueblo for more than 10 years, and during much of this time has had charge of the operations of the plant and of the iron-mining operations of the company.

J. P. Rogers who, early in the current year, resigned the position of superintendent of the White Pass & Yukon Railway, has been appointed general manager of the group of mining companies organized by Col. J. H. Conrad to operate in the Windy Arm section of Yukon Territory, Canada. There are three companies in this group, the Conrad Consoldated mines, Canadian Yukon mines, and J. H. Conrad Bonanza mines.

Louis S. Noble, mining engineer, of Denver, Colo., recently visited Franklin camp, situated well up the north fork of Kettle river and distant about 45 miles from Grand Forks, British Columbia. There are several large showings of copper ore in this camp, and it was lately announced that F. Augustus Heinze had acquired interests there. The Great Northern Railway system has already been extended to Grand Forks.

Professor James F. Kemp was the recipient of a token of affection from his old students at the annual dinner of the Geology Club of Columbia University, May 16. The gift was intended to commemorate the close of the professor's fifteenth year as head of the department of geology. The token took the shape of a Tiffany loving cup, suitably engraved, and also of a certificate of life membership in the American Institute of Mining Engineers.

Obituary.

Lewis William Washington, formerly president of the Pittsburg Sheet Steel Manufacturing Company, died at Nice, France, May 15. He was 37 years old; he was born in Pittsburg and had always been a resident of that city.

William H. Stuart, United States vice-consul at the oil-shipping port of Batum, on the Black Sea, in Russia, was shot and killed by unknown parties on the night of May 21. He was 49 years old and had lived many years in Russia. He had been engaged in shipping, and was one of the largest handlers of the petroleum from the Baku field, which finds an outlet through the port of Batum.

Societies and Technical Schools.

Case School of Applied Science—This well-established institution, situated at Cleveland, Ohio, offers courses in civil, mechanical, electrical and mining engineering, and in metallurgy. F. H. Neff is Dean of the Department of Engineering. A summer school will be opened in June.

Society for the Promotion of Engineering Education—The council has voted to hold the fourteenth annual meeting of the society, at Ithaca, New York, June 29 to July 4. The meeting will be held in affiliation with Section D of the American Association for the Advancement of Science.

American Institute of Electrical Engineers—The annual convention will be held at Milwaukee, Wis., May 28—June 1. A number of papers are to be presented at the meeting, among which we note one on "Magnetic Properties of Electrolytic Iron," by Chas. F. Burgess and A. Hoyt Taylor, University of Wisconsin, Madison, Wisconsin.

American Chemical Society—The next meeting of the Society will be held at Ithaca, N. Y. June 28-30. The chairmen of the several sections, respectively, are as follows: Physical chemistry, W. Lach Miller, of Toronto; inorganic chemistry, L. M. Dennis, of Ithaca; organic chemistry, G. B. Frankforter, of Minneapolis; biological chemistry, Waldemar Koch; agricultural chemistry, E. B. Vorhees, of New Brunswick, N. J.; industrial chemistry, J. D. Pennock, of Syracuse, New York.

University of Leipsic—This celebrated German institution, which was founded in 1409, will celebrate its 500th anniversary in 1909, and the Royal Historical Commission of Saxony is preparing an exhaustive work on the story of the university and its town. The story of the academy is in the hands of Professor Kammel; that of the arts, Professor Hahnel; domestic economy, Professor Kötzschke; music, Dr. Wüstmann, and the intellectual life of the city of Leipsic, Professor Witkowski. Professors Zirkel and Ostwald will deal with their departments.

Leeds University—William Cook & Co., owners of the Tinsley Steel and Iron Wire Rope Works, Leeds, England, have notified their intention of offering five mining scholarships annually, each of which is tenable for 3 years, and is good at the Universities of Leeds, Sheffield, Birmingham and Nottingham. These scholarships are intended to assist young men to take the higher engineering courses with a view of qualifying as mining engineers. The universities in which they are tenable are distributed over the entire area of the Midland coalfields in England; the recipients are expected to specialize in colliery engineering.

Industrials.

H. C. Baker, recently at Atlanta, Ga., has taken charge of the San Francisco office of the Coocker-Wheeler Company.

Randolph Brandt, maker of "Selden" and "Zena" steam packings, has removed his office from No. 38 to No. 70 Cortlandt street, New York.

The Allis-Chalmers Company, in addition to its temporary office in Oakland, has opened an office in the Atlas Building in Mission street, San Francisco.

The Wellman-Seaver-Morgan Company's Pacific Coast office, formerly San Francisco, is now temporarily located at 220 Twelfth street, Oakland, California.

The Sullivan Machinery Company announces that Randolph D. Talmage is appointed local manager for the company at Joplin, Mo., succeeding S. A. Allison.

The National Wood Pipe Company, of Los Angeles, Cal., informs us that its San Francisco office was destroyed, but its branch works there escaped and are ready for work. A temporary office has been established at 518 Eleventh street, Oakland.

The Ohmen Engine Works, San Francisco, were almost entirely destroyed. The company has established temporary quarters at Fifteenth and Utah streets, San Francisco, and requests that engineering and supply catalogs may be sent to that address, to replace the files destroyed.

The Buffalo Forge Company, Buffalo, N. Y., reports recent orders for forge equipments for the Midvale Steel Company, and for the Lynn Works of the General Electric Company. Orders are also in hand for the Calumet Manual Training School, Calumet, Mich., and for other schools.

The Kent Mill Company, New York, has been forced by increasing business to seek larger quarters, and has bought the large buildings of the Worthington Pump Works in Brooklyn, N. Y. These buildings have 235,000 sq.ft. of floor space, and are well situated and convenient for receiving material and shipping finished products.

The Reese-Hammond Firebrick Company, the Curwensville Firebrick Company and the United States Enameled Brick Company have passed under one control. The organizations remain separate, but the same officers and directors have been chosen by the three companies, William Metcalf, Jr., of Pittsburg, is president, and J. H. Allport secretary.

Fairbanks, Morse & Co., San Francisco, Cal., now occupy temporary headquarters at 969 Broadway, Oakland, California, until they are able to return to their per-

manent location in San Francisco, where they were burnt out in the conflagration following the recent earthquake. The central office in Chicago reports recent sales of their standard mine cars to the Republic Iron and Steel Company, Nassau Ore Company, La Rue Mining Company and the Rhodes Mining Company, for use in these companies' iron mines in Minnesota.

The Abner Doble Company, San Francisco, gives the following notice: "We lost in the fire some of our correspondence and drawings. In order to check up our files and make our records complete, we should like to have you send us as soon as possible, copies of all recent correspondence with you that refers to work which has not been closed up. We should also like to have copies of all drawings and blue-prints sent you and sent by you to us before the fire. Our organization is intact and we are now ready to take orders and to carry on our business as before Your efforts in helping us to complete our files will assist us materially and will be very greatly appreciated."

Trade Catalogs.

Receipt is acknowledged of the following trade catalogs and circulars:

Wyckoff Wood Pipe Company, Elmira, N. Y. Catalog, Wyckoff Wood Pipe; Pp. 16, illustrated; paper, 5 by 7 in.

American Concentrator Company, Joplin, Mo. Booklet, New Century Machinery; Pp. 8, illustrated; paper, 5 by 7 in.

Keuffel & Esser Company, 127 Fulton St., New York City. Catalog, Pp. 532, illustrated; indexed; paper, 6 by 9 in. 1906.

B. F. Sturtevant Company, Hyde Park, Mass. Bul. 127, High Pressure Blowers; Pp. 7, illustrated; paper, 6 by 9 in. Feb. 1906.

T. H. Broske, 1734 Fifteenth St., Denver, Colo. Catalog, The Ajax Drill Sharpener Pp. 11, illustrated; paper, 6 by 9 in.

Kilgore Steeleter Company, 30th Ave., S. E., Minneapolis, Minn. Catalog No. 3, Dump Cars; Pp. 31, illustrated; paper, 6 by 9 in.

Emerson Steam Pump Company, Prince street and Strand, Alexandria, Va. Catalog; Pp. 16, illustrated; paper, 6 by 9 in.

Deurer & Kaufman, Grosse Reichenstrasse 25-, Hamburg, Germany. Catalog, Motorboots; Pp. 50, illustrated; paper, 7 by 11 in.

Joshua Hendy Machine Company, 61-77 Fremont St., San Francisco, Cal. Catalog 17, The Pinder; Pp. 16, illustrated; paper, 7 by 11 in. Jan. 1906.

Miner's Smelting Furnace Company, 45 Broadway, New York City. Catalog, The Medberry Rotary Smelting Furnace; Pp. 15, illustrated; paper, 6 by 8 in.

Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y. Bull. No. 15, Central Energy Telphones; Pp. 42, illustrated; paper, 7 by 9 in.

United States Drying Engineering Company, 66-70 Beaver St., New York. Catalog, Dryers. Digesters Presses; Pp. 16, illustrated; paper, 6 by 9 in.

Baldwin Locomotive Works, Philadelphia, Penn. Catalog No. 53, Record of Record of Recent Construction; Pp. 31, illustrated; paper, 6 by 9 in. 1905.

Westinghouse Electric & Manufacturing Company, Pittsburg, Pa. Circular 1117, Westinghouse Type A Motors; Pp. 9, illustrated; paper, 7 by 10 in. August, 1905.

C. L. Berger & Sons, 37 William St., Boston, Mass. Handbook and illustrated catalog; Engineers' and Surveyors' Instruments of Precision; Pp. 212-N; paper, 6 by 9 in. 1905.

A. S. Aloe Company, 513 Olive St., St. Louis, Mo. Catalog and price list, Mathematical and Engineering Instruments and Drawing Materials; Pp. 272, illustrated; cloth, 7 by 10 in.

Sullivan Machinery Company, 1506 Railway Exchange, Chicago, Ill. Bull. 51-C, The Sullivan Plug Drill for quarying and contracting work; Pp. 10, illustrated; paper, 6 by 9 in. Feb. 15, 1906.

S. Flory Manufacturing Company, North Main St., Bangor, Pa. Catalog, The Cable System of hoisting and conveying for quarries and mines; Pp. 162, illustrated; indexed; paper, 10 by 11 in. 1904.

Construction News.

Sierra Madre District, Utah—It is proposed to put up a mill at the Santa Maria mine. Don Maguire, Ogden, Utah, is manager.

Kimberly, Utah—The Holland Gold Mining Company, of which W. F. Snyder, of Salt Lake, is manager, is in the market for an air compressor.

Twisp, Washington—The Elone Mining Company is arranging to develop its property in the Methow Valley district. E. C. Gove, Spokane, Wash., is chief owner.

Platteville, Wisconsin—The Fox Lead and Zinc Company proposes to put in a boiler, engine, steam hoist and steam pump on its property. The address is at Platteville.

Loomis, Washington—The owners of the O. S. group intend to put in a large air-compressor plant and a sawmill. It is also proposed to install an aërial tramway to convey ore.

Loomis, Washington—Ingham & Witcher propose to develop an antimony property near Loomis, and will need machinery. Their address is at Loomis, Okanogan county, Washington.

Special Correspondence.

San Francisco. May 16.

At a meeting this week of the citizens committee on revision of building laws in San Francisco, the Vulcan Iron Works and the Golden State Miners' Association sent representatives to protest against making the fire laws apply to factories. It was openly threatened that unless the committee would permit the erection of factories, in which it was understood the employees would be housed, the concerns would move across the bay to Oakland. The manufacturers, it was represented, could not stand the expense of putting up fire-resisting buildings. The committee took the matter under advisement.

Yuba county has a new dredging town called Marigold. The town at present consists principally of the big new boarding house, machine shops, stables, offices and other buildings required by the Marysville Gold Company and the employees. More will be built soon. There is a good drainage system, electric lights and a good water supply system. Like the new town of Hammon, a few miles further up the river, Marigold has no saloons, and none will be allowed there. The new town is on the south side of the Yuba river, about 12 miles east of Marysville. There are two gold dredges in operation there, and more are to be built in the near future, so the town will grow. Neither Marigold nor Hammon has any stores, for the dredge firms do not engage in mercantile pursuits. They allow their employees to spend their money where they please and as they please. Both towns will be connected with Marysville by the California Midland Railway when it is constructed.

It will please many persons in the Eastern States who have been swindled out of money by George W. Rumble, of the Sunset Mining Company, to learn that he has at last got his deserts and has been sent to the State Penitentiary. He was, over a year ago, convicted of using the United States mails with intent to defraud and was sentenced to a fine of $500 and 18 months in the State's prison. Since then he has been out on bail and has been fighting in all sorts of ways in the courts to escape punishment. There are judgments against him for upward of $200,000 in the State Courts. On Monday Rumble appealed to the United States Circuit Court of Appeals to grant a stay of the judgment of the District Court, but was unable to secure favorable action. He filed a petition in bankruptcy, and claims that he is penniless. But his creditors believe that he has $300,000 cached somewhere within easy reach when he has served his term. Rumble returned last week from Washington, where he went without leave, to the great worriment of his bondsmen, for the purpose of inducing the President to intercede in

his behalf. Finding every loophole closed, he said that he was anxious to get to San Quentin, the sooner to have his sentence over with. This man is perhaps the boldest and most successful mining swindler who ever schemed in California. He obtained money in large quantities by systematic advertising and sending out a circular about the mythical richness of the Old Glory, mine at Oroville, Butte county. He even accused the Governor of the State and the State Mineralogist of blackmailing him when they tried to bring him to task for his operations.

The mining men are now consigning all shipments of ore, cyanides, gold dust, gold and silver bullion, for the Selby Smelting works, direct to Vallejo Junction, and settlements therefor are being made from the temporary quarters of the company at the mint in San Francisco.

The Balaklala Mining Company, of Shasta county, has established offices in Redding and manager White makes his headquarters there. The company is pushing the work of preparing for the erection of the smelter as fast as possible. Some of the plans have been upset by the disaster in San Francisco, but no appreciable delay will result. It is stated on good authority that by June 1 the actual work of construction will be under good headway.

It is said that the Folsom Development Company is planning to intall a big rock-crushing plant near Dredge, in Sacramento county, to crush the cobbles turned up by the dredging operations, and to ship crushed rock to all parts of the State. A large steam-shovel will be installed to handle the cobbles and load them on cars, which will carry them to the crusher. The office of the company in San Francisco was destroyed by fire and it is understood that the main office will be established in Folsom.

The surprising discovery has been made by Census Marshal W. H. Crawford that there are 567 less people in Nevada City than in 1900. At that time the place was credited with a population of 3250. The falling off in population is attributed to the lack of employment in that immediate vicinity. The big suit between the Home and Champion mining companies has thrown scores of men out of work, these properties having been virtually closed by the legal action. As a result workingmen have moved away. Many have gone into the upper part of the county, where new properties are being opened up.

It has been decided that the Comstock mines in Virginia City, Nevada, will run with light force on account of the fire and destruction of San Francisco. Pumping will be continued, but no deep work will be attempted until the stock board is righted The lay-off is temporary, at least it is so given out by the superintendents of the mines. The cause is the catastrophe in San Francisco where the shares in the mines are principally held. It will be impossible to levy and collect any more assessments until San Francisco gets settled. The disaster has also affected financially the mines at Goldfield, Tonopah and other Nevada mining centers. Several mines have suspended work for the present. Many Nevada banks closed temporarily until financial affairs are in a more settled condition.

Butte. May 20.

Ben. B. Thayer, representing H. H. Rogers in Amalgamated, arrived here last week and announced that the capacity of the Washoe smelter would be increased 500 tons a day, and the output of the company's mines 10 per cent. within a short time. The increase in ore production will be achieved through the working of the Snohomish, Tramway and Michael Devitt mines, which were in litigation up to a short time ago. The mines of the company, the output of which goes to the Washoe, are now yielding about 7,500 tons of ore a day, but the Washoe is handling about 9,000, the difference between the production and the quantity treated being supplied by North Butte, smaller producing companies and individual production. In addition, Boston & Montana is mining 3,500 tons, which goes to Great Falls, making the total output of Amalgamated about 11,000 tons.

American Consolidated Copper has secured grounds on the Big Hole river, 29 miles from Butte, for smelter purposes. It intends to erect a plant having a capacity of 4,000 tons a day. The company has bought 15 or 20 claims in Butte, and expects to begin active operations within a month. Before leaving for the East, Joseph A. Coram, organizer of the company, announced that F. A. Heinze would not have anything to do with the company, but would hold stock, which he accepted as pay for the eleventh interest he held in the Davis estate property, now an asset of the corporation. Four or five shafts are to be sunk by the company, one of which will be on the Lizzie claim. Through this opening the veins of the Baltic and Smokehouse, which traverse the Moonlight, an Amalgamated mine, will be developed.

Parrot has begun sinking its main shaft from the 1800-ft. level to the 2200, and may add 200 ft. more. Work in the crosscut from the 2400 of the Anaconda has been suspended, pending the cutting out of two compartments of the shaft between the 2400- and 2200-ft. levels. The main vein has been cut on the lower level, but no drifting will be done until the other work is finished.

North Butte is raising about 900 tons of ore a day, but expects to increase the quantity to 1500 within 60 days, when it will have its new hoisting engine in working order. The engine is fast assuming shape, and the head frame is going up. The new air compressor arrived today. It has a capacity for 50 drills.

Reins Copper is finishing its station at the 1200-ft. level, and is preparing to install two pumps. Crosscutting for the vein will begin as soon as the pumps are in place.

Salt Lake City. May 19.

The Herschel Gold Mining Company has brought suit for damages from the Sacramento Gold Mining Company, alleging trespass and unlawful extraction of ore from the Remnant and Pegasus mining claims, in the Camp Floyd district, better known as Mercur. The amount claimed is $231,000.

The Silver King Mining Company has filed its answer in the trespass and damage suit filed against it recently, in which the Magnolia-St. Louis Mining Company of Park City appeared as plaintiff. The defendant sets up a general denial, admitting that it has extracted ore from the Magnolia and St. Louis lode mining claims, but justified the act on the ground that it had a right to the ore through extra-lateral rights. Immediately following the filing of the answer, attorneys for the plaintiff filed a second suit in the Federal court at Salt Lake to enjoin the defendant from entering or extracting more ore and asked the court for an order permitting engineers of the plaintiff company to enter and examine the underground workings in dispute. This is one of the most important mining suits ever instituted in Utah, as it will involve property valued at millions of dollars. The Magnolia-St. Louis Company, in order to establish its claim, is sinking a shaft to intersect the workings made by the Silver King Company; it is now down over 200 ft. and should connect with the stopes mined out at 550 ft. At the last meeting of the Silver King's directors, the regular monthly dividend was cut from $100,000 to $50,000.

At the annual meeting, shareholders of the Phœnix Mining Company, at Bingham, elected the following officers: Andrew Gebhardt, president; H. A. Gebhardt, vice-president; W. D. Gebhardt, secretary and treasurer, all of Salt Lake City.

The annual election of the Annie Laurie Gold Mining Company, in the Gold Mountain, Utah, district, resulted in the election of G. A. Baird, of Sharon, Pa., as president; A. A. Ball, treasurer and Samuel M. Levy, of Kimberly, Utah, manager.

The Boston Consolidated Mining Company, at Bingham, will begin using steam shovels about June 1. One machine will be started about that date in stripping the surface, preparatory to mining ore in this manner during the coming autumn, or about the time the Garfield mill, now under construction, will be ready for commission.

The Daly Judge Mining Company at Park City is preparing to increase its production by starting to stope ore from the big shoot opened on the 1500 level. This

shoot is 275 ft. long, and has been crosscut for over 25 ft., disclosing only one wall. The shipping ore, of which there is considerable, will average between $45 and $50 to the ton, while the mill stuff, concentrating three tons into one, will net about $45. The company will be entirely out of debt before July.

The Bingham Metal Mining Company, of which R. L. Booth, of Bingham Junction, is manager, has placed an order with the Utah Mining Machinery and Supply Company for a five-drill air compressor.

Mining operations have begun again in the Sierra Madre mining district after a very severe winter. While some properties were kept under development, others were obliged to close on account of the deep snow and difficulty in getting in supplies. Probably the best developed properties in the district are those operated under the management of Don Maguire, of Ogden, one of them being the Santa Maria mine. This property will likely be provided with mill facilities during the present year, and an aërial tramway will be built to transport the ore down to the base of the mountain where access can be had to the tracks of the Oregon Short Line railroad. The district is about 14 miles north of Ogden.

Denver. May 21.

One of the most interesting transactions of the past few months took place a few days ago, when Chas. M. MacNeill, Spencer Penrose, C. C. Hamlin and a few others purchased the controlling interest in the Cripple Creek Central Railway, which owns the Florence & Cripple Creek and the Midland Terminal railroads, besides La Belle Light, Water and Power Company and the Colorado Trading Company in the Cripple Creek district. Since the purchasers are largely interested in the treatment of Cripple Creek district ores, this deal may have added significance. The amount which changed hands is stated to be between three and four million dollars.

It is understood that a formal demand for $500,000 has been made by the Portland Gold Mining Company for ore alleged to have been abstracted from its territory by lessees of the Stratton Company, and litigation may result.

At a meeting of the Independence Consolidated Gold Mining Company at Cheyenne recently, the action of the board of trustees, transferring their property to the Vindicator Consolidated Gold Mining Company, was ratified, and the company dissolved by a majority vote of the stockholders.

After being connected for more than ten years with the Colorado Fuel and Iron Company, and having for most of that time had charge of the operation of the Minnequa plant, C. S. Robinson has resigned, the resignation to take effect June 1. It is rumored that he has accepted a prominent position with the United States Steel Company. The plant at Pueblo is working full capacity and orders for steel rails are booked for some time ahead. The tin-plate mill, which has never yet started up, will probably be used for other than the original purpose for which it was constructed.

The General Electric Company of New York has just filed an application in the United States Circuit Court for the appointment of a receiver for the Salida Light, Power and Utility Company and a lien on the plant for $6732.

In the same court the American Asphalt Association of Missouri has filed suit for the amount of $5249 against the Uintah Railway Company, in which the Barber Asphalt Paving Company owns the controlling interest for charging excessive freight rates on their product from Dragon, Utah, to Mack, Colorado.

The Turkey Creek Stone Company has purchased nearly 300 acres of sandstone quarry land, 20 miles east of Florence, containing a very superior quality of building stone.

A. B. Frenzel, the rare-mineral operator, has donated $150 for special prizes for the graduating class of the State School of Mines. They will be awarded for the best theses.

Calumet, Mich. May 19.

Nos. 1, 2 and 5 shafts of the Tamarack mine, closed because of the fire which started early in January, have been reopened. There are no signs of fire in the underground workings, but the large volume of water which accumulated during the period of idleness must be drained before operations can be resumed. No. 5 shaft is clear of gas and miners have been sent underground a few times to examine the workings. Fans are in use at Nos. 1 and 2 shafts, where gas still lingers in the openings.

The water in the three shafts is being removed by means of three bailers, built especially for the work, which are in commission in three of the four operating compartments of No. 5 shaft. Each of these bailers has a capacity of 2000 gal., and in the course of 24 hours the three hoist more than 9,000,000 gal. of water. A fourth bailer is at the shaft and may be installed in the remaining compartment, which is at present used for handling men and supplies. Water rose 150 ft. from the bottom of No. 5 shaft, the deepest opening, during the period the workings were sealed, and this means an immense volume through the workings. In addition to the bailers in No. 5 shaft the workings are also being drained by the use of the pumps which are located underground. All of these are in commission, with the exception of that in the bottom of No. 2 shaft, which was drowned out, being submerged by 30 ft. of water.

At no time since the Tamarack fire broke out, in January, have operations at the North Tamarack branch been delayed. That portion of the property is not connected with the openings in which the fire originated. No. 3 shaft is the deepest in the world, and its production has been crowded to the limit of the rock-house facilities the last few months. Upward of 1100 tons of rock daily has been hoisted.

As every indication points to the Tamarack fire being out, it is expected Nos. 1, 2 and 5 shafts will resume production as soon as they have been cleared of the accumulated water in the workings.

Production has been suspended entirely at the Atlantic mine, owing to the settling of the ground, and operations at the stamp mill at Redridge nave been discontinued. There has been a settling of the ground at the Atlantic for several years, but during the last two years it has been more pronounced than formerly. Numerous efforts have been made to keep the shafts in commission and prevent a general shut down, but the hanging and foot walls of the lode in the shafts have come together to such an extent that the skips cannot be operated.

It is problematical when the Atlantic will be able to resume production. Every effort will be centered upon the reopening and re-timbering of the shafts and all the miners that can be possibly used as timbermen will be employed in that capacity. A few miners will be needed in reopening the shafts, but the remainder of the force, including other miners, trammers, surface employees and the mill men who are not needed will be laid off for an indefinite period. A short time ago the Atlantic closed its B shaft to permit re-timbering. This work is still in progress, and it will be at least six weeks before it is finished. This week shaft D went out of service. Repairs to E shaft, which is used exclusively for the handling of men, will be made while the work of re-timbering the other shafts is under way. It is expected that the present repairs at the Atlantic will enable the mine to operate regularly after they are completed. The showing in the bottom levels is better than for many years. During the last two years a new system of operations has been introduced underground, and this is expected to permit much lower operating costs, once it is fully in service.

Platteville, Wis. May 19.

The Red Jacket Mining Company, at Centerville Camp, is in the market for a large concentrating plant. Contract will be let on May 21. The development work has been such as to convince the management that they have a paying proposition. In cleaning up the old drifts and straightening the walls, enough pay ore has been taken out and hand-cobbed to partially defray the expenses.

The Big Jack Mine, in Platteville Camp, is one of the best developed in the district. Some 1000 ft. of drifts and crosscuts have been run. The ore found is

high-grade and for the present no roaster will be needed. The mine is so situated that the water is drained off in a natural crevice, finding its way to the river, which lies several feet below the ore level.

Mr. L. Underwood, of Kansas City, reports that the erection of the proposed concentrating plant will be started soon. There is some talk of installing a double mill, using one side for custom work, the other for their own use. Should this be done, mining in this camp will receive an impetus, for there will be many small mines operated that lie idle for want of capital to install machinery.

The Fox Lead and Zinc Company will let a contract soon for the installation of an 80-h.p. boiler, double-cylinder steam hoist, 40-h.p. engine and a double 12-in. crosshead pump. The drillings, it is claimed, were of such quantity and quality as to assure the owners of the necessity of a plant.

The ore at the Rowley mine is reported as increasing in quantity. The roaster was given a trial run during the week, with satisfactory results reported.

The Etna mine lying east of Benton camp, claims to have drilled through 5 ft. of zinc ore. The Etna is located on property that was worked years ago and produced a great quantity of lead. It is in this locality that the strongest ore has been found below the glass-rock. The water in this neighborhood is strong and the owners will make preparations accordingly.

Scranton. May 21.

With very few exceptions conditions are again normal in the anthracite region. Miners have returned to work, and the six weeks' suspension has been quickly forgotten. Ordinary conditions have been resumed so quickly that there is already a demand for a meeting of the Conciliation Board to dispose of the old grievances, as well as to consider some new matters which have been pending for some time. It is now generally believed that there will be no change in the composition of the board. No action has been taken by the operators, and it is taken for granted that Messrs. Connell, Warriner and Richards will remain their representatives. The mine workers' representatives, District Presidents Nicholls, Dettery and Fahy, will remain on the Board. Chairman Connell has directed Secretary Dettery to write Judge Gray, asking him to appoint an umpire to pass upon a grievance in which the board was deadlocked, and to arrange a meeting subject to the convenience of the umpire appointed. The meeting is expected to take place next week, when the members who file their credentials for the coming three years.

District President T. D. Nicholls, of Scranton, leaves for England on Wednesday, to attend the International Congress of Miners, which opens in London, on June 5. During his absence his place on the Conciliation Board will be filled by Secretary-Treasurer Dempsey, of Scranton.

A little hitch occurred at some of the collieries of the Philadelphia & Reading Company; it was complained that some mine workers were being discriminated against, and were not reinstated, on the ground that they had resorted to violence during the suspension. Messrs Dettery, Fahy and Dempsey waited on President Baer, in Philadelphia, and discussed the questions with him. They were assured that he would take the matter up and that everything would be straightened out to the satisfaction of the men, and for universal peace throughout the anthracite district.

No truce, however, has been made up in the trouble between G. B. Markle & Co., and the miners in the Jeddo and Ebervale collieries. The trouble arose over payment for putting down new sheet iron in the chutes in the breasts. The miners declare that they were paid for this work previous to the suspension, while the company contends that it paid when the iron was first placed, but that when the material was worn out, it had to be replaced by the men. The matter cannot be taken before the Conciliation Board until the men return to work.

Some of the fire and loader bosses employed at the Philadelphia & Reading collieries were not given back their places, on the ground, it was alleged, that they were in sympathy with the union. The foremen contended that as these bosses were not members of the union, the men could not demand their reinstatement. It is understood that Mr. Baer has ordered their reinstatement.

A strike of a few days occurred at No. 4 and 5 collieries of the Delaware & Hudson Company, owing to some of the men not being reinstated. The same trouble occurred at the Mocanaqua colliery, of the West End Coal Company. In both cases the companies agreed to reinstate the men without further delay.

The Pennsylvania Coal Company has issued an order that whenever a workman is a brother of a foreman his services are no longer required, as favor might be shown at the expense of other employees.

There is great indignation among the foreign element throughout the anthracite field over the action of the immigration authorities in deporting some of the returning mine-workers on the ground that they are contract laborers.

A large tract of coal land near Mt. Carmel has been sold by the Beckley Coal Company, to a syndicate from New York. The consideration was $500,000.

The oft-discussed question as to whether there is any coal in the Shickshinny valley, on the outskirts of the northern anthracite basin, is soon to be settled. It has been determined hitherto that there is a small vein of coal in the valley but it is not known whether the coal is there in paying quanities. A company has been organized, and will sink a bore-hole 3500 ft. deep west of the town of Shickshinny. A diamond drill specially made for the purpose has been received, and, if necessary, a 2-in. hole will be sunk to the cradle bed, which it is estimated is 3500 ft. deep. The boring will be made on the John Sult farm.

A mysterious explosion took place in the City colliery, Shenandoah, when six men were killed. The cause of the accident is not known; it was either from the use of dynamite or the firing of a gas pocket. Inquiry has been made to determine as to whether any dynamite was used in the mine that day, but no record of that explosive being taken down the shaft can be found.

The Reading Company will build a breaker at the Bear Valley colliery, at a cost of $200,000.

The Lehigh Valley Company's new breaker at the Sayre colliery, Mt. Carmel, which will have a capacity of 2500 tons, will be completed in July.

The Spencer Coal Company, Dunmore, is building an addition to the breaker to deal with the culm pile adjoining.

The Taylor colliery, of the Delaware, Lackawanna & Western, which is the only one in the system idle, is being completely overhauled. The repair work will occupy two months. A new head-house is being built while the shaft is being re-timbered.

The Pine Brook colliery, of the Ontario & Western, has not resumed after the suspension; the shaft is being re-timbered and concreted.

The Delaware & Hudson Company is placing large steel head-frames, instead of the old wooden structures, at the following collieries: Delaware; No. 3, Plymouth; No. 5, Plymouth; Boston colliery. The company is also installing a large blast fan at the Olyphant colliery, the contract having been awarded to the Buffalo Steam Forge Company.

A report is now current in the anthracite region that the Delaware & Hudson Company is to be absorbed by the Pennsylvania Railroad Company, and that the acquisition of coal tracts in Schuylkill county, by the former, is but a prelude to the absorption. A story emanating from Pottsville states that it is proposed to extend the Delaware & Hudson system to New York, so that the Pennsylvania Railroad could increase its anthracite tonnage. A large portion of the New England traffic of the Pennsylvania is now sent over the Delaware & Hudson lines, instead of being forwarded by New York, as heretofore. The railroad is also being made a three-track road between Carbondale and Wilkes-Barre, the busy portion in the anthracite region, while a new route is being surveyed between Carbondale and Lanesboro, where the traffic is now run over the Jefferson branch of the Erie road.

All indications point to some changes of importance.

Seven men were burned by an explosion of gas in the Lance colliery, of the Lehigh & Wilkes-Barre Company. The men were passing a bad spot when a lamp, worn by one of them in his cap, came in contact with a feeder.

The rockmen of Lackawanna and Luzerne counties, who were out on strike, have returned to work, having been given an advance of 10 per cent.

Toronto, Ont. May 19.

The Ontario Legislature was prorogued May 14, after one of the most important sessions that has been held for many years. In the speech of Lieut.-Gov. Clark dismissing the House, the following reference was made to the policy adopted with regard to the Gillies timber limit. "An important feature of the mining policy is the decision of my Government to operate for the benefit of the people of Ontario the rich mineral deposits which have been discovered in what is known as the Gillies timber limit. The expressions of general approval by which this announcement was met showed in an unmistakable way the minds of the people on this subject."

A motion was made on May 14 before Chief Justice Meredith at Toronto on behalf of La Rose Mining Company for an injunction to restrain the Ontario Government from selling mining rights in the right of way of the Timiskaming & Northern Ontario Railway. La Rose Company claims to own the lands through which the railway runs. The motion was postponed until May 23. The Timiskaming & Northern Ontario Railway commission, who were made parties to the suit, claim that the original patents issued for the land, expressly excepted minerals. The title to the minerals is expressly vested in the commission by the legislation adopted at the session just closed. Owing to the proceedings, however, the tenders received by the commission for mining concessions along the right of way and also for mining leases in the town of Cobalt were not opened on May 15, the latest time set for receiving tenders, the date being postponed for one week.

There has latterly been a great influx of speculators, capitalists and joint-stock company promoters into Cobalt and many large deals are reported. The Cobalt Contract Silver Mines, Ltd., a recently organized company with a capital of $300,000, has acquired the Green property, comprising about 40 acres. C. L. Hanson is vice-president of the company, in which New York capital is largely represented. They propose to divide the property into single-acre blocks and lease alternate acres as is done in some western camps. John C. Quinn and George Lozensky, experienced California miners, are largely interested in the enterprise. The Cobalt Contact mine has a showing on the main shaft of a vein of smaltite 7½ in. wide. A nugget said to be the second largest yet discovered in the Cobalt area, is reported to have been found on the Rothschild property south of Giroux lake and immediately adjoining the Wiley-Pardee or Nugget claim. Large numbers of prospectors are returning from the Montreal river region where many have staked out claims. Many still remain at work in that direction, a large proportion being inexperienced men. The influx of new arrivals is still largely directed farther northward. Mayor L. O'Connor, of Sudbury, has this season sent out three parties to Hudson Bay, who have gone by way of Bisco, Chapleau and New Liskeard respectively.

There is considerable activity in mining in the Temagami forest reserve this season. W. A. Cockburn, of Sturgeon Falls, has a force of 12 men working on a copper vein 4 ft. wide, which has been traced for 300 ft. Two shafts have been started, and at a depth of 14 ft. a copper-galena ore was struck. Dunlop & Gibson are developing a copper vein on an island in the reserve about 2½ miles from Bear Island. The Mulock-Caldwell property, near Temagami station, will be worked this summer under the direction of Professor Wilmot. The Arsenical Development Company has been working all winter with a force of 20 men, but operations are now suspended to allow the installation of a new plant.

The date of the excursion of the members of the Ontario Legislature to the Cobalt region has been fixed for May 28, the special train returning to Toronto on June 1.

Active silver-mining operations will shortly be resumed in the mines of the Port Arthur district, including the Silver Mountain, West End, Badger and Porcupine. With the exception of the West End these properties have been closed for about 12 years owing to the fall in the price of silver, which did not allow sufficient margin of profit to make their operation profitable. With the higher prices now obtainable it is believed that these mines can be worked at a profit.

Gold bars valued at $10,000 were recently sent from the St. Anthony Reef mine on Sturgeon lake to the Philadelphia mint to be made into American gold coin.

Victoria, B. C. May 19.

Cariboo—The following information relative to operations in 1905 on one of the largest of the deep-drifting mines in Cariboo—at La Fontaine, Lightning creek—is taken from the annual report of the Minister of Mines for that year, just issued: The manager (Melbourne Bailey) of the Cariboo Consolidated (1904) Ltd., writes: "With the exception of a period of six weeks' time lost through the breaking of the main crank of the pumping engine, work has proceeded steadily during the entire year, with a force of men numbering, on an average, 36 a day. The total length of the various tunnels, drives, cross-cuts, etc., run to date in developing the deep channel is 2976 ft. The face of the main tunnel running up stream is now 1130 ft. from the shaft; the tunnel will be continued a further distance of 436 ft. This will allow the working at an early date of the rich gravels known to exist at that point. Early last May the old Eleven of England lower workings were tapped and drained by our drives and, by June 1, the deep channel gravels, from No. 1 east cross-cut 600 ft. up-stream, were sufficiently drained to enable us to commence taking out the gravel on a large scale. The channel gravels from No. 1 east cross-cut down-stream to No. 1 west cross-cut, a distance of about 500 ft., are draining very slowly, and as yet are too wet to work economically. The channel, where it has been possible to mine the gravels, has been found to average 250 ft. in width from the extremes of the pay lead, and this would account for the comparatively low values per cubic yard thus far recovered in our work. Cross-cuts run from the old Eleven of England lower workings show that the channel narrows rapidly as we proceed up-stream, and much better results may be looked for as soon as we shall be able to mine the gravels farther up the channel. During the period from June 1 to Oct. 13, a total of 4043 cu. yd. of gravel was mined and washed and yielded 498 oz. gold, the gravel having, therefore, a value of about $2.22 per cubic yard. While it is unfortunate that we should have opened the channel at this wide point in its course with low gravel values, at the same time development work both up and down stream shows most encouraging results, and the work now under way should in a few months' time fully demonstrate the value of this property."

Boundary—At the Providence mine, the first and most developed of the high-grade silver-gold mines of this district, the vein has been encountered at the 600-ft. level, the incline shaft having been sunk that depth and a cross-cut driven to the vein. This is the greatest depth yet reached in sinking in Boundary mines, though diamond drill holes have been bored to 1000 ft. The Providence has shipped more than 3000 tons of ore, much of it averaging higher than $100 per ton, with occasional carload lots of sorted ore running from $200 to $246 per ton, gross value.

Mexico. May 12.

Unusually early and heavy rains have already materially affected the mining industry in a number of districts, but mining generally throughout the Republic may be vigorously pushed for another two months before it is greatly hampered by the opening of the rainy season. From early July, however, and, for three

months thereafter, many sections, distant from the railroads and dependent on wagon roads will have practically to cease production and limit themselves to development work or shut down entirely, as the roads become impassable because of the heavy rains.

In the State of Chihuahua, the many excellent mining camps continue unabated in their increasing productions and numerous improvements and changes. At Naica the Naica Mining Company is preparing to install a large central electric generating plant. At Minas Prietas, an option has been given by Angel Garcia, on his Refugio mine, to G. C. Beckman, of Parral, for $800,000 gold. The property has on it a 120-ton hyposulphite lixiviation plant for treating the low-grade ores, while the high grades are shipped to the smelters. The Sierra Plata Mining Company, of which E. C. Morrow, of Clarksville, Tenn., is president, has bought the mines known as Los Muertos, adjoining the Quebradillas of Minas Nuevas, and new machinery and electric power is being installed; the production will be greatly increased. The Quebradillas Mining Company, has purchased of the Westinghouse Electric Company, a plant equivalent to 1500-h.p. to replace the old steam plant and run all machinery by electricity.

In Parral the Veta Colorado is working steadily; the San Cristobal is opening up a good orebody; the Carmen, after a good many months of hard work, has started shipping; work is being pushed at the Gran Britaña, Buena Vista, and El Favor. Miguel Aguilar is said to have made a rich strike in El Palmar on the south side of the Palmilla hill, where is located Pedro Alvarado's famously rich property. The house of Stallforth Hermanos, through its head man, Leopold Iwansky, is said to have secured New York and German capital to the extent of $10,000,000 Mexican currency, with which to erect a large power plant on some of the mountain streams, and an immense concentration plant between Parral and Minas Nuevas.

H. C. Harrison, who for many years has been working hard at Cerralvo, near Monterey, Nuevo Leon, in developing some lead properties there and erecting a small smelter, the bullion product from which is shipped to the larger smelters at Monterey, has sold his entire holdings at that point for $150,000 gold and returned to the United States.

Robert McF. Doble, of San Francisco, is drawing up plans and specifications for the erection of a 5000-h.p. hydraulic electric plant at the falls on the Plaxtla river, in Sinaloa, to cost in the neighborhood of $100,000, and to be built by the Guadalupe de los Reyes Mining Company, which owns a number of mining claims in the Cosala district.

W. H. Ellis, in addition to the large iron deposits recently acquired near Monclova, in the State of Coahuila, is in search of other desirable iron lands to add to his present holdings. Canadian investors, who are said to be closely allied to those who control the Mexican Electric Light and Power Company, and who have recently purchased the street railways of Mexico City, are also seeking for iron fields. The idea is to keep ships busy during the winter months, when it is too cold to navigate the Canadian waters, by bringing coal from convenient depositories to the Mexican ports, and returning laden with iron ores for treatment in the Canadian furnaces. As yet no deposits have been found sufficiently accessible to the Mexican Gulf coast to make the plan feasible or attractive.

London. May 14.

I recently mentioned in this column that special attention is being given nowadays in London to tin mining in Cornwall. The continued rise in the price of tin, which today stands at £195 cash, has served to draw speculators into the market, and for the first time for years there has been a boom in tin mining shares. Dolcoath has been very much to the fore, and its £1 shares, which have for a long time stood about 4s., are now up to 25s., with a prospect of going still higher. The field for speculation is naturally limited, and promoters are loud in complaint that they cannot lay their hands on new tin properties to float on the market. There are many tin lands in the Straits that are as yet undeveloped, but they are mostly under the virtual control of the East India merchants, who are now profiting by the rise in price, and it would be difficult for outsiders to acquire them or to deal effectively with the ores if they did. As I mentioned before, the Cornish deposits are being looked into closely and it is probable that most of the London money available for new tin ventures will, for a time at least, find its way there rather than to foreign parts. In order to adapt itself to modern requirements, the Wheal-Grenville mine at Camborne, Cornwall, is abandoning the old cost-book plan and is about to turn itself into a limited liability company. The old company had 6000 shares, on which £18 12s. 6d. each had been paid, while £22 has been distributed as profits. The shares are officially quoted on the London Stock Exchange at prices varying from £9 to £11. The new company is to have a nominal capital of £100,000, divided into 100,000 shares of £1 each. Of these 60,000, credited as fully paid, are to be given in exchange for the 6000 shares in the old company and 30,000 are also to be allotted to shareholders, with 5s. credited as paid, leaving a liability of 15s. The shareholders will therefore receive new shares of practically the same market value as their old ones, and they will be saddled with a liability equal to £3 15s. on each of the old shares. Their fully paid shares in the new company will find a ready market at any time, and in view of the present price of tin the shares with the liability on them should also prove an attractive speculation in some quarters.

While writing on tin matters, it may be of interest to point out a feature of the industry which does not appear to be generally known. I refer to the increasing inclination of Cornish smelters and other local magnates to invest their money in foreign tin districts. While London capitalists and other outsiders have been doing something toward reviving and extending the Cornish tin industry, the owners of the smelters have been looking to other tin countries for a supply of ores, and the local money men have been investing their money in other quarters of the world. Two notable Cornish companies operating in this way are the Totoral, which owns properties in Bolivia, and the Tronoh, which works tin mines in the Straits Settlements. Both of these companies have their offices in Cornwall and are under local direction.

Ralph Nichols who has recently been appointed consulting engineer to the Avino Mines of Mexico, Ltd., has just issued an interesting preliminary report, giving his impressions obtained by his examination of the property. The mines belonging to this company are situated near the town of Avino, Durango, and they were originally sold to the English company in 1899 through the instrumentality of Messrs. Newhouse, Reynold Ward and Frank Gardner. As I have remarked before the British public seems to have a propensity for acquiring refractory propositions in Mexico. In this case the precious metal values in the oxidized ores were mostly in the quartz, while the sulphides were mixtures of pyrite chalcopyrite, blende and galena; both classes of ore being equally unamenable to water concentration. At the beginning, the English shareholders were handicapped also by the want of proper advice as to treatment of the ores, for large and expensive concentrators were put up which proved useless from the first. Afterward Ottokar Hofmann's services were called in and he recommended the adoption of lixiviation for certain of the ores. It is doubtful whether the board and managers made the most of Mr. Hofmann's advice. Affairs at the mine were put in Mr. Nichols' hands a few months ago. He reports that the lixiviation process as conducted by the company has been a failure, and that there has never been any real system in developing the orebodies. His recommendations are that the treatment of the ore shall cease for a time and that exploration and development shall be prosecuted for a considerable period with the object of opening up large reserves of sulphide ore. The company will then be in a position to sort suitable shipping ore and make reasonable terms with the smelters.

General Mining News.

Petroleum Exports—Exports of mineral oils from the United States for the four months ending April 30 were, in gallons:

	1905.	1906.
Crude oil	28,003,424	41,111,330
Naphthas	8,487,934	14,629,251
Illuminating	265,387,039	255,810,369
Lubricating	34,728,082	59,913,571
Residuum	19,566,708	21,578,639
Total	356,173,187	393,063,150

Paraffin is included in lubricating oil. The total shows an increase of 36,889,963 gal., or 10.4 per cent., this year.

ARIZONA.

COCHISE COUNTY.

The directors of four of the companies operating at Bisbee—the Calumet & Pittsburg, the Lake Superior & Pittsburg, the Junction and the Pittsburg & Duluth—have prepared a plan of consolidation, which is submitted to the shareholders. It is proposed to organize a new corporation under the laws of Minnesota with an authorized capital of $20,000,000, divided into 2,000,000 shares of the par value of $10 each. Of this amount 1,400,000 shares will be set aside to exchange for the outstanding stock of the four corporations. One hundred thousand shares of the new corporation will be sold at par to stockholders and the remaining 500,000 shares will remain in the treasury. The following is the method of proportionate exchange. One share of the companies named will receive new stock, Calumet & Pittsburg 1 35/60, Lake Superior & Pittsburg 1 35/60, Junction 1 23/60 and Pittsburg & Duluth 1 3/60. Application will be made to list the new stock on the Boston Exchange.

Cochise Consolidated—This company's concentrating mill in the Chiricahua district, near Portal, has been started. It has a capacity of 100 tons per day.

GILA COUNTY.

The shaft which is being sunk at Deer creek, on the former San Carlos Indian reservation, is down 100 ft., and drifts have been run 100 ft. each way. A seam 3 ft. thick is reported, the coal being of fair quality.

PIMA COUNTY.

At the Helvetia smelter recently the ore-bins gave way, and a large quantity of ore was thrown down upon the furnace, tearing it from its foundation. Repairs are being made.

YAVAPAI COUNTY.

Crowned King Mining Company—The stockholders of this company met in Taylorville, Ill., May 14, and voted to approve the sale of the stock and property for $100,000 to New York parties.

CALIFORNIA.

ALPINE COUNTY.

Loope—This camp, the largest mine in which was recently taken over by the Humphrey-Kirman combination, of Reno, Nevada, is expected to become one of considerable importance within a short time, as the new company is employing additional men with a view of working the mine upon a large scale. The stamp mill is to be doubled and the mine is to be run at its fullest capacity. As soon as the supplies can be received a large electric station will be built below the camp on the Carson river.

BUTTE COUNTY.

Henry Downing, of Oroville, has bonded an 80-acre tract of land situated south of Oroville to a syndicate in which J. H. Leggett, the well-known dredger man, is the leading spirit. The tract is situated in close proximity to the dredger district.

At Oroville, G. W. McCall, a well known pocket hunter, has uncovered a rich pocket on what is known as the old brewery lot, a few yards from the Northern Electric Railway depot. The land belongs to the Western Pacific, and has always been known to be rich, a continuation of the famous old Carpenter flat lead running through there. Many attempts have been made to obtain permission to prospect it, but without avail. It is understood McCall is in the employ of the railroad company. Considerable excitement prevailed when it became known that a rich pocket had been found, and many stories were revived of the famous old lead.

EL DORADO COUNTY.

Union—The new 20-stamp mill of this mine, El Dorado district, has started. Twenty more stamps are to be added as development work progresses. The mine is now under bond to P. Humbert, Jr.

Vandalia—Chas. Seymour is endeavoring to carry out a deal which will result in starting up again this mine at Shingle Springs.

INYO COUNTY.

Casa Diablo Mining Company—This company has made final payment for the Sherwin mines. A mill and cyanide plant are to be built and running before October. The 7-mile pipe from Rock Creek will receive first attention, as an ultimate increase of working force to probably fifty men depends on this additional water supply.

NEVADA COUNTY.

Yuba Consolidated Gold Mining Company—A company composed of W. A. Merralls, John W. Heisner, C. A. Mariner and B. W. Price, has purchased this property near Maybert.

North Star Mines Company—This company, at Grass Valley, is putting the finishing touches to an addition to its immense cyanide plant, which will more than double the present capacity. The plant, with the additional 24 tanks, will be able to handle over 200 tons of tailings per day. A big saving will be made in water, the company having excavated a reservoir above the cyanide works. The water in the tailings will be pumped into the reservoir, and made to do duty over and over again. At present it is allowed to run off after passing through the tanks.

Cold Spring—W. G. Motley & Co., of New York, have started to reopen the Cold Spring tunnel in the old Harmony channel two miles northeast of Nevada City. The tunnel was run a number of years ago under the direction of M. L. Marsh for a distance of 1500 ft. and tapped the channel. The gravel was cemented and did not pay by the usual washing process. The present company is now in 50 ft. and is re-timbering the ground and making a permanent job of it. Harry B. Gray is the superintendent in charge.

Young America Mining Company—Having erected the necessary building for housing its men, this company is now engaged in running a tunnel at its property on the Yuba near French Corral. In facing up, after running a cut into the side of the hill, the ledge followed showed a width of 20 in. It is strong in formation and samples brought in since that time carry a large quantity of sulphurets, besides a showing of free gold.

Phoenix Mill—Simmons Brothers have leased the Phoenix quartz mill on Gold Run, near Nevada City, and have begun placing it in repair. They will crush there the ore from their Eclipse mine, which is situated near by, and also do custom work for other mines. The plant is modern, and one of the best in the district, having been used but six months. It has 10 stamps, two Johnson concentrators and a perfect plate system. Local mine owners who do not have mills of their own have for a long time felt the necessity of such an opportunity as will now be offered to have their ore reduced.

SHASTA COUNTY.

Delta Consolidated Gold Mining Company—This company has concluded the purchase of the Laconia group, consisting of the Little Donkey, Scorpion and Crown Point claims, giving the company an ownership on Dog Creek from the Delta mine to the Trinity mine. There is about a mile and a half of tunnels and drifts on the properties and a two-stamp mill for prospecting. A large ore-reducing plant will be operated. The force of men employed will be doubled, and instead of confining the work to development, ore will be produced for treatment.

TRINITY COUNTY.

River Bed Mining—A. W. Lindsay has been engaged in building a tunnel at the Horseshoe bend of the Trinity, about three-fourths of which is completed. The place is above China Flat, Humboldt county. He expects to have the remainder finished within a few months. When completed the ditch will be 505 ft. long and will divert the water from the main river into the ditch, leaving and draining about three-quarters of a mile of river bed to

prospect. The indications that some rich find will be made in the river bed are good.

Bonanza King Mining Company—Joseph Porter, superintendent of the Bonanza King mine above Trinity Center, says the big fire will not interfere with the installation of the new plant upon that property. The machinery ordered by the company, including a 20-stamp quartz mill, power plant, aërial tramway, sawmill and air-compressor plant will be on the ground by June first. The power plant will be installed on the Trinity river four miles from the mine and will be run by water power. The sawmill, stamp mill and machinery will be run by electricity. Each battery of five stamps will be run by a separate motor. Each stamp weighs 1250 lb. There will be 10 concentrators of the latest designs. Ore will be transported from the mine to the mill bunkers by gravity tram. The air compressor will furnish power for the machine drills and hoisting in the mines. The sawmill, with a capacity of 12,000 ft. per day, will furnish all lumber for building and timber for mine purposes.

COLORADO.

SUMMIT COUNTY.

Everything points to a very active season for Breckenridge district in particular and for Summit County in general.

The Jessie mine has opened up a 4-ft. ledge of exceptional value, between the second and third levels of the main workings, and the management is now busy opening this up to ascertain its extent. Three feet of this ledge is streaked with heavy lead sulphide, carrying high values in gold and silver. The other 12 in. is milling gold ore which assays high in silver and gold. The company's mill is being put in good shape for work and will be started up into operation next month.

The Old Union Mining and Milling Company is now running its large mill up to its full capacity. The main tunnel workings are producing good concentrating ore which is being milled.

The Wellington mine is making regular shipments of zinc and lead ores, and is shipping its mill ore to the Old Union mill.

The famous Oro mine in French gulch, which has been in litigation for the past 13 years, is now in shape for the resumption of work. The litigants have arrived at an amicable settlement.

The Beaver Creek Gold Mining Company, which has been operating the Lucky mine for the past 18 months, has now purchased the Minnie mine and mill, which adjoin them on the southwest on Mineral hill. The Minnie is at present being operated under lease and will so continue until the end of July, when the new company will take possession.

The Country Boy lode, which is being worked on lease by the Lanyon Zinc Company, is being well developed. The management is now drifting on the vein and getting ready to stope ore which runs from 40 to 55 per cent. zinc. The pay streak is from 24 to 38 in. wide and the ore is shipped direct to Iola, Kansas.

The Mary Verna Mining Company, operating in the Ten Mile cañon in Frisco, has struck lead ore in the main tunnel which runs into Royal mountain from the Ten-Mile river side and taps the mountain at a depth of 1200 ft. This is the deepest work in this mountain.

Albert Newton has sold his property, adjoining the Victoria mine, on Mount Royal, at Frisco, to a company, which intends to push development with vigor.

The Summit Banner Placer Mining Company, operating under the management of Col. Lemuel Kingsbury, in Iowa gulch, is about to start the season's operations. The pipe line and boom are in order, and washing has actually commenced.

IDAHO.

BLAINE COUNTY.

A group of claims adjoining the Lost Packer mine on the Loon creek, has been sold to Samuel Newhouse by the former owners, C. C. Ruthrauff, H. A. Walter and others. It is said that development work on this group will be begun soon.

MICHIGAN.

The State Industrial Commissioner reports that the coal production of the State for the four months ending March 31 was 743,789 tons. The total number employed in and about the coal mines was 3243 men.

IRON-GOGEBIC RANGE.

Empire Iron Company—This company has bought a No. 6 Allis-Chalmers rock-crushing plant consisting of a No. 6. style K Gates breaker, a 36-in. geared troughing belt conveyor, two 12x18-in. bin gates and a Chandler & Taylor engine.

MONTANA.

SILVERBOW COUNTY.

Anaconda Copper Mining Company—At the annual meeting at Anaconda, May 16, the following directors were chosen: H. H. Rogers, William Rockefeller, John D. Ryan, John E. Judson, E. C. Bogart, William L. Bull, Geo. H. Chance.

OHIO.

Columbus & Hocking Coal and Iron Company—In the year ending March 31, 1906, the gross earnings of this company from coal were $474,839; rents and royalties, $52,226; total earnings, $527,065. The working expenses were $423,237; interest and other charges, $73,597; total, $496,834, leaving a surplus of $30,231. This contrasts with a deficit of $39,500 in the previous year. The result is due to careful management, especially as the year was one of competition and small profits in the Western coal trade. The report says: "Much attention has been given during the past year toward developing our Kinkaid field. During the first period of operating the coal seam worked was much thicker than it is now, making mining easier and cost of production smaller. We are gradually increasing the output and reducing the cost, and recent investigations and borings prove that we have an extensive and very valuable coal field before us here, which can be worked profitably and extensively for a long period of years.

"The greatest asset possessed by the company lies in its deposits of clays of every description, possessing qualities making them suitable for the manufacture of face bricks of every kind, fire bricks, paving blocks, sewer-piping, pottery, fireproofing, tiles, etc. We are able to report the successful outcome of our plans to turn this asset, which in the past has been entirely neglected by the company, into a revenue-bearing enterprise. By next spring we expect the first plant to be in full operation ready to compete for business."

OREGON.

BAKER COUNTY.

Manager Geo. W. Boggs, of the Mayflower mine, in the Cornucopia district, reports that the roads there are now in good condition, and that all the different mines in that camp are again accessible.

The Union Companion mine is working 50 men, and they are preparing heavy shipments of ore and concentrates.

The Mayflower is putting on a full force of men. The new mill plant will be completed and producing within 60 days. Many tons of ore are in the ore-bins and blocked out in the mine.

The Queen of the West will begin the construction of a 10-stamp mill as soon as the lumber can be prepared and placed on the ground. The lumber is now being cut by the company's sawmill.

PENNSYLVANIA.

ANTHRACITE COAL.

John Lloyd, of Philadelphia, has bought 700 acres of coal land adjoining the Buck Mountain colliery, and in Norwegian township. The parties represented in the purchase are not known, but it is said that the property will be developed at once. The former owners were Richardson & Tate, of Pottsville.

BITUMINOUS COAL.

Pittsburg & Westmoreland Coal Company—This company's Hazel Kirk No. 2 mine near Washington was threatened on May 21, by a fire in the surface plant. It started in an engine house, which was soon destroyed, with a warehouse and tipple. The 300 miners in the mine were in jeopardy, and the fans were stopped, as it was feared the airshaft would ignite and cut off their escape. A trapper boy

who volunteered to go into the mine and warn the men gained an entrance by the ladder in the airshaft. While the men outside fought the flames with buckets of water and kept the blaze from the airshaft, miners poured from the pit. The cage shaft was soon ablaze, and as it would be but a short time until burning embers from the timbers would ignite the coal, a trainload of buckets was rushed from Monongahela and a bucket brigade of the 300 miners was formed. Water was taken into the mine through the airshaft and the bottom of the cage shaft deluged.

Pittsburg Coal Company—This company reports production for the three months ending March 31 as follows, in short tons:

	1905.	1906.	Changes.
Pittsburg district..	2,631,635	3,956,205	I. 1,324,570
Ohio district.....	209,257	314,670	I. 105,413
Total coal.....	2,840,892	4,270,875	I. 1,429,983
Coke made.....	77,137	103,630	26,493

The increase in coal mined this year was 50.3 per cent.; in coke made, 34.4 per cent.

SOUTH CAROLINA.

GREENVILLE COUNTY.

T. W. Miller, William Teague and D. E. Shade, of Joplin, Mo., who have been operating for monazite in Greenville county for several months past, have decided to work ore on a larger scale and are erecting four mills to increase their product. Until recently they have had but one mill with a capacity of 400 lb. a day. The four now being constructed will have a capacity of about 1000 lb. each per day. The operations are about 7 miles from Piedmont, a station on the Columbia & Greenville line of the Southern Railway, and about 14 miles from Greenville.

SOUTH DAKOTA.

LAWRENCE COUNTY.

Reliance—Contracts have been let for the lumber, machinery and construction of the new 150-ton cyanide mill on this company's property. Work of grading for boarding and bunk houses is under way. As soon as these buildings are enclosed, men will be put to work grading for the mill. The Allis-Chalmers Company will furnish machinery and other supplies. The mill will be a wet-crushing mill, and the slimes will be treated by filter-pressing. A No. 5 Gates crusher, rolls and Huntington mills will be installed.

Homestake South Extension—Drifting from the 150-ft. level of the shaft has commenced for the purpose of cutting off the water. A good body of ore was encountered at a depth of 100 ft. Indications are favorable.

Homestake Extension—The bids for the construction of the 120-stamp mill for this company have been opened, and the contracts will be let in a few days. The shaft on the New England Extension is now down to 110 ft., and a larger hoist has been ordered.

Globe—At a special meeting of the board of directors held in Chicago, April 28, it was decided to complete the mill by installing the Ogden process. The company owns a large mill building a short distance from Lead, near the tracks of the railroad.

Superior Chemical Reduction Company—By an arrangement with the Globe Mining Company the Superior Company will have the use of half of the mill belonging to the Globe, and will install a plant of its own. This is to take the place of the mill which was burned at Deadwood on March 12 last.

Golden Reward—The Ruby Bell tunnel, run for the purpose of draining the Union shaft, has been completed, the men having broken through a few days ago. The tunnel is 1700 ft. long, and as soon as a few dams are removed, it will be in condition to drain the Union shaft and the adjacent workings.

Calaboga District—Some strikes have been made recently in this district, which lies in the southeastern part of this county between Jim Creek and Box Elder. The Yellow Jacket has, in shaft No. 1, a ledge 2 ft. wide on the surface and 20 ft. wide at a depth of 65 ft. L. A. Richards, with ground just south of the Yellow Jacket, in running a tunnel for ventilating purposes, struck a vein 14 ft. wide, carrying values in gold and silver, and also 7 per cent. zinc.

PENNINGTON COUNTY.

Montana—Work on this property will probably be resumed on a large scale. It has been idle for some years, but Manager Hibbard, who has been developing it by means of an old tunnel, has opened up a vein of ore running from $5 up. The tunnel is now in 350 ft. The estate of the late ex-Governor Smith, of Vermont, is interested.

Spodumene Property—Ed. Christiersson has leased his spodumene property to a Philadelphia company which will begin operations shortly. The demand for lithia minerals has increased lately, and the property can now be worked at a good profit.

Mainstay—Enough water has been encountered on the 300-ft. level of this mine to insure the running of the mill. Not less than 10 stamps are dropped, and part of the time it is possible to use as many as 15. The orebodies hold out well.

TEXAS.

CHEROKEE COUNTY.

Rusk—The Star and Crescent blast furnace has been sold and the new owners will operate it after an idleness extending over several years.

JEFFERSON COUNTY.

Beaumont—In several of the coastal oil fields an increase in production has taken place this month. Humble has advanced its output 1500 bbl. daily, Jennings 4000 bbl.; Spindletop and Saratoga show small increases. Prices for crude hold steady; holders of crude have not realized their hopes of a stiff advance and likely will not until the Jennings output, which dominates the fuel market, shows a material decline. Many old Spindletop wells are being cleaned out and pumped. Other proven fields are steadily developed, but there is very little wildcatting and no new gusher fields in sight.

Present production and prices are as follows: Spindletop, 4400 bbl.; 60c. Sour Lake, 6750 bbl.; 49c. Saratoga, 6800 bbl.; 40c. Batson, 7000 bbl.; 39c. Humble, 11,300 bbl.; 43c. Jennings, 29,500 bbl.; 32c. Estimated stocks, 17,000,000 barrels.

UTAH.

Ore and bullion settlements amounting to $417,700 are reported by the Salt Lake City banks, for last week.

BEAVER COUNTY.

Horn Silver—The zinc mill at this property is now in commission, and three carloads of concentrate have been shipped.

Talisman—Ore shipments continue regularly from this property. The ore is of a grade which gives the owners a fair profit.

Majestic Smelter—There is some talk of placing this plant in commission again. W. H. Nutting, former superintendent of the Bingham Consolidated smelter at Bingham Junction, has made an inspection and reported what is needed to put the smelter in first-class running order.

Harrington & Hickory—This mine is owned by the Majestic Copper Company. Recent developments have disclosed some bodies of low-grade lead ore as well as high-grade.

JUAB COUNTY.

Black Jack—It is reported on good authority that the American Smelters' Securities Company has an option on a control of the stock of this corporation on the basis of $1.10 a share.

Yankee Consolidated—The directors of this company have posted a dividend of $25,000, payable June 1. An order has been placed for an air compressor to replace the one recently destroyed by fire.

Scranton—This property is making regular shipments of zinc ore, which is sent to Kansas for treatment. The company has applied for patents on two of its claims.

PIUTE COUNTY.

Sevier Consolidated Mill—This plant, which went into commission in the latter part of March, is making a good account of itself. The management claims it is making a saving of 95 per cent. of the gold contents of the ore treated.

SUMMIT COUNTY.

Ore Shipments—From Park City last week shipments were 4,408,400 lb., the shippers and amounts being: Daly Judge, 1,015,000; Daly Judge (zinc middlings),

641,000; Kearns-Keith, 108,000; Silver King, 1,504,000; Daly West, 1,140,000 lb.

Ontario Tunnel—Work is still being pushed ahead in the effort to open this adit, which has been closed because of caves for over a year. It will probably take several months yet to open the avenue, and until it is opened development work in many of the mines will be greatly retarded. As it is, the Daly West can sink no deeper, nor can the Daly or American Flag companies. The flooded condition does not affect such mines as the Daly Judge and Little Bell in the upper end of the camp, the lowest workings of which are many hundreds of feet above the water level of the mines affected by the stoppage of the Ontario tunnel.

The ore output of Park City's mines last week footed up to 4,732,500 lb., the shippers and amounts being: Daly Judge, 963,000; Daly Judge zinc middlings, 500,000; Kearns-Keith, 269,000; Daly West, 1,200,000; American Flag, 527,900; New York, 47,000 pounds.

TOOELE COUNTY.

Overland—The blocking of ore in the drift from the bottom of the new shaft continues and the grade is better than was obtained in the old workings.

WASHINTON.

OKANOGAN COUNTY.

Referring to the discovery of molybdenite in this county, Ingham & Witcher reported last fall that they had struck a vein on their ranch, on Cayuse mountain, and were informed by Eastern metallurgists that specimens sent them from the discovery ran heavily in molybdenum. A report just received states that samples of the mineral were sent to Tacoma, Wash., and Los Angeles, Cal., for assay. The results reported from the Tacoma smelter are as follows: No. 1, antimony 70.1 per cent. No. 2, antimony 43.3 per cent. The returns from samples sent to Los Angeles were: No. 2, antimony 49.6 and No. 2, 38.8 per cent. The report states that Ingham & Witcher have an immense deposit of this mineral, and they have been offered by an Eastern buyer $2 per unit for all of it they can ship, and "the railroad has given them a rate of $23 for transportation."

Golden Chariot—This property is 5 miles northwest from the town of Oroville, with a down-hill haul to that place. Two years ago it was purchased by Minnesota and Dakota people, Spokane, Wash., capital being also interested. The Golden Chariot Mining and Smelting Company was then incorporated. Last fall a vertical shaft was sunk 100 ft., cutting through 2 ft. of a pay shoot at a depth of 30 ft., and drifts were started north and south on the vein. Work was resumed lately, and a winze was started from the south drift and is down 20 ft. on ore that averages well in gold and silver, the former predominating.

Q. S. Group—If the tunnel continues encountering good ore, the company contemplates driving another one to cross the vein at a depth of 3000 ft., starting at the base of the hill and installing a 40-drill compressor. A sawmill will be put up for cutting mine timbers and lumber for building. The company is considering the installation of a gravity tramway for the conveyance of men and materials.

Elone Mining Company—This company owns three claims in the Methow Valley district, near Twisp. The principal vein is 30 ft. wide, the ore running principally in gold. Only assessment work has been done. The company will hold the first shareholders' meeting June 12 and then formulate plans for development.

WEST VIRGINIA.

Davis Coal and Coke Company—This company, it is understood, has bought some 25,000 acres of coal lands in Marion and Monongalia counties. They are on the line of the Western Maryland or Wabash extension to Wheeling, now under construction.

John C. Brydon has been appointed general manager of the company, and will have his office at Cumberland, Maryland.

Foreign Mining News.

CANADA.

BRITISH COLUMBIA.

Tyee Copper Company—This company reports that its smelter at Duncan's Station, Vancouver Island, ran 13 days during April and treated 1717 tons of Tyee ore, giving a return, after deducting freight and treatment charges, of $34,723; on average of $20.22 per ton.

ONTARIO.

Cobalt—The explosion of a quantity of dynamite in the northwestern section of Cobalt on May 18, caused by the spreading of a bush fire, wrecked a number of houses, and caused a general panic by the violence of the shock. About 50 houses were burned, but no one was seriously injured, and at last accounts the fire was under control. Many exaggerated reports of the extent of the disaster obtained currency, which are contradicted by later information.

Cobalt Smelting and Refining Company—This company, the leading promoters of which are C. H. Gowman and J. H. Schlund, of Chicago, has purchased 10 acres at Argentite, two miles north of Cobalt, on which it will erect a smelter at a cost of $120,000. The company has purchased a new smelting and refining process from Thomas H. Miller, of Detroit. Demonstrations were made at Detroit recently with ores taken from two mines, one rich in silver and the other in nickel and cobalt. The result, it is stated, was satisfactory, entailing a loss of only 4 oz. of silver to the ton. The plant is to have a capacity of 120 tons of ore per day, and the company will pay for ore at the smelter, including nickel and cobalt contents. Several Cobalt mine owners are identified with the enterprise.

MEXICO.

CHIHUAHUA.

Dolores—An esteemed correspondent writes us as follows, from Mexico: "Your London correspondent, in your issue of May 5, might have gone a little further in his criticism of a London journal referring to Mexican news. The Dolores mine is not in the State of Guerrero; it is in the State of Chihuahua, distant 2½ days' ride from Miñaca, a station on the Stillwell road, which is being built through from the city of Chihuahua to Topolobampo, which is a port south of Guaymas, the northernmost port on the Gulf of California.

"What is the matter with the geographical instincts of London and New York?"

SONORA.

Oro Maximo Mining Company—Ore is being blocked out at the mine of this company, preparatory to the installation of the mill. The orebodies are reported to be extensive. The mill will have a capacity of 200 tons daily. Over 100 men have been sent to the property in the past two weeks.

Sierra de Cobre Mine—After two years of extensive development work, shipping is about to begin at this mine, which is in the heart of the Cananea district, and is controlled by the Copper Queen Consolidated. For many months the water was so bad in the mine that development work was practically at a standstill, but now this has been overcome.

EUROPE.

BELGIUM.

The output of pig iron in Belgium for the three months ending March 31 was 345,283 metric tons, against 317,748 tons last year; an increase of 27,535 tons.

Pressure is being brought on the Government to grant concessions in the new Campine coalfield. None has been given as yet.

SPAIN.

Exports of minerals from Spain for the three months ending March 31 are reported by the *Revista Minera* as below, in metric tons:

	1905.	1906.	Changes.
Iron ore	1,659,050	2,500,204	I. 841,154
Copper ore	235,411	288,139	I. 52,728
Zinc ore	34,478	35,006	I. 528
Lead ore	1,882	1,136	D. 746
Manganese ore	10,147	23,415	I. 13,268
Pyrites	161,075	239,153	I. 68,078
Salt	86,172	107,408	I. 21,236

Exports of metals for the three months included 16,614 tons pig iron, against 20,897 tons in 1904; 10,590 tons manufactured iron, against 514 tons; 2356 tons copper, against 1905 tons; 5706 tons copper precipitate, against 4080 tons; 63 tons spelter against 355 tons; 37,571 tons lead, against 35,871 tons last year.

SOUTH AMERICA.

BRITISH GUIANA.

Exports of gold from British Guiana for the four months ending April 30 were 22,998 oz. bullion; a decrease of 756 oz. from last year. The bullion reported was equal to 19,781 oz. fine gold, or $408,864. Exports of diamonds were 565 karats, valued at $3209; against 1815 karats, valued at $10,445, last year.

DUTCH GUIANA.

The gold production by districts is reported as below for March and the three months ending March 31, in grams:

	March.	Three Mos.
Surinam	16,924	60,372
Saramacca	34,685	58,457
Marowijne	15,613	42,698
Lawa	24,532	40,969
Corantijn	.....	12
Total	91,754	202,508

The total was equal to 6511 oz. gold, or $134,582 in value.

Coal Trade Review.

NEW YORK, May 23.

The coal situation in the West still continues uncertain. In Ohio an attempt is to be made in District No. 8 to open the mines with non-union labor; if it succeeds, the same course will be taken in other districts. It is doubtful, however, if a sufficient number of men can be secured to carry out the plan, even in one district.

An offer made to arbitrate differences in the Ohio field has been declined by the miners' representatives.

In Indiana and Illinois, joint conferences are in session this week. In both the results are doubtful. It is probable that the conferences will last for several days more.

It is reported that the Norfolk & Western Railway Company has obtained control of the old Short Line from Columbus, O., to Sandusky. This will give the road an outlet over its own tracks to a Lake Erie port, completing a line from West Virginia to the Lakes.

Public interest has been aroused by the investigation which the Interstate Commerce Commission is now conducting into the coal traffic in the bituminous region of Pennsylvania. In a general way it has brought out little that is new. Inequalities and favoritism, shown chiefly in the distribution of cars and the despatch given shipments, have long been matters of knowledge and complaint, especially in the Clearfield region. The investigation has brought out specific charges and evidence of bribery to railroad officials, the truth of which may be tested in the courts. It is rather a shock to the public, which has been accustomed to look upon the management of the road under investigation as straight; and the company itself may undertake some inquiry, to clear its own reputation. A similar condition will undoubtedly be found on other roads. Those in the trade are not surprised, and possibly not ill pleased with the exposures; though for reasons which will readily be understood, they have not been inclined to share their knowledge with the public heretofore.

COAL TRAFFIC NOTES.

The total coal and coke traffic originating on all lines of the Pennsylvania Railroad east of Pittsburg and Erie for the year to May 12 was as follows, in short tons:

	1905.	1906.	Changes.
Anthracite	1,654,813	1,427,778	D. 227,035
Bituminous	10,010,832	11,845,990	I. 1,835,158
Coke	4,009,689	4,632,419	I. 622,730
Total	15,675,334	17,906,187	I. 2,230,853

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the week ending May 19 were 12,382 tons. For the year to May 19 they were 311,797 tons.

Receipts of coal at Boston for the four months ending April 30 are reported as below:

	1905.	1906.	Changes.
Anthracite	593,983	475,406	D. 118,577
Bituminous	825,513	1,025,329	I. 199,816
Foreign	218,578	283,237	I. 64,659
Total	1,638,074	1,783,972	I. 145,898

The foreign coal is chiefly from Nova Scotia, but a little comes from Great Britain also.

The Ohio Coal Traffic Association reports coal tonnages over the roads included for the three months ending March 31, as follows:

	1905.	1906.
Hocking Valley	741,349	1,120,334
Toledo & Ohio Central	348,617	534,826
Baltimore & Ohio	495,134	539,502
Wheeling & Lake Erie	629,925	913,507
Cleveland, Lorain & Wheeling	462,943	680,646
Zanesville & Western	233,748	366,802
Toledo Division, Penna. Co.	554,479	740,046
Lake Erie, Alliance & Wh'ling.	206,870	295,719
Total, net tons	3,673,065	5,191,382

The total increase this year was 1,518,317 tons, or 41.3 per cent. All the roads showed large gains over last year. Much of the increase was done to stocking in February and March, in anticipation of a strike.

The coal tonnage of the Baltimore & Ohio Railroad for the three months ending March 31 was as follows:

	1905.	1906.	Changes.
Anthracite	291,008	249,381	D. 41,627
Bituminous	5,388,062	6,689,768	I. 1,301,706
Coke	1,032,452	1,533,840	I. 501,388
Total	6,711,522	8,472,989	I. 1,761,467

Both bituminous coal and coke show large increases.

The coal tonnage of the Norfolk & Western Railway for the three months ending March 31 was, in short tons:

	Coal.	Coke.	Total.
To Line points	2,104,687	622,578	2,727,265
To Tidewater	803,107	44,878	847,985
Total	2,907,794	667,456	3,575,250

The total tonnage shows an increase of 513,670 tons, or 16.8 per cent., over last year.

Coastwise coal shipments from Atlantic ports for the three months ending March 31 are given by the Bureau of Statistics as below:

	Anthracite.	Bituminous.	Total.
New York	3,915,911	2,420,744	6,336,665
Philadelphia	428,760	1,203,297	1,632,057
Baltimore	49,998	853,785	903,783
Newport News	.....	714,532	714,532
Norfolk	.....	534,085	534,085
Total	4,394,669	5,726,443	10,121,112

The total shows an increase of 2,248,960 tons, or 28.6 per cent., over last year.

New York. May 23.

ANTHRACITE.

The situation among anthracite producers is about the same as last week. The demand for all domestic sizes is fairly good, but the supply is not what it might be; this is not due to car shortage but rather to a decided lack of topmen or laborers at the mines. These laborers are coming back in fairly good numbers. During the strike many men left the anthracite fields to find employment elsewhere and those with families will undoubtedly return to their former places. Production under the circumstances is resuming its former proportions. About 75 per cent. of the usual tonnage is being mined and altogether the situation is resuming a normal aspect.

Prices continue as follows: $4.35 for broken and $4.60 for domestic sizes. For steam sizes; $3 for pea; $2.25@2.50 for buckwheat; $1.45@1.50 for rice and $1.30@1.35 for barley f.o.b. New York harbor shipping points.

Complaints having been made in New York, Philadelphia and other cities as to the high price of anthracite, the operators have issued the following statement: "If the price of domestic sizes of hard coal is being maintained above the normal level for this season of the year, as stated in some quarters, the responsibility is wholly with the dealer. Based on the prices that have been charged by the large anthracite companies to the local dealers, there neither is, nor has been, any justification for local advances. It is true that the $5 price at tidewater was maintained during the period of uncertainty, but when that ended the May schedule of $4.60—the same as heretofore—was put into effect. Certainly this does not justify any advance over the price that obtained a year ago in May. Even during the period of stress, when the strike was in force, the operators continued to deliver coal to all their regular customers without any increase in price, and they were surprised, even then, at the comparatively small demand from the consuming public and especially from the large dealers for other than steam sizes."

BITUMINOUS.

The Atlantic soft-coal trade becomes duller as the season progresses. A large number of mines in central Pennsylvania are still suspended on account of labor disturbances, but the production from these mines is not necessary to the

market, as what is coming from the other regions is more than consumption will take care of. In fact, the producing mines are curtailing shipments liberally. The anthracite operators, in commencing to ship, have absorbed some of the cars used for shipments of soft coal, but even under these conditions there seems to be enough cars.

Trade in the far East is sluggish and consumers prefer to use up some of the large stocks of coal they have on hand, rather than keep those stocks intact, which were accumulated as a precaution against the strike.

Trade along the Sound is a little more active than further east. Dullness is the general report from this consuming territory. Contractors are trying to take their monthly proportion and as yet are falling off but slightly. New York harbor is quiet, and producers are not sending much coal to this market, which is rather a declining one. Good grades of Clearfield have sold as low as $2.50@2.60 f.o.b. New York harbor shipping port, with West Virginia coals selling lower.

All-rail trade is comparatively active; prices are on the decline for current business running from $1.20@1.30 f.o.b. mines for good grades. Car supply is up to all demands. Transport is a little slow but nobody is complaining, however.

In the coastwise vessel market, vessels are a little scarce, especially among smaller sizes. They have apparently become bunched in the East.

We quote current rates of freight from Philadelphia as follows, on large vessels: Boston, Salem and Portland, 65c.; Lynn, Newburyport, Gardner and Bangor, 75c.; to the sound, 60c.; Portsmouth and Bath, 70c., and towages.

Birmingham. May 21.

Car shortage is being felt in Alabama and coal producers are complaining. It is holding down the production quite a bit. Good prices prevail and the demand is stronger than ever before in the summer time. The State mine inspectors are kept busy watching conditions. A report was made by Assistant State Mine Inspector M. M. Kuffner last week on the Margueretti mines, in St. Clair county, recently opened by the Alabama Fuel and Steel Company. The output is growing, 200 tons a day now being the record. The report shows that the development is on a modern scale and that a tipple has been erected and labor-saving devices will be used in handling the coal so that the daily output can be increased to 1500 tons at least. Labor-saving devices in handling coal are being added at a number of other places in the State. The Woodward Iron Company will put in an electrical haulage system at its coal mines, while the Republic and Tennessee companies are equipping their mines with modern machinery.

Coke is still in good demand and the production is strong.

Chicago. May 21.

Quietness continues to characterize the coal market. Supplies of western coals are still fairly large for current needs, and there is no disposition of manufacturers or railroads to go beyond these needs. It is probably true that individual stocks—that is, those laid in by consumers—are nearly if not quite exhausted, but needs are not great at this season and there are several non-union mines sending coal to the local market in addition to the stores accumulated by the union mines. Prospects at present do not seem bright for settlement of the labor question as regards Illinois. Though settlement of Iowa labor troubles is reported, the mines of that State do not seem to be yet producing any amount of coal to influence the market.

Under these conditions, speculative conditions continue in the Chicago market. Eastern bituminous is in good supply and brings high prices, though the demand is not large. There is a good supply of Hocking and smokeless is being more largely used on account of the city smoke regulations. Prices are about the same as last week.

Anthracite is in better demand, though not yet active. Probably it will not be in active demand before the end of the summer season. As it now looks, the Chicago river tunnels will be lowered to 25 ft. depth of water by Nov. 1 next, and this improvement will allow coal carriers to bring large cargoes to Chicago for their final trips before laying up for the winter. The present depth is only 17 to 18 ft., so the improvement will be a great one for the coal trade.

Cleveland. May 22.

The coal market has been stronger during the past week, due to the fact that much of the surplus produced by the mines in the Pittsburg territory has been taken by the lake trade, thus limiting the amount of material on the market. Railroads are also taking coal freely, and some of them have increased the activity at their shops, having discontinued operations in some quarters while coal was so scarce. The market for steam coal therefore has shown some improvement and prices have ruled at $1@1.10 at the mines for mine-run quality. The mine operators in the middle district have determined to use non-union labor. This trial will be made in No. 8 district and as soon after as possible non-union men will be employed in their other mines. It is the intention to give the system a complete trial in No. 8 district first, however.

The lake coal trade has been as brisk as the supply would permit. The serious congestion of boats at Lake Erie docks gave the shippers all the boats they could possibly need. It was apparent that most of them could only employ the smaller boats for the greater part of the time. Boats wanting loads had to go to the head of the lakes light.

The coke market is about steady, holding on the basis of $3 at the oven for the best grades of 72-hour foundry coke and $2.25@2.50 at the oven for furnace coke. Lower prices are expected in the near future.

Pittsburg. May 22.

Coal—There is but little change in the situation. All the mines in the Pittsburg district are in full operation, but railroad cars are not so plentiful and a decided shortage is expected before the end of the week. Heavy shipments to lake ports have been made by the Pittsburg Coal Company and other lake shippers and the cars are being used to carry iron ore. The railroads promise a good supply of cars within the next week or two. Prices remain unchanged and are based on mine-run coal at $1.15 a ton f.o.b. mine. The demand is increasing and prices are certain to advance unless the strike in the western States is soon broken. A determined effort is being made by Ohio operators to start the mines on a non-union basis and a large number of miners have been employed and armed guards are protecting them.

Connellsville Coke—The market is a trifle easier and $2.50 and less is quoted for furnace coke. Foundry coke is quoted at $2.75@2.80 a ton. The production of strictly Connellsville coke last week amounted to 271,175 tons and the shipments were 12,609 cars to the following points: Pittsburg district, 4509 cars; west of Pittsburg, 6604 cars; eastern points, 1496 cars. This was a decrease of 152 cars compared with the previous week. The combined shipments from the Connellsville and Masontown fields amounted to 344,131 tons.

Foreign Coal Trade.

May 23.

Exports of fuel from Great Britain, with coal sent abroad for the use of steamships engaged in foreign trade, for the four months ending April 30, were as follows, in long tons:

	1905.	1906.	Changes.
Coal	14,731,791	16,934,250	I. 2,202,459
Coke	201,387	224,824	I. 23,437
Briquets	344,264	467,051	I. 122,787
Total exports	15,277,442	17,626,125	I. 2,348,683
Steamer coal	5,396,169	5,932,517	I. 536,348
Total	20,673,611	23,558,642	I. 2,885 031

The large items of export were this year: To France, 3,054,952 tons; Italy, 2,723,729; Germany, 2,135,150; Spain, 924,365 tons. Exports to the United States were in long tons:

	1905.	1906.	Changes.
Atlantic ports	14,891	20,174	I. 5,283
Pacific ports	21,183	8,536	D. 12,647
Total	36,074	28,710	D. 7,364

The decrease this year was 20.6 per cent. The total is not large.

The export tax of 1s., or 24c., per ton on coal exported from Great Britain is to be taken off by next November, according to

budget now before Parliament. Experts in the trade, however, do not anticipate any special increase in exports to follow.

Imports of fuel into Spain for the three months ending March 31 were, in metric tons:

	1905.	1906.	Changes.
Coal	521,049	549,256	I. 28,207
Coke	36,789	50,078	I. 13,289
Total	557,838	599,334	I. 41,496

The principal part of these imports were from Great Britain.

Iron Trade Review.

NEW YORK, May 23.

The iron and steel markets show no especial change. While there is a little hesitation in foundry iron, owing to the widespread strike of the molders, steel pig of all kinds, especially basic, is in demand. The weakest point just now is in Southern iron, where some concessions seem to have been made to secure orders.

In finished materials the railroads continue heavy buyers, both directly in orders for rails, and indirectly through contracts for bridges and steel cars. Construction plans continue to make heavy demands for structural steel, and the mills are all full for a long time ahead. A special demand has been noted for corrugated sheets, large quantities being wanted for temporary structures in San Francisco.

There has been some talk about possible imports of material, but we hardly seem to have reached the importing point yet, notwithstanding the pressure for some classes of material.

Iron ore is now moving freely on the Lakes, and the mines are in a position to ship as fast as the docks can be cleared.

Birmingham. May 21.

The production of pig iron is not at its best in Alabama just now, but every ton is finding a sale. All furnace companies report that while there is no very great demand the short make is being disposed of right along. There is a strong home consumption of iron, and shipments are fairly good. There is a little weakness noted in prices. The larger concerns are holding their product at $14 per ton for No. 2 foundry. It is learned that some iron has been sold recently at $13.75 per ton, while rumors prevail that even that price has been shaded. It is now stated that the Sloss-Sheffield Steel and Iron Company will blow in its city furnace by June 1. The explosion at No. 4 furnace at North Birmingham, belonging to the same company, the first of the past week, caused three days' output to be lost. The damage has been repaired, the molten iron having broken through the hearth. Announcement is made that the Woodward Iron Company will rebuild its No. 2 furnace at Woodward, putting up a stack equal to No. 3, which is one of the largest furnaces in Alabama. The new furnace of the Alabama Consolidated Coal and Iron Company at Gadsden is nearing completion.

The rolling mills in this district are working steadily and the employees are under the impression that there is to be no let-up this summer. The cast-iron pipe works are losing no time and shipments are heavy and steady.

Chicago. May 21.

Notwithstanding a certain falling off in the demand for foundry iron, traceable to the molders' strike, transactions in pig iron have been fairly strong in the last week, and there are no signs of weakness in the immediate future. Buying continues strong of lots for immediate use and for delivery in the third and fourth quarters of the year. The size of individual orders is not large yet, 1000 tons being the limit, and most orders running one-fourth to one-half that amount.

Southern iron has perhaps dropped a trifle in price, being now quoted at $13.75. Birmingham ($17.65 Chicago), though on many orders a price 25c.@50c. higher prevails. Northern iron is steadily in demand for special uses, and holds up steadily to $18.50 minimum.

Malleable iron is in strong demand, and bids fair to continue so. These orders extend over the last half of the year.

Iron and steel products are in good demand, steel rails being especially active. The South Chicago mills are said to have booked orders for 1907 delivery aggregating nearly 700,000 tons.

Coke continues plentiful at $5.40 for Connellsville 72-hour.

Cleveland. May 22.

Iron Ore—The movement of ore down the lakes has been resumed with freedom. The congestion at the various lower ports was quickly relieved and boats started up the lakes. They are now bunching at Marquette and Duluth, the supply of ore being scarce at Escanaba. This makes it possible that boats will be delayed at Lake Superior ports, thus curtailing the amount of ore moved during the month of May. Rates on wild and contract shipments are unchanged at 75c. from Duluth, 70c. from Marquette and 60c. from Escanaba.

Pig Iron—Buying of pig iron is limited to the demand for third-quarter delivery. A little iron is being bought for fourth-quarter delivery, but not much. Some consumers are holding off for $16 iron in the Valleys, but so far are disappointed. Basic is strong at $17 in the Valleys, and bessemer is in demand at between $17.25 and $17.50.

Finished Material—Sheet-bars and billets are scarce. The supply of sheet-bars is so short that some sheet-mills have been shut down, the supply curtailed and the market strengthened. This demand has been unusually good and there is talk of higher prices. The only thing which may determine the mills to adhere to their old prices is the fact that it may not be policy on the part of the owners at present to make any change. Sheet-bars and billets are selling at $35@36 at the mill. The demand for structural is good in all quarters and specifications against old contracts are heavy, with new orders coming in. Plates are also stronger. Tractions are buying rails freely.

New York. May 23.

Pig Iron—Selling has been larger, the pipe foundries and pump works having taken some good lots. The molders' strkie is holding back orders for foundry iron. Furnaces are inclined to hold out for the present prices, and iron is not being pressed for sale.

For Northern iron in large lots we quote: No. 1X foundry, $18.50@19; No. 2X, $18@18.50; No. 2 plain, $17.50@18; forge, $16.25@16.75. Southern iron is held firmly by the larger companies on the basis of $14 Birmingham for No. 2, but 25c. may be conceded on a large order. For large lots on dock, New York prices are: No. 1 foundry, $18@18.50; No. 2, $17.50@18; No. 3, $17@17.50; No. 4, $16.25@17; No. 1 soft, $18.25@18.50; No. 2 soft, $17.50@18; gray forge, $16@16.50. Basic is held at $19 for Virginia, $18.50 for Alabama and $18@18.25 for Northern.

Cast-Iron Pipe—Prices are steady, the present basis being $30.50 per net ton for 6-in pipe in carload lots, at tidewater points. The foundries are full of work.

Bars—Business is good, and prices are steady. Sales are at 1.645c. for common iron bars, and 1.695c. for refined iron. Steel bars are 1.645c. tidewater. Store trade is steady at 2c. delivered.

Plates—Steel plates are in fair demand. Tank plates are nominally 1.745@1.825c.; flange and boiler, 1.845@1.945c.; universal and sheared plates, 1.745@1.845c. according to width. Sales here are chiefly in small lots.

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

Steel Rails—No change in standard sections. Light rails are in steady demand; prices are a shade higher, from $28 for 25-lb. up to $34 for 12-lb. rails. The demand for trolley rails is good. The price of $28 for standard sections is being accepted for orders running into 1907 deliveries. Open-hearth rails are quoted at $29 for standard sections.

Old Material—Business is quieter, but dealers are not ready to make concessions; No. 1 railroad wrought is $18.75@19.50; No. 1 yard wrought can be had for $17@18; machinery cast, $14@14.50; heavy steel melting scrap, $16@16.50. These prices are on cars, Jersey City or other terminal delivery.

Philadelphia. May 23.

Pig Iron—The market is termed quiet by our pig-iron people, but this does not mean they are not doing considerable business. Steel irons are more active than forge or foundry, unless we except pipe iron. The pipe works in this territory have secured a very large amount of business, and they have been for some days quietly endeavoring to place contracts, which has been done in some cases but not in all. In fact, the buyers of pipe iron think the time has come when the concession should be made, and they are fighting for it. The greatest activity has been in basic pig, which seems to be wanted faster than it can be conveniently furnished. No. 1 X foundry sells at $19@19.50; No. 2 X at $19; No. 2 plain at $18.50; standard gray forge, $16.50; basic, $17.50; malleable, $19.50; bessemer $20 and charcoal $21.

Steel Billets—The rush for steel billets is about as active as it has been and the delivery price is pretty close to $29.

Bars—If there is any weakness it is in bar iron, but the bar-iron people say that everything is moving along well. The mills are well supplied with business and the outlook for the summer is right. Prices for bars are 1.63½.

Merchant Steel—A good deal of merchant steel has been reaching this territory and the iron stores have been stocking up.

Plates—The plate situation is about the same, the chief demand at this time being for boiler plate, including some orders for shipyards.

Structural Material—It is impossible to set forth the structural-material situation in an intelligible shape. The trouble appears to be that a good deal of business has been accepted, but that the details as to delivery have not in all cases been arranged, and the customers are anxious to have all doubts removed so that they can count on deliveries to meet their requirements. Quite a volume of business is coming in from the smaller builders engaged in office and warehouse construction and the like, and these people are very exacting and are not stopping on the question of a little premium when it comes to the point. Some very large orders are now before the market.

Steel Rails—An enormous business is being done in steel rails for next year's delivery. There is also quite a demand for light rails for lumbering purposes, coal mining and the like.

Old Iron Rails—Old iron rails are quoted at $21.50.

Scrap—The scrap dealers are on the lookout for better grades of scrap, but they are holding what they have at prices that are not attracting buyers. Choice No. 1 yard scrap is held at $18.50; choice railroad scrap at $19.50 and machinery scrap at $16 per ton.

Pittsburg. May 22.

The features of the market during the week included a stiff advance in the price of tin-plate and large transactions in steel rails for 1907 delivery. Sales of pig iron have been light, as nearly all the bessemer iron available for second quarter has been sold, and there is not much demand for foundry iron. Very little new business has developed in the different finished lines, but the mills continue in operation to capacity on old contracts.

An advance in tin-plate had been expected and no surprise was caused when the American Sheet and Tin-Plate Company yesterday announced an increase of 15c. a box, fixing the price at $3.75 per base box f.o.b. Pittsburg, for 14x20-in. 100-lb. cokes. This is the highest price in three years, a rate of $3.80 a box having been established on March 3, 1903. At that time pig tin was selling at 30.80c. a pound and the quotation today is about 41c. The highest point was reached about a week ago when pig tin sold at 49.50c. At the close of the third and opening of the fourth quarter last year tin-plate was selling at $3.30 a box, or 45c. a box under the price just established, and the average daily price of spot tin during that period was 32.56c. Sheet and tin-bars were $25 a ton or $3 a ton below the present price. The contract of the American Company with Phelps, Dodge & Co. for pig tin expired early in the year and since then it has been buying its tin itself. Independent tin-plate interests have been more seriously affected than the leading interest, not only on account of the high price of tin, but because of the scarcity of steel.

It is estimated that about 1,000,000 tons of standard steel rails have been sold for delivery in 1907, but this estimate includes some transactions that have not been entirely closed. The largest order is that of the Pennsylvania which calls for 190,000 tons. Of this the Carnegie Steel Company's allotment is 90,500 tons. The St. Paul has contracted for 160,000 tons and another large order is from the New York Central, calling for about 100,000 tons. The heaviest buying was by western roads which came into the market early, as they were unable to get all their requirements for last year and the year before from western mills. The Illinois Steel Company has sold over 550,000 tons for 1907 and will carry over from 50,000 to 75,000 tons. This practically puts it out of the market for next year. The Colorado Fuel and Iron Company has sold over 100,000 tons and the Tennessee Coal, Iron and Railroad Company has sold between 150,000 and 200,000 tons. The Tennessee Company began selling last month at $29 a ton for next year's delivery, $1 a ton advance over the established price.

Unless the strike of the structural-iron and bridge workers is prolonged and a strike of iron molders is ordered, there will be no serious labor disturbances in this district during the summer. The convention of the Amalgamated Association of Iron, Steel and Tin Workers closed in Cincinnati last week and the delegates returned yesterday. All the existing wage scales were reaffirmed with some slight modifications in the footnotes in some branches, that will not affect the cost of production to any great extent. The only change that may prove objectionable to manufacturers was in the boiling scale. The base remains at $5 a ton when bar iron sells at 1c., but the advance of 25c. a ton in the rate for boiling with each one-tenth cent increase in the average selling price of bar iron becomes effective when the price reaches 1.2c. instead of 1.3c. as at present. This is equivalent to an advance of 25c. a ton for the puddlers, as the average selling price for bar iron since the opening of the year has been 1.60c., under which rate the puddler receives $6 a ton. The average price of bar iron for May and June, on which the pay of the puddlers for July and August will be based, is expected to average 1.50c. Under the present scale the puddling rate would drop to $5.75 but under the proposed scale it will remain at $6. President P. J. McArdle, of the Amalgamated Association, is arranging for conferences on the iron scale with the Republic Iron and Steel Company, and the Western Bar-Iron Association, which is composed of independent producers. The new scales, if adopted, will go into effect on July 1.

Pig Iron—The pig-iron market is quiet, sales being confined to small lots. There is but little bessemer iron available for delivery this quarter, and while there are a number of inquiries for third-quarter shipment, no important transactions have been closed, owing to inability to agree on a price. The furnaces are holding firm for $17.50, Valley. The foundry-iron market is inactive, as some furnaces have sold up for two or three months and the foundries are not contracting for any additional iron, owing to the threatened strike of the molders. No. 2 grade is quoted at $16.50, Valley, and gray forge continues at $16.50@16.60, Pittsburg.

Steel—Bessemer steel billets have dropped to $26. Open-hearth billets are scarce and are quoted at $27. Sheet-bars and tin-bars are firm at $28. Plates remain at 1.60c. and merchant steel bars at 1.50c.

Sheets—The sheet market is strong and mills are behind in deliveries. Black sheets are firm at 2.40c. and galvanized at 3.45c. for No. 28 gage.

Ferro-Manganese—For spot delivery $85 is quoted, but for second-half delivery $75 can be done.

Cartagena, Spain. May 5.

Iron and Manganiferous Ores—Messrs. Barrington & Holt report that shipments for the week were one cargo, 2200 tons

dry ore, to Rotterdam; one cargo, 3350 tons dry ore, to Great Britain. Stocks are now pretty well drawn down by recent heavy tonnage.

Quotations are 8s. 7d.@8s. 10d. for ordinary 50 per cent. ore; 9s.@9s. 4d. for special low phosphorus; 12s. for specular ore, 58 per cent. iron; 10s. 2d. for S. P. Campanil. Manganiferous ores range from 11s. 9d. for 35 per cent. iron and 12 manganese up to 18s. 2d. for 20 per cent. iron and 20 manganese. All prices are f.o.b. shipping port.

Pyrites—Iron pyrites, 40 per cent. iron and 43 sulphur, are quoted at 10s. 6d. per ton, f.o.b. shipping port. Shipments for the week were 274 tons.

London. May 14.

The exports of iron and steel and of machinery from the United Kingdom for the four months ending April 30 are valued by the Board of Trade returns as below:

	1905.	1906.	Changes.
Iron and Steel..	£9,580,055	£12,161,182	I. £2,581,127
Machinery.....	6,942,108	8,346,398	I. 1,404,290
New Ships.....	1,182,871	1,816,730	I. 633,859
Total.....	£17,705,034	£22,324,310	I. £4,619,276

Exports of mining machinery this year were valued at £234,513, a decrease of £46,956 from 1905. The total quantities of iron and steel exported were 1,090,933 tons in 1905, and 1,339,359 tons in 1906; an increase of 248,426 tons, or 22.8 per cent. The leading items of these exports were, in long tons:

	1905.	1906.	Changes.
Pig iron.....	266,645	406,041	I. 139,396
Wrought iron.....	54,663	60,813	I. 6,150
Rails.....	176,776	133,760	D. 43,016
Plates.....	50,538	77,508	I. 26,970
Sheets.....	132,617	149,998	I. 17,381
Steel shapes, etc.....	62,120	80,686	I. 18,563
Tin-plates.....	124,734	123,151	D. 1,583

Exports of pig iron to the United States were 42,539 tons in 1905, and 70,629 tons in 1906, an increase of 28,090 tons; of tin-plates, 24,385 tons in 1905, and 15,059 tons in 1906, a decrease of 9326 tons.

Imports of iron and steel, and of machinery for the four months were valued as follows:

	1905.	1906.	Changes.
Iron and steel...	£2,656,313	£3,216,219	I. £559,906
Machinery.....	1,621,454	1,659,072	I. 37,618
Total.....	£4,277,767	£4,875,291	I. £597,524

The total quantities of iron and steel imported were 427,119 tons in 1905, and 495,034 tons in 1906; an increase of 67,915 tons, or 15.9 per cent. The chief items were as follows, in long tons:

	1905.	1906.	Changes.
Pig iron.....	37,879	24,248	D. 13,631
Wrought iron.....	25,135	45,058	I. 19,923
Steel billets, etc.....	203,572	213,419	I. 9,847
Bars and shapes.....	13,980	22,237	I. 8,257
Structural steel.....	35,155	56,371	I. 21,216

Imports of manganiferous ores for the four months were 100,366 tons in 1905, and 135,514 tons in 1906; an increase of 35,148 tons. Imports of iron ores were 2,147,937 tons in 1905, and 2,570,561 tons in 1906; an increase of 422,624 tons, or 19.7 per cent. Of the imports this year 2,009,980 tons were from Spain.

Metal Market.

New York, May 23.

Gold and Silver Exports and Imports.

At all United States Ports in April and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Apr. 1906...	$2,485,552	$14,972,576	Imp. $12,487,024
" 1905 .	1,303,874	2,581 057	" 1,277,183
Year 1906..	22,632,174	25,288,663	" 2,656,489
" 1905..	35,319,138	11,803,259	Exp. 23,515,879
Silver:			
Apr. 1906...	4,213,687	2,796,626	Exp. 1,417,061
" 1905 ..	2,317,599	2,559,876	Imp. 242,277
Year 1906 ..	23,379,295	15 473,624	Exp. 7,905,671
" 1905 ..	14,930,041	8,075,232	" 6,854,809

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

Gold and Silver Movement, New York.

For week ending May 19, and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	$658,585	$15,193,632	$ 570,588	$ 30,065
1906.....	4,968,621	41,378,528	24,685,712	776,429
1905...	32,914,546	5,038,242	12,068,639	1,459,809
1904.....	60,048,528	2,019,802	16,174,860	529,262

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

The statement of the New York banks—including all the banks represented in the clearing house—for the week ending May 19, gives the following totals, comparisons being made with the corresponding week of 1905:

	1905.	1906.
Loans and discounts..	$1,120,426,800	$1,040,722,160
Deposits.....	1,165,151,700	1,026,832,900
Circulation.....	45,308,300	50,011,800
Specie.....	215,174,200	185,441,600
Legal tenders.....	84,333,700	81,395,900
Total Reserve.....	$299,507,900	$266,837,500
Legal requirements....	291,287,925	256,708,225
Surplus reserve.....	$8,219,975	$10,129,275

Changes for the week this year were increases of $15,071,600 in loans, $1,305,600 in legal tenders and $12,276,500 in deposits; decreases of $1,001,800 in specie, $366,800 in circulation and $2,765,325 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars:

	Gold.	Silver.	Total.
New York.....	.....	.....	$185,441,600
England.....	$158,008,625	.....	158,008,625
France.....	588,858,345	$212,300,770	801,159,115
Germany	189,985,000	63,330,000	253,315,000
Spain.....	75,615,000	120,475,000	196,090,000
Netherlands...	27,586,000	28,676,000	56,262,000
Belgium.....	16,130 000	8,065,000	24,195,000
Italy.....	142,585,000	19,640,500	162,225,500
Russia.....	439,545,000	27,235,000	466,780,000
Austria.....	231,505,000	63,945,000	295,450,000

The returns of the associated banks of New York are of date, May 19, and the others May 18. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows for the year to May 8.

	1905.	1906.	Changes.
India.....	£ 2,835,771	£ 6,606,603	I. £ 3,770,832
China.....	228,070	.....	D. 228,070
Straits..	2,800	1,750	D. 1,050
Total.....	£ 3,066,641	£ 6,608,353	I £ 3,541,712

Imports for the week were £1000 from New Zealand and £124,000 from New York; £125,000 in all. Exports were £212,475, all to India.

Indian exchange has been steady, and the Council bills offered in London brought an average of 16.03d. per rupee. Silver buying for India is still on a good scale.

The gold and silver movement in Great Britain for the four months ending April 30 was as follows:

Gold:	1905.	1906.
Imports.....	£ 13,819,489	£ 16,102,931
Exports.....	8,475,363	12,722,964
Excess, exports....	£ 5,344,126	£ 3,379,967
Silver:		
Imports.....	4,329,068	7,145,508
Exports.....	4,461,591	7,447,619
Excess exports.....	£ 132,523	£ 302,111

Of the silver imported this year £6,239,231, or 87.3 per cent. of the total, came from the United States.

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars.....	$0.52½	$0.54½
Peruvian soles and Chilean.....	0.48	0.50
Victoria sovereigns.....	4.85⅞	4.87⅞
Twenty francs.	3.86	3.89
Spanish 25 pesetas..... ...	4.78	4.80

SILVER AND STERLING EXCHANGE.

May.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	May.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
17	4.85	66⅞	30⅞	21	4.85⅛	67⅛	31¼
18	4.85¼	67¼	31 1/16	22	4.85⅛	67½	31 3/16
19	4.85¼	67⅝	31¼	23	4.85	68	31 5/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine.

Other Metals.

Daily Prices of Metals in New York.

May	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
17	18⅜ @18⅞	18⅜ @18⅝	85 13/16	46	5.75	5.90 @5.95	5.75 @5.80
18	18⅜ @18⅞	18⅜ @18⅝	85¼	44¾	5.75	5.90 @5.95	5.75 @5.80
19	18⅜ @18⅞	18⅜ @18⅝	.....	44	5.75	5.90 @5.95	5.75 @5.80
21	18⅜ @18⅞	18⅜ @18⅝	84⅝	41	5.75	5.90 @5.95	5.75 @5.80
22	18⅜ @18⅞	18⅜ @18⅝	84⅞	41½	5.75	5.90 @5.95	5.75 @5.80
23	18⅜ @18⅞	18⅜ @18⅝	85⅛	42	5.75	5.90 @5.95	5.75 @5.80

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

The silver market has been a rising one, owing to a combination of causes. It is understood the India Government is again in the market, and also that speculators are covering contracts. The undertone seems firm in London.

Copper—Following the activity of last week, there has been a desidedly quieter tone prevalent in the market. Such demand as came up has been readily met at practically unchanged prices, the closing being steady at 18⅝@18⅞ for Lake copper; 18⅜@18⅝ for electrolytic in ingots, cakes and wirebars; 18⅛@18½ for casting copper.

As was to be expected, the standard market reacted sharply after the bears had covered some of their lines. It is reported that there are still heavy commitments outstanding for next month, and a repetition of the recent squeeze may be looked for at any time. At the close quotations are cabled as £85 7s. 6d. for spot, £84 16s. 3d. for three months.

Refined and manufactured sorts are quoted: English tough, £88 6@88 10s.; best selected, £88 10@89.10s.; strong sheets, £98.

Exports of copper from New York for the week were 2604 long tons. Our special correspondent reports the exports from Baltimore at 1692 long tons of fine copper. There were also 224,975 lb. copper sulphate shipped from Baltimore.

Imports and exports of copper in Great Britain for the four months ending April 30 were as follows, in long tons; the totals giving the contents of all material in fine copper:

	1905.	1906.	Changes.
Copper ore	31,036	31,543	I. 507
Matte and precipitate	20,652	25,343	I. 4,691
Fine copper	25,057	24,650	D. 407
Total imp. fine copper	38.487	40,476	I. 1,989
Exports	12,529	14,672	I. 2,143
Balance	25,958	25,804	D. 154

Of the imports this year 1611 tons of matte and 7409 tons of fine copper were from the United States; against 1372 tons matte and 11,968 tons copper last year.

Tin—The weaker tendency made further progress, and a violent break took place at the beginning of this week, spot declining to £182 and three months to £177. A little better tone is observable at the close, which is quoted £188 10s. for spot, £187 for three months.

The domestic market was very narrow as buyers were distrustful of the London gyrations and only placed orders for their most urgent requirements. The close is unsettled at 42c.

Imports and exports of tin in Breat Britain for the four months ending April 30 were as follows, in long tons:

	1905.	1906.	Changes.
Straits	9,876	11 302	I. 1,426
Australia	1,132	1,527	I. 395
Other Countries	381	945	I. 564
Total imports	11,389	13,774	I. 2.385
Re-exports	8.415	10,493	I. 2,078
Exports	2,165	2,436	I. 271
Total exp	10,580	12,929	I. 2,349
Balance	809	845	I. 36

The re-exports are largely of Straits tin to the United States.

Lead—The market is quiet but steady at unchanged quotations. Spot continues to command a slight premium.

In London prices show a considerable decline, the closing being £16 15s. for Spanish lead, £16 17s. 6d. for English lead.

Imports and exports of lead in Great Britain for the four months ending April 30 were as follows, in long tons:

	1905.	1906.	Changes.
United States	7,481	7,161	D. 320
Spain	33.213	34.462	I. 1,249
Australia	30,547	17,028	D. 13,519
Germany	5,217	6,616	I. 1,399
Other countries	754	1,657	I. 903
Total imports	77,212	66.924	D. 10,288
Exports	13,162	14,286	I. 1,124
Balance	64,050	52,638	D. 11,412

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

St. Louis Lead Market—The John Wahl Commission Company telegraphs us on May 23 as follows: Lead is strong and higher. Missouri brands are selling on a basis of 5.90@5.92½c., East St. Louis.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of May 5, that silver has been 14 reales per ounce. Exchange is 28.96 pesetas to £1. Lead has been 77.75 reales per quintal; equal, on current exchange, to £15 os. 7d. per long ton, f.o.b. Cartagena. Exports for the week were 200 tons desilverized to Marseilles; 450 tons desilverized and 907 tons argentferous lead to London.

Spelter—Business is of a retail character, and the small quantities which came on the market caused a further recession in the price, which is quoted at 5.75@5.80 St. Louis, 5.90@5.95 New York.

The London market is steady, and the close is unchanged, being quoted at £27 2s. 6d. for good ordinaries, £27 7s. 6d. for specials.

Imports and exports of spelter in Great Britain for the four months ending April 30 were as follows, in long tons:

	1905.	1906.	Changes.
Spelter	27,278	29,508	I. 2,230
Zinc sheets, etc	6,080	5,931	D. 149
Total imports	33.358	35.439	I. 2,081
Exports	2,698	2,394	D. 304
Balance	30,660	33,045	I. 2,385

Zinc ore imports are not reported separately.

St. Louis Spelter Market—The John Wahl Commission Company telegraphs us on May 23 as follows: Spelter is dull and rather inactive. The latest sales here are on a basis of 5.82½, East St. Louis.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of May 5, that the market shows no change. Shipments for the week were 638 tons blende to Swansea.

Silesian Spelter Market—Paul Speier writes from Breslau, Germany, under date of May 7, that the market has been firm and higher. Quotations are 52.75 marks per 100 kg.—equal to 5.7c. per pound—f.o.b. smelting works, for good ordinary brands; 53.75 marks for specials. Quotations are now given per 100 kg., instead of 50 kg., as heretofore. Zinc sheets have been advanced and are now quoted at 57.50@58.50 marks per 100 kg., according to brand; the higher price being equal to 6.3c. per lb. Zinc dust is quoted, for 10 tons or over, at 47.50 marks per 100 kg.—5.13c. per lb.—f.o.b. Stettin.

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

Antimony—The market shows less activity, but prices are unchanged. Cookson's and Hallett's are quoted at 25@26c.; other makes are offered at somewhat lower prices.

Nickel—Quotations for large lots, New York, or other parallel delivery, are 40@47c. per lb., according to size and condition of order. For small quantities, prices range from 48c. up to 60c., also according to size of order and deliveries.

Platinum—Prices are strong, the demand being good, while supplies are uncertain, and barely sufficient to meet requirements. Current price in New York is $25 per ounce.

Quicksilver—The metal is firm and New York prices are still $41 per flask of 75 lb. for lots of 100 flasks or over, and $42 for small lots down to 10 flasks. For retail quantities, under 10 flasks, pound prices are charged, which work out to $43.50@44 per flask. San Francisco prices are firm at $39.50 for domestic orders and $38 for export. The London price is weaker, at £7 5s., with £7 3s. 9d. quoted by jobbers.

Imports of quicksilver into Great Britain for the four months ending April 30 were 1,906,528 lb. in 1905, and 809,382 lb. in 1906; a decrease of 1,097,146 lb. Exports were 649,054 lb. in 1905, and 736,923 lb. in 1906; an increase of 87,869 lb. this year.

Missouri Ore Market.

JOPLIN, May 19.

Zinc ore sold at $44 on an assay basis of $40 to $41 per ton of 60 per cent. zinc, the price of all grades averaging $40.56 per ton.

Lead sold as high as $83 per ton, or $80 for 80 per cent. grades, and an average price of $79.74 per ton.

Perfect weather and all other outputting conditions being favorable, is making this month the banner month in the history of the district in outputting record, since it has become possible for all the mines to secure a supply of fuel.

The district value for year to date is $643,828 greater than last year, and at this time a year ago many mines were inundated by inflows and overflows on account of continued excessive rains.

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

	Zinc, lb.	Lead, lb.	Value.
Carterville-Webb City..	2,863,620	648,620	$84,648
Joplin	3,301,400	248,350	79,263
Galena-Empire	1,325,740	209,900	33,586
Duenweg	950,970	119,110	24,258
Alba	888,530	.....	19,130
Badger	685,130	2,160	14,476
Neck City	613,420	.....	13,188
Oronogo	605,220	13,040	12,717
Aurora	598,610	.....	10,725
Prosperity	120,510	145,030	8,260
Granby	475,000	13,000	7,820
Carthage	194,750	.....	4,187
Spurgeon	44,160	31,210	1,695
Zincite	49,600	.....	1,015
Sherwood	31,960	2,420	750
Diamond	31,870	.....	600
Totals	12,780 490	1,432,840	$316,318
20 weeks	208,075,600	28,869,250	$5,609,003

Zinc value, the week, $259,189; 20 weeks, $4,524,637.
Lead value, the week, 57,129; 20 weeks, 1,084,366.

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

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1905.	1906.	Month.	1905.	1906.
January	52.00	47.38	January	61.50	75.20
February	52.77	47.37	February	57.62	72.83
March	47.40	42.68	March	57.20	73.73
April	42.88	44.63	April	58 00	75.13
May	43.31	....	May	58 27	....
June	40.75	....	June	57.80	....
July	43.00	....	July	58.00	..
August	48.83	....	August	58.00	....
September	46.75	....	September	63.50	....
October	47.60	....	October	63.86	....
November	49.55	....	November	68.67	....
December	49.00	....	December	76.25	....

Wisconsin Ore Market.

PLATTEVILLE, May 19.

Producers with speculative inclinations are inclined to hold their ore for higher prices. Apparently there is little surplus in the bins, as the greater part of the ore not loaded is sold and awaiting favorable loading conditions. All the farmers being busy it is a hard matter to secure teams. The Baxter management made arrangements last week for hauling ore, the loading of which materially increased the Cuba City output. The price of 60 per cent. ore was in most instances $42 per ton. A few choice lots of ore sold at $45. Lead remained the same as last week, as did also drybone and sulphur.

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

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	275,850	.....	.....
Cuba City	283,550	.....	.....
Linden	155,055	.....	131,780
Benton	130,000	.....	.....
Highland	60,440	.....	.....
Rewey	52,000	.....	.....
Mineral Point	48,240	.....	.....
Montfort	45,000	.....	.....
Livingston	40,000	47,500	.....
Total	1,090,135	47,500	131,780
Year to May 19.	24,644,215	1,339,460	2,502,14

The small shipment from Platteville is due to the fact that the Empire is still holding its ore for treatment on the roaster which will be completed early in June.

Mining Stocks.

NEW YORK, May 23.

The stock market generally has been dull and rather uncertain, with small changes and turns, on no apparent cause. On the whole there is little change from the level of last week. Amalgamated Copper closes at $109½; American Smelting at $154¾ for the common; Tennessee Coal, Iron and Railroad at $145. Homestake Mining was quoted at $83 during the week, on a sale of 20 shares.

The outside market was dull and narrow, with small fluctuations. Greene Consolidated Copper was about the most active stock, closing at $28. Of the other coppers, United common sold at $64, while Boston Copper closed at $25. Outside these Montgomery-Shoshone made some showing, with $16¼ as closing price.

Mining stocks on the Consolidated Exchange were quiet and dull. Portland, of Cripple Creek, brought $1.80, and Elkton, 50c. Chollar sold for 15c., and Comstock at 16c. at the close.

The present indications are that the market will continue variable and uncertain, but with no great changes, for some time to come.

Boston. May 22.

There has been little interest in mining shares the past week outside of one or two stocks, although the market is really in a stronger position than it has been in years. There has certainly not been any sky-rocketing, and stocks have advanced on their merits. The Calumet & Hecla today declared another $15 dividend, North Butte has increased its rate by declaring $2, and the Old Dominion has declared another 50c. dividend as a result of the $6.50 dividend declared by the United Globe, which is owned by Old Dominion. Atlantic mining furnished a new low record May 1 at $12 per share, from which it recovered to $13.50, against the close a week ago at $14.50.

Amalgamated advanced $2.25 to $111.37½, but yielded to $108 tonight. Mohawk has displayed good strength and has been in good demand on increased dividend prospects. The stock is up $4 for the week to $66, which is its record price. Old Dominion spurted $2.50 to $43. but lost $1.50 of it. Osceola has also been in good request advancing $5.50 to $112, with a $2 set-back. The dividend to be declared next month is expected to be $6, against $4, the last time. Parrot recovered $1.25 to $28, but did not hold it all. North Butte touched $94.50, but closes a trifle better than a week ago at $93.12½. United Copper has been freely offered and is off over $2, to $63.75. Quincy is $3 lower at $98 and Calumet & Hecla sold at $702 today. Michigan spurted $1.75 to $14.50, but lost it. Allouez is up $1.50 to $39.50. President H. F. Fay, who has been ill for several months, is back at his desk again.

Arizona Commercial has been the curb feature, advancing $8 to $40, on heavy trading. A rich ore strike on the 400-ft. level at the Black Hawk mine was responsible for this advance. The announcement of consolidation of the Bonanza Circle stocks in Arizona caused these stocks to weaken materially on the curb.

At the Bingham Consolidated annual meeting Congressman John W. Weeks and George A. Baird resigned. The latter represented the Kimberly estate. No mention was made of Heinze representation.

Colorado Springs. May 18.

The market has been fairly active and several of the stocks in the mines list have made gains, although there have been no startling developments of any kind, and nothing new in regard to the new drainage tunnel.

El Paso Company has made the announcement that it will not endeavor to unwater the mine with pumps, therefore the lower levels will undoubtedly remain as at present until the new tunnel is built. This stock has registered a decline of 3c., closing today at 47c. Elkton, on the contrary, has made a marked gain, advancing from 44½ to 49, but closing today at 48c. Findley remains stationary, selling for 75½c. Isabella has lost a fraction, being traded in today at 24½c. Portland has declined 2c. to $1.82. Vindicator is selling at 94c. Gold Sovereign gained ½c. to 6½c. Work made an advance of 2c., closing at 10¼c. Acacia has made a fractional gain, selling for 10. Golden Cycle is quoted at 75@85; while 50c. was paid for Mary McKinney.

San Francisco. May 21.

A San Francisco despatch of this date says that the Stock and Bond Exchange has refused offers made to it to establish itself in Oakland. It has leased a site on Old Bush street, near Montgomery street,

for two years. A corrugated iron structure will be immediately erected. President Ruggles and 100 brokers belonging to the exchange expect to be transacting business in their new quarters within 20 days.

The exchange has to be situated near the banks, and the fact that the latter are to open in a few days in their old quarters or near them induced President Ruggles and his associates to select the Bush-street site.

Dividends.

Company.	Payable.	Rate.	Amt.
Amalgamated Copper	May 28	$1.75	$2,712,500
Am. Smelters A pfd	June 1	1.50	255,000
Am. Smelters Sec'ties, B pfd.	June 1	1.25	375,000
Calumet & Hecla	June 22	15.00	1,500,000
General Chemical, pfd	July 2	1.50	150,000
International Salt	June 1	1.00	187,500
L. high Coal & Nav	May 28	2.00	695,140
North Butte	June 21	1.50	150,000
National Lead	July 2	1.00	149,054
National Lead, pfd	May 31	1.75	260,820
Old Dominion	June 15	0 50	144,000
Parrot, Mont.	June 12	0.25	57,463
Standard Oil	June 1	9.00	8,730,000
Tonopath Belmont	June 15	0.10	100,000
U. S. Red. & Ref. pfd	July 1	0.50	59,187
U. S. Steel, pfd	May 31	1.75	6,305,480

Assessments.

Company.	Delinq.	Sale.	Amt.
Arrow, Utah	May 7	June 1	$0 005
Brewer-Harrison, Utah,	May 10	June 1	0.01
Alameda, Idaho	June 11	July 9	0.04
Butler—Liberal, Utah	May 26	June 16	0 02
Congar, Utah	May 29	June 10	0.01½
Justice	May 17	June 12	0.05
Loon Creek, Utah	May 12	May 31	0.01
Overman	May 18	June 8	0.10
Sierra Nevada	May 7	May 28	0.10
Utah & Montana, Utah,	June 4	June 4	0.00½

Tonopah Stocks. May 23.

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

	High.	Low.	Last.
Tonopah Mine of Nevada	19.75	19.75	19.75
Tonopah Montana	3.27	3.20	3.20
Tonopah Extension	11.00	11.00	11.00
Tonopah Midway	2.00	2.00	2.00
Tonopah West End	3.40	3.40	3.40
Goldfield Mining Co.	.47	.47	.47
Jumbo Mining	1.40	1.40	1.40
Red Top	1.50	1.50	1.50
Sandstorm	.65	.65	.65
Montgomery Shoshone Cons.	15.87½	15.75	15.75
Eclipse-Bullfrog	.95	.95	.95
Denver-Bullfrog	1.75	1.75	1.75

St. Louis. May 19.

Adams, $0.40—$0.25; American Nettie, $0.15—$0.10; Center Creek, $2.20—$2.00; Central Coal and Coke, $61 50—$60.50; Central Coal and Coke, pfd., $80.00—$79.00; Central Oil. $60.00—$50.00; Columbia, $5.00—$1.00; Con. Coal, $25.00—$22.00; Doe Run (old stock), $350.00—$300.00; Granite Bimetalic, $0.27—$0.20; St. Joe (old stock), $32.00—$30.00.

LONDON. (*By Cable.**) May 22.

Dolores, £1 17s. 6d.; Stratton's Independence, £0 6s. 6d.; Camp Bird, £1 2s. 6d.; Esperanza, £3 17s. 6d.; Tomboy, £1 6s. 3d.; El Oro, £1 7s. 6d.; Oroville, £0 17s. 6d.; Arizona Copper, pf., £3 13s. 6d.; Arizona Copper, def., £3 12s. 0d.

PHILADELPHIA.

Cambria Steel	35	35	34⅝	34¾
Philadelphia Co.	50¾	50¾	50	50⅜
Tonopah	19⅛	20¼	19⅛	20

PITTSBURG.

Crucible Steel	13⅞	13⅞	13¼	13⅝
Crucible Steel, Pref.	80	80	80	80
Tonopah Ext	10¾	11	10¾	10¾

STOCK QUOTATIONS.

NEW YORK. Week May 22

Name of Company.	High	Low	Clg.	Sales
Amalgamated	111¾	107⅞	108	469,310
Anaconda	275¾	266	270	299,400
Boston Copper	26⅛	24⅜	24¾	16,875
British Col. Copper	8⅛	7¼	7¾	11,505
Federal	169¾	169¾	169¾	100
Federal, Pf.	100¾	98	100	3,500
Greene Copper	28¼	27⅞	27⅞	7,490
Greene Gold	4	3⅜	3⅞	4,275
Mitchell	8¼	7¾	7¾	2,087
Tennessee Copper	45	44	44⅜	1,000
Union Copper	2	1¾	1¾	8,950
United Copper	66¾	63⅝	63¾	18,300
Utah Apex	6½	5¾	6	430
Utah Copper	27¼	25¼	25⅞	3,500

NEW YORK INDUSTRIALS.

Am. Smelting & Ref.	157⅝	153¾	153¾	181,400
Am. Smelting & Ref., Pf.	122	118¼	118¼	5,100
Col. Fuel & Iron	51½	49¼	49¾	28,500
Pittsburg Coal	14¾	14	14	100
" " pfd	57	54		
National Lead	81⅝	75½	76¼	46,300
Republic I. & S.	29	28¼	28¾	4,900
Republic I. & S., Pf	102½	101	102⅝	7,298
Tenn. C. & I.	148⅜	144½	147½	2,900
U. S. Red. & Ref.	39	34	37¾	16,000
U. S. Red. & Ref., Pf.	80	75	78	15,300
U. S. Steel	41¾	40½	40½	117,650
U. S. Steel, Pf	106¼	105	105¼	34,250
Standard Oil	625	610	625	160
Bethlehem Steel	28	27	27	870

These stocks, not elsewhere quoted, had the following range of prices during the week: (New York) Bamb. Delamar, 5—5¾; Butte Coalition, 33½—35⅝; Cumb. Ely Min., 6⅞—7⅛; Greene Gold-Silver, 2½—2⅝; Mont. Shoshone, new, 15½—16½; Nevada Con. Copper, 18½—19¼. (Boston) Adventure, 6¼—6⅞; Montana C. & C., 3⅝—3½; Nevada, 18½—19½; Trinity, 9—10; U. S. Oil, 12—13; Wolverine, 135—137; Wyandotte, 1—1⅛.

BOSTON.

Alloues	39⅛	38	39	817
*Amalgamated	111⅜	108	108¼	23,757
Atlantic	15	12	13⅛	9,239
Bingham	35⅛	34½	35	1,815
Boston Consolidated	25⅞	24⅛	24⅛	910
*Calumet & Hecla	705	700	702	85
Centennial	24¾	23¼	24	570
Copper Range	78¼	76⅛	76¾	2,755
Daly-West	17	16	16	758
Franklin	18	17¾	17½	1,065
*Granby	13⅛	12¾	12⅞	1,011
Green Con. Copper	29	28	28	3,280
Isle Royale	20¾	20		543
Mass	8⅞	8	8	105
Michigan	14¾	12¾	12¾	2,680
Mohawk	66	62	65¾	2,647
*North Butte	94⅛	91¾	93½	23,481
Old Dominion	43	41½	41½	765
Osceola	112¼	107	110	4,285
Parrot	28	26	27¾	4,264
*Quincy	101½	98	98	360
Rhode Island	5¾	4⅞	5	820
Shannon	9¼	8¾	8⅞	7,312
Tamarack	105	102	102	113
Tecumseh	12	11	11½	1,197
United Copper, com	66⅞	63¾	63⅞	12,455
U. S. Smg. & Ref.	59⅜	58	58⅜	1,337
" " pfd	46¼	46	46	2,852
Utah Con	62½	61	61⅛	7,511
Victoria	7⅛	7	7½	565
‡Winona	7½	6¾	6¾	335

COLORADO SPRINGS.

Name of Company.	First	High	Low	Clg
Elkton	44¾	48½	43	48
El Paso	51	51	49¾	49¾
Isabella	25	26	24½	24½
Portland	195	195	180	180
Vindicator	95	95	93	93

SAN FRANCISCO.

(Business suspended for the present; last figures left for reference.)

Best & Belcher	1.25	1.25	1.15	1.15
Bullion	.31	.31	.25	.29
Caledonia	.37	.44	.35	.44
Confidence	.90	.94	.90	.90
Con. Cal. & Va	1.35	1.35	1.30	1.30
Gould & Curry	.28	.28	.27	.27
Hale & Norcross	1.20	1.20	1.05	1.10
Mexican	1.15	1.15	1.15	1.15
Occidental Con	.96	.96	85	.95
Ophir	5.37½	5.50	5.25	5.25
Savage	1.00	1.00	1.00	1.00

*Ex-dividend. †1st Installment Paid.
‡Assessment Paid. §2d Installment Paid.

Monthly Average Prices of Metals.

SILVER.

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

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

COPPER.

	NEW YORK.				LONDON.	
	Electrolytic.		Lake.			
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.	15.008	18.310	15.128	18.416	68.262	78.896
Feb.	15.011	17.869	15.136	18.116	67.963	78.147
March	15.125	18.361	15.250	18.641	68.174	81.111
April	14.920	18.375	15.045	18 688	67.017	84.793
May	14.627	.....	14.820	.....	64.875	.....
June	14.673	.....	14.813	.....	65.881	.....
July	14.888	.....	15.005	.....	66.887	.....
Aug.	15.664	.....	15.725	.....	69.830	.....
Sept.	15.965	.....	15.978	.....	69.667	.....
Oct.	16.279	.....	16.332	.....	71.406	.....
Nov.	16.599	.....	16.758	.....	74.727	.....
Dec.	18.328	.....	18.398	.....	78.993	.....
Year.	15.590	.....	15.699	.....	69.465	.....

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

TIN IN NEW YORK.

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

Prices are in cents per pound.

LEAD IN NEW YORK.

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

Prices are in cents per pound. The London average for January, 1906, was £ 16.850 per long ton; February, £ 16.031; March, £ 15.922; April, £ 15.859.

SPELTER.

Month.	New York.		St. Louis.		London.	
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.	6.190	6.487	6.032	6.337	25.062	28.225
Feb.	6.139	6.075	5.989	5.924	24.594	25.844
Mar.	6.067	6.209	5.917	6.056	23.825	24.563
April	5.817	6.078	5.667	5.931	23.813	25.781
May	5.434	.....	5.284	.....	23.594	.....
June	5.190	.....	5.040	.....	23.875	.....
July	5.396	.....	5.247	.....	23.938	.....
Aug.	5.706	.....	5.556	.....	24.675	.....
Sept.	5.887	.....	5.737	.....	26.375	.....
Oct.	6.087	.....	5.934	.....	28.225	.....
Nov.	6.145	.....	5.984	.....	28.500	.....
Dec.	6.522	.....	6.374	.....	28.719	.....
Year.	5.882	.....	5.730	.....	25.433	.....

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2,240 lb.) good ordinary brands.