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On Horseback in Western Chihuahua

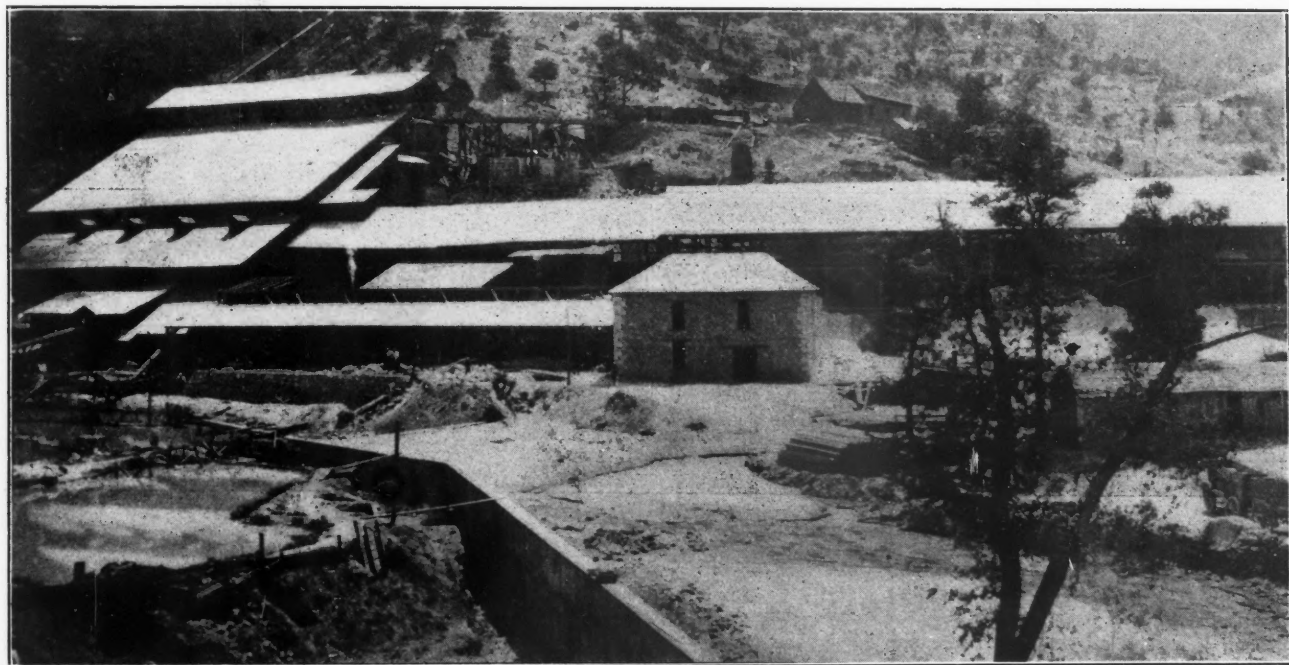
Traveling Light without Pack-train or Camping Outfit among Mining Camps Where Sectionalized Machinery Is the Rule

B Y M A R K R. L A M B *

My fellow-passengers on the train from Miñaca to Temosachic advised the purchase of a saddle-mule and two pack animals, since I expected to be on the road at least a month; they said this would be much less expensive and more nearly certain than taking the chance of hiring outfits from one camp to another. Old George of the Greene company was ready with several horses and mules for my inspection and was also ready to drive a hard bargain. When told that the matter would be left entirely in his hands

from. Besides that, feed is so short and scarce now that if you take my advice you will get no pack animals at all, but make for any ranch that is handy every night. In that way you can rest while your meals are being prepared instead of being obliged to stop early, build a fire, carry water and cook for yourself. The food will be good; better than you can cook for yourself. Get two good heavy blankets, a slicker, some quinine, a forty-four and a broad hat and you are all right for the trip. Roll your under-

and many forest fires were burning what little dry grass was left. The Colonel earned his name by insisting on a drink every time we crossed water, which was many times in an hour on some parts of the journey. He was a little too spirited for a man not used to the saddle, wherefore the man felt rather sore for a few days. This had its advantages, however, as that tired feeling experienced each night was an excellent substitute for a mattress. The latter is merely a luxury of the pampered and is soon forgotten.



CONCHENO MILL, GREENE GOLD-SILVER COMPANY

and that I was prepared to take his advice about the trip without question, he looked rather disappointed at being beaten out of a trade.

"Here is your outfit," he said, later in the afternoon, as he brought up a big, young, white horse with saddle and bridle. "Of course I should like to sell you two or three mules, but if you put it up to me, you do not need to buy mules here where they cost so much, when you are going right where the mules come

*Milling and cyaniding engineer, Guanajuato, Mexico.

wear up in the blankets and tie the lot on behind the saddle. Keep your gun in plain sight and you will have no trouble anywhere in Mexico unless you look for it."

I took his horse and his advice and had no cause to regret either decision. The horse was supposed to get his corn in the morning and at night and by no means in the middle of the day, but it took the Colonel about two days to coax corn out of the pack every time we stopped to rest. Feed certainly *was* short. It was just at the beginning of the rains

It is a solemn fact that 95 per cent. of the Mexican race, counting the native Indians, sleep all their lives with only a square of matting between them and the ground and are none the worse for it.

CONCHENO

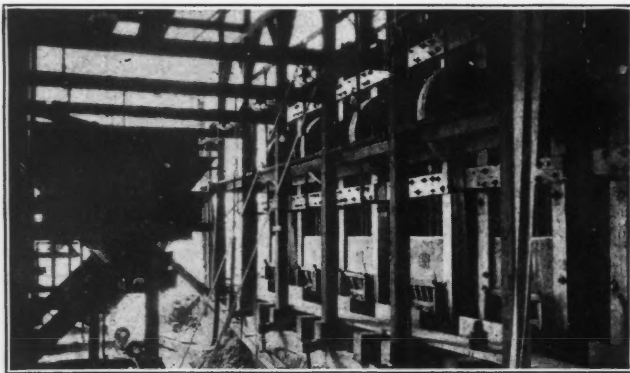
From the railway at Temosachic to Concheño is over the broad, easy road built by the Greene company. I passed many heavily loaded wagons drawn by big Norman horses. These big fellows cost the company a small fortune each by the time they reached their work,

and from the stories told by the drivers, the experiment of importing them was a failure. One driver who was stuck at a bad turn on a grade was almost crying in disgust.

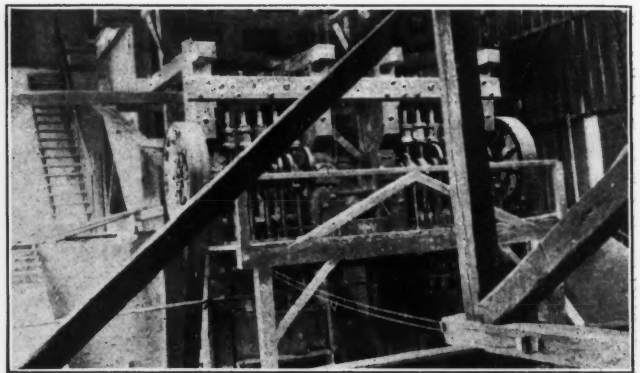
"What can they expect such elephants to do on mountain roads? They have all they can do to drag their own big feet up these grades, much less can they negotiate the big loads piled upon us! I've been driving for three months for this company and at least one of these poor fellows has died on every trip. They came from around sea level in the States and are expected to work up here, over a mile high. I can beat mules with a chain and with pleasure, but who could

by six. Several small iron filter-presses were being added to the slime end of the plant in an endeavor to save the dissolved metals. The framing for an additional 40 stamps was complete, but I hear that this lumber has since been used to build a carpenter shop. The whole plant is so old and tumbled-down that the company should insure and burn it. A good site would remain for a modern economical mill which could be built for less than the cost of partially repairing this one. At this camp my horse ate complimentary grass-hay worth about 100 pesos per ton and was on a very short ration of corn, that necessity being almost unattainable for man or beast.

vast workings. The English company which formerly owned it obtained an increased concession covering an area of 27 square miles as a recompense for the death of a manager who was killed by the natives. It would take a full year to go over the entire property, so precipitous is its surface. The 50 stamps of the old mill have been remodeled into a "25" and cyanide plant, but is not running. A sawmill just completed at the end of the property has a world of pine to cut preparatory to the building of a hydro-electric power plant some miles from the mill and mines. There is ample water and wood is pretty well cut off from the neighborhood of the plant.



PINOS ALTOS MILL



POTRERITO MILL



MILL AT SAHUAYACANCITO



PINOS ALTOS MILL

touch these willing beauties when they actually break their hearts trying?"

When I arrived at Concheño the camp was congested with laborers of all nationalities and one good-natured mill man insisted on kicking a couple of puppies off the last cot in the town, for me. How could I tell him I had rather sleep on a bed of pine needles under the trees? The 60-stamp mill was in the throes of reconstruction and it was difficult to get around in it. It is an old amalgamation mill remodeled, so there are many features which are unsatisfactory to the man who must make it go. The stamps are old and rickety. After concentration the sand goes to leaching tanks and the slime to settling pits, shown in the photograph. The thickened, or partially dried, slime is trammed back up into the mill and agitated in dinky little tanks about six

PINOS ALTOS

A few vague directions started me over the trail to Pinos Altos and warnings as to the danger of traveling alone were cheerfully volunteered. I have finally decided that the only danger in thus traveling without a *mozo* lies in the possibility of meeting with some accident with no help near. It is just as safe anywhere in Mexico as it is in San Francisco or Chicago. For lack of a guide I lost a little time on this ride, which should have required four hours. Instead of landing at the town I arrived at the mill and had the pleasure of the climb up the steep, winding trail over a thousand feet straight up. This climb gave my nerve and Colonel's strength a good test; he was equal to it. Mr. Ray took me in and regaled me with interesting stories of the mine, which is an old one with

The mill engine is a duplex, tandem-compound, *sectionalized* marvel by Fraser & Chalmers and must contain a ton of nuts and bolts. Some vandal in trying to reduce engine friction, when less power was required on cutting out the pans and settlers and reducing the number of stamps, *cut both piston-rods* between high- and low-pressure cylinders instead of disconnecting one-half the engine.

Many Cornish miners were here employed in the mines 20 years ago and it is quite a shock to see faces of young people of this age who really belong in England but who do not know a word of English.

OCAMPO

Several days were spent with a most delightful host and hostess who speeded

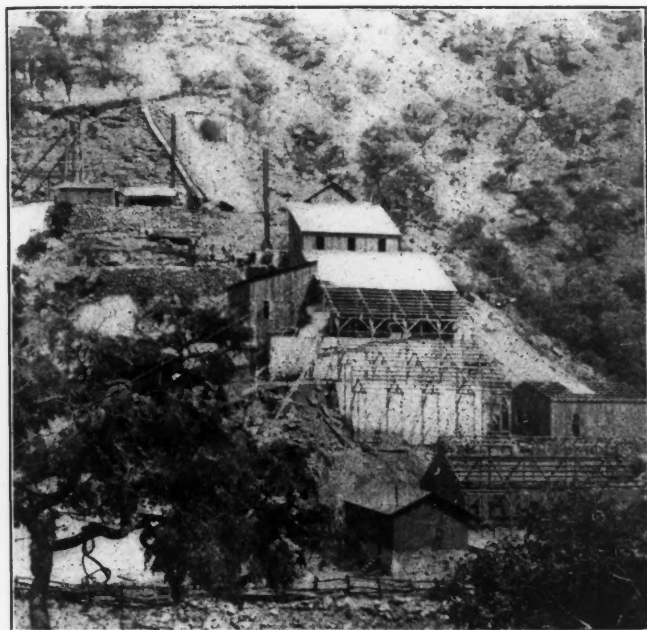
me on to Ocampo, but not without advice to take a *mozo*. The trail from Pinos Altos soon turns into the broad Greene road running through Temosachic and Concheño to Ocampo. This is a magnificent undertaking, said to be 100 miles long and is about 50 years ahead of the country. Colonel Greene's name will be as much blessed by posterity for this road as it has been cursed by his fellow-operators in the neighborhood for the raise of wages made while building said road. (Note that the laborer is not complaining about the raise in wages.) The road is carved out of the sheer rock cliffs where it drops off the mountain ridge into Ocampo. The story runs that all the numerous old mills in the cañon which belonged to the company were dismantled and moved out of harm's way in order that large charges of powder

have run. No fortunes have been made this way but there is always a good excuse, other than that there is nothing in the river. Ocampo ice supply is unique and ingenious and should be imitated in others of these western camps. A long tunnel, driven by some deluded prospector near the top of the mountains, is packed hard full of snow during winter, and furnishes ice for this hot camp when it is most needed.

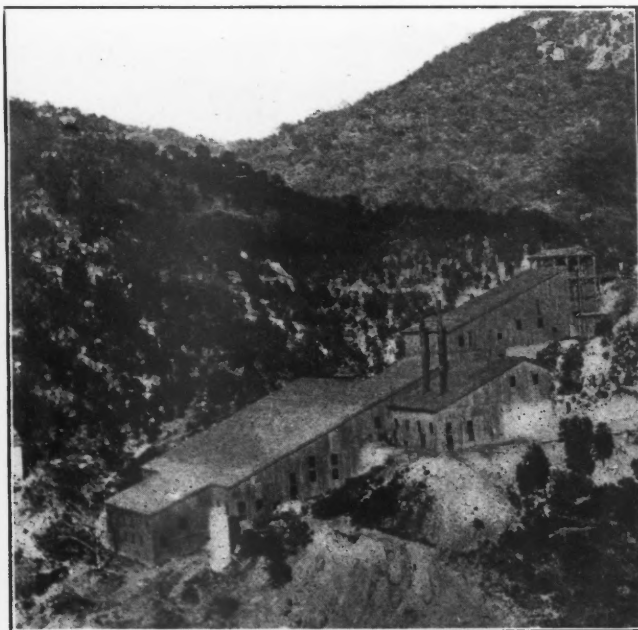
MORIS AND EL SOCORRO

I left the camp late in the morning and climbed a slippery sandstone trail behind the town, quickly reaching the low summit of the divide and starting down hill toward Moris. Through all these mountains the trail no sooner leads one to the bottom of the cañon than it starts up the farthest highest mountain in sight. This

at 3000 ft. as the river bed is only 1200 ft. above sea level. The river was nearly dry but we found several deep pools and took a bath in each. Chocolate formed a major part of my lunches and as this resting time was appropriate for a lunch I opened the bag of corn and unwound my pack—to find chocolate, brushes, kerchiefs, films and underwear cemented into a cenozoic conglomerate. I also discovered that contact of this magmatic mass with cold water did not result in complete segregation. Going into Moris hot, hungry and heavy-footed, we were both treated royally. The Colonel had corn and alfalfa and I had the finest cool watermelon ever seen. Both diets were against all instructions, but I concluded to let the horse take care of himself. Moris is a town which has stood still for half a century. The people do not



LA REPUBLICA MILL



SANGRE DE CRISTO MILL

might be used on the grade. The machinery of these mills lies there still.

The Watterson Gold Mining Company was just starting its mill after adding a cyanide plant and remodeling generally. It was the only plant actually working in the camp. Very good results have since been obtained by Manager Thompson, extending to the successful cyanidation of silver ore concentrates. Conditions in these out-of-the-way camps are very favorable to local treatment of this material as freight charges to the railway are excessive and will warrant heavy treatment charges at the mill.

An attempt has been made to recover "the fabulous amounts of amalgam and quicksilver which had escaped from the pan mills in past years," but the quantity of water was too much for the equipment provided, and the plant stood idle. This statement with slight variations can be applied to every old camp where mills

range that is climbed last before reaching Moris opens up such a panorama that one is sure the Pacific Ocean must be visible on a clear day. Down, thousands of feet below, glistens the dry bed of the Moris river and the tiny, dice-like white houses of the town apparently prove that the host at Ocampo must have been wrong in allowing six hours for the trip. The horse had a bite of grass while I tried the impossible of getting a photographic record of the view, and we started down the *cuchillo*, the well-named "knife-blade" trail. We slid and skidded down the mountain for hours. I thought I would surely push the horn off the saddle. From the chill breeze of the top we gradually became submerged in the tropical, humid air of the valley. As we neared the bottom, both bathed in perspiration, we passed tiny orange groves, banana trees and such emblems of the tropics. This drop has been estimated

move. There is no reason for them to do so. Several baths and a good meal assisted me to remember that our hours of travel had been few that day, so early next morning we were en route to El Socorro, which is within sight of Moris though six hours away.

El Socorro is beautifully situated among a grove of oaks and the company has wisely refrained from cutting timber from around the houses. At the time of my visit the tunnel was progressing and the old mill was undergoing minor changes to fit it for treating ore as soon as possible. This is a very enticing and cosy camp. Cool shade in that country is the first and greatest blessing as the majority of the mills and plants are near the rivers which always spells fever.

The trail from El Socorro to Potrerito leads past El Pilar, the most prominent feature of the landscape. It is an immense core of granite standing a thou-

sand feet from base to summit. It can be seen from the range above La Republica and from the trail far south on the way to Chinipas. What appears to be brush on its top is really a small forest of sturdy oaks.

Potrerito is a one-store camp. The mine is said to be rich. A Chihuahua banker agreed to build a mill if supplied with ores worth over 25 pesos per ton. The mill was built and the agreement resulted in the miner delivering ore worth barely 25 pesos, sorting out the high grade for shipment to the smelter, to the dismay of the banker. Now this mill is closed down and neither the miner nor the banker profits. This is an opening for a diplomat to bring the conflicting interests together.

SAHUAYACANCITO AND LA REPUBLICA

An hour's ride over the hill brought us to Sahuayacancito, of which company Mr. Howard is manager. He took us in and

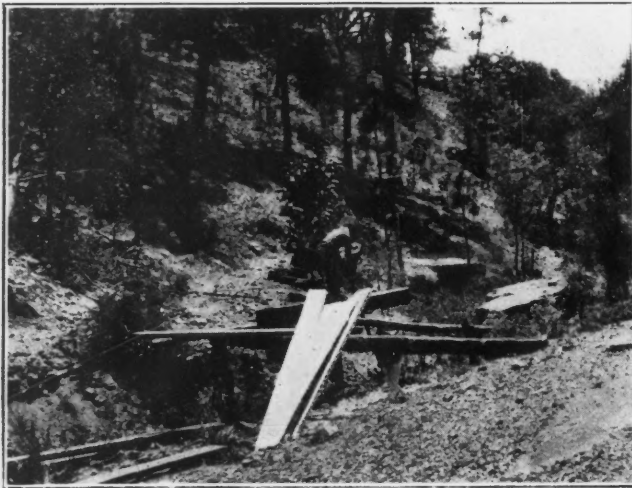
days of air agitation could be made by building of local lumber, thus making a cyanide mill of a pan mill, at low cost and in short order, which would have greater capacity, require less steam and which would make better extraction at lower cost per ton. Such a change practically doubles the available ore reserve of the average mine.

Another climb up one side of the world and down the other took us to La Republica mine. Between these two mines are many places where the *arrastré* has flourished in the past and each old resident has tales of rich veins in the various mines known only to himself. A thunderstorm caught us here and it was my first experience of having the thunder and lightning arrive at the same time. The air seemed surcharged; spurs, harness buckles and even pocket knives sing in a most weird way, humming most loudly just before the lightning strikes. A touch of any metal gives quite a shock and it

was shot. This is a convenient rite—getting the prisoner to try to escape. This prisoner had been wounded in his fight with the judge and was suffering agonies with his arm, so it must have been difficult to get him to run.

THE EDGE OF THE PLATEAU

From here it was necessary to cut across the country toward Chinipas over little-used trails, so this time it was easy to persuade me to take a *mozo*. I tried to insist on his taking a horse, fearing that we would lose time, but he gently explained to my American ignorance that he could out-travel any horse or mule in the mountains. What worried *him* was that I took no cooking outfit. It was well enough for him to get along on *tortillas* and beans, but for a gringo to be willing to take chances on getting only such food was unheard-of! I found that on the entire trip the lack of pack train caused me not the slightest discom-



PRIMITIVE SAWMILL



IN LIGHT MARCHING ORDER

made the obligation seem his in his pleasure in visitors. He has a 20-stamp mill and complete pan plant with concentrators, all sectionalized. Compound condensing engines with water-tube boilers, similarly sectionalized, supplied the power. The plant is idle and from the neighbors one gathers that the mine and equipment is just a toy or source of recreation for its Pittsburg owners. The Mexicans say that the mine has produced ore of very high grade and that they should like to take leases. Some good tailings have been caught, but owing to the limited area for storage, the tailings must now be sent into the river as fast as made. A good water-power which is to be harnessed is available, thus saving wood worth over 10 pesos per cord. All of these pan mills through this country could, by a slight expenditure on the pans, be made to grind *finé* a large tonnage for cyaniding. The pans could be adapted to a continuous feed and the addition of the few tanks needed in these

is a case of being just a little too close to one form of nature. Colonel had the same idea of the matter, only more so. These storms must be frequent, as a large part of the trees on the ridge are blasted.

Mr. Parker was just starting his 10-stamp mill and concentrators on high-grade silver ore. The mine is new, but has been developed rapidly, and as the vein of pay ore is large, the reserve is already extensive. The cyanide plant is now about ready to start and will have docile material to treat. This mill is, of course, sectionalized. Mr. Parker was building comfortable quarters and was having a garden planted for the mess, so that life in that pine-sheltered camp will be pleasant.

The day I arrived a drunken rancher had shot a judge to death. Another judge arrived the next day, tried the murderer and sentenced and started him to Chihuahua under a guard of *rurales*. The party was only a short distance on the way when the man attempted to escape and

fort, and saved me much time, discomfort and expense by permitting fast traveling. We would stop at a ranch house at night, buy the children's pet chicken perhaps, and have a good meal. In the morning we could rest until the last minute before breakfast and thus "let the women do the work." At daylight we rolled up the blankets and were off without the otherwise unavoidable delays of cooking breakfast, washing dishes and packing the outfit on mules which might or might not be near when wanted.

A long ride over a good trail finally brought us to the river where Don Benito Bourne lives. Melons were again in order; and after a heavy feed of corn, *tortillas* and beans we started up the cañon through a heavily mineralized country. Big, good-looking croppings were on all sides. The wash in the creek was practically all quartz spotted with pyrite and galena. We passed three little ancient mills which had been hypo-leaching establishments, and had seen two

ruins on the river bank at El Rio. The machinery and stamps were light, but having been transported such a distance over such trails, when the nearest railway was at Chihuahua, made them pretentious structures. Nothing was doing in the mines but taxes were paid, probably in the expectation of later results. It appeared to be an excellent chance for a speculation—since all mining is, authoritatively, speculation. A good trail with little to break the monotony for two days led us to the ridge which we followed to within sight of Chinipas. Then followed another slow descent to the hot country. The difference in climates must be experienced to be realized. A native of the hot country is not comfortable in the mountains, and the *hombre frio* (cold man) will not live in the hot country. My *mozo* could tell at a glance to which country any passing native belonged. All

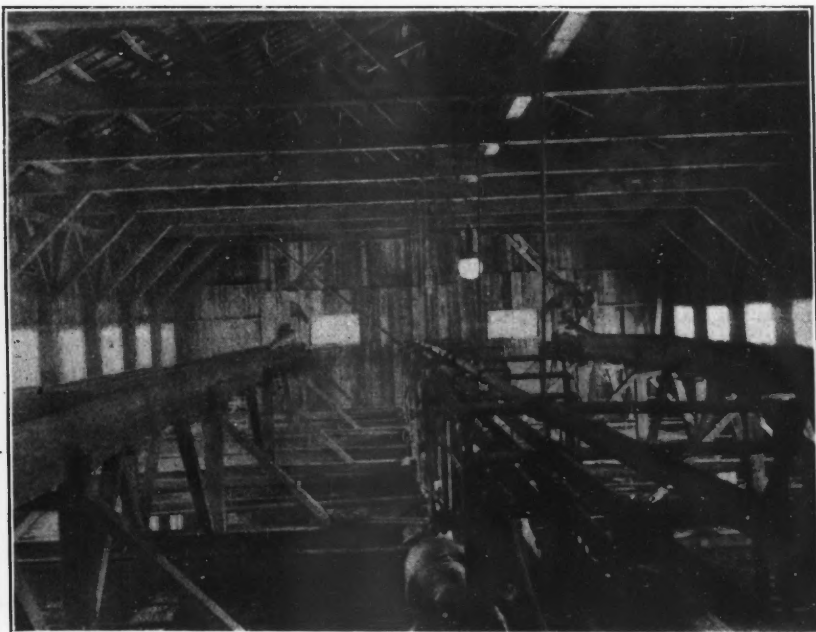
flume, which is built for some distance just a little above the level of the river, is annually filled with gravel and boulders by some one of the violent floods of this country. One of the pictures shows the height to which the river rises. The water reaches the mill in the flume under a head of 90 ft. Each year sees a month or less of limited water followed promptly by damaging floods. Chinipas is about 1000 ft. above sea level though surrounded by towering ranges, and it follows that the fever called *calentura* gets every one sooner or later, leaving them quite susceptible to another attack and not able to do much work even when comparatively well. The wonder is that with power unlimited most of the time, an ice plant has not been placed to supply the fever patients, if no one else. Such a plant using ammonia or methyl chloride would require perhaps two horse-power, 10 lb.

than the material is worth. There is a story of a pack-train of powder one mule of which was loaded with caps. When he stumbled and "went off" nothing but spots were ever found of mules, powder or muleteers. There is one load for a train of mules which insures against loss of load and animals. When say 2000 ft. of 1-in. hoisting cable is sent in, a few coils of the rope are tied on each mule with a sufficient length between to allow clearance, and every mule with every load is sure to arrive.

The Zapote mill and cyanide plant of the Palmarejo company has been thoroughly described by Mr. Oxnam in the *Transactions of the Institute*. This also is an old amalgamation mill and one of the pictures shows the wear on the camshafts when crushing dry. The only changes of importance since his description are the cyaniding of concentrates and



RIO PLAYA TAILINGS AND RIVER



SQUARE STEEL LEACHING TANKS

along the way these last two days we noted the crying lack of water. Cattle were dying for lack of both feed and water. Many were dead and dying around holes which had once contained water and we ran the risk several times of paying for cattle, by shooting them. It seems a more useless and unnecessary loss than when sheep are caught in the snow in the north. There was water in this river on bed-rock anywhere available by pumping. When the Chinipas river was reached the tropics began in earnest. Beautiful, long-tailed green parrots, or mackaws with their ear-splitting squawks, went past us in countless pairs. Mocking birds were plentiful and the little *perico*, the small talking parrot, appeared frequently.

THE PALMAREJO COMPANY

We passed the in-take of the large flume of the Palmarejo company. This

of methyl chloride for a charge, make 200 lb. of ice per day and cost \$500.

The new manager, Mr. Holmes, has the idea of changing the mill from its present site to the mine, several miles up in the mountains, generating power at the present plant and transmitting it electrically, thus saving heavy transportation costs incurred on the narrow-gauge railway between the mine and mill with its constant locomotive repairs, derailments and wash-outs. There are places along the track where a car drops for minutes if it goes over the edge. After arriving at the bottom of the cañon it is unrecognizable and is never even looked for. This same remark applies to loaded mules which occasionally slip off the trail in this country. One sees them in all stages, down in the cañons, from bleached skeletons to recent arrivals. It costs more usually to get a load back up the trail

the purchase of a vacuum filter by the recent manager, Mr. Pomeroy. The method of treatment has been changed also, with a resulting increase in extraction.

UNUSUAL METHODS FOR SECURING LABOR

The Guerra al Tirano mine, six hours forced march from Chinipas, is under the same management at present. A 10-stamp mill has been finished there recently and the mine has a very large reserve of gold ore of good grade. The mill is high in the mountains, among the trees. The mill was blessed by the priest when the first stamp was dropped. This pays. Candles and crosses and Virgins were distributed liberally around the building, the entire camp was commanded to appear at the exercises and—after a liberal collection—the priest told the men how particularly they would be damned if they stole amal-

gam or precipitates from this particular mill. This is a proceeding which the stockholder should insist upon at any mine in Mexico, as it is not expensive and is quite effective—for a while. When the effect, like paint, wears off, it can be applied again. Another good plan in this line is to provide a miracle, a Virgin, for instance, who appears and says that the spring is possessed of special healing virtues. Then the matter must be advertised. A page in the JOURNAL would not be of much service, but there are other ways. Your neighbor mine managers will be jealous, as you will always have an excess of labor, but it will be a scoop which it will do no good to try to imitate. One little mining town has a wooden image of the Christ which possesses the valuable ability to distinguish between those who have confessed and those who have not. The image is small and light. A person who is "right" can easily lift the image, even small children. But one who is not, though capable of carrying a 400-lb. load from the mine, is unable to start it! These are facts—and they draw crowds—and incidentally it is easy to secure all the required labor. This image decided at one time to change its abode on account of the negligence of the management. The image walked in one night over the mountains in its bare feet to the rival town, 40 miles, but after considerable talk it was persuaded that the church was to be properly supported, so returned in the same way, its power unimpaired, though its feet were worn off some two inches! These are facts to be taken seriously into consideration by the mine manager in Mexico, and until some proper effort has been made in this direction, no sympathy should be extended to those who lack laborers.

From Guerra al Tirano to Rio Plata one can go via Guazapares, though this is a little out of the way. The little town is supported by those who work up small lots of "high-grade" in their primitive cupels or *vasos*. An engineer who was temporarily in the town told me that in the few days he was there, at least 2000 oz. of bullion had been offered him at very profitable figures. Some of the ores contain gold, but the bullion obtained is sold merely as silver. This high-grading is as impossible to stop in Mexico as it is in the United States. In Mexico, however, the native who steals ore is occasionally shot, but in the States he has an assay office to take it to which will buy it openly. It is much better in the States—for the high-grader.

RIO PLATA

The Sangre de Cristo (Blood of Christ) mill near Guazapares has had a heart-breaking history. Three Americans who had been leasing successfully, so the story is told, took a fancy to this mine and took it over under bond. They organized a company, sold stock for ma-

chinery and had the machinery at the terminus of the railway when it was burned and destroyed in the station. More stock sales bought more machinery and increased their obligations and by the time the mill was ready to run they owed everyone in the country. The mill ran only a few months and was closed down by creditors who took the mine over because it was good. The mill is not for sale, though it has not run for years; the mine is caved and the creditors are still sure they have a good property, as are the Mexicans who have worked in it. The equipment consists of breakers, rolls, driers, screens, roasters and lixiviation tanks. All the machinery is sectionalized, and was made by Fraser & Chalmers.

Between Guazapares and Rio Plata is a little settlement of lepers. It is said that one man a century ago came to this little town and is responsible for all the leprosy. One sees considerable of this in Mexico, but it does not seem possible that it is contagious to the extent generally believed, as little attempt is made to segregate it, and if mere contact would convey it, every Mexican and American in the Republic would have it sooner or later. In some towns it is a municipal regulation that lepers can beg on the streets Tuesdays of each week. If germs were as powerful in Mexico as is claimed for them in the States or if Mexicans knew about such things, the country would be depopulated.

The Rio Plata company, under the management of Mr. Shanks, of Los Angeles, has arrived at the dividend point, though a very new concern, after much trouble in getting a mill built on time. Mr. Gracey, of "all over the West," was in charge of mill construction. The bond for the purchase of the mine required that the mill be in operation on or before a certain date under penalty of forfeiture, and in spite of delays in shipments of materials, the mill was in operation on the last day of grace. The plant consists of 20 stamps, concentrators, pans and settlers, and it is now proposed to add a cyanide plant to treat tailings. A photograph shows the mill and another shows the small space at their disposal for tailings, reservoirs and the necessity of building the cyanide plant promptly. The ore is high-grade and the concentrates run into "per cents" of silver. Plenty of water in the river the year around supplies a fine power, sufficient for a dozen such mills. At one point back of the camp is a water-fall which is just over 1500 ft. high during rainy weather. There are several other falls visible from the camp during this season. The difficulties in bringing the material in were very great, and this was strongly impressed on a visiting director from New York. After a long, painful ride (for a novice) from the railway, interspersed with long and almost equally painful walks, he

looked at the 12 ft. rope sheave-wheel which drives the mill from the Pelton wheel, and could not realize nor believe that it had come over the same trail he had. He is still certain that he was taken a long way around for effect, having failed to note that the sheave was in sections.

Until the sawmill was ready, lumber was obtained as illustrated. It is a good way, but slow. The Orient railway will pass not far from this camp and will open up a dense forest of pine from its present terminus at Creel to the Fuerte river. From Rio Plata to Creel is three days riding through a much broken country, heavily wooded. It is interesting with its birds, turkeys, deer and wild hogs, but these are only shot with the camera if the trip is made in three days. One passes the brink of the Barranca de Cobre, a cañon which rivals the Grand Cañon of the Colorado in all except coloring. No photograph can do it justice and probably no painter-man has ever been near it. The line of the railway skirts the brink for some distance and in a year or so I shall probably be able to look out of the car window and see Colonel's hoof-prints within the grounds of a world-famous resort.

Electric Smelting Tests in California

SPECIAL CORRESPONDENCE

At the Heroult electric iron smelter on the Pitt river in Shasta county, California, a number of new types of electric furnaces are being tested on a small scale, instead of working with one large furnace alone, as has been heretofore the plan. A bank of transformers will be ready by the time the new Lyon furnace under construction is completed. The new furnace, of a capacity of 25 tons of pig iron per day, is on the same plan as the original experimental one. It is claimed that it will remove the objections found to the Heroult furnaces, first installed.

Transvaal Stope Drill Competition

With regard to this competition, which was mentioned in the JOURNAL, of June 27, page 1293, the Transvaal Chamber of Mines informs us that a number of copies of the rules governing the contest have been forwarded to the American Institute of Mining Engineers. Persons desiring to compete for the prizes can obtain copies of the rules from the secretary of the institute at No. 29 West Thirty-ninth street, New York.

An authority states that the best test for cylinder oils is to heat them in a current of air for one hour at the temperature corresponding to the steam pressure at which they are to work. The loss in weight should not exceed 0.5 per cent.

Cost of Producing the World's Supply of Copper

The Great Producing Mines Are Divided into Three Classes, and the Costs Per Pound of Metal for Each Class Are Compared

BY JAMES RALPH FINLAY*

An example of mine conditions and costs similar to those of Butte is furnished on the other side of the world by the Wallaroo and Moonta mines of South Australia. These mines have not been described with the definiteness one would like; but in a general way the first is a group of fissure veins in metamorphic schist and the second a similar group of fissures in porphyry. The production of the district has not been so large as that of Butte, and the mineralization is less intense. The mining costs are somewhat higher because exploration is more extensive, but in other respects the parallel with the great Montana camp is close and interesting.

These mines are described by the general manager, H. Lipson Hancock (son of the inventor of the Hancock jig) in a pamphlet issued at Wallaroo, in November, 1907. The mines were discovered in 1860. In 47 years these mines have raised and extracted as follows:

Dressed ore and concentrates..	1,670,360 tons.
Copper, averaging 15 per cent.	
in ore	248,993 "
Total value	£13,944,445
Total cost	£11,285,809
Total dividends	£2,018,254
Average cost per ton of concentrates	£6 15s. 2d.

"The dressed ore of Wallaroo," says Mr. Hancock, "has throughout recent times averaged about 11 per cent.; that of the Moonta about 20 per cent. of copper, excepting that in later years it has been 2 or 3 per cent. lower. For a long time the vein stuff as raised to surface at both properties has contained on the average from 3 to 4 per cent. copper."

Port Wallaroo, the smelting point, is situated on the west side of the York peninsula. The Moonta mines are 12 miles south and the Wallaroo mines six miles east of the port. The ore comes from about 10 different veins in all. At the Wallaroo mines there are three large veins and several smaller ones in metamorphic mica schist supposed to be of Cambrian age.

Most of the work has been confined to one lode along which were occurrences of copper near the surface for a length of 10,000 ft., but at the depth of 2000 ft. the length of workable ground has contracted to 2500 ft. On the other veins the ores did not prove remunerative below the 1000-ft. level. At Moonta there are five veins of which only one is holding out below the 2000-ft. level. In both groups the copper is largely in the form of chal-

copyrite mixed with iron pyrite. The ore occurs in rather short shoots, often where the vein is intersected by cross-courses.

The high cost for mining is easily explained. There are more than 80 miles of development openings, including shafts, drifts, etc. This work would probably cost at least \$12 a foot, or \$5,000,000. This accounts for \$3 per ton of dressed ore, or approximately 75c. per ton of veinstuff hoisted. The actual stoping, including hoisting, pumping, etc., costs about \$3.50 per ton. The ground is soft like that of Butte, probably softer, requiring close timbering as well as close filling. The granulated slag from the smelter is used for filling.

Sorting and milling in 1903 cost 75c. at the Wallaroo and \$1.25 at the Moonta.

The external factors are favorable. Fuel is cheap and transportation to markets much less than for western mines. Wages are about 20c. an hour, but I do not believe this means cheap labor.

The internal factors are favorable, with the exception of the necessity of smelting all the ore. This is a most powerful element of high cost. The ore yields only 32½ lb. copper to the ton.

The current operating costs for 1907 were as follows:

Mining	\$1.22
Smelting	2.14
Administration, etc.	0.49
Total	\$3.85

To this I think should be added 21c. a ton for the use of the mining plant and

COSTS OF OPERATION AT WALLAROO AND MOONTA FOR SIX YEARS.

	1,176,000 Tons. Crude.	292,889 Tons Concentrates.
Interest and discount	\$0.07	
Adelaide office	0.07	
Special funds for employees	0.04	
Depreciation and redemption	0.40	
Wages and contracts	4.20	
Machinery and materials	0.55	
Fuel	0.44	
Buildings	0.04	
Water supply	0.04	
General and miscellaneous	0.41	
Freight on concentrates		\$0.52
Wages		3.73
Machinery and supplies		1.33
Fuel and flux		3.02
Buildings and improvements		0.15
General and miscellaneous		0.28
Shipping copper		0.49
Total	\$8.63	\$34.66

These costs seem high, but the work is done with extreme care.

In terms of short tons and American money I find that the average cost of mining, concentrating and smelting a ton of concentrates for the whole life of the mine has been \$32.90. In recent years the cost has exceeded this by about \$2 per ton. The increased cost is to be explained by the increased depth and a certain deterioration of the mines.

The accompanying table gives the cost of the complete operations for six out of the last 10 years. The reports are excellent.

TENNESSEE COPPER COMPANY

Only one mine of importance is found in the United States east of Lake Superior. It is owned by the Tennessee Copper Company, which works several large lenses of cuprififerous pyrite. All the ore must be smelted in the blast furnace. For ores of this character I believe this company does the cheapest work in the world. Its reports are excellent and reveal not only the operating costs in detail, but also the plant expenditure and the ore in sight.

47c. a ton for the use of the railroad and the smelting plant, making a total of \$4.53.

In detail these costs are as follows:

Development	\$0.1318
Mining, hoisting, etc.	0.9389
Crushing and sorting	0.0804
General	0.0851
Total current cost	\$1.2162
Add cost of preliminary development amortized in 15 years at 5 per cent. interest and 5 per cent. annual amortization	0.06
Mining plant similarly amortized	0.15
Transportation to smelter	\$0.1329
Blast furnace	1.6279
Engineering and laboratory	0.0628
General	0.0852
Converting	0.2402
Total current smelting cost	\$2.1430
Add amortization of smelting plant and railway as above	0.47
Add administration, shipping, refining and selling expenses	0.49
Grand total	\$4.5292

On the basis thus figured, anything received above 12c. a pound for copper in New York is applicable to dividends and anything above 14c. is net profit after allowing for the return with interest of money invested in the plant. These costs are higher than the average by from 5 to 10 per cent. The costs for 1907 were

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high on account of unfavorable economic conditions throughout the country. It should be explained further that in addition to the copper the sulphur is being utilized so that in future the property will not be wholly a copper mine. Its operations will be nearly equivalent to those of the Rio Tinto company in Spain.

UTAH CONSOLIDATED

This company has mined since 1899 large deposits of cupriferous pyrite at Bingham, Utah, averaging by actual recovery for five years 60 lb. copper, 1.33 oz. silver and 0.104 oz. gold per ton. The silver and gold are worth about \$2.88 per ton, so that with copper at 14c. per lb. there is a total metallic extraction equivalent to 80 lb. copper. The ore occurs in large lenses or shoots in limestone. It is approximately self-fluxing, there being a moderate excess of iron over silica. Most of the mining has been done through adit levels. The mining plant is not extensive. The ore is delivered to the railroad over an aerial tramway about 12,000 ft. long. It is transported by rail about 25 miles to the smelter.

The external conditions are, for the Rocky Mountain region, good, and the internal factors, with the single exception of the requirement of smelting all the ore, very favorable for cheap work. The ore is soft, uniform, and occurs in good-sized bodies. The stoping is done in square set rooms. The item of timbering must be one of the chief mining expenses.

There is nothing in the reports to show the mining or smelting losses; but with this exception the reports are excellent. They give the stockholders in brief, but sufficient outline, the costs and financial results of the business.

In the five years ending December 31, 1907, the costs were as follows:

COSTS PER TON FOR FIVE YEARS, UTAH CONSOLIDATED.

	Per Ton.
Mining, 1,260,453 tons	\$1.73
Development, 1,400,000 tons	0.30
Transportation, smelting and refining, 1,276,393 tons	2.80
General expense, 1,276,393 tons	0.23
Current construction, 1,276,393 tons	0.34
Amortization at 5 per cent. interest and 5 per cent. annual amortization of \$1,232,274 invested in plant at beginning of period; this being sufficient to retire the investment in 15 years—proportion for five years	0.48
Total cost	\$5.88

Recollecting that the ore contains in copper, gold and silver the equivalent of 80 lb. copper to the ton we get an average complete cost of producing copper of 7.35c. per lb. This may be divided as follows: actual operating cost 6.75c.; allowance for return of working plant 0.60c. Of course, everything received above 6.75c. for copper or its equivalent in New York goes to the stockholders as dividends.

MOUNT LYLLE

The Mount Lyell company operates a cupriferous pyrite mine and a smelter in western Tasmania. The original Mount

Lyell deposit was a great mass of nearly pure iron pyrite containing only 0.6 per cent. copper, but a portion of it had been enriched near the surface. This deposit has been mined almost wholly from an open pit. Another mine, however, called the North Mount Lyell, produces a much more silicious ore averaging 6 per cent. copper. This ore has to be mined underground. During the last four years, which will presently be reviewed, about 60 per cent. of the ore has come from the Mount Lyell proper and 40 per cent. from the North Mount Lyell.

The external factors are probably nearly average for English-speaking countries. The climate is rainy, but not more so than Cornwall or Scotland. The mine is situated near the coast, so that supplies must be reasonable in cost, and transportation of copper, even to England, must cost less than transportation of western American copper to New York.

The internal factors are, for a smelting enterprise, very favorable. The ores are mined, thanks to the large proportion obtained from the open pit, for less than \$2 a ton. The smelting is largely pyritic, and the proportion of coke used in the charge is said to be only one per cent.

In four years 1,690,531 tons were mined. In the same period the ore reserves diminished from 4,666,000 to 4,107,000 tons, a loss of 559,000 tons. At this rate of loss the property would last 30 years, but since (1) a large part of the low-grade pyrite which hitherto has been mined from open pits must be taken at greater cost from underground and, (2) there does not seem to be a first-class reason to believe that the rich ores of North Mount Lyell can be found in the same abundance for a long period, it seems safer to estimate a life of 20 years as the amortizing period of the investment. On this basis we may compute the costs as follows:

COSTS PER TON AT MOUNT LYLLE.

Mining, 1,690,531 tons	\$1.05
Stripping, 1,690,531 tons	0.26
Developing, 1,131,258 tons	0.50
Total mining	\$1.81
Smelting, 1,698,793 tons	\$1.78
Converting, 1,698,793 tons	0.34
Railway expenses	0.27
Freight and marketing	0.72
Total for smelting, refining and marketing	\$3.11
General expense, 1,698,793 tons	\$0.25
Use of plant; being 5 per cent. interest and 3 per cent. amortization for four years on average amount invested (£376,000)	0.35
Total cost	\$5.52

The actual returns of metal from the Mount Lyell ores have been 34,210 long tons copper, 3,056,231 oz. silver and 91,815 oz. gold. The extraction has been 86 per cent. copper, 99 per cent. silver and 105 per cent. of the gold estimated by assay to be contained in the ore. There is no statement as to whether the ore treated is given in long tons or short tons, but it is probably safe to assume that the copper output is given in long tons. We have on this basis a recovery of 45.5 lb. copper,

1.8 oz. silver and 0.054 oz. gold per ton of ore treated. The gold and silver are worth \$2.18 per ton, at average prices. This is the equivalent of 15½ lb. copper, and we may figure the metallic contents altogether as equal to 61 lb. copper. On this basis the cost per pound of copper is 9 cents.

GRANBY CONSOLIDATED

The Granby Consolidated Mining, Smelting and Power Company, Limited, British Columbia, has mined in three years, 1,995,948 tons and treated 2,088,381 tons. The ore yielded by actual extraction 24.2 lb. copper, 0.38 oz. silver and 0.06 oz. gold per ton. The silver and gold are worth \$1.42 per ton equal to about 10 lb. copper. The total value, therefore, is equivalent to a little more than 34 lb. copper, and this may be taken as a safe basis for figuring the economic performance of the mine. The ore is chalcopyrite disseminated through porphyry altered by magmatic waters so as to form an approximately self-fluxing gangue. The ore will not concentrate, but is smelted in bulk. A large part of the mining has been done in open pits with steam shovels.

This company does not issue a good report to its stockholders. The statement is too brief; it contains no estimate of ore developed, nor does it give any intimation of the probable life of the mine. The reports give no figures about the capital invested in lands as distinguished from capital in equipment. On these accounts it is possible that the costs indicated may not do the property justice.

COSTS PER TON AT GRANBY.

	Per Ton.
Current operating cost; mining, smelting, refining and marketing for 2,088,381 tons treated	\$3.39
Current construction 2,088,381 tons treated	0.36
Return of \$14,000,000 invested in lands and equipment at 5 per cent. interest and 5 per cent. annual amortization; this being sufficient to extinguish the investment in 15 years with an output of 11,200,000 tons	2.00
Total	\$5.75

On this basis copper or its equivalent costs in New York about 17c. a pound.

It is stated in the reports that a maximum capacity of 3500 tons a day, say 1,200,000 tons a year, has been provided. If this volume of operations can be maintained for 15 years the amortization charges on the invested capital may be computed at about \$1.16 per ton on 18,000,000 tons. This will equal 3½c. per pound copper and the total cost required to neutralize the investment is 14½c. per lb. The idea can be expressed somewhat differently, as follows:

Cost of copper for current operation and construction per lb.	11c
Profit per ton required to return capital in 15 years with 5 per cent. interest	3.5c
Total cost required at maximum output for 15 years to make the investment justifiable	14.5c

It is pertinent to remark that this is what I mean in all cases by amortization;

but in other illustrations I have attempted to amortize only the capital invested in actual plant, while in the case of the Granby the amortization covers the entire investment in lands and property besides plant.

GENERAL CONSIDERATIONS

We may divide copper mines into three classes, each presenting a different economical problem: I. Disseminated ores in which concentration is the all important thing, smelting being applied only to a fraction of the material mined. II. Quartz pyrite ores in fissure veins in which the ratio of concentration is low, the proportion smelted considerable, making the costs usually high. III. Ores that cannot be concentrated and must be smelted in bulk.

I. DISSEMINATED ORES

The first class contains the Lake Superior copper ores in which native copper is disseminated, either in porphyry or in conglomerates derived from porphyries, in the proportion of from 1 to 4 per cent. These ores are concentrated in the mills (with 20 per cent. loss in milling) to from 1 to 4 per cent. of their original volume. This is the proportion smelted.

We have in this group also the disseminated porphyry ore of Bingham, Utah, containing 2 per cent. copper in the form of chalcocite. This ore concentrates with 70 per cent. recovery into 4½ per cent. of its original volume. The disseminated ore of Ely, Nevada, which concentrates into 12½ per cent.; that of the Clifton-Morenci district in Arizona, which concentrates into 15 per cent.; that of Nacozari, Mexico, which concentrates into 17 per cent.; the ore of the new Miami Copper Company at Globe, Arizona; and the Braden copper mines of Chili, may all be included in this class.

The cost of producing copper from these ores will average about 9c. per lb. delivered in New York. These ores now produce a third and will soon yield one-half of the copper of North America, and they may be described as the most important, most profitable and most promising source of copper.

On the basis of the ton mined these ores are far more cheaply worked than any other copper ores. The internal conditions for cheap mining are excellent. The orebodies are large, uniform and firm. There are some, such as Utah Copper, Nevada Consolidated and others, which present the great advantage of being accessible to open-pit methods of mining.

The cost of concentrating (including transportation to mills) is determined largely by the external factors of the cost of water, fuel, transportation and labor. The variation is between the figures of 40c. in Lake Superior to \$1 in less favorable situations. The internal factor of the mineralogical complexion

of these ores does not, to my knowledge, introduce in this class any great difficulties.

The cost of smelting, refining and marketing this class of ores presents the same external variables as that of concentrating. An internal factor of significance is the effect of concentration on the fluxing qualities of the ore. In terms of the concentrates smelted we have in general the following factors: (1) The cost and quantity of fuel and flux required for reduction; (2) the richness of the concentrate which determines, *a* the cost of converting or bessemerizing, *b* the cost of transportation to market, and *c* the cost of electrolytic refining.

Manifestly the cost per ton smelted is more a question of the richness of the ore smelted than of anything else; thus in Lake Superior, where the external factors are extremely favorable, the cost of smelting, refining and marketing per ton of 70 per cent. concentrates is about \$15, while the concentrates of Ely, Nevada, carrying 13½ per cent. copper smelted and sold under the most costly conditions are estimated to cost only \$10.50 per ton.

Manifestly also the supreme factor of cost is the divisor which represents the proportion smelted. In the case of Lake Superior an ore producing only 2 per cent. concentrates divides its cost of \$15 per ton by 50, so that, as spread on the ore milled, the cost is only 30c. a ton. In the case of Ely ores the \$10.50 cost can only be divided by 8 and the resultant cost on ore mined is \$1.31.

The salient facts regarding the cost of mining disseminated ores may be expressed in the accompanying table:

COST OF MINING DISSEMINATED ORES.

	Low.	High.
Mining.....	Open pit . . . \$0.50	Underground. 1.25
Concentrating.....	0.40	1.00
Smelting, refining and marketing.....	0.15	1.30
	Open pit . . . \$1.05	Underground. 1.80

At the average price of 14c. for copper, these figures mean that under the most favorable conditions a Lake Superior ore, if it could be mined from an open pit, might meet expenses with a yield of only 7½ lb. per ton. If mined underground about 13 lb. is the minimum; while under the most unfavorable conditions a yield of 34 lb. may be required.

II.

QUARTZ-PYRITES WITH LOW CONCENTRATION

Of quartz-pyrite ores I have given the conspicuous examples of Butte and of the Wallaroo and Moonta. There is substantial agreement on the following points:

(1) A high mining cost owing to *a* high development cost due to searching for ore shoots through much larger volumes of barren vein material; *b* considerable selection of ore in the process of mining; *c* soft ground requiring elaborate timbering and filling.

(2) A high concentrating cost due in part to the use of hand sorting, but particularly to the careful milling methods required to prevent undue losses.

(3) Smelting costs are high because first, a low degree of concentration gives a large proportion to smelt (from 25 to 50 per cent.); second, because the silicious and aluminous character of the gangue renders smelting rather difficult; third, because the ore as mined is necessarily of fairly high grade.

The external conditions in Butte are somewhat less favorable than at the Wallaroo and Moonta, but in neither case are the high costs due to them. I believe that high costs are inherent to quartz-pyrite ores in fissure veins.

	Australia.	Montana.
Mining.....	\$4.68	\$3.78
Milling.....	1.00	
Smelting, refining and marketing.....	2.37	4.62
General expenses.....	0.58	
	\$8.63	\$8.40

Applying to these costs the average price of 14c. per pound copper, it is evident that such ores must yield about 60 lb. copper or its equivalent in order to pay expenses. As a matter of fact, Butte ores have averaged for the last 13 years not far from the equivalent of 87 lb. copper per ton and the metal has cost less than 10c. per lb. With the impoverishment of the ores with increasing depth, costs have increased until today the average Butte copper must cost more than 11c. and perhaps 12c. At the Wallaroo and Moonta copper has averaged in cost almost exactly 10c. and lately as high as 15c. The last figure, however, was an incident of the boom of 1906, and must be considered abnormal.

Other mines of this class are, I believe, the Old Dominion and others on the great fault fissure of Globe, Arizona, and in part, at least, those of Cananea, Mexico. Whatever geological grouping may be appropriate, the economic results are similar to the illustrations given, and bear out emphatically the generalization that cupriferous pyrites with a highly silicious and aluminous gangue, occurring in shoots in fissure veins are essentially high-cost ores at every stage of the process.

III. WHEN ALL ORE MUST BE SMELTED

I have given as examples of the third class of copper mines; *i.e.*, that in which all the ore must be smelted, Bisbee, Arizona, Tennessee Copper, Utah Consolidated, Granby Consolidated and Mount Lyell. To this list might be added the Rio Tinto pyrite mines of Spain and Portugal, the mines of Shasta county, California, United Verde in Arizona, Cerro de Pasco in Peru and others of less importance.

Economically we may make the following distinctions in this class:

(1) Cupriferous pyrites in an advanced state of alteration and reconcentration, so that only a small part of the original

mass can be mined. In this case mining costs as well as smelting costs are inevitably high. Bisbee, Arizona, is a good example.

(2) Cupriferous pyrites in their original state or moderately enriched. In this case there is usually presented a large mass of homogeneous ore easily mined and easily treated. Tennessee Copper, Utah Consolidated and Mount Lyell are examples. At these properties the cost per ton is from \$4.20 to \$6.

(3) Disseminated, self-fluxing ores not very pyritic. Granby Consolidated is an example.

Speaking generally it must be admitted that mines of class III produce a goodly proportion of the world's copper. The list of big producers includes the Rio Tinto, the Copper Queen, Calumet & Arizona, United Verde and many other mines not so big but very profitable. Rio Tinto seems to produce the cheapest copper in the world, but, I believe, this is due to the fact that the sulphur is also utilized to an important extent. Leaving out this case, in which copper only costs 5c. per lb., it does not seem probable that copper from these ores is produced at an average of less than 10c. per lb.

Short Talks on Mining Law—V

By A. H. RICKETTS*

As previously shown, mining claims cannot properly be located within the United States, unless in accordance with the mining act and State or Territorial legislation, and the local rules, regulations and customs of miners, if such local statutes or local rules exist. If not, the requirements of the act are alone to be fulfilled, as it is not essential that there be either of the latter. In most of what may be called the "mining States," laws have been enacted regulating the manner of location, recording, the doing of assessment work, etc. Such laws generally supersede the local rules and are effective when not in conflict with the paramount law. But miners may still make rules and regulations or indulge in customs not in conflict with the act or local legislation.

SOURCES OF MINING LAW

The statutory mining law within the United States consists of acts of Congress and the legislation of the mining States and Territories. The Federal law invites such supplementary legislation, as well as that of the miners themselves, whose rules, regulations and customs are deemed the common law of mining in the United States. The only provision attached to such right of elaboration in either instance is that they shall not be in conflict with

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the Federal laws. If repugnant thereto, such addition is void.

It would be beyond the scope of these articles to present herein more than some general principles and practical suggestions to aid the miner in the acquirement, preservation and perfecting of his title, without entering into matters of detail. A locator cannot pay too close attention to the law and rules prevailing in the locality in which he intends to make his location, or has his claim, as the validity and right of possession thereto depends thereon.

The decisions on the law and the practice thereunder may be found in the reports of the United States Supreme and Circuit courts, the decisions of the Land Department, of the courts of last resort in the different States, Territories, and District of Alaska, and in the rules and regulations of the Land Department. In case there is a want of harmony in the decisions of the United States Supreme Court with those of other appellate courts in matters affecting the public domain, the former prevail. In other words, such decisions are mandatory, not persuasive, authority. The courts have no revisory power over the rulings of the Land Department upon questions of fact, except in cases of fraud, etc., which permit any determination to be re-examined. Its rules and regulations may be avoided by judicial decree and its decisions upon the law set aside by the courts.

Miners' rules, regulations and customs were introduced into the United States by the early miners of California, who obtained them in their principal features from various foreign sources. The absence of statute law regulating mining and the use of water on the public domain was the cause of their establishment, and they present the curious anomaly of great armies of adventurers, who were governed, in vast property interests, by no higher law than that made and enforced by themselves. The validity of a local rule, regulation, or custom does not depend upon enactment nor formal adoption, but upon observance by the miners of the district. If they fall into disuse, or are generally disregarded, they are void.

The student of the United States mining law will discover that there is much conflict in the reported cases, and in some instances that they are not consistent with others emanating from the same source; this may be accounted for in a way, by the fact that the mining act is not free from ambiguities and that it does not always confer what it seems to give. Cumulative and often cumbrous local legislation further tends to prevent uniformity in the operation and application of the provisions of the act.

The production of iron pyrites in the United States during 1907 was 261,871 long tons, valued at \$851,346.

Separation of Silica and Alumina in Iron Ores

T. G. Timby (*Journ. Am. Chem. Soc.* April, 1908, p. 614) compares four methods of determining silica and alumina in iron ores and arrives at the conclusion that at least three of the standard methods are not universally applicable.

The following methods were employed:

(1) Sodium carbonate fusion: one gram of the sample was treated with concentrated hydrochloric acid and evaporated to dryness twice, then dissolved in hydrochloric acid, the solution filtered and the residue fused with sodium carbonate. The fusion was treated with hydrochloric acid and evaporated twice to dryness and the silica determined as usual.

(2) Double dehydration of ore in hydrochloric acid: Solution in same, ignition of the insoluble residue in platinum and re-solution in hydrochloric acid, and silica determined.

(3) Ignition of ore in porcelain with sulphur, solution in hydrochloric acid, and silica determined.

(4) Ignition of ore in porcelain without sulphur, solution in hydrochloric acid containing one gram of stannous chloride in 225 cc., and silica determined.

Alumina was precipitated as phosphate. The ores used were those encountered in routine work and were as follows: (a) brown hematite-limonite mixture; (b) brown hematite; (c) red-brown hematite mixture. The following percentages are averages of numerous determinations:

Methods.	(a)		(b)		(c)	
	SiO ₂	Al ₂ O ₃	SiO ₂	Al ₂ O ₃	SiO ₂	Al ₂ O ₃
(1).....	7.70	3.11	5.52	1.44	13.31	4.00
(2).....	8.90	2.49	6.01	1.15	13.76	3.70
(3).....	8.92	2.37	6.00	1.07	14.07	3.44
(4).....	8.71	.....	6.17	.....	14.17	.....

The following figures show the amounts of alumina soluble in hydrochloric acid before the ignition in method (2), and the amounts liberated by the ignition:

Ore.	Alumina, Per Cent.	
	No. 1.	No. 2.
(a).....	0.97	1.53
(b).....	0.62	0.59
(c).....	1.48	2.21

Three different ignition temperatures for method (2) were tried on ore (a). A low red heat, barely sufficient to redden the crucible bottom, was applied until the filter was carbonized and about half consumed; this gave results as follows: silica, 8.92, alumina, 2.48. A moderate red heat, sufficient to redden the crucible (15 g.) clear to the top, and applied until the filter was entirely consumed, gave: silica, 8.88, and alumina, 2.51. Igniting to bright redness gave figures much higher on silica and lower on alumina and so discordant as to be totally worthless.

The production of fuller's earth in the United States during 1907 was 34,039 short tons, valued at \$323,275.

Lead Mining at Mechernich, Prussia

Galena Occurs as Fine Grains in Immense Flat Beds of Sandstone.
The Great Deposits Are Mined without the Use of Any Timber

BY LUCIUS W. MAYER*

The center of the lead-mining operations of the Mechernicher-Bergwerks-Aktien-Vereins, is situated in the neighborhood of the town of Mechernich, 34 miles southwest of Cologne, in the province of Rhenish Prussia, Germany. Mechernich is in the heart of a mountainous plateau, the surrounding country being known as the Eifel, a name applied to the district lying between the Moselle, the Rhine and the Roer rivers.

Geologically the strata of the Eifel are Devonian. Lying above are sandstones and conglomerates known as *Bundsandstein*. These are red, green and white in different horizons. In Mechernich the sandstone particularly, and occasionally the conglomerate, has been impregnated with nodules of galena known as *Knot-*

25 per cent. of the lead contents occurs in the form of disseminated particles, and it is to this material that a large proportion of the extraction losses are due. The extraction of lead is given at 66 per cent.

THE ORE DEPOSITS

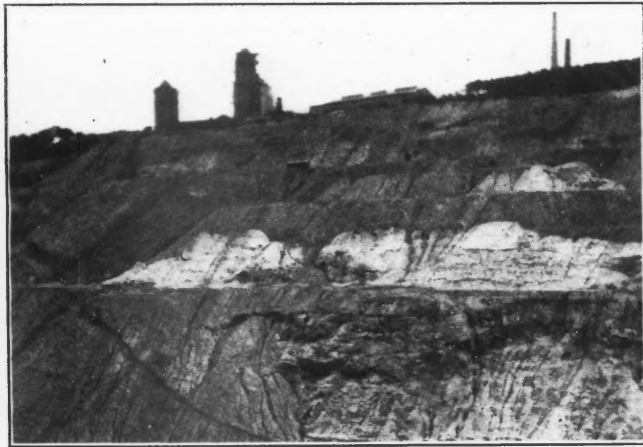
The lead-bearing formation is sharply faulted, and the volcanic action which occurred after the deposition of the *Bundsandstein* produced considerable distortion. The strata outcrop strongly on the surface. The dip averages from 6 to 7 deg. The faults, which are very steep thrusts, account for the gain in depth of the mining operations.

The overburden is a reddish sandstone which, in general, is soft and is worked

stand extremely well under pressure. Occasionally harder sandstones, red and white in color, are encountered.

METHOD OF MINING

The mining operations which in this district date back to the time of the Romans, have been carried on both by *Tagebau* (open cast) and *Unterirdischgebau* (underground mining). Veins within 150 ft. of the surface are mined entirely by the open-cast method. The two modes of mining supplement each other, the stripping being in all cases disposed of by surface work. The ore is sent down small shafts or chutes connecting the ore horizon of the open cut and underground workings below, and thence hoisted to the surface and dis-



OPEN PIT AND HOISTING SHAFT, MECHERNICH

ten which might better be called *Knotchen*, for the crystals of galena are generally very small, and are to a certain extent so finely disseminated in the rock as to be invisible.

The ore is usually in appearance a cream to white sandstone of a sugary texture, the grains being apparently independent and well defined. Under a microscope the rock as a whole appears very much like a lump of sugar, except in color. The grains of lead mineral interspersed through the sandstone are also separate; the soft ores may be taken in the hand and crumbled and the lead *Knotten* cleanly separated from the sandstone. The lead mineral is not all visible to the eye. It is estimated that

off with bucket excavators in open-cast operations. Below this comes the conglomerate, the sands, and the ore. These bands often repeat themselves in certain sections, as many as five veins being worked one below the other. Below the ore-bearing formation lies a rock known as *Grauwacke* which belongs to the lower Devonian, and has the appearance of gray sandstone.

The ore averages between 2 and 3 per cent. lead, the lead carrying 13.14 gram silver per 100 kg. Pockets of copper-bearing rock are sometimes encountered, and small shipments are made monthly. The copper stain is sometimes marked, but the lead ore is usually clean and white, speckled with particles of galena. While in general the ore has little resistance to abrasive action, it seems to

tributed to the concentrator. All the ore but that from Callumtherberg and Gute Hoffnung finds its way to *Förderturm* (hoisting shaft) Schafsberg.

There are five mines in operation, three having both open-cast and underground workings, and the other two underground only. These properties are known as follows: Schafsberg, Unterirdisch, Tagebau Bachrevier, Tagebau Virginia, Unterirdisch Virginia, Neu Schunk Olligschlager, Tagebau Callumtherberg, Unterirdisch Callumtherberg and Unterirdisch Gute Hoffnung.

During my visit, about 1600 men were employed, 558 underground, mining 2000 tons of ore daily, or 3.58 tons per man. The daily pay averages about four marks for eight hours' work for the underground men, and for ten hours for surface men.

*Mining engineer, 193 Pearl street, New York City.

It appears that the higher wages paid in Essen and Dusseldorf attract the men there, so that there has been more or less difficulty at Mechernich in obtaining labor.

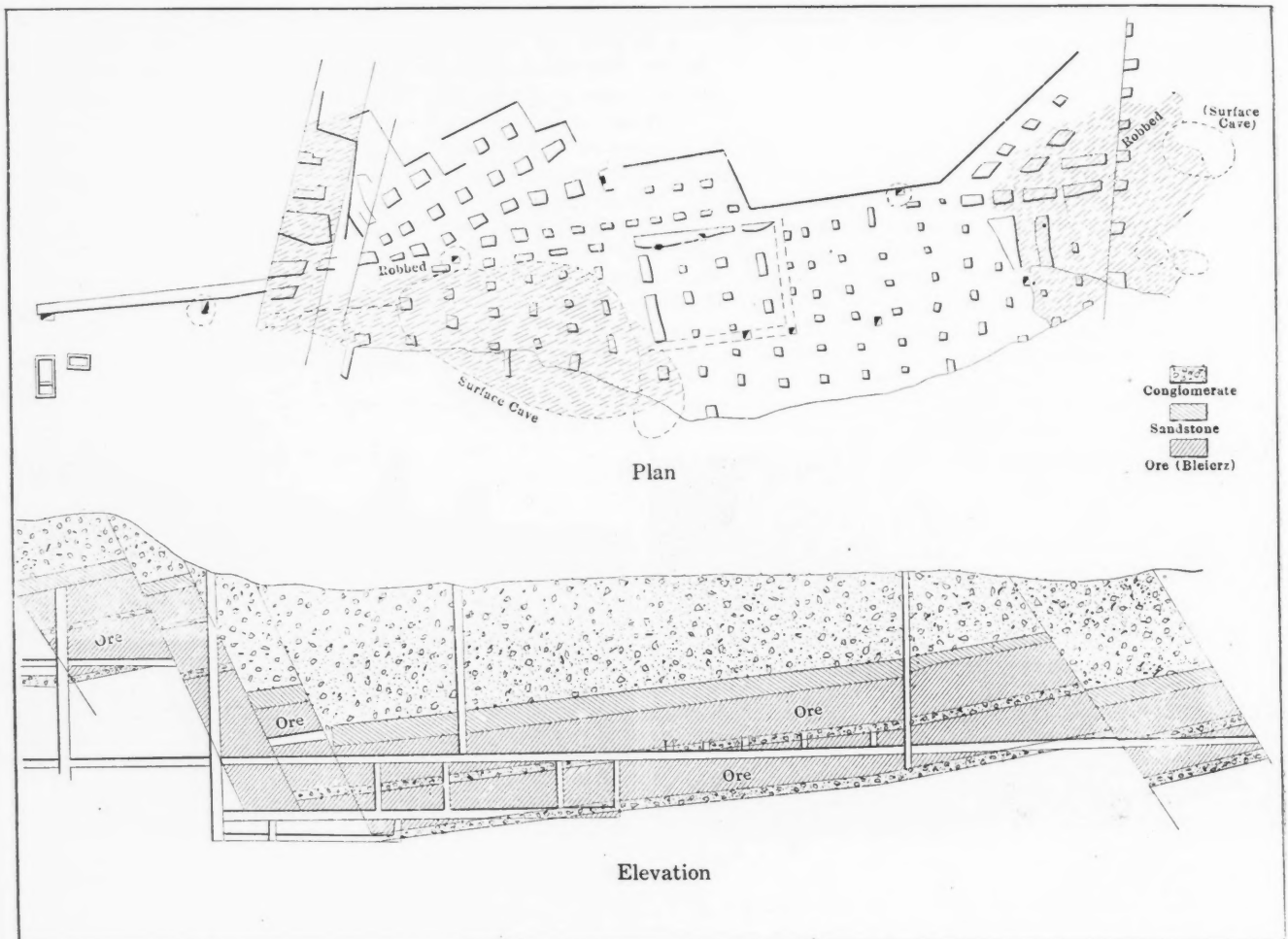
The tonnage produced in the Mechernich lead mines has been greatly reduced; the mines formerly turned out 3500 tons per day. In open-cast mining it is estimated that three tons of overburden are removed per ton of ore won. As the open-cut work widens, the ore is opened at the bottom of the excavation. When a

berg. The engine is rated at 128 h.p. capacity.

The seams vary from 4 to 20 m. in thickness, and while dipping at the maximum not much more than 7 deg., often become quite horizontal, thus resembling in certain features the Cambrian limestone lead-bearing formation of southeast Missouri. The Flat River formation is, however, in general much harder and tougher than the Mechernich rock. According to figures given, 1 lb. of explosive breaks 3.25 tons rock. In Mechernich

on in old workings; (3) square work and pillar robbing in conjunction with sand filling, as carried on in Gute Hoffnung.

In the first method drifts are extended laterally in the bottom of the seam until a fault plane is encountered, from which point mining proper is begun. Drilling is done by air drills, hand hammer, or jumper drilling. The average advance for a 2x2-m. drift is 60 m. per month, in three shifts, excluding Sundays, with power drills; 40 m. per



PLAN AND ELEVATION OF OLD WORKINGS AT GOTTESEGEN

depth of 450 ft. has been attained, open-cast operations cease, and the work is carried on by underground methods.

The bucket excavators running on three tracks remove the overburden at the rate of 1000 to 3000 cu.m. per 10 hours, men barring down the material to feed the buckets. Light steam locomotives haul side-dump all-steel cars of 1 cu.m. capacity. From the Callumtherberg mine to Schafsberg the ore is hauled in trains on the surface by means of a steam-storage locomotive, the steam being charged into the boiler under a pressure of eight atmospheres. The capacity is sufficient to make the return trip of 6 km. from Callumtherberg to Schafs-

berg. diamond-drill prospecting has not proved successful, the operators being unable to obtain cores. I do not know whether or not the sludge method was tried.

Centrifugal pumps are largely used at these mines. One pump raises 2662 gal. per min. against a 50-m. head; the suction and column pipes are 300 mm. in diameter. The pump operates at 1000 r.p.m., the motor requiring 5000 volts and 17½ amperes.

The methods of underground mining employed by the Mechernich company, which has absorbed all the important mines in the district, involves three distinct kinds of work: (1) square work and caving; (2) pillar robbing, as carried

month is given as an average for hand drilling.

The use of air drills in this rock is in interesting contrast to the use of the hand rotary drill in the harder rocks of the Cleveland district, England; the wisdom of the policy in both instances appears open to question.

The method of mining is shown in the accompanying plans and sections. Drifts *aa* are driven approximately 2 m. square at intervals of 8 to 10 m., and cross-drives *bb* of similar dimensions, connect these parallel drifts. These cross-drives are shown driven at an angle of 45 deg. to the main drives; this feature is dependent on the grade; where a horizon-

tal formation is met cross-drives will be 90 deg. to the main drives, also at intervals of 10 m. This work of blocking out pillars is done entirely in the lower two meters of a seam the entire thickness of which is perhaps 20 meters.

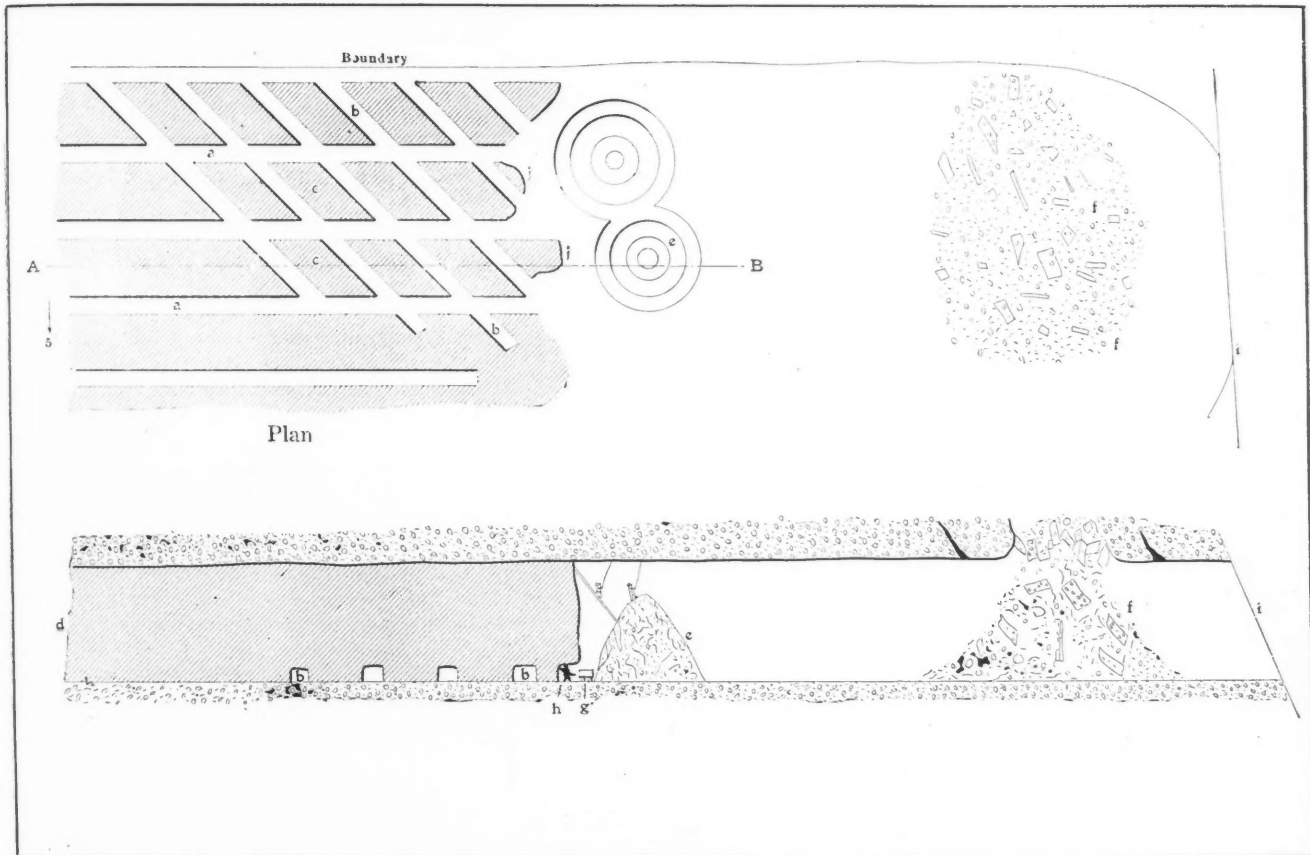
STOPING

When the main drives have encountered a fault the drifting is discontinued; by this time the blocking out of the pillars by the cross-drives has already made considerable progress. The cross-drives having blocked out the pillars nearest the fault, the work of bringing down the upper part of the seam is now com-

ing operations, in the methods here described, are for ladders and the long poles used in cleaning the high back and bringing down loose rock.

In attacking the two-meter pillars which are to be removed in order that the overlying rock may cave, undercutting may be begun on all sides, but usually the work is advanced on three sides in the direction of the retreat. As an overhang is produced, this rock is immediately attacked, every endeavor being made to cave everything above the area of the pillar which has been undercut. If this ground does not cave without forcing, the men first test it with poles

vided that the roof overhead is sufficiently safe. At *h* is a machine drill operating on the pillar. The pile of ore *e*, is not entirely withdrawn until it is certain that no further testing of the roof at this point is necessary. This artificial method of obtaining hight, which may be 50 ft. or more, is part and parcel of the process. The drifts originally extended to the fault *i*, from which stoping has been carried back as seen in the figure. The roof has stood over a large area before the conglomerate fall, *f*, of the main roof occurred. The parting between roof and lead rock is well defined, and there is little mixture of the two.



SECOND STEP OF WORKING THICK SEAM AT MECHEARNICH. REMOVING THE ORE

menced. The manner of attacking the pillars in the lower part of the seam is a development of long experience. In the early days *Sicher Pfeilern* (pillars of safety) were left. At that time these pillars were not disturbed, as shown in the plan of the old workings, the pillars being left with more or less regularity. To-day, however, the extraction of ore-bodies is as complete as may be expected.

The rock for the most part is soft and friable, although under uniform and constant pressure it is remarkably firm. The ground is much cut up with slips and horses, which are not favorable to safe mining. In spite of this, no timber is used whatever, even for temporary support. The only wood seen in the cav-

before proceeding with the work of bringing it down by means of explosives. If drilling is to be done well up in the face and sufficient hight cannot be made by standing on the broken ore piled up from a previous fall, the men drill from ladders, jumper or hammer drills being used. A stump of a pillar is sometimes left to insure a firm support for the roof to aid the work of cutting an adjacent pillar. The men constantly test the roof and make it safe by means of the ladders and poles fitted with iron shoes at one end.

In the illustration showing the method of breaking down, the ore has been piled up at *e*, and the men are barring down irregularities in the roof. At *g* is a car into which the men shovel the ore pro-

WIDE UNSUPPORTED AREAS

In one place I saw an unsupported area approximately 40x80 m. in extent. In this place, which was considered small, the hight of roof above the floor was about 30 ft. and there was no sign of an impending roof fall; the men showed no hesitancy in walking about the area, which was constantly being enlarged. The floor all about was perfectly clean, which fact is evidence that the roof had originally been properly cleaned and was not scaling off.

When a roof fall is anticipated the men exercise more than usual care. Being trained to the condition, they know at what moment to take refuge in the drifts which are at all times within easy reach. Only the men who are working

on the roof are exposed to danger, warning of which is invariably given by the roof itself in the form of falls of pieces of rock.

The walls of the stopes are so formed as not to cause right angles at the intersection of wall and roof, but rather broad arches to prevent shearing. This point is extremely important, and one which, I believe, admits of wider spacing between pillars because the arching effect

was worked the two bands of ore were taken as one with the intervening conglomerate band. At present where this conglomerate becomes too thick, it is left as a floor for the upper seam of ore. When there is sufficient thickness, pillars need not necessarily be left one directly above another.

In this mine pillars attained a height of more than 75 ft., and the method of robbing is in a measure quite similar

to the pillars near that attacked; the work on one bears a definite relation to the condition of its neighbors. Perhaps one-half of one pillar may be cut while the last stump of a third will be removed, before the part left in the second is taken. In each case the men climb upon the fallen ground and bar the roof to as safe a condition as possible.

The work of removing the pillars, and in fact mining according to the system here described, is a matter of confidence on the part of the men, who work under what appear to be dangerous conditions in the most matter-of-fact way.

The cost of mining in Mechernich was given at 8 to 10 marks per ton of rock, delivered at the top of the shaft. The total cost of producing lead was said to be 24 to 25 marks per 100 kg., equivalent to about 3c. per lb. of lead.

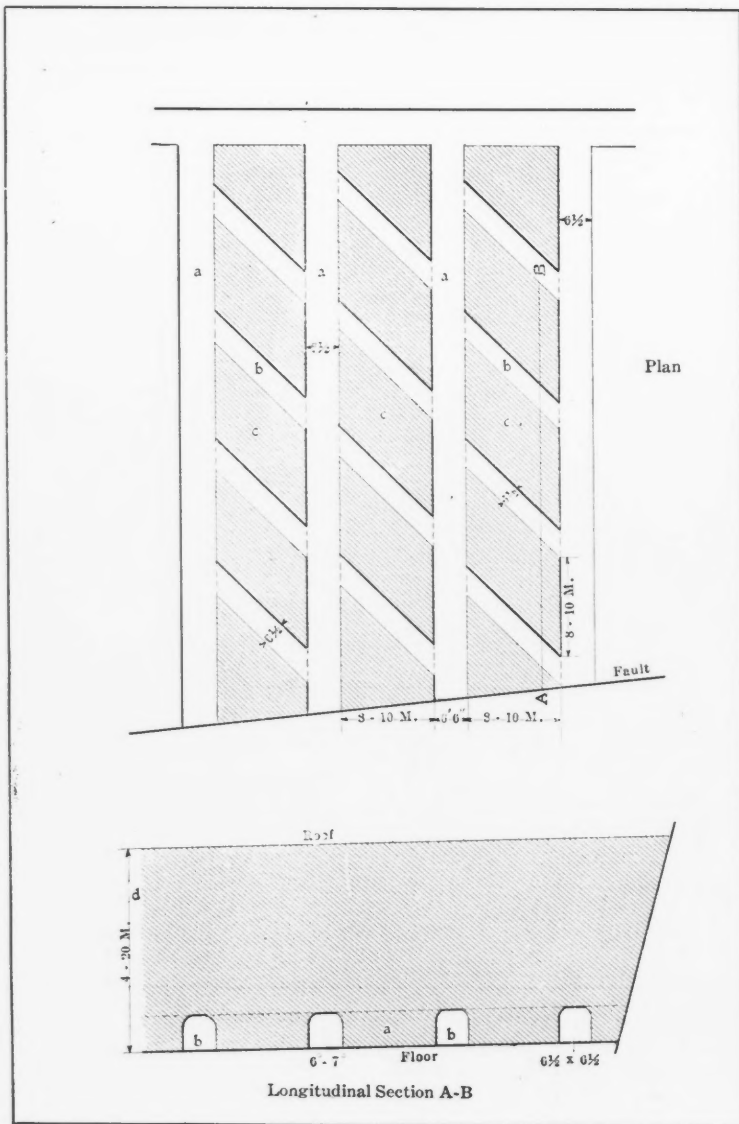
Profit Sharing in the Comstock Mines

SPECIAL CORRESPONDENCE

People in San Francisco have always been interested in the Comstock mines, which for years poured so much wealth into the city, and they have continued for a long period to pay assessments which made it possible to continue mining operations though no profits resulted. They are pleased now to see improvements in methods of conducting the companies being carried out; an important one of which was the reduction of "topheavy" expenses by cutting down salaries and reducing force in the city offices, as recently mentioned. Added to this the plan has been adopted of paying a percentage of the profits of the companies to the miners actually engaged in the work of developing the properties. One of the announcements posted at the mine is as follows:

"In the hope of stimulating a still greater interest in the search for paying ore in our mines, as well as to encourage all reasonable speed in taking the same out, the board of directors hereby makes the following announcement: That until further notice they will (in addition to the regular salary, wages or pay earned) divide one-tenth of the net value of ore produced exceeding \$50,000 in any month among the officers, miners and other employees of the Ophir company in proportion to the amounts earned by such officer, miner or other employee during that month."

Similar notices have been posted by the Consolidated California & Virginia, the Sierra Nevada, Union Consolidated, Mexican and Andes mining companies, with the exception that the latter named companies allow 10 per cent. over all net proceeds—omitting the \$50,000 clause. This is an entirely new departure, but should be productive of good results, in stimulating interest in hunting for paying ore.



BLOCKING OUT PILLARS IN WORKING THICK, HORIZONTAL SEAM AT MECHEARNICH

produced affords better resistance to roof pressure.

The old Gottesegen mine, shown in plan and section in one of the accompanying illustrations was worked years ago. The present company was not involved in the original exploitation, but is now engaged in robbing operations. Directly above the uppermost band of ore is a formation called *Taubesandstein*, which lies under the conglomerate cover. Between the two horizons of ore is a band of conglomerate also found as a floor of the lower ore seam. When this mine

to that employed elsewhere by the company. The men work about the bottom of the pillars without fear of scaling off in the roof. The pillars at the limit of the stope are attacked first, drilling being done mostly in the bottom of the pillar, which may be attacked from all sides. As undercutting proceeds and shots are fired, the rock in the upper part of the pillar is constantly tested and barred down. The entire pillar is not necessarily removed at once, nor are the pillars necessarily attacked one at a time. However, the work is not done without regard

The Cochiti Mining District, New Mexico

A Low-grade Gold-silver Camp Which Has a Reputation for Failure, but Which Possesses Many Promising Though Unexplored Veins

BY PERCY E. BARBOUR*

In certain quarters renewed interest has recently been shown in the old Cochiti mining district in New Mexico and some effort to revive mining operations there has been made. The town of Bland, the center of the district, is about 30 miles west of Santa Fé and about 50 miles north of Albuquerque. It is reached by a 25-mile stage ride from Domingo (formerly Thornton), a station on the main line of the Santa Fé railroad, 37 miles northeast

across the river by ford, the bridges having been washed away; then through the Cochiti Indian Pueblo and then across the foothills to the mouth of Piño cañon. These foothills are the result of erosion on a low flat mesa of volcanic ash and the total rise in elevation is only about 500 ft. From the mouth of the cañon to Bland, about seven miles, the rise in elevation is about 1200 ft., Bland being 7500 ft. above sea level.

a mile wide called *potreros*. Beginning on the west these cañons are called Peralta, Colla, Piño, Media Día, Cañada de Cochiti, etc. Of these cañons Peralta and Media Día have creeks which run water all the year; the other three have water only during the winter and spring. All these cañons and mesas were very well timbered, but Colla and Piño have been heavily drawn upon for mining operations.



THE TOWN OF BLAND, N. M.

from Albuquerque. A railroad was projected when this camp had its boom and the grade was surveyed and staked the entire distance from Thornton to the camp, but no work on it other than this was ever done.

Leaving Thornton, the stage road runs along the sandy river bottom of the Rio Grande, for 10 miles, to the Mexican adobe town of Peña Blanca, thence

*Mining engineer, Goldfield, Nevada.

NATURE OF THE COUNTRY

There is a series of nearly parallel cañons, running from the northwest to southeast toward the Rio Grande river, which are from 800 to 1000 ft. deep and are generally very narrow. They were eroded from a mesa formed by successive flows of lava, volcanic ash, and volcanic tuff, superimposed, which made a broad, nearly level table-land. The cañons are separated by narrow mesas about half

At the head of these cañons (Piño is about 10 miles long) the country rises into an irregular series of mountain peaks attaining heights of 10,000 and 11,000 ft. above sea level. All these mountains are well timbered and some are now within the Government forest reserve.

The Cochiti mining district is a volcanic country and has recently been the scene of active volcanism, evidenced by flows of pure lava, now existing in black porous

sheets, and volcanic ash, cinder and pumice. A great variety of both crystalline and non-crystalline igneous rocks occur, but there are no sedimentary rocks in the district. In Peralta cañon is a natural park of several acres containing many pinnacles and monuments showing some of the most beautiful results of weather erosion to be seen in the United States. The formation here is a white volcanic tuff filled with particles and fragments of pumice of varying size. The pinnacles are of all sizes and some of very fantastic shapes, several of them being nearly 100 ft. high.

In Calla cañon is a very interesting belt of opal formation in which a show tunnel has been run. Some few very fine specimens of opals have been obtained there.

MINES OF THE DISTRICT

The district is divided into two distinct sections. The western section contains the Albemarle mine of the old Cochiti Gold Mining Company, which was exploited in Boston about 12 years ago, and after a more or less meteoric career ended in bankruptcy. This mine, situated in Calla cañon, was opened up by a two-compartment shaft to a depth of 800 ft., and during its operation produced more than \$1,000,000. It was equipped with steam and electric double-drum hoists, air drills and the finest of mining machinery. The gallows frame was a very elaborate one of steel.

A cyanide mill of 250 tons capacity was erected wholly of structural steel, and while the judgment shown in this was perhaps questionable, the engineering required to transport and install this plant under the then existing conditions was deserving of great credit.

A high-tension power plant was erected at Madrid, 40 miles away, at a cost of about \$250,000, and the power transmitted to the mine at 10,000 volts. The enterprise was a colossal failure, said to be due to the diminishing value of the ore at depth. The mine is now caved and the old records burned, so this statement cannot be gainsaid, but the geological and underground conditions of the rest of the camp seem to cast a reasonable doubt on the statement.

EASTERN SECTION

That part of the district now under notice is the eastern half in or contiguous to Píño cañon. Here a series of porphyry dikes has intruded the overlying volcanic flows and is first seen when coming up the cañon about two miles below Bland, where they outcrop in the roadbed. They become more marked farther up the cañon until at the town of Bland, the west mesa is entirely dike mass, the overlying tuff having been wholly removed by erosion. On the crest of this outcrop is located a U. S. mineral monument."

The east mesa just above the town has been forced into an anticline with a very thin capping of tuff still present over the main dike. This dike has a general north and south strike and a nearly vertical dip, and seems to be the eastern boundary of the mineral zone of the district. The dike rocks are various forms of diorite varying from the coarse-grained, granitoid texture of the green-speckled white variety to the compact, fine-grained dark greenish-gray type.

The geologic age of this section is not great. The volcanic flows are considered to be of late Tertiary age, the dikes are more recent and the ore deposits still more recent, so that geologically they are rather young.

MINES OF THE EASTERN SECTION

There are four well defined independent veins, practically parallel, which define the vein system as generally north and

The most important group in the district is the Lone Star group. This property is opened up by six adits all in one, which are connected by raises. Lower down on the other side of the mountain a working adit was driven to tap these workings. This adit for an expected output of but 100 tons per day was driven with a cross-section of 10x10 ft. in the clear and double-tracked with 56-lb. rails. The Lone Star vein in some places attains a width of 70 ft. and will average 25 ft. An analysis of the ore gave the following results:

	Per Cent.
Gold	0 00062
Silver	0 04200
Iron sulphide	0 09000
Antimony	0 19000
Tellurium	0 24200
Sulphur	0 61020
Silica	98 10300
Copper	Trace
Total	99 27782

This district received such an unen-



STAMP MILL AND CYANIDE PLANT, BLAND, N. M.

south. Beginning on the east these veins are the Washington, the Iron King, the Lone Star and the Crown Point. Each vein has been opened up more or less by a mine of the same name, and from each considerable ore has been shipped to the smelters at Pueblo. The Washington vein dips west; the Iron King is nearly vertical; the Lone Star dips east; and the Crown Point dips west.

The Iron King is opened up by a single adit with a 100-ft. winze on the vein which shows a width of 8 ft. throughout the workings and underhand stopes. The Crown Point is opened up in a similar manner, but the workings are in bad shape for examination. It was recently bonded to an English syndicate. The Washington group is next to the Lone Star in importance, but it has been tied up by litigation which has been continuous for nearly 13 years. The difficulty has recently been reported settled.

viable reputation through the failure of the Cochiti and Navaho undertakings that it has been very difficult to reopen the camp.

THE QUESTION OF VALUE AND DEPTH

The assertion that the value did not continue with depth was made to account for these failures. The theory was advanced that the ores were the result of deposition by descending hot waters and that therefore the value grew less with depth. That this theory is without foundation is evident from even a casual examination of the facts. The Iron King mine which adjoins the Lone Star has the deeper workings by 100 ft. or more, and had good ore in the deepest winze. The workings in the Star ran off the pay shoot. Furthermore, the mineral-bearing zone, as previously stated, is formed by a series of porphyry dikes intruding the overlying volcanic tuffs. Descending

waters would have had to traverse this tuff capping to reach the fissures in the porphyry. No traces of water courses exist in the tuff and there were no subsequent igneous rocks laid on top of it and no trace of any mineral has ever been discovered in this tuff formation.

On the other hand, one kind of the porphyry forming the country rock is mineralized. The source of the magma was below, as evidenced by the dike itself, and it unquestionably provided the course for "ascending" waters carrying mineral.

Therefore, if time and development should prove that the ores do not continue with depth, some other reason than descending waters must be found to account for it. Bland is a low-grade camp, the ores averaging \$10 to \$15 with the value about evenly divided between silver and gold, but the district has a great deal of merit and it is to be hoped that this renewal of interest in it will be productive of results.

The Development of the Delprat and Potter Flotation Processes

BY W. R. INGALLS

Among the recent methods introduced for the separation of the mineral components of mixed sulphide ores—magnetic processes, electrostatic processes, pneumatic processes and flotation processes—the last mentioned occupies the premier place in point of commercial application up to the present time. I feel justified in making this statement in view of the fact that the greatest recent addition to the world's supply of zinc ore has come from Broken Hill, New South Wales, and the largest producer in that district has been the Broken Hill Proprietary Company, using a flotation process. The success of the Broken Hill Proprietary Company in this direction led many investigators to study the theory of ore flotation, which is now generally believed to be a function of surface tension, and the results of their investigations have created surprise that the bearing of well known phenomena had been so long overlooked. Every chemist is acquainted with the tendency of mineral particles, put into a breaker for digestion, to float upon the surface; and everyone who has walked on the seashore has observed the flotation of particles of mica when the incoming tide wets the sand. Yet thousands of scientists failed to draw any useful conclusion from these well known facts.

It was natural that in the introduction of these new processes there should be disputes as to priority of invention. This appears to be inevitable when an invention is sufficiently valuable to be worth a contest. It is one of the curiosities of economic history that most of the important inventions have been the result of study

wherein two or more persons have approached success at about the same time. The flotation processes were no exception to this experience. The process originally introduced by the Broken Hill Proprietary Company was patented by G. D. Delprat, the general manager of that company. However, a similar process had previously been patented by C. V. Potter, of Australia, who died a few weeks ago. Potter claimed that the Proprietary Company was infringing his process, and a long litigation ensued, which was settled, in 1907, by the Broken Hill Proprietary Company recognizing the Potter patents, paying the owners thereof a large sum for the use of them in lieu of any further royalties and assigning the Delprat and other patents to the company owning the Potter patents.

In an article published in *The Mineral Industry*, Vol. XV, I said, "the Potter process was the original flotation process. The Delprat process is a slight modification of the Potter, being designed to evade the patents on the former." Mr. Delprat took some umbrage at this statement, which he considered to be a reflection upon him, although I did not intend to imply any illegality, wrong or impropriety. The evasion of a patent implies legality, else there would be no evasion; and a design to evade a patent does not imply anything illegal, wrong or improper. The only implication in my remark was that Mr. Delprat did not originate the acid-flotation process. In this it appears that I was wrong, inasmuch as it appears that he did originate it independently of Potter.

In a letter lately received from Mr. Delprat, he communicates some very interesting history respecting the origin of his patents, and I think that I am justified in quoting some paragraphs from his letter, although he has not specifically authorized me to do so. Mr. Delprat says:

"I quite admit that Potter's patent was taken out six or 12 months before mine, but my point is that I did not know anything of Potter's existence until my patents were applied for, and that consequently my patents could not have been designed so as to evade Potter's. This has clearly come out in the evidence given at the trial, and is public property. To say, therefore, that my patents were designed with a view of evading Potter's patent, is not only an inaccuracy, but furthermore puts me in a very unfavorable light with any right-thinking men.

"Although not affecting the point at issue, I may add that my invention was purely accidental; that in fact I was experimenting in quite a different direction at the time, and that during these experiments, in boiling tailings in a solution of acid saltcake, one of my assistants drew my attention to the fact that a heavy scum formed on the top of the solution, which could not be kept down. After re-

peated trials to sink this scum, it was given up as hopeless, the scum was decanted and then it struck us that the separation thus unexpectedly effected was all we were really in search of, and appliances were designed to carry the idea into practice; and it was only after applying for the patents that the existence of Mr. Potter was revealed to me.

"I am not writing to you to claim any credit for my process; I am quite willing to give all the credit to my able assistants, without whose help the process would never have reached its present state of efficiency. What I do most strongly object to is that anyone should have a right to say that I designed my process in order to evade another man's process; in other words to reap the benefit of another man's work without adequate remuneration. Such a proceeding, is in my opinion mean and contemptible and is an action I hope never to be guilty of."

It is, of course, a pleasure to me to correct an unintentional and involuntary error, and also to make it a matter of authoritative record how the flotation process was first introduced at Broken Hill. No one should desire to do any injustice, least of all to so distinguished an engineer as Mr. Delprat, to whom no one has ever denied the credit of developing the acid-flotation process into a great commercial success. I was not previously aware of the early history of Mr. Delprat's discovery, as to which I am now informed, and accepting his statement, as I am bound to do, I freely admit the error in my remark in *The Mineral Industry*, Vol. XV, and tender him my apology.

The Hancock Jig at Palmetton, Penn.

The New Jersey Zinc Company, at its smeltery at Palmetton, Penn., is using a Hancock jig to treat the residue from the oxide furnaces. From this material the jig yields a zinc ore containing 16 to 18 per cent. zinc oxide, which is sent back to the oxide furnaces; iron-manganese clinker, containing 40 per cent. iron and 14 per cent. manganese, which goes to the spiegeleisen furnaces; and unburned coal containing 65 per cent. carbon, which is used in the charge for oxide furnaces. The only waste is 2 per cent. of ash. The jig handles 15 tons per hour, but can do more.

At Creede, Colo., strong fissure veins, occurring in igneous rocks, carry galena and blende with a quartz gangue, the minerals being separated by jigging. The ore is easily milled, affording a high-grade lead, and a high-grade zinc product. This district was discovered in 1892, since which time it has been worked continuously.

Atlanta Gold District, Idaho

BY ROBERT N. BELL*

The gold production of Idaho, since the first placer discoveries at Pierce City in 1860, has amounted to fully \$250,000,000, of which probably 70 per cent. has been derived from placer mining, and 75 per cent. of the remaining 30 per cent. from the silicious milling-ore deposits contained in porphyritic formations, geologically related to the Nevada deposits, of which the State has afforded some notable examples and bonanzas.

The ores of this class of deposits are in-

ter mines, in the Yankee Fork district, and at the Trade Dollar and Delamar mines in the Silver City district, where former milling costs of \$16 to \$20 per ton have been reduced to about \$3 per ton by more modern wet methods of treatment.

The latest success in this line of development in Idaho is in the Atlanta district, where the Bagdad-Chase Gold Mining Company, of Rochester, N. Y., operates the Pettit mine, which has recently been equipped with a new milling plant, comprising a 20-stamp mill, 16 Frue vanners, 8 Dimmick slime tables, 10 Callow dewaterers, a Callow screen, and Dimmick sizers, a 16-ft. tube mill and a Pierce amalgamator.

to Callow dewaterers and Dimmick sizers; the tube-mill product, after grinding, passes over a Pierce amalgamator, thence to the Dimmick sizers. All material is distributed from the Dimmick sizers to vanners and slime tables.

The high-grade concentrates will be roasted and cyanided, which gives a very high extraction. The ore of this district has always been looked upon as difficult to treat; but the present installation seems to have solved the problem both in the matter of cost and of extraction. This means an important addition to Idaho's gold yield, for the ore resources of this district are extensive. The crude ore now supplied to the mill averages \$10 to \$12



ATLANTA, IDAHO

variably associated with more or less silver, and the richer surface horizons, which produce largely a high-grade ore, were treated by the expensive roasting and pan-amalgamation process. After the exhaustion of the shallow surface deposits of secondary enrichment, extensive reserves of lower-grade ore were left by the early-day operators; these remained for modern metallurgical methods to utilize at a profit. Notable results have been obtained in the treatment of this class of ores in Idaho at the Lucky Boy and Cus-

*State Inspector of mines, Boise, Idaho.

The ore is a massive white quartz, yielding about 1 per cent. of high-grade concentrates, consisting of iron sulphides, rich in gold and antimonial silver minerals, and involves very fine grinding and close concentration. The ore is crushed at the mine, transported by aerial tramway 3000 ft. to the mill, stamped, and then run over 12 ft. of copper plates, which are broken every 2 ft. with a ½-in. drop. The pulp then passes over Callow dewaterers and vanners, the slimes going directly to slime tables, and from the first vanners to Callow screens, with the over-size to tube mill; the fines pass

per ton, and the concentrates run about \$200 per ton, the ratio of values being about 85 per cent. gold and 15 per cent. silver.

The mill began operation about the end of February, 1908, in extremely cold weather, and has run satisfactorily without any serious difficulty. The results thus far obtained show that a saving of about 85 per cent. of the total values in the ore is being made, about 40 per cent. of which is recovered on the plates.

The power used is transmitted as electric current from the company's water-power plant, situated a mile from the mill,

on the Middle Fork of the Boise river. The flume is covered and gave no trouble, even in extremely cold weather. The machinery of the power plant embraces a 200-h.p. Trump water-wheel, under 50 ft. head, with a 200-h.p. dynamo and exciter. The capacity of the mill is about 70 tons in 24 hours.

MINES OF THE DISTRICT

The Pettit mine is operated through adits to a depth of 500 ft., with extensive underground connections, developing ore to the estimated value of \$2,000,000. The vein is from 5 to 27 ft. wide and stands nearly vertical in walls of porphyritic granite. The ore course is clearly defined, but is accompanied by a mineralized condition of the wall rocks, which carry small quantities of gold and silver for a width of 25 to 50 ft. on each side of the main quartz vein. These combined constitute the great Atlanta lode.

The holdings of the company embrace 5600 ft. of the Atlanta lode, which is so situated that it can readily be developed to an additional depth of 1000 ft. by adits on the course of the vein. Recent development in the present lowest level of the property has shown a marked expansion in the width of the orebody, and it seems likely that the property may develop into one of the big mines of the West that will produce a very large tonnage of ore, and can be very cheaply worked, even in its somewhat remote location, 80 miles from railroad transportation.

The milling costs with the present equipment are \$3.50 per ton. The mill building has been built with a view of adding further machinery, as the mine promises to warrant an output of several hundred tons per day. With increased capacity it is believed that the milling costs can be reduced to \$3 per ton, and probably less.

Adjoining the Pettit mine to the west, on the same lode, is the Monarch mine, owned by the Atlanta Mines Company. This property is developed through a 600-ft. vertical shaft with six extensive levels, and has an ore reserve aggregating about \$5,000,000 in estimated value, of about the same average grade as that of the Pettit. This property has a new milling plant of 200 tons daily capacity nearly completed, and will follow the same lines of treatment as the Pettit plant. This property has also installed a hydro-electric plant of ample capacity for its own use. It is expected that this mill will be completed and producing within the next 90 days.

There are several other promising properties in the Atlanta district, which already has a bullion record of \$5,000,000 from shallow surface ores, and seems destined, through the application of modern metallurgical methods, to take a prominent place in the gold production of Idaho.

Heating of Conductors by Electric Currents

By SYDNEY F. WALKER*

The two formulas, upon which nearly all electrical calculations are based are

$$C = \frac{E}{R}, \text{ and } W = EC.$$

The first of these formulas means that the current passing in any circuit depends directly upon the pressure available in the circuit, and inversely upon the resistance. By transposition it becomes $E = CR$. This last form is the formula that is employed in the calculation of cables. By it may be calculated how much resistance, and therefore what size a cable must have, that has to carry a certain current, with a certain pressure available for driving the current through the cable. The second formula is the usual electrical-power formula in which power equals pressure multiplied by the rate of flow. By substituting the first value of C in the second formula, it becomes $W = \frac{E^2}{R}$, and by substituting the value of E in the first formula, the second formula becomes $W = C^2 R$. W is used for power, or rate of doing work, and the above formulas are used for measuring the power delivered by a generator, the power entering a motor, the power wasted in cables, etc.

In certain parts of the circuit, in the cables for instance, the only work done is in generating heat, and the formulas for power, or work, are then written:

$$H = EC = C^2 R = \frac{E^2}{R}.$$

In this form, when the pressure is given in volts, the current in amperes, and the resistance in ohms, H is in watts; 746 watts equal 1 h.p., and 1 watt equals approximately 44 ft. lb.

Taking the B.t.u. as 778 ft. lb., this gives 17.58 watts per B.t.u., and the above formulas may be written:

$$H \text{ (heat units)} = \frac{EC}{17.58} = \frac{C^2 R}{17.58} = \frac{E^2}{17.58 R}.$$

If X is the number of lb. of copper contained in the cable, the formula becomes

$$H \text{ (in heat units per pound of copper)} = \frac{EC}{17.58 X} = \frac{C^2 R}{17.58 X} = \frac{E^2}{17.58 R X}.$$

The last formula gives the rate of heating. For any given length of copper $R X$ is a constant quantity. If the size of the cable is halved, its resistance is necessarily doubled. If a cable has a sec-

tional area of, say, 0.25 sq. in., and a certain length, say a mile, it has a certain resistance. If the cable is reduced to a sectional area of 0.125 sq. in., the length remaining the same, the resistance becomes double, and the weight one-half. Further, for lengths of conductor of one mile, the product $R X$ equals 859 approximately, and therefore the last formula may be written as follows:

$$H = \frac{E^2}{17.58 \times 859 \times l^2}.$$

Where l is the length of the conductor in miles.

It will be seen that halving the length of the conductor, quadruples the number of heat units per lb. of copper, and *vice versa*. But taking 0.095 as the specific heat of copper, 1 B.t.u. will raise the temperature of 1 lb. of copper, approximately 10.5 deg. F., and therefore the formula may be written:

$$T = \frac{E^2 \times 10.5}{17.58 \times 859 \times l^2},$$

where T is the number of degrees Fahrenheit that each individual lb. of copper is raised. The formula becomes in its simplest form:

$$T = \frac{E^2}{1438 \times l^2}.$$

To my mind the importance of the formula lies in the fact that it shows so clearly the effects of the length of conductor, and of a short-circuit. In ordinary work the highest possible rise of temperature is practically negligible; but if a short-circuit occurs—if a connection is made between the positive and negative conductors of a service—the heating effect will depend inversely upon the square of the length of the conductor, between the generator and the connection. Thus it may happen that a short-circuit at the end of about two miles of double cable, with four miles of cable in circuit, may not do any serious harm to the cables themselves, whereas a short-circuit within a short distance of the generator, may raise the temperature of the conductor to the melting point. The formula also shows clearly the effect of the pressure and how the dangers of excessive heating increase with the pressure. The pressure may rise in two ways: (1) higher pressures may be used on the general service, where, say, 3000 volts is employed, instead of 500; (2) owing to a connection or partial connection between the positive and negative conductors.

The formula for the heating effect of alternating currents would simply be a modification of the foregoing formulas.

At temperatures of about 2200 deg. C. absolute, each increase of temperature of 10 degrees increases the resistance of a tungsten filament about 0.45 per cent.

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Determination of Lead in Spelter and in Ores

A New Method for the Wet Assay of Lead by Means of a Hydrogen Peroxide Reaction with Potassium Permanganate Titration

BY ERIC JOHN ERICSON*

The JOURNAL of July 27, 1907, contained an editorial calling attention to the unreliability of the fire assay for lead and recommending the wet assay, without mentioning any specific method. Other journals have also called attention to defects in assay methods for lead. C. A. Cooper, in the *Mining World*, Sept. 21 states:

"One has deplored the unreliability of the Alexander method for low-grade ores, without explaining the defects; another says the fire assay is worthless; another says all known methods are imperfect."

After showing that the fire assay gives from 2 to 3 per cent. lower results than Alexander's method, he says further:

"Another curious fact which I have not seen mentioned and therefore advance with apprehension, is this: A standard solution checked on 200 milligrams of lead foil and used on a 5-per cent. ore will give results 1 per cent. too low, the principle being squarely opposed to that held to obtain in the zinc assay. An apparent, but deceptive explanation lies in the failure of our filter papers to perform according to schedule, a 30-per cent. ore seeming to clog the pores more completely and to render the loss proportionately less. Anyone who has stirred filtrates from lead-sulphate solutions has noted the loss to be equally great on respectively 5-per cent. and 30-per cent. ores and that more decantations to the original filter are necessary in the case of low-grade ores, two or three being usually required for a perfect saving, while one or two are sufficient for ores high in lead; however, even when extreme care in this respect is observed in standardizing, the difference above stated will be found. Four tests were made respectively upon 200, 100 and 50 milligrams of chemically pure lead foil, enough, with careful work, to base an opinion upon. Within parentheses, I may say that the same thing has probably been done a few thousand times by others, but if variations were found and published, I have failed to see them. Nevertheless, the use of 200 and 100 milligrams gives practically the same factor, and from the recollection of some experiments made several years ago, I am inclined to think there would be no appreciable difference when using 500 or even 600 milligrams. In checking on 50 milligrams of lead a

surprisingly different factor was obtained which suggests the possibility of a still greater variation on ores running under 5 per cent. In the absence of better knowledge regarding the behavior of very low-grade ores, it seems the safer plan to use enough ore to bring the percentage handled to five or more and within reach of a reliable factor. If reliable, this evidence indicates the impossibility of a correct standard table based upon two extremes."

NECESSITY OF ADDING ALCOHOL

This quotation shows the present unsatisfactory state of affairs, especially in regard to low-grade ores. The necessity of adding alcohol to cause the complete separation of lead as sulphate seems to be disregarded or overlooked. The accompanying table of analyses shows its necessity:

LEAD ANALYSES WITH AND WITHOUT ALCOHOL.

	With Alcohol. Per Cent. Lead.	Without Alcohol. Per Cent. Lead.	Per Cent. of Total.
Calamine.....	0.14	0.07	50.00
Zinc blende...	0.39	0.24	61.30
Zinc blende...	0.92	0.75	81.50
Calamine.....	3.82	3.68	96.30
Calamine.....	7.15	6.78	94.80
Mixed ore.....	16.40	16.20	98.70
Galena.....	84.30	84.30	100.00

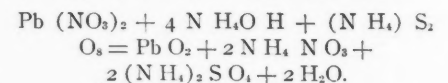
It would seem that lead concentrates require no addition of alcohol. This point will be investigated further. The method here described gives the same factor on 50, 150 and 300 milligrams lead foil, thus showing its adaptability for all kinds of ores, both of high and of low grade. It is pre-eminently well suited for low-grade ores, and gives more accurate results than any other method. It is not as rapid as Alexander's, but the loss of speed is compensated by the greater accuracy obtained. Alexander's method is accurate, if lead is properly separated and if lime is absent. As practically all zinc and lead ores carry lime, this limitation is its chief defect. In this method lime does not interfere, nor such traces of iron that the lead sulphate might carry—two important advantages over Alexander's.

THE NEW METHOD

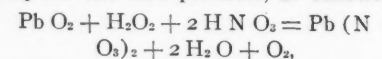
The fundamental principles of my method were described in the *Journal* of

the American Chemical Society, Sept., 1904. The scheme for its application to spelter and zinc ores has been evolved in the Edgar Zinc Company's laboratory, where it has been in continuous use for two years with very satisfactory results. Its application to spelter involves a radical departure from the existing methods in vogue. The new method is both rapid and accurate. Duplicate assays check mostly to the point, or within one or two points. The value of a rapid and accurate method for lead, the chief impurity in spelter, can hardly be over-estimated.

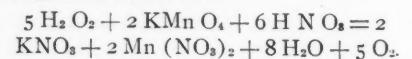
Briefly the method is as follows: After the lead is obtained in solution as a nitrate, free from sulphates and chlorides, the solution is made alkaline with ammonia and the lead peroxidized by means of ammonium persulphate, probably according to the following equation:



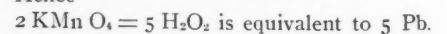
The resulting lead peroxide is filtered off and washed (with hot dilute 10-per cent. ammonia in presence of copper and zinc) with hot water. The filter with the precipitate is thrown back into the vessel in which the precipitation was made. Then an excess of acidulated hydrogen peroxide is added which decomposes the lead peroxide, as follows:



and the excess of hydrogen peroxide decomposed by standard potassium permanganate, as follows:



Hence



As the theoretical factor $\frac{5 \text{ Pb}}{10 \text{ Fe}} = 1.851$ gives too low results, the empirical factor 1.92 was chosen, agreeing exactly with the standard gravimetric sulphate method.

Solutions required: hydrogen peroxide of a suitable strength for spelter and zinc ores is made by the addition of 8 to 10 c.c. hydrogen peroxide of U. S. pharmacopial strength, and 50 c.c. concentrated nitric acid to every liter of water; standard potassium permanganate solution—dissolve 0.568 gram of Kahlbaum's or Merck's "Reagent" (some other makes require more) potassium permanganate to every liter of distilled water

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and standardize in the usual manner (0.35 gram ferrous-ammonium sulphate should require 49.9 c.c. permanganate; 1 c.c. equals 0.0010 gram iron and 0.00192 lead on a 1-gram sample, and 0.10 per cent. lead when 1.92-gram sample is taken, hence each 0.1 c.c. equals 0.01 per cent. lead).

METHOD FOR SPELTER

Dissolve 19.2 grams drillings in 60 c.c. water and 60 c.c. concentrated nitric acid in a No. 6 beaker. Add the acid gradually and then boil 5 to 10 min. Cool, transfer to a 500-c.c. volumetric flask and dilute to the mark with distilled water. Shake thoroughly, pipette off 50 c.c., equal to 1.92 grams, into a No. 3 beaker or a casserole of 350 c.c. capacity, add 40 to 50 c.c. water, 30 c.c. concentrated ammonia and by means of a horn spoon, 3 to 4 grams of solid ammonium persulphate; boil five minutes, and remove to a cooler part of the hot plate for 10 min. Filter while warm through a 11-cm. filter. Use double filters if lead appears high. Wash four times with hot 10-per cent. solution of ammonia and finally five times with hot water, taking care to wash the beaker thoroughly free from ammonia.

Transfer the filter with the precipitate back into the beaker in which the precipitation was made and add 25 c.c. hydrogen-peroxide solution of the strength described, and stir frequently until dissolved. Then add 15 c.c. nitric acid (1.20 sp.gr.) and about 50 c.c. water, and titrate with standard permanganate until pink color appears. Assuming the hydrogen peroxide blank to require 18 c.c. and the sample 15.5 c.c. then lead equals 18 — 15.5 equals 0.25 per cent. If the sample is uniform, 1.92 grams may be dissolved in 12 c.c. nitric acid (1.20 sp.gr.) boiled, diluted with water, ammonia and ammonium persulphate added, etc., as previously described. Manganese, if present, would interfere and cause too high results, but as it is hardly ever present, and if at all in very minute quantities, it need hardly be considered.

METHOD FOR ZINC ORES

Blendes—Weigh 1.92 grams into a casserole of 200 c.c. capacity, dissolved in 15 c.c. concentrated nitric acid, and after a few minutes add 7 c.c. concentrated sulphuric acid; cover with watch glasses; boil until copious fumes of sulphur trioxide are evolved, and the nitric acid is expelled.

Calamines (Silicates and carbonates)—Weigh 1.92 grams of the sample into a porcelain casserole of 300 to 350 c.c. capacity; moisten with water; add 10 c.c. concentrated hydrochloric acid, 2 c.c. concentrated nitric, 2 c.c. hydrofluoric acid to carbonates, and 4 c.c. to silicates,

then gradually 7 c.c. concentrated sulphuric acid. Put on the hot plate and after five minutes cover with watch glasses and boil as in the case of blendes. From now on proceed alike for blendes and calamines, as follows:

Cool; add 30 c.c. water; heat to boiling, and maintain for a few minutes until the soluble salts are in solution; cool, add 30 c.c. 95-per cent. alcohol (wood alcohol will do); stir the mixture and allow to stand over night. Filter off insoluble lead sulphate on a 11-cm. No. 100 Munkell filter, add a little pulp and apply gentle suction, wash twice with the solution of 25 per cent. ethyl alcohol and 2½ per cent. sulphuric acid by volume and once with cold water (one filtration is usually sufficient). Transfer filter with the precipitate to a funnel 2¾ in. diameter and place the casserole under the stem. Make small hole in the apex of the filter and wash the lead sulphate into the casserole with hot water, using a fine jet. Wash twice with 5 per cent. carbonate of ammonia and finally again with hot water; lift the folder to see that nothing remains. The object of the ammonium-carbonate wash is to break out any lead sulphate that might stick tenaciously to the filter. Now add to the casserole 3 grams solid ammonium carbonate and boil a few minutes; cool and filter on a 11-cm. No. 100 Munkell filter, or its equivalent, washing the casserole and filter twice with cold 5-per cent. ammonium carbonate and twice with cold water. Reject the filtrate, and place the casserole under the stem. Now add on the filter 10 c.c. dilute nitric acid (1.20 sp.gr.) and wash immediately with hot water around the edges of the filter, so that the dilute acid will come in contact with all parts of the filter. Wash four times more and reject the filter paper.

To the solution of lead nitrate in the casserole add 15 c.c. concentrated ammonia, and about 3 grams solid ammonium persulphate; boil five minutes and allow to settle, filter hot and wash five to six times with hot water. Transfer the filter with the precipitate back into the casserole in which the precipitation was made; add 25 c.c. hydrogen-peroxide solution and proceed exactly as described for spelter.

For zinc ores running several per cent. of lead, a hydrogen-peroxide solution about two to three times the usual strength is employed, and if 25 c.c. fails to dissolve the lead peroxide, another 25 c.c. is added and a blank run on the same amount of peroxide.

METHOD FOR LEAD ORES AND CONCENTRATES

Make a potassium-permanganate solution of three times the strength used for zinc ores, i.e., 1 c.c. equivalent to

0.0030 gram iron. Make the hydrogen peroxide five times the strength given or strong enough to dissolve the lead peroxide and leave a fair excess for back titration.

Treat one gram of ordinary ore or low-grade concentrates, and 0.5 gram of high-grade concentrates and galena, in the usual manner according to the nature of the ore. Add some hydrofluoric acid to ores carrying silica, and the sulphuric acid after decomposition has been effected; then proceed throughout as directed for calamines, except that 20 c.c. dilute nitric acid is used in dissolving the lead carbonate on the filter, then 25 c.c. concentrate ammonia and about 4 grams ammonium persulphate. Use double filters, 12½ cm. for concentrates. The iron value of the permanganate solution multiplied by 1.92 x 100 and dividing by the weight taken equals the per cent. of lead. It may be advisable to check this factor on a standard ore, especially when used for concentrates. Pipettes and burettes with automatic overflow have proved a great aid to accuracy as well as facilitating work.

PURITY OF STANDARD LEAD

I stated earlier in this paper that this method gives the same factor on 50, 150 and 300 milligrams lead foil. While uniform, the factor came out higher than the iron value of potassium permanganate multiplied by 1.92 or, in other words, using this factor only an average of 98.43 per cent. lead was indicated of the weight taken. The lead foil was tarnished and it was suspected that the failure to obtain 100 per cent. might be due to surface oxidation. This was subsequently verified, by procuring Kahlbaum's lead in sticks (100 gram original package) and cutting off fresh pieces for analysis, when an average of 100.02 per cent. was obtained. These were all direct determinations, without previous separation as sulphate.

COMMERCIAL CHEMICALLY PURE LEAD FOIL.

Weight Taken. Mg.	Weight Obtained. Mg.	Per Cent.
50	49.30	98.60
150	147.50	98.33
300	295.10	98.37

KAHLBAUM'S LEAD IN STICKS (fresh cuttings).

50	49.96	99.92
150	150.33	100.22
300	299.80	99.93

If the sample of lead foil employed in this analysis may be considered typical of what reputable dealers sell, it is evident that the commercial article is unfit for standardizing purposes, owing to surface oxidation. Foil of this kind is used extensively for standardizing in Alexander's method. Lead in sticks, cut off in small pieces as needed, is better by far. A little foil may be used for ad-

justing the weight. These analyses demonstrate again the correctness of the factor 1.92 which gives the lead factor by multiplying the iron factor of potassium permanganate.

Transvaal Notes

SPECIAL CORRESPONDENCE

The feeling on the Rand is distinctly more hopeful than it has been for months past. Money is more plentiful on the markets of Europe, and thousands of investors, attracted by the improved conditions in the Transvaal, are buying the shares of the gold mines. There has been no boom, for which everyone is thankful, but a steady rise in values. What strikes one as most peculiar about Kafir shares is the way that some of the leading stocks keep up, even after paying dividends for several years. One of the popular shares of the Rand is a good example of this. It is a small mine, but rich; about 3½ years ago the public paid between £4 10s. and £5 for these shares. Since then large dividends have been paid out, and, of course, the life of the mine has been very much reduced, but the price of the shares are still £4 10s. to £5. Buyers seem to look only at the rate of interest, and do not appear to ask how long the payments will keep up.

Many of the advances in prices are justified, but the upward tendency has carried forward much rubbish. Some of the professional gamblers are shouting out the merits of their trash, and no doubt unwary persons will be caught in their nets; but after the experience of the past few years, people should know better than to go into wildcat schemes.

One of the most popular horses on the race course of the share market seems to be Randfontein. These shares have gone up from 20s. (the price a few months ago) to 33s. at the present time. There are ample reasons for this increase in price. The Randfontein group should have a brilliant future. Besides the mines which are now turning out gold, there are large areas still to be developed. It is proposed to erect two huge batteries of 300 stamps each, with tube-mills, to deal with the ore from these undeveloped claims. At the Randfontein Central mine a 300-stamp mill is to be erected; the plant to have a crushing capacity of near 63,000 tons per month, on which it is expected that a profit of about 10s. per ton will be earned. A central power station has just been erected for supplying electrical energy to the Randfontein mines.

Another stock that has received a lot of attention from the public is the Modderfontein. This mine has made a most excellent showing during the past few years. It was not so very long ago that

the monthly profits were about £4,000. Today, with a larger plant and more efficiency, they are making a profit of about £20,000 per month. The mine has one of the largest claim areas on the Rand so that a long life is assured. The quotations have gone from £4 15s. to £8 10s. per share.

The rumor that several idle mines are to start up is good news. Before the end of the year there should be a number of new producing mines to enter the list. Besides the idle mines, at least two new producers will commence turning out gold on the West Rand, where a large mine—the West Rand Consolidated—will make a beginning; and on the East Rand, that huge deep-level proposition, the Simmer Deep, will start crushing. If only the labor holds out, the future of the Rand for the next few years appears satisfactory.

The returns for the month of May have just been published, and they show a total output of 558,992 oz., or £2,472,143. Of this the Rand contributed 558,243 oz., or £2,371,265, while the outside districts produced 23,749 oz., or £100,878. During May there were 8920 stamps at work in the Transvaal, of which 8475 were crushing on the Rand. Of the individual producers the largest was the Simmer & Jack mine, which produced 26,551 oz. of fine gold. Second on the list was the Robinson mine, with 26,190 oz., while the Robinson Deep was third with an output of 20,646 oz. fine gold.

Parliament meets in Pretoria in a few weeks, and there are many matters of vital importance to the mining industry to be discussed. One of the most important is the new gold law. Next to that is the recommendations of the Mining Industry Commission, which advises the running of the mines by white labor.

Dominion Iron and Steel Company

This company owns large steel works at Sydney, Cape Breton; iron mines in Nova Scotia and Newfoundland. Its report is for the year ended May 31, 1908. The company has \$20,000,000 common stock, \$5,000,000 preferred stock, and \$9,368,833 bonded debt.

The profit on sales for the year was \$2,613,825, an increase of \$366,289 over the previous year. Against this profit was charged \$766,525 for interest and sinking fund, and \$1,376,831 for contingent account; a total of \$2,143,356, leaving a balance of \$470,469. Adding the balance from previous year made a total surplus of \$789,178 at the close of the year.

The report of the directors says, in substance: "The earnings have again to be considered in the light of the judgment against the Dominion Coal Company, which entitles us to recover from them the cost of coal in excess of the contract

price of \$1.28 per ton. As in the previous year all coal used has been charged against the operation of the contract price, and on this basis the earnings for the year were \$2,613,825. From this amount we have transferred to contingent account \$1,376,831, to offset the sum which we have charged to Dominion Coal Company for money paid during the year in excess of the contract price for coal. The remainder has provided for the sinking fund on the first mortgage bonds, and the maturing installment of the second mortgage bonds, \$250,000, leaving a balance of \$220,477. The gross earnings during the past four years increased from \$500,000 to \$2,613,815.

"The various departments of the company's works have been carried on steadily throughout the year, with increased production and lessening costs. The output of steel for the year reached 290,953 gross tons. In 1907 the output was 238,000 gross tons. The floating liabilities are larger than usual, but the increase in the amount as compared with last year is more than covered by the further increase in the value of raw and finished materials on hand. A considerable portion of the finished materials are merely awaiting shipment.

"In view of the larger working capital we are henceforth likely to require, your directors think it well that a scheme for the reorganization of the company's finances should now be under consideration. As a preliminary step you will be asked at the annual meeting to consider, and, if approved, to authorize an increase in the capital stock of the company, and the creation of consolidated mortgage bonds.

"The appeal of the Dominion Coal Company to the Privy Council against the judgment rendered in our favor by the Supreme Court of Nova Scotia, cannot be heard until after the summer vacation, owing to the time consumed in completing the record. The claim against the coal company up to May 31, 1908, exclusive of interests and costs, was \$2,923,808.

"Efforts have recently been made by friendly intermediaries to bring about a settlement of the dispute, but without result. No definite offer has ever been received by the steel company, and the most favorable arrangement which has been put forward as likely to be acceptable to the coal company—in other words, the best settlement which it appears open to us to make—is not one which your directors could recommend for your acceptance."

A recent pamphlet issued by the industrial agent of the Mexican Central Railway states that 48 per cent. of the freight carried over the rails of that system consists of products of the mines and of mining supplies. This is a fair index of the relative importance of the mining industry in Mexico at the present time.

Cornish Tin Mining

SPECIAL CORRESPONDENCE

A correspondent of the London *Mining Journal*,¹ in discussing the financial condition of the tin-mining industry of Cornwall and Devon, tabulates the output and the cost of producing one ton of black tin at six of the leading tin mines for the last eight years. The mines discussed are the Dolcoath, Carn Brea, Basset, Grenville, East Pool, and West Kitty, together affording about 84 per cent. of the total output of the district, exclusive of stream works.

The following table summarizes the discussion, giving the total output of each mine, in long tons, for the eight years, 1900 to 1907 inclusive, and the average cost of producing one ton of black tin throughout the same period:

	Total Output.	Average Cost.
Dolcoath.....	14,543	\$278.58
Carn Brea.....	5,165	394.00
Basset.....	5,436	353.46
Grenville.....	5,455	358.72
East Pool.....	5,164	325.26
West Kitty.....	3,074	387.62

Total and average..... 38,837 \$330.32

The average price received for the output of these mines during the same period was \$390.96 per ton, whence the average net profit to the mines was \$60.64 per ton, equivalent to about 18 per cent. of the working cost, or 15 per cent. of the price received. It is apparent, however, that this profit was not participated in equally by all mines, since operations at Carn Brea have been conducted at a loss, and at West Kitty at practically no profit. As is to be expected, the mine with the largest output has the lowest working cost. On the basis of the tin ticketings on May 18, 1908, when the average price received by all mines was \$384.56 per ton, a still larger number of the mines are seen to be working at a very narrow margin of profit, Dolcoath being the only one to make a fair return at the current quotations.

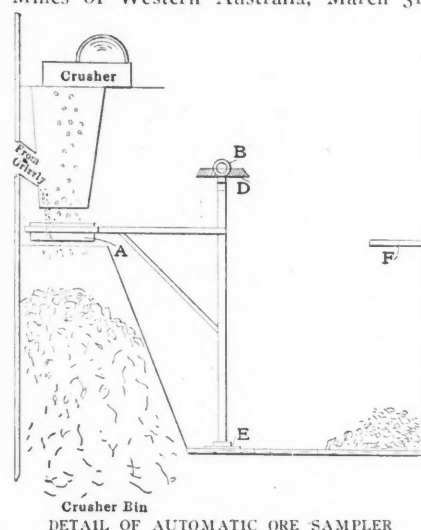
The unequal participation of the several mines in the average net profit is further affected by the variation in the grade of product afforded by the different mines. Thus the Dolcoath product generally commands a premium of \$7.25 over the average price quoted at the ticketings, while the output from Carn Brea, for example, was sold lately for \$36.15 less than the average quotation.

The most obvious criticisms of the Cornish tin-mining industry as a whole seem to be that a sufficient proportion of the net income has not been applied to the maintenance of plant and equipment nor to the development of the orebodies, and also that the economy of large-scale work has not been appreciated. Practically all profits have been realized from the fortuitous discovery of richer ore

shoots, or from temporary high tides in the tin market. The Carn Brea mine, for example, has had unfortunate disasters with its underground workings, but, taking the industry as a whole, the high cost of production has been the result of operating on a meager scale, with only spasmodic attempts to maintain or improve equipment.

An Automatic Ore Sampler

The automatic ore sampler in use at the Tasmania gold mine, Beaconsfield, Tasmania, is described by C. S. Heathcote (*Monthly Journal* of the Chamber of Mines of Western Australia, March 31,



1908). The ore from underground is delivered to bins, from which it is fed automatically by eccentric-driven screens to two Blake-Marsden breakers, which reduce the ore to pass a 1½-in. ring. The crushed ore from each breaker, together with the fines from its feeding screen, falls through an opening 1 ft. wide and 2 ft. long, the latter being the length of the breaker opening.

The samplers, of which there is one to each crusher, consist of a revolving arm making 3¼ r.p.m., which cuts through the falling stream of ore. This arm carries a swinging bucket of radial shape, the width at any point being 1/112 of the circumference of the circle traveled by that point; this proportion insures a width of at least 3 in. The length is sufficient to cover more than the opening. This swinging bucket tips automatically at each revolution.

The bulk sample is approximately 20 lb. per ton. It is quartered and broken down in the usual way, and the result multiplied by the daily tonnage passed through the breakers. The attention required by the apparatus is practically nil; it is necessary only for the crusherman to see three or four times a day that it is working properly. Occasionally the pivot pins of the bucket require tightening slightly to insure the bucket being station-

ary in these supports, and the mouth horizontal, while passing through the stream of ore. To insure its working at all times the sampler is driven by fixed pulleys from the main driving shaft in the breaker house. The height lost by installing the sampler is only 3 feet.

The following is the result of a 16-weeks' run: Tons of ore in stock at the beginning of period, 443; tons of ore in stock at end of period, 809; sampled, 18,870 tons (averaging 12.8191 dwt.); crushed, 18,504 tons (averaging 12.9607 dwt.); the difference between the two samplings was only 0.1416 dwt. per ton.

In the accompanying sketch A is the bucket; B, the pinion on belt-driven shaft; D, crown wheel; E, step bearing; F, tippler.

Anti-Debris Action in California

SPECIAL CORRESPONDENCE

The board of supervisors of Yuba county, California, has adopted resolutions calling upon the district attorney to begin suit at once against certain hydraulic and ground-sluice mines which are alleged to be dumping debris into the Yuba river. The action will be instituted against the mines, and not the owners, as in the past. The owners either transferred the properties or leased them, so new suits had to be commenced by the Anti-Debris Association. A number of members of this association have, within the past six months, been secretly securing evidence against those miners who they allege have been violating the Caminetti law, and are now proceeding against them. In this matter there is a new departure in two respects. The first is in bringing suit against the mine itself and not the miner, but it is probable that such mines as are incorporated will disincorporate, as has been done in the past under similar circumstances, and thus avoid trouble in the courts. The second is the bringing suit against mines which are not hydraulicking, but are ground sluicing. How this will work is yet to be seen. The ground sluicers do not violate the Caminetti law. That law prohibits hydraulic mining in the drainage basins of the Sacramento and San Joaquin rivers—hydraulic mining to be understood as defined in California. The State Legislature adopted an official definition as "mining by means of the application of water, under pressure, through a nozzle, against a natural bank." In ground sluicing the gravel is not worked in any such manner, or by any such means. The only way to reach these men, therefore, is not through the provisions of the Caminetti law, but by showing they are doing material damage to the property of other persons, by letting their tailings flow onto land owned by somebody else.

¹May 30, 1908.

A Modern Coal Washery in New Mexico

One of the largest and best arranged coal-washing plants in America has recently been completed by the Dawson Fuel Company in connection with its coal mines and coke operations at Dawson, New Mexico. As this plant washes the entire coal supply for 570 coke ovens, of the under-flue type, and has a capacity of 2400 tons of coal in 10 hours, a brief description of its operation will be of interest.

After a primary screening and crushing,

screens with 1½-in. round perforations, as shown on Fig. 6. The oversize from each screen is discharged into a roll crusher, by which it is reduced to the equivalent of the undersize from the screens. The combined product of the screens and crushers then passes over an automatic weighing machine located just outside the crusher building, after which it is carried by a belt conveyer to the third floor of the washery building, marked C on the general view, Fig. 2. Here it is delivered to a distributor located in a dust-tight room, from which it passes through launders to eight Stewart jigs on the second floor.

GENERAL METHOD OF OPERATION

The two refuse elevators from each battery discharge into a launder leading to a 4x8-ft. refuse trommel with 5/16-in. perforations. The oversize from each of these trommels passes directly to a circular steel refuse bin located at one end of the building, and arranged to discharge directly into electric refuse cars. The screenings from the refuse trommels, which are to be rewashed, pass through launders to four Luhrig fine-coal jigs, one pair of which is located on either side of the building. These are of the same general construction as the Stewart

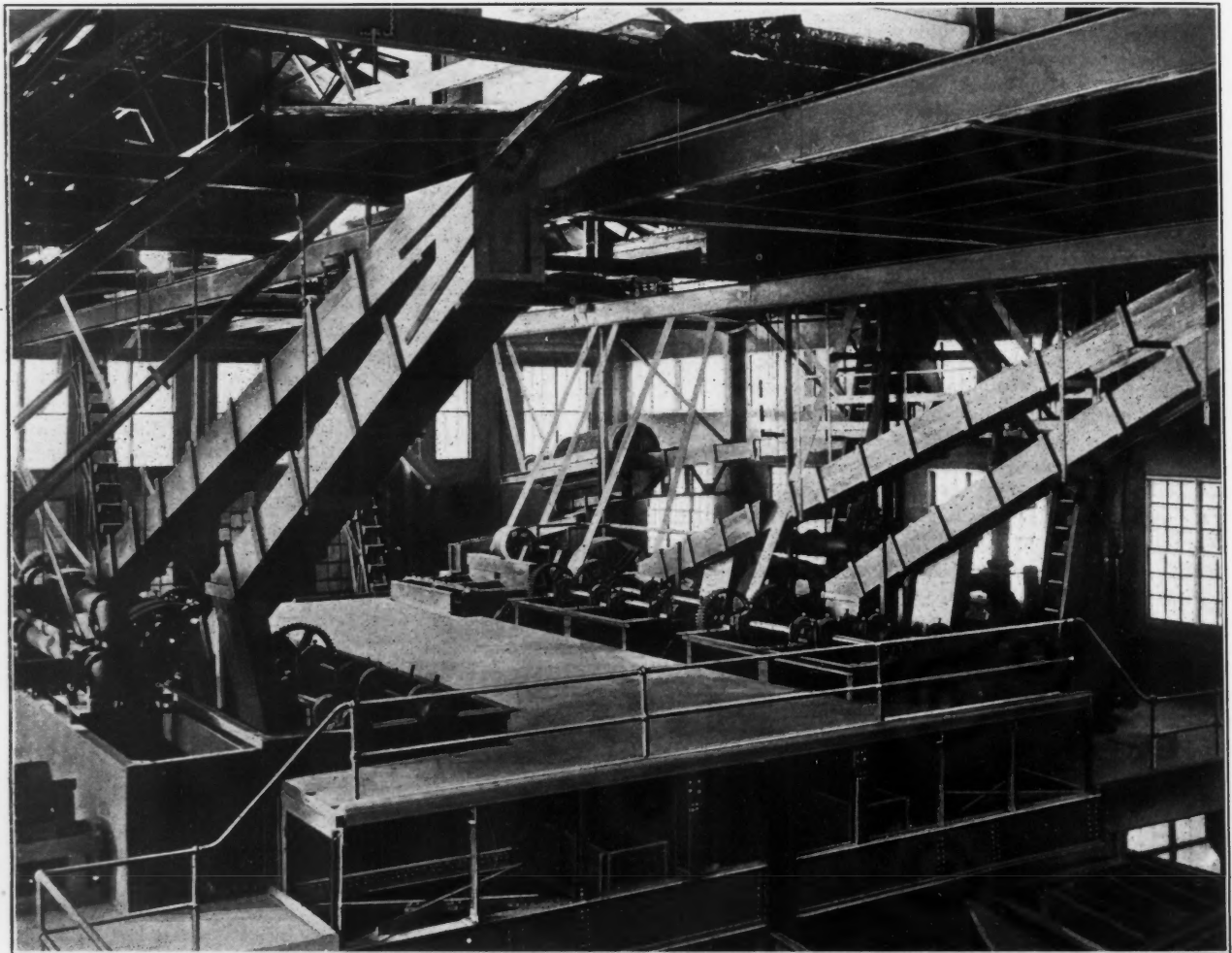


FIG. 1. PARTIAL VIEW OF JIG FLOOR SHOWING REFUSE ELEVATORS FROM STEWART JIGS ON RIGHT

the raw coal is carried by a belt conveyer from the coal tipples to two cylindrical steel bins, 40 ft. diameter by 40 ft. high, marked *A* on the accompanying general view. Each bin has a capacity of 1000 tons, and the coal is discharged through eight rocker-gate feeders at the bottom of the bins onto two parallel belt conveyers which carry it to the crusher building, marked *B* on Fig. 2.

EQUIPMENT OF WASHERY

In the crusher building at the head of the conveyers, are two 6x12-ft. shaking

These jigs are arranged in batteries of four jigs each, on opposite sides of the room. Each battery consists of two pairs of jigs connected by a water-supply tank. These jigs differ in construction from the usual Stewart type, inasmuch as both the jigs and supply tanks, instead of being of wood construction, are of ¼-in. steel plate with a 4-in. concrete lining. The hutches of each pair of jigs taper toward the bottom and are connected by two 8-in. pipes with a No. 5 Luhrig elevator which handles the combined refuse from the two compartments (see Fig. 4).

jigs, and are placed in line with the latter, as shown on Figs. 1 and 3. Each pair of these rewashing jigs is provided with a No. 5 Luhrig elevator which delivers the final refuse into the bin mentioned above.

The combined washed coal from both the Stewart and Luhrig jigs is carried by launders under the operating floor to four 4x12-ft. dewatering trommels, two of which are located on either side of the building, directly over the settling tanks (see Fig. 5). The oversize from these trommels passes through chutes to two 60-in. disintegrators located on the first

floor, and the undersize is recovered from the settling tanks by two perforated continuous-bucket elevators, as shown on Fig. 2, and is distributed by a belt conveyor operating above the bins. From these bins the coal is taken by electric laries to the coke ovens.

It will be noted from the description that the plant is a double installation, each side being complete in itself. The

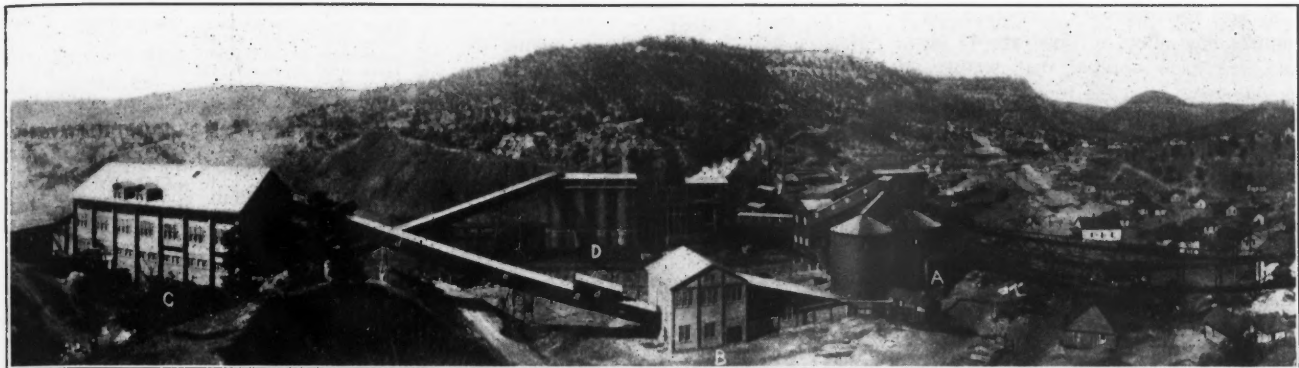


FIG. 2. GENERAL VIEW OF COAL-MINING PLANT AT DAWSON, NEW MEXICO

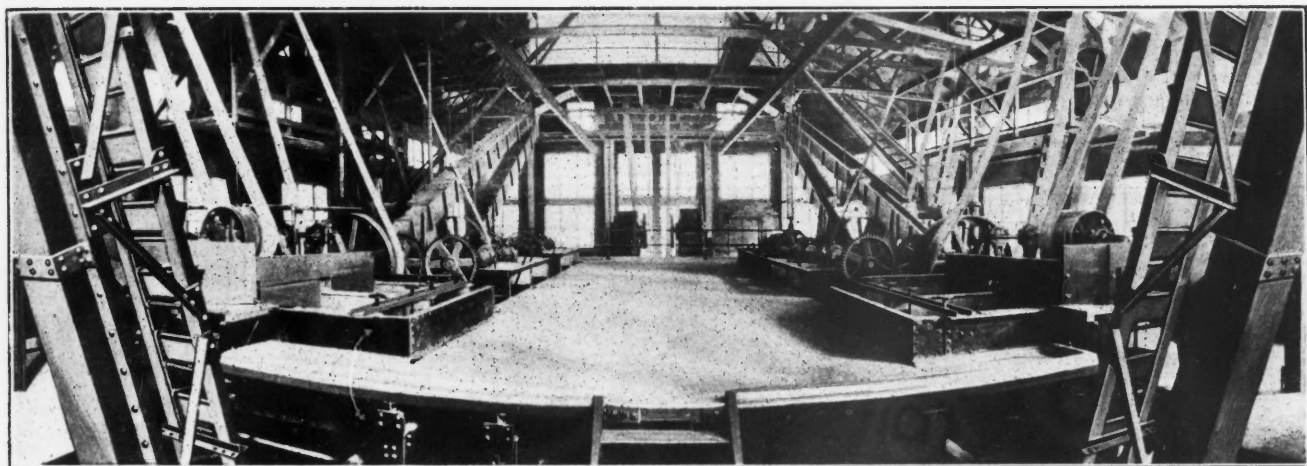


FIG. 3. VIEW OF JIG FLOOR, SHOWING LUHRIG JIGS IN FOREGROUND AND STEWART JIGS IN BACKGROUND

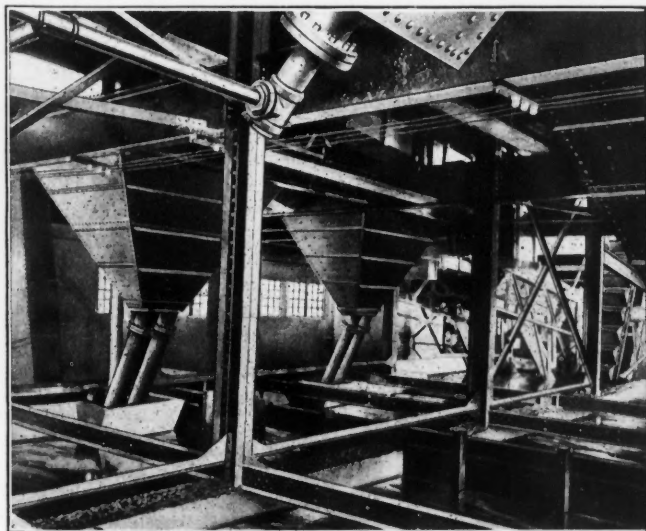


FIG. 4. SHOWING HUTCHES FROM FOUR OF THE STEWART JIGS, AND 8-IN. DISCHARGE PIPE THROUGH WHICH THE REFUSE PASSES

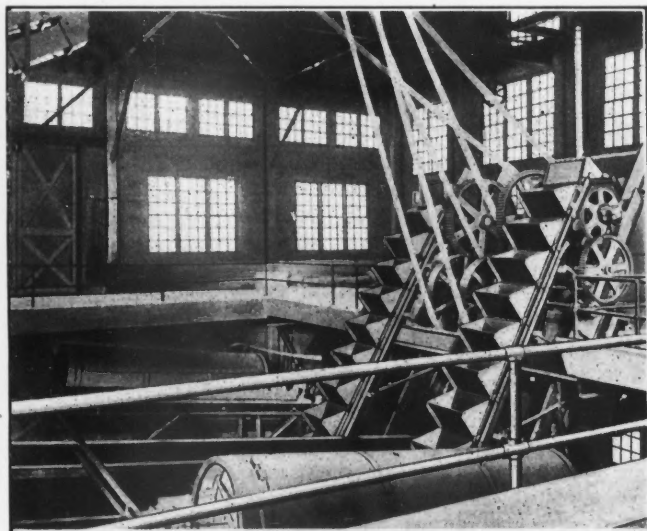


FIG. 5. THREE OF THE DEWATERING TROMMELS THROUGH WHICH THE WASHED COAL PASSES

Figs. 4 and 5. The washed coal from the disintegrators and settling tanks is then carried by a belt conveyor to four circular steel bins, 20 ft. in diameter and 40 ft. high, marked *D* on the general view, Fig. 2, and is distributed by a belt conveyor operating above the bins. From these bins the coal is taken by electric laries to the coke ovens.

crusher and washery buildings are of steel and concrete construction, and all windows are of prism glass. The washery

building contains a thoroughly equipped laboratory for conducting tests and analyses.

Owing to the complicated arrangement of the water system employed in this plant, and the necessity for preparing a complete flow sheet to illustrate its operation, we have omitted that feature of the equipment from the foregoing description. All washing machinery proper; used in the plant, including the screens and crushers for raw coal, and the jigs, trommels and elevators for handling the washed coal and refuse, was built and installed by the Jeffrey Manufacturing Company, of Columbus, Ohio. The entire system was designed by Dr. D. L. Ricketts, consulting engineer for the Dawson Fuel Company.

Owing to the recent completion of the plant, definite records of the results secured are not yet obtainable. It is stated, however, that the entire operation of the plant is highly satisfactory to the company; when further records have been completed they will be made the subject of a later announcement.

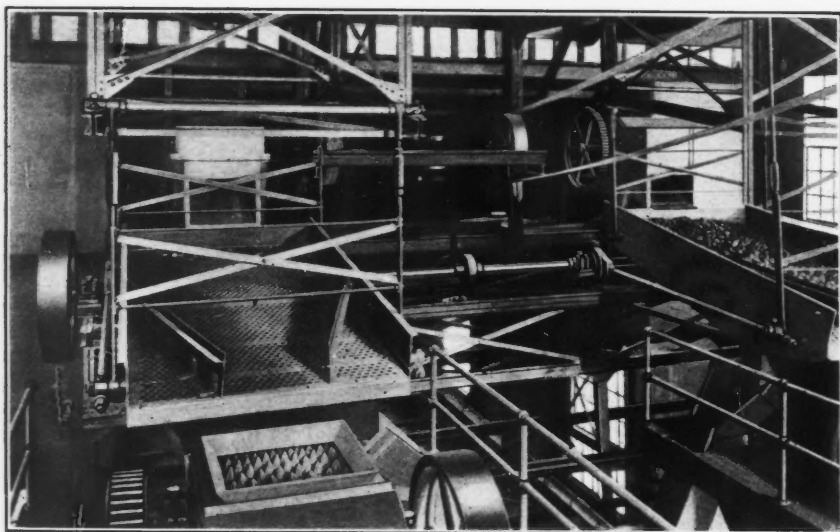


FIG. 6. INTERIOR OF CRUSHER BUILDING SHOWING SCREENS AND ROLL CRUSHER

During the year 1906, only 11 per cent. of the fatal accidents in West Virginia mines were due to explosions, while over 66 per cent. were caused by falls of roof and coal. These figures are approximately true over a period of 30 years in this coalfield. Because the more recent mine disasters were of such magnitude and were attributed to dust explosions, they have attracted much attention, but the fact remains that during most years, a far larger percentage of accidents must be attributed to roof falls. Bearing these figures in mind, the proposed free use of water as a preventive of dust explosions, while more or less effective in this direction, may add greatly to the already high percentage of deaths from roof falls.

Combustion of Coal upon Grates*

By E. G. BAILEY†

The heat balance of a boiler test as given usually includes the following distribution of the total available calorific value of the coal: (1) heat used for evaporation of water in boiler; (2) loss due to latent heat in moisture formed from the combustion of coal; (3) loss due to products of combustion, or sensible heat of gases produced exclusive of excess air; (4) loss due to air excess, or sensible heat of unused air leaving boiler; (5) loss due to unburned gases, consisting of carbon monoxide, hydrogen and



FIG. 7. WASHERY BUILDING

The average of the above tests is as follows:

DISTRIBUTION OF HEAT IN 200-H.P. STATIONARY BOILER PLANT.

	Per cent.
1. Heat used for evaporation.....	66.7
2. Loss due to latent heat.....	2.7
3. Loss due to products of combustion	8.5
4. Loss due to air excess.....	8.5
5. Loss due to unburned gases.....	0.8
6. Loss due to unburned coal.....	2.4
7. Loss due to radiation and absorption	10.4
Total heat.....	100.0

The extent to which the losses may be reduced is dependent upon the kind of coal, method of firing or supply of coal and air, conditions under which combustion takes place, and extent and conditions of heat-absorbing surface. The amount of gases produced from the combustion varies almost directly with the calorific value of the coal, so that the percentage of loss due to this factor is practically constant except for variation in the flue temperature. The temperature depends upon the rate of combustion, area of boiler heating surface and cleanliness of the same.

AIR EXCESS

This loss is one of the greatest importance, for it causes a loss of 30 per cent. or more. It not only carries away sensible heat, but reduces the furnace temperature, thereby reducing the efficiency. This loss may be affected to some extent by the character and quality of coal burned. A non-coking coal generally lies closer together and is less apt to allow holes to burn in the fire than a coking coal; also the formation of clinkers causes the air to pass through the fire in streams, thus causing high velocity in certain parts. The fireman is largely responsible for the loss due to air excess because he does not keep the fire to the proper thickness for the draft, or he may fire the coal unevenly, allowing holes or thin spots to form.

The best method of determining the extent of this loss is by analyzing the gas leaving the boiler. This is usually done with the Orsat apparatus, but the automatic continuous recording CO₂ machines now on the market make it much easier for the fireman to keep his fire in good condition, and the effectiveness of his work is permanently recorded. One per cent. of CO₂ means about 20 per cent. air excess, or 2 per cent. loss under average conditions. The air excess as determined at the uptake from a boiler or at the bottom of the stack does not always show what the fireman is doing, as the air leaking through cracks in the brickwork, around clean-out doors and even the porosity of the brickwork is often as great as or greater than the excess air passing through the furnace.

UNBURNED GASES

Usually the analysis of flue gases gives the carbon monoxide as the only unburned gas, but there are undoubtedly other

hydrocarbons; (6) loss due to unburned coal or coke dropping into the ash pit or passing through flues or up the stack; (7) loss due to radiation from boiler setting and absorption by brick setting.

The relative magnitude of the losses depends upon the kind of boiler, furnace, rate of combustion, and method of firing. The results recently determined from 18 evaporation tests on a 200-h.p. return tubular boiler, hand fired, give some idea of the relative importance of the various losses as they occur in a stationary plant.

*Abstract of a paper read before the Boston Society of Civil Engineers, December 18, 1907.

†Chief of coal department, Arthur D. Little Laboratory, Boston.

Colliery Notes

The English Royal Commission on "safety in mines" has decided that the only breathing apparatus practical for rescue work is that of the regenerator type.

Tests have shown that steam jackets are useful for slow revolution, but not for quick revolving engines, and their efficiency is doubtful when applied to triple or quadruple expansion engines.

A Davy lamp used without a shield ceases to be safe in an explosive current when the velocity exceeds 5 ft. per sec. A Clanny lamp is unsafe in an explosive current which exceeds a velocity of 10 ft. per second.

Hydraulic wedges and hydraulic cartridges are both effective as a means of gaining coal without the use of powder. Only a comparatively small amount of water is necessary; 1½ pints for one operation, the resulting pressure being 3 tons per square inch.

Twenty-seven coal companies of Lancashire and Cheshire, England, have united in the establishment of a place in which men can be trained in the use of life-saving apparatus. It is hoped that before long all the coal companies in the district will be united in this work.

The depreciation of water softening plants is an item worth consideration. Wooden tanks depreciate rapidly, and unless their first cost is much lower than steel, they should not be used. With reasonable care steel tanks do not show more than 5 per cent. depreciation per year.

The advantages gained by the use of pulverized coal in furnaces are: (1) complete combustion without excess of air and resulting high temperature; (2) no expensive stoker machinery to be kept in repair; (3) the possibility of using cheap and fine fuels that cannot be used in ordinary furnaces.

Horizontal suction pipes if of considerable length, should be larger than vertical suction pipes in order to overcome the friction between the water and the pipe. They should also be uniform in grade to prevent the formation of air pockets, and all bends should be of large diameter. Every suction pipe should be equipped with a strainer to prevent debris lodging under the valves.

In boilers which have riveted seams exposed to the action of the fire, cracks caused by the unequal expansion of the metal often result, and generally extend from the rivets to the center of the plate. This cracking can be temporarily repaired by drilling a hole in the extremity of the crack, thus drilling out the crack, then, if the fracture is less than 3 inches long a wrought-iron gas plug may be inserted in the hole. There the cracks are of

greater length, the best method is to put in a new plate.

The life of wire ropes is largely dependent on good or bad management. Where ropes are kept in stock they should be placed on a raised platform of planking and covered with brattice to prevent oxidation, rust and corrosion. Every care should be taken to keep them free from damp and dirt. Careful estimate should be made of the work the rope is required to perform so as to decide the kind of rope required, the size, weight and strength. The factor of safety should not exceed one-tenth of the breaking strain.

Some idea of the density of the vegetation that formed the present day coal beds and the time required for their formation, may be obtained from the fact that it has been estimated that 100 tons of vegetable matter, the amount produced per acre per century, if compressed to the specific gravity of coal and spread over an acre, would form a layer less than 0.6 of an inch thick; four-fifths of this would be lost by the evolution of the gaseous products, therefore, the resulting accumulation per century would be ⅛ of an inch or one foot in 10,000 years.

Much of the strength and efficiency of mine timber depends upon the method of storage. All mine timbering should be stored in alternate layers upon a platform of narrow boards, just sufficient to keep the bottom layer of props off the ground. Upon these boards place a layer of timber, then another layer at right angles above the first layer. Build up the pile in this manner for 5 or 6 ft. and as there is a clear air space between each layer, the wind can percolate through the space between and so keep the props in a dry condition, which is essential to maintain good results.

Recent surveys of the nation's coalfields indicate an area for the more accessible coals of 327,000 square miles. This is four times the area of the known coalfields of the rest of the world. In these vast coalfields, the nation has available nearly 2000 billion tons of coal, mineable under present conditions, or twice the tonnage estimated for the rest of the world. It is therefore evident that America's fuel supply is so great as to render immediate alarm unnecessary; however, if the present phenomenal rate of increase in consumption is maintained, the supply of easily and cheaply mined coal will be gone before the middle of the next century.

The new English fuel, coalite, is the residue produced by subjecting coal to partial distillation. It is practically smokeless, capable of producing sufficient heat for household purposes with a minimum of dirt and ash. It requires less attention while burning than does coal, it ignites readily and insures clean flues, burns with a cheerful glow, and is said to be more economical, radiate more heat

and deposit less soot than coal. It is formed by distilling coal at a low temperature; this distillation removes all volatile smoke-producing matter without burning away the carbon. The process does not break down the hydrocarbons. Most of the calorific value of coalite is converted into sensible heat.

Lime cartridges are often used in Europe in powderless mining. Pure carbonate of lime ground to a fine powder is made up into a cartridge 3 to 4½ in. long with a groove ½ in. in diameter on one side. An iron tube ½ in. in diameter, and perforated on the upper side, is inserted the whole length of the bore hole. This tube is inclosed in a calico bag which covers the perforations and one end of the tube, the other end is fitted out with a tap. The cartridges are then pushed to the back of the hole drilled for them and tamped as if they were gun powder. A small force pump is connected with the tap at the end of the tube by means of a short flexible pipe, and water equal in bulk to the quantity of lime used, is forced in. The water escapes through the perforations as it passes along the groove and the lime in the cartridge is saturated, the tap is closed, steam is generated and the combination of generating steam and expanding lime brings down the coal.

A new safety fuse which has given good results in French mines and has proved of material help in reducing the number of misfires, aims to ignite the blasting charge along its whole length by means of a leaden detonator tube charged with tri-nitrotoluene. This substance is not very sensitive to external conditions and the fuse is safe to handle. The ignition is caused by a detonator composed of one gram of fulminate. Tests have shown that 28 in. of fuse can be ignited safely in an explosive atmosphere; ignition of the gases occurring only with a length of 6½ ft. of fuse. As the shorter length is more than sufficient to fire 1 lb. of explosive, it is claimed that this fuse can be used in fiery mines without risk. With the narrow fuse, as much as 10 yd. could be ignited without setting fire to the gas. This detonating tube is said to have the following points of superiority over the ordinary method. It enables the use of certain high explosives, such as mixtures of ammonium nitrate and naphthalene, that have hitherto been unsuitable on account of the difficulty of insuring satisfactory detonations; it also enables slow powders to act as high explosives and thereby removes the only obstacle in the way of their use in safety explosives. Furthermore, it seems probable that this fuse will permit ammonium nitrate to be used as a blasting charge. Another advantage claimed is that the detonator being outside the shot hole, can be replaced with less risk in event of a misfire.

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Contents PAGE

Editorials:	
Consumption of Copper in the United States in 1907.....	187
The Resumption at Cananea.....	188
A New Precedent in the Conferring of Degrees.....	188
Reform in the Comstock Mining Companies.....	188
*On Horseback in Western Chihuahua. Mark R. Lamb	159
Electric Smelting Tests in California. Special Correspondence	164
Transvaal Stope Drill Competition.....	164
Cost of Producing the World's Supply of Copper..... James Ralph Finlay	165
Short Talks on Mining Law.—V. A. H. Rickells	168
Separation of Silica and Alumina in Iron Ores.....	168
*Lead Mining at Mechernich, Prussia. Lucius W. Mayer	169
Profit Sharing in the Comstock Mines. Special Correspondence	172
*The Cochiti Mining District, New Mexico. Percy E. Barbour	173
The Development of the Delprat and Potter Flotation Process..... W. R. Ingalls	175
The Hancock Jig at Palmerton, Penn.....	175
*Atlanta Gold District, Idaho. Robert N. Bell	176
Heating of Conductors by Electric Currents. Sydney F. Walker	177
Determination of Lead in Spelter and in Ores. Eric John Ericson	178
Transvaal Notes..... Special Correspondence	180
Dominion Iron and Steel Company.....	180
Cornish Tin Mining..... Special Correspondence	181
*An Automatic Ore Sampler.....	181
Anti-Débris Action in California. Special Correspondence	181
*A Modern Coal Washery in New Mexico.....	182
Combustion of Coal Upon Grates. E. G. Bailey	184
*Hoisting Rope Connection.....	185
Colliery Notes.....	186
Justice for the Miner in Timber and Mineral Land Decisions.....	189
*Sampling and Buying Ore in the Joplin District..... Evans W. Buskett	190
Patents.....	191
Personals, Obituaries, Societies and Technical Schools.....	193
Special Correspondence.....	194
Mining News.....	196
Markets, etc.....	202
*Illustrated.	

Consumption of Copper in the United States in 1907

In the JOURNAL of May 23, we reported our revised statistics of the production of copper in 1907, these statistics representing the production of the smelters, and corresponding substantially with the production of the mines. We pointed out in the discussion that those statistics represented the metal shipped from the Western smelteries during the year ending Oct. 31, or even earlier, and not the amount of metal turned out by the refiners in final marketable form. We now give the production of refined copper in the following table:

Kind.	Pounds.
Lake.....	220,317,000
Electrolytic.....	854,441,000
Casting.....	47,957,890
Pig, exported.....	30,032,000
Total.....	1,152,747,890

This table includes not only the copper from ore, both domestic and foreign, but also the amount of old copper re-entering the market by the refining of scrap and other waste products and junk. The total amount of this old copper was in round numbers 39,350,000. This was treated not only by the smelters who make it their sole business to rework such material, but also by nearly all of the refiners, whose chief business is the refining of blister copper. The latter refiners pass the old material through the same kind of treatment as the new, and out of it produce both electrolytic and casting copper of virgin quality. Pig copper, low in gold and silver, from Arizona, California and Tennessee is also marketed as casting copper.

In the refining of blister copper, a portion thereof is recovered and marketed in the form of bluestone. In 1907 the refiners produced 34,550,000 lb. of bluestone, equivalent to about 8,300,000 lb. of copper. Adding this to the production of refined copper, plus the pig copper exported, the total is 1,161,047,890 lb. Deducting 39,350,000 lb. derived from old material, the production of refined copper and the copper content of bluestone in 1907 was 1,120,697,890 lb. This total is not very different from the total of the production of the mines of the United States, viz., 879,241,766 lb., plus the imports of copper in ore and matte (60,622,415 lb.) and the imports in pig and scrap (192,901,267 lb.). These figures give a total of 1,132,765,448 lb., which must be diminished by

about 5,000,000 lb. to allow for refined copper imported into the United States.

The stock of copper on hand at the refineries at the end of 1907 is not easy to determine precisely. For obvious reasons, the refiners are reluctant to disclose the whole truth respecting their stocks, although the statistics may not be published for six months later. On the basis of reports, which we know to be reliable, accounting for a fairly large portion of the stock on hand, and estimating the remainder, we compute that the amount of refined copper on hand at the end of 1907 was about 120,000,000 lb., of which 80,000,000 lb. was electrolytic and casting copper, and 40,000,000 lb. was Lake copper. In comparison with the production, the stock of Lake copper was proportionately much greater than the stock of electrolytic. These statistics do not include the metal in process of treatment at the refineries.

The United States imports a small amount of refined copper. Of course the importation of refined copper into the United States is like carrying coals to Newcastle, but there are times, such as occurred in the spring of 1907, when a species of arbitrage transactions may show a profit. In this way the United States in 1907 imported some "best selected" copper from Great Britain, some casting copper from Japan, and reimported some American electrolytic copper from Japan and China. In the aggregate these imports may have amounted to 5,000,000 lb. (No precise statistics are available.) The exports of copper from the United States in the form of pigs, bars, plates and cathodes amounted to 508,929,401 lb. With these data the domestic consumption is computed to have been about 538,000,000 lb., as appears in the accompanying table.

	Pounds.
Stock, Jan. 1, 1907.....	9,000,000
Imports of refined.....	5,000,000
Production.....	1,152,747,890
Total supply.....	1,166,747,890
Exports.....	508,929,401
Remaining in U. S.....	657,818,489
Stock, Dec. 31, 1907.....	120,000,000
Domestic consumption.....	537,818,489

In previous years our estimate of the consumption of copper in the United States has been based upon the imports and exports, the production of the domestic mines, and the total stock of copper in first hands, including copper in transit and in process of refining, the latter being estimated on the basis of the production of the domestic mines in the

last quarter of the year, reckoning Lake copper as being in transit an average of 20 days, and blister copper in transit and process of refining an average of about 60 days. Computing in this way, the total stock at the end of 1907 was 221,265,000 lb., and the consumption of copper in the United States was 531,510,118 lb. This figure is not very different from the consumption computed on the basis of the refined copper as above. The basis of refined copper is without doubt the more accurate. It is to be remarked that this is the first time that any attempt has been made to base the statistics of consumption on the production of refined copper including material derived from scrap, and consequently there are no corresponding figures for 1906 with which comparison may be made.

We received reports from most of the refiners covering the first eight months of 1907. Comparing those returns with the returns for the full year, it appears that there was no great reduction in the output of refined copper during the last quarter of the year. The mines had curtailed their production, but because of the copper in transit and in process of refining, the refiners had to keep on at about the same rate as previously, the result of which was, of course, a great accumulation of stock. This throws considerable light upon the situation in the market at the beginning of 1908. It was not until after the end of 1907 that the refiners were able to restrict materially their output.

The Resumption at Cananea

A noteworthy event was the resumption of work at Cananea on July 11. It required a good deal of nerve on the part of the management to suspend operations and practically disband the organization of a great mining camp, but, as it is always easy to say after such a step has been taken, it was the correct and obvious thing to do. The future of the Greene-Cananea company depends upon its ability to produce copper at a much lower cost than heretofore. By the introduction of improved methods of mining and the modernization of the smelting works, the management now expects to be able to compete successfully with the other big copper-producing companies. The management of the Greene-Cananea company is of the ablest character, and we have no

doubt that its present expectations will be largely realized.

However, in this connection, it is only a matter of simple justice to refer to the previous management of A. S. Dwight. Memory is short and the glorious sun of yesterday is forgotten in the brilliancy of today's, just as the old cry used to be, "*Le roi est mort, vive le roi!*" Mr. Dwight fully recognized the glaring defects of the Cananea practice and was making rapid progress in correcting them, though greatly hampered by adverse conditions other than technical that finally led him to tender his resignation, which adverse conditions were subsequently eliminated. However, it was he who introduced the caving method of mining, that has been of immense importance at Cananea, and inaugurated other economical systems of operation which have been ably carried out by the present management. It is, moreover, fair to remark that his management was coincident with the only period in the history of this great property when dividends were continuously earned and paid.

A New Precedent in the Confering of Degrees

Lehigh University during its 45 years of existence has granted only four honorary degrees, namely, two doctorates of science, the first to Dr. Rossiter W. Raymond in June, 1906, the second to Dr. Arthur Arton Hamerschlag, director of the Carnegie Technical School, of Pittsburg, on Feb. 22, 1907; and two degrees of master of science, the first in June, 1907, to the eminent electrical engineer, L. B. Stilwell, of New York, a graduate of Lehigh's electrical course in 1885, and the second to Horace Field Parshall, who has made so great a name for himself as an electrical engineer in England, although he is an American. Mr. Parshall is a graduate of Lehigh's electrical course in 1887. His new degree has been conferred under circumstances which constitute a precedent; it may be called the granting of a degree under power of attorney.

Last June the board of trustees of Lehigh University voted to confer upon Mr. Parshall the honorary degree of master of science, but important duties before a parliamentary commission in London made it impossible for him to come to this country to receive the degree.

Through the interest of Sir William Ramsay, a special congregation of the University of Liverpool was held for the purpose of the admission of Mr. Parshall to the degree of master of science on behalf of Lehigh University. The University of Liverpool was given a power of attorney over the seal of Lehigh University, duly attested, authorizing it to confer this degree. When the matter was brought to the attention of A. W. W. Dale, the vice-chancellor of the University of Liverpool, it impressed him favorably, and in a letter to Dr. Drinker, president of Lehigh, he wrote: "So far as I am aware, no precedent or parallel for such an act can be found in the history of British universities. But it is our business to make precedents as well as to follow them, and we trust in so doing our act will be regarded as an expression of fellowship and sympathy with kindred institutions carrying on similar work."

Reform in the Comstock Mining Companies

In the JOURNAL of July 11, one of our correspondents related how an experienced mining man of Pennsylvania, who recently secured a controlling interest in several of the Comstock mines, has stirred things up in the San Francisco offices of those companies. He suggested that salaries should be largely reduced and other reforms instituted, which suggestion "met with the unanimous approval of the directors of the several companies affected." This was certainly kind of them. They have not been so receptive of economical ideas during the many years that such have been suggested by minority stockholders and the mining press. However, our correspondent illuminates the situation when he says that the new interest expects to make money by mining, and not in the San Francisco offices. It is to be hoped that a real reform is now to be instituted upon the Comstock, where for many, many years operations were a scandal.

THE INDEX to Volume LXXXV of the ENGINEERING AND MINING JOURNAL is sent out as a supplement with the present issue. It is, as usual, a complete guide to the varied contents of the past volume. Subscribers who do not receive this index are requested to notify the office promptly.

Justice for the Miner in Timber and Mineral Land Decisions

An important decision of Secretary of the Interior James R. Garfield, in the latter part of May regarding the inspection of mineral lands by Government agents affects the mineral interests of the West. A conference was called at the suggestion of Lewis E. Aubury, State mineralogist of California, including the following men: Chief Forester Gifford Pinchot, Commissioner of the General Land Office Fred Dennett; Director Smith, of the U. S. Geological Survey; F. H. Newell, Director of the Reclamation Service; and L. E. Aubury.

The first matter considered was the patenting of mineral claims in forest reserves. Mr. Aubury stated that cases had been brought to his attention in which patents had been applied for mineral lands in the reserves, and that the owners of the claims had asserted that forest assistants who were not qualified to pass upon the mineral character of the lands had turned the applications down. Without questioning the truth of these claims, he admitted that the forest service had sufficient cause for looking with suspicion upon many applications for mineral patents, particularly where a fine growth of valuable timber was found on the ground. He was of the opinion, however, that in some cases, overzealous forest assistants had worked a hardship upon legitimate miners by refusing to report favorably upon their applications.

Another point raised by Mr. Aubury was that while forest officers were probably capable of administering the affairs of the service in forest matters, and occasionally such officers might possess a practical knowledge of mining, there were many who were not qualified to make a mine examination. The adverse opinions rendered by some of these forest officers had aroused an antagonistic sentiment toward the Forest Service from certain directions, and it was with a spirit of assisting Mr. Pinchot in his work and to preserve the friendly interest of the miners in forest work that the suggestions referred to in the following paragraphs were made.

IGNORANCE OF SPECIAL AGENTS

In regard to the matter of reports of examinations made by special agents of the General Land Office on mineral lands, Mr. Aubury contended that these agents, with but few exceptions, were entirely ignorant on the subject of what constitutes mineral land, and said that Eastern men who, even if they did have some knowledge of mining, when sent West to report on mineral conditions, were dealing with conditions entirely unknown to them.

"Give us practical men to report upon conditions, and appoint them from the

State or Territory where examinations are to be made, and I believe there will be no further trouble," he said. "Occasionally it may be found that the appointment of local men may not prove to the best interests of the Government, but on the whole, much greater progress would be made, and a fairer adjustment of controversies between the miners and other claimants would be obtained."

In the complaints made to the State mineralogist by many miners, it has been asserted that Government agents had refused to consider as mineral ground any which did not show pay ore practically from the commencement of development. The injustice of such a decision against the miner is apparent to anyone having mining experience, for in probably 90 per cent. of the mines which have been opened in the West, thousands of dollars have been expended in development before ore in paying quantities has been discovered. "Were such a decision to be upheld," said Mr. Aubury, "we might as well quit mining. In many districts, and particularly in Nevada, there are bodies of ore far below the surface, which show no sign of mineral on top. It is necessary for the miner to sink expensive shafts and cross-cut before these orebodies can be uncovered. But Nevada is extremely fortunate in that there are no valuable growths of timber upon the surface; neither are there small portions of the ground upon which a few vegetables might be grown, thus giving an opportunity to file scrip, timber, homestead or agricultural entry upon the miners' ground. In California, conditions are different; likewise, in a few other western States; but while the Government applies one rule to Nevada, Arizona, or Utah, this ruling is not observed in other western States."

Mr. Aubury also called the attention of Commissioner Dennett to the action of homestead entries on mineral ground, particularly to those entries which had been made upon the ancient river channels of California, the chief source of plaster gold.

INJUSTICE OF SOME DECISIONS

Special agents had reported favorably on homestead entries against the miner, in spite of the decision of Secretary Garfield made in May, 1907, in favor of the miner. The courses of these channels are plainly marked. Their surfaces are covered with lava and entirely unfit for cultivation or grazing in most instances. They carry large volumes of water, and it is necessary for the miner to run long and expensive bedrock tunnels to tap the gold-bearing gravel; yet homestead and other entries have been filed upon and over the miners' claims, while they were prosecuting work upon their tunnels endeavoring to reach the gravel. Until such tunnels had pierced the gravel, the miners could not prove to the satisfaction of the special agents that their land was mineral, and notwithstanding the good faith shown

by the miners, decisions have been made against them.

Mr. Aubury cites one case in which upward of \$80,000 had been expended by the miner in running a long bed-rock tunnel; he was prosecuting work upon it when a timber and stone entry was filed over his claims. Thanks to Secretary Garfield, his decision reversed that of the then commissioner of the General Land Office, who had decided in favor of the timber and stone entry.

Hundreds of cases of discrimination against the miner can be found in our Western States and Territories, and this has been brought about by the misinterpretation of the laws by special agents, who, in the opinion of Mr. Aubury, were not qualified to pass upon the lands in controversy; and it was the reports made by these agents that caused most of the trouble between the miners and the different departments at Washington.

SPECIAL AGENTS SHOULD BE MINING MEN

Mr. Aubury suggested to those attending the conference that he believed the remedy for these conditions might lie in the appointment of practical mining men, to be selected from the different States and Territories where controversies existed, to make the necessary examinations. This suggestion was adopted by the conference, and it was decided that a special corps should be selected to act under the direction of the Secretary of the Interior, such appointees to be available for service to report on cases both for the Forest Service and the General Land Office. Secretary Garfield and the heads of the different departments showed great interest in the matter, and it is believed that earnest cooperation will be given toward a peaceful and satisfactory solution of the problem. "I believe that the Secretary will do all in his power to see that the miners secure a 'square deal,'" said Mr. Aubury. "While there have been some complaints against the Forest Service, I am satisfied that Mr. Pinchot will see that the evils are rectified if the facts are placed before him. The affairs of the General Land Office also promise, under the direction of Mr. Dennett, the new commissioner, to give the miner an even chance, something he has not had under some former administrations."

A Correction

In the article on "Ore Contracts from the Smelters' Standpoint," by Clarence A. Grabill in the JOURNAL of July 11, a confusing and erroneous statement appears under the diagram on page 74. The sentence, "Fig. 3 covers the same conditions except that the ore contains 22 per cent. lead," should read, "Also tracings representing the same conditions except that the ore contains 22 per cent. lead."

Sampling and Buying Ore in the Joplin District

By EVANS W. BUSKETT*

The system of buying ore in the Joplin district is full of advantages to the mine operator, especially to the operator with but little capital, for in no other mining district can such quick returns be realized from the ore. Often ore that is mined and milled Saturday morning is bought, loaded, sampled, assayed and paid for by Saturday night.

There has been no evolution in the system of buying ores during the last 15 years and a tightening of the lines between the miner and smelter are apparent. In the early days of the district the ore was bought on a flat bid. None of the smelters employed a chemist in the ore-buying office and few had one at the smelter. The whole business was run by guess. Every week the jack-buyer visited the mines, looked at the ore and made an offer for it. The price ranged from \$15 to \$18 per ton. If the ore was bought, as soon as the buyer was out of sight the seller brought out a hose and a stream of water was turned into the bin until the ore was saturated. More or less of this water remained to be weighed and paid for as ore. The ore was shipped to the smelters where the methods were equally lax. But during the last 10 years there have been noteworthy improvements.

The ore is now bought on a basis of 60 per cent. zinc with a dockage of \$1 per unit for iron over 1 per cent. Some buyers make a similar deduction for lead and lime. A premium of \$1 is paid for each unit of zinc over 60, and for each unit below 60 a deduction of \$1 from the basis price is made. Thus if an ore carries 59.7 per cent. zinc and 3 per cent. iron it would be docked \$2.30 and the price on a \$40 basis would be \$37.70. Nearly all buyers now determine the actual moisture on a sample taken from the car.

The jack-buyer has a more or less regular program which he follows every week. Monday he does his bookkeeping, loads any ore that was left out the week before, and makes settlements for it. Tuesday afternoon and Wednesday he is taking samples and having them assayed. He is also keeping his eyes and ears open to find out how the market will be. He tries to find the basis price that other buyers are expecting to pay and in every way aims to learn the amount of competition he will have. Thursday morning he calls up his customers on the telephone and makes his bids; if he is lucky he gets the amount of ore his company has ordered him to buy and withdraws from the market. More often, however,

he fails to get his supply on account of higher bids. In this case he must take more samples and the assayer has his hands full of rush work, especially if the order is large.

As soon as the first ore is bought the teams begin to haul and the ore is loaded as fast as possible. Some buyers buy on a flat bid, making the price on the ore according to their assay. Others make a basis price and settle for moisture and metallic content on a car sample.

The sampling is done with a horn or



TAKING THE SAMPLE



SAMPLING HORN OR "GUN"

"gun." This is an instrument made of sheet iron. It tapers from about 4 in. at the large end to 1½ in. at the small end. The handle is at the large end and is made of a piece of split pipe.

In using this sampler it is grasped by the handles and driven into the ore. It is then loosened and with a quick upward jerk, followed by a heavy downward push, it is driven further into the ore. This pumping action is continued until the bottom of the bin or car is reached. In this manner a bin 4 ft. deep may be

sampled with a gun and a fair sample of the ore from top to bottom secured. When the gun has been driven to the bottom it is pulled out of the hole and inverted over a cloth or clean board.

In sampling a car at least 18 samples are taken, which are then mixed on a cloth and two screw-top cans, holding about 2 lb., are filled. One of these cans is taken by the miner, who is generally present at the sampling, and the other by the buyer. They are taken to their respective assayers, who determine the moisture, zinc, iron, etc. This is called a split sample.

The difference of assays on split samples has been responsible for a system of split pulps which is growing in popularity. In this case the buyer and miner take one of the cans to an assayer who dries the sample and grinds it to a pulp. The pulp is then thoroughly mixed and divided, each party taking a few ounces for assay. The other can is divided and run for moisture by the respective assayers, or the moisture determination made by the assayer who splits the sample is accepted. This is the most satisfactory method of sampling that has been used in this district and is perfectly fair to both parties. There is seldom any important difference in the assays of the split pulps, whereas where the split sample is taken there is often a difference of over 1 per cent. in the zinc content as assayed by the two chemists. There is seldom any difference in the moistures on a split sample.

It is likely that in a few years the ore in the Joplin district will be bought and sold on an umpire system similar to that in use in the West. Already some of the smelting companies have developed such a system and are making contracts for ore five years ahead with a regular system of sampling and settling.

Two of the smelting companies buying ore in this district have adopted a system of sampling and assaying ore which seems to handle the matter very well indeed. Three samples are taken from the car and put into air-tight cans. One of these cans is taken by the seller, another by the buyer and the third is filed away for reference. If the assays on the two cans of the buyer and seller do not agree, the third can is taken to an assayer mutually agreed upon and assayed by him. The settlement is made on the middle assay of the three. This method has so far proved very satisfactory to all parties concerned and will no doubt come into general use. The buyer for one of the companies using this method has stated that it saves much time and trouble in settling, and that, after several months of trial it has been found that the middle assay corresponds very closely with the results obtained in sampling and assaying the ore at the smelter.

*Metallurgical engineer, Rolla, Mo.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

SOLDERING FLUXES—Improvements in and Relating to Fluxes for Aluminum Solders. Harry D. Willey, Bloomfield, Neb. (Brit. No. 15,943 of 1907.)

CEMENT

MANUFACTURE—Improvements in the Manufacture of Cement. Sherard O. Cowper-Coles, London, S. W., Eng. (Brit. No. 10,366 of 1907.)

COAL AND COKE

BITUMINOUS COAL BURNING—Process for the Treatment of Bituminous Coal to Render it Practically Smokeless when Burning, and for the Recovery of By-Products Therefrom. Walter Dixon, Glasgow, Scotland. (Brit. No. 10,804 of 1907.)

COAL-WASHER JIGS—Mechanism for Controlling the Gates of Coal-Washer Jigs. William M. Duncan, Alton, Ill. (U. S. No. 891,610; June 23, 1908.)

COAL-SCREEN. Frederic S. Converse, Lyons, N. Y. (U. S. No. 892,406; July 7, 1908.)

COAL-TIPPLE—Steam-Tipple. Freeman R. Willson, Jr., Worthington, Ohio, assignor, by mesne assignments, to Jeffrey Manufacturing Company, a Corporation of Ohio. (U. S. No. 890,321; June 9, 1908.)

COAL-TIPPLE. Ross M. Bickley, Pittsburg, Penn., assignor to Heyl and Patterson, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 891,760; June 23, 1908.)

COKE OVENS—Apparatus for Coke-Ovens. Thomas J. Mitchell and James A. McCreary, Uniontown, Penn. (U. S. No. 891,355; June 23, 1908.)

COKE-EXTRACTOR. George B. Foust, Masontown, Penn. (U. S. No. 802,042; June 30, 1908.)

COKE-OVEN APPARATUS. Thomas J. Mitchell and James A. McCreary, Uniontown, Penn. (U. S. No. 891,850; June 30, 1908.)

COKE QUENCHING—Machine for Quenching Coke. Paul H. Douglas, Cleveland, Ohio, assignor to the Wellman-Seaver-Morgan Company, Cleveland, Ohio. (U. S. No. 892,032; June 30, 1908.)

CONVEYING APPARATUS—A New and Improved Conveying Apparatus for Use on Slides for Transporting Coal in Mines. Josef Parusel, Laurahütte, Germany. (Brit. No. 25,613 of 1907.)

CONVEYING APPARATUS—Improvements in or Relating to Combination Carriages and Conveyors for Coal. Gardner Inglis & Co., Ltd., Lanarkshire, Scotland. (Brit. No. 5470 of 1908.)

DISTILLATION of Coal and Other Carbonaceous Substances. Thomas Parker, London, W., Eng. (Brit. No. 1972 of 1907.)

GRINDING APPARATUS—Apparatus for Grinding Coal. Thomas A. Edison, Llewellyn Park, Orange, N. J. (U. S. No. 890,625; June 16, 1908.)

MINING-MACHINE. Alexander Palmros, Columbus, Ohio, and Edward L. Hopkins, Erie, Penn., assignors to The Jeffrey Manufacturing Company, Columbus, Ohio, a Corporation of Ohio. (U. S. No. 889,149; May 26, 1908.)

MINING-MACHINE. David N. Osyor, Columbus, Ohio, assignor to Joseph A. Jeffrey, Columbus, Ohio. (U. S. No. 889,148; May 26, 1908.)

MINING-MACHINE. Rufus D. Secoy, Athens, Ohio. (U. S. No. 892,904; July 7, 1908.)

RESCUE APPARATUS—Improvements in Respiration Apparatus for Use in Coal Mines and Other Places. William Edward Garforth, Normanton, Yorkshire, Eng. (Brit. No. 11,367-A-B of 1907.)

WASHER AND CONCENTRATOR—Coal and Ore Washer or Concentrator. William L. Scaife, Allegheny, Penn. (U. S. No. 890,876; June 16, 1908.)

COPPER

ELECTROLYTIC COPPER—Improved Method of, and Apparatus for, Rendering Electrolytic Copper Homogeneous. Marcel A. J. Juillen and Emil L. Dessolle, Levallois-Perrett, France. (Brit. No. 12,563 of 1907.)

ELECTROLYTIC RECOVERY—Process of Recovering Copper from Copper-Bearing Solutions. Luis Amenabar, Coquimbo, Chile. (U. S. No. 890,887; June 16, 1908.)

LEACHING—Method of Recovering Copper from its Ores. Henry M. Wilcox, Chicago, Ill., assignor to Esmeralda Copper Precipitating Company, Chicago, Ill., a Corporation. (U. S. No. 12,815; reissue June 16, 1908.)

GOLD AND SILVER

AMALGAM-PRESS. Anthime J. Leveque, Lead, S. D. (U. S. No. 890,913; June 16, 1908.)

CONCENTRATOR—Dry Concentrator. Homer P. Curtiss, Denver, Colo., assignor to The Curtis Dry Placer Machine Company, Denver, Colo. (U. S. No. 891,409; June 23, 1908.)

ORE TREATMENT—Process of Treating Crushed Auriferous Ore Products. William A. Caldecott, Johannesburg, Transvaal. (U. S. No. 891,459; June 23, 1908.)

SLIMES TREATMENT—Improvements in Means or Apparatus for Treating Slimes and Other Substances with Air and Other Fluids. Communicated from Benito Solis, Guadeloupe de los Reyes, Mazatlan, Mex. (Brit. No. 12,726 of 1907.)

STAMP-MILL. Francis I. Matthews, Oakland, Cal., assignor to Oakland Stamp Mill Co., Oakland, Cal., a Corporation. (U. S. No. 891,497; June 23, 1908.)

TUBE-MILL LINING—Improvements in Linings for Tube Mills and the Like. Peter Arthur Walsh, Johannesburg, So. Africa. (Brit. No. 6934 of 1907.)

IRON AND STEEL

BLAST-FURNACE PRACTICE—Improved Means for Drawing Away Heat to Protect the Brickwork of Certain Parts of Blast Furnaces. Lawrence F. Gjers, Middlesborough-on-Tees, Eng. (Brit. No. 13,456 of 1907.)

BLAST-FURNACE PRACTICE—Preparing Fine Particles of Iron Oxide for Use in Blast-Furnaces. Utley Wedge, Ardmore, Penn. (U. S. No. 889,563; June 2, 1908.)

BLAST-FURNACE GASES—Improved Process and Apparatus for Purifying Blast-Furnace and Other Gases. Francois Sepulchre, Liege, Belgium. (Brit. No. 254 of 1908.)

BLAST-HEATING APPARATUS for Furnaces. William A. Wheeler, Worthington, England. (U. S. No. 891,452; June 23, 1908.)

HARDENING—Improvements in Method of Hardening Steel. William A. Painter, Pittsburg, Penn. (Brit. No. 3982 of 1908.)

CAST-IRON PURIFICATION—Improvements in, and relating to, the desilicizing or purifying of cast iron which can be utilized in the manufacture of basic open-hearth steels and for other purposes. William Muirhead, Shettleston, Lanarkshire, Scotland. (Brit. No. 7946 of 1907.)

INGOTS—Method of Forming Ingots. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Clair, Duluth, Minn. (U. S. No. 890,235; June 9, 1908.)

LADLE for Molten Metal. Gustav A. Hassel, McKeesport, Penn., assignor to Pittsburgh Steel Foundry, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 891,542; June 23, 1908.)

OPEN-HEARTH FURNACE PRACTICE—Dog-House for Open-Hearth Furnaces. Adam Cruickshank, Chicago, Ill. (U. S. No. 889,962; May 26, 1908.)

ORE TREATMENT—Method of Treating Ore. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Clair,

Duluth, Minn. (U. S. No. 891,704 and 891,705; June 23, 1908.)

STEEL INGOTS—Improvements in the Treatment of Steel Ingots, for the Manufacture of Rails and for other Purposes. Benjamin Talbot, Middlesborough, England. (Brit. No. 12,929 of 1907.)

LEAD

ALLOYS—Process of Removing Gold, Silver, Copper, and Platinum from Lead Alloys. William Morrison, Des Moines, Iowa. (U. S. No. 890,160; June 9, 1908.)

ELECTROLYTIC REFINING—Treating Anode Slime from the Electrolytic Refining of Lead. Anson G. Betts, Troy, N. Y. (U. S. No. 891,396; June 23, 1908.)

ELECTROLYTIC REFINING—Treating Slimes from Electrolytic Refining of Lead. Anson G. Betts, Troy, N. Y. (U. S. No. 891,395; June 23, 1908.)

WHITE LEAD—A Process for the Production of White Lead and Lead Carbonate. Frank W. Morris, Victoria, James B. Raine, Vancouver, John Kerr, Vancouver, and Charles McLachlan, Vancouver, B. C. (Brit. No. 24,865 of 1907.)

TIN

SLAG TREATMENT—Process for the Treatment of Slag from Tin-Smelting Furnaces. George T. Holloway, London, England. (U. S. No. 891,477; June 23, 1907.)

ZINC

ELECTRODEPOSITION—Improvements in the Electrodeposition of Zinc. Heinrich Paweck, Vienna, Austria. (Brit. No. 8562 of 1907.)

ORE DRESSING

CENTRIFUGAL MACHINE. Birger Ljungström, Stockholm, Sweden, assignor to Aktiebolaget Separator, Stockholm, Sweden. (U. S. No. 891,271; June 23, 1908.)

CENTRIFUGAL MACHINE. Birger Ljungström, Stockholm, Sweden, assignor to Aktiebolaget Separator, Stockholm, Sweden, a Company. (U. S. No. 891,845; June 30, 1908.)

CLASSIFIER or Separator. Creighton Churchill, U. S. Navy, assignor to The Churchill Company, Boston, Mass., a Corporation of Massachusetts. (U. S. No. 890,606; June 16, 1908.)

CLASSIFIER—Sizing-Classifier. William L. Card and Francis W. Bosco, Denver, Colo., and Clarence I. Glassbrook, San Francisco, Cal. (U. S. No. 890,602; June 16, 1908.)

CLASSIFIER. James R. Holmes, Santa Monica, Cal. (U. S. No. 890,906; June 16, 1908.)

CLASSIFYING—Apparatus for Classifying Solid Materials. René E. Trotter, Hussein-Dey, Algeria. (U. S. No. 888,767; May 26, 1908.)

CRUSHER—Reck and Ore Crusher. William H. Lloyd, Los Angeles, Cal. (U. S. No. 892,861; July 7, 1908.)

CRUSHERS AND PULVERIZERS. Milton F. Williams, St. Louis, Mo. (Brit. No. 3091 of 1908.)

CRUSHING—An Improved Crushing and Pulverizing Machine. Abraham Martin and Alfred A. Buronfosse, Paris. (Brit. No. 6426 of 1908.)

JIG. George C. Stone, New York, N. Y. (U. S. No. 890,939; June 16, 1908.)

ORE-CONCENTRATOR. Frank G. Janney, Salt Lake City, Utah. (U. S. No. 892,057; June 30, 1908.)

ORE CONCENTRATION—Improvements in Ore-Concentrating Machines. George Edwin Woodbury, San Francisco, Cal. (Brit. No. 13,266 of 1907.)

ORE TREATMENT—Improved Method of Treating Ores by the Precipitation Process by Means of a Superheated Liquid Reacting Metal. Antoine H. Imbert, Grand Montrouge, France. (Brit. No. 16,834 of 1907.)

ORE TREATMENT—Improvements in Apparatus for Washing and Separating or Concentrating Metallic Ores, Minerals and the

Like, Charles, William and George K. Craig, Sacriston, Eng. (Brit. No. 20,622 of 1907.)

PULVERIZING MILLS—Improvements in Pulverizing Mills. Levi Dee York, Portsmouth, Ohio. (Brit. No. 3557 of 1908.)

PULVERIZING MILLS—Improvements in Pulverizing or Grinding Mills. James Wheeler Fuller, Jr., Catasqua, Penn. (Brit. Nos. 24,392 and 24,393 of 1907.)

SEPARATION—Improvements in and Relating to the Separation of Solids from Liquids. Henry Thomas Durant, Bulawayo, Rhodesia. (Brit. No. 15,350 of 1907.)

SEPARATOR. Robert W. Jessup, Oakland, Cal.; assignor of one-half to Fairfax H. Wheelan, Oakland, Cal. (U. S. No. 891,424; June 23, 1908.)

SEPARATOR. Henry Ruddick, Dallas, Ore. (U. S. No. 889,811; June 2, 1908.)

SEPARATORS—Feed for Grain, Ore and Mineral Separators. William Gray, Lincoln, Neb. (U. S. No. 891,688; June 23, 1908.)

SLIME CONCENTRATORS—Improvements in Slime Concentrators. Isaac Willey, Helston, and Charles D. Bartle, Tuckingmill, Cornwall, Eng. (Brit. No. 9415 of 1907.)

METALLURGY—GENERAL

ALLOY—A Metallic Silver-like Alloy. Eduardo Barrala, Palermo, Italy. (Brit. No. 5451 of 1908.)

ALLOYS—Process of Producing Low-Carbon Alloys. Frederick M. Becket, Niagara Falls, N. Y., assignors to Electro Metallurgical Company, a Corporation of West Virginia. (U. S. No. 892,211; June 30, 1908.)

ALLOYS—Process of Making Low-Carbon Metals or Alloys. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia. (U. S. No. 891,898; June 30, 1908.)

ANNEALING, HEATING, ETC.—A method of Annealing, Heating or Melting Oxidizable Materials Without Causing Oxidation Thereof. Victor Stoble, Sheffield, Eng. (Brit. No. 10,185 of 1907.)

ELECTRIC-FURNACE METHOD. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia. (U. S. No. 892,212; June 30, 1908.)

ELECTRODEPOSITION—Improvements in the Electrodeposition of Metals. Sherard O. Cowper-Coles, London. (Brit. No. 11,471 of 1907.)

ELECTRODEPOSITION—Improvements Relating to Apparatus for the Electrodeposition of Metals. Sherard O. Cowper-Coles, London, Eng. (Brit. No. 27,385.)

ORE TREATMENT—Improvements in or Relating to the Treatment of Ores and Metal-bearing Solutions for the Separation of Metals Contained Therein. Communicated from Frederick C. Brown, Komata, N. Z. (Brit. No. 17,779 of 1907.)

PHYSICAL PROPERTIES OF METALS—Process for Improving the Physical Properties of Metals and Their Alloys. David Lamont, Denver, Colo. (U. S. No. 892,269; June 30, 1908.)

PURIFICATION—Device for the Purification of Metals. Charles T. Knipp, Urbana, Ill. (U. S. Nos. 891,264 and 891,265; June 23, 1908.)

SINTERING PROCESS—Improvements in and Relating to Ore Roasting and Sintering Processes. Arthur S. Dwight and Richard L. Lloyd, New York City. (Brit. No. 17,344 of 1907.)

SMELTING—Process of Smelting Ores. Frederick L. McGahan, St. Louis, Mo. (U. S. No. 891,630; June 23, 1908.)

SMELTING-FURNACE. Engen A. A. Grönwall, Ludvika, Sweden. (U. S. No. 891,248; June 23, 1908.)

MINING MACHINERY AND APPARATUS

CONVEYERS—Filling Apparatus for Conveyers. Charles W. Hunt, New York, N. Y. (U. S. No. 891,698; June 23, 1908.)

CONVEYERS—Improvements in Endless Conveyers. Percy R. J. Willis, Kingston-on-Thames, Eng. (Brit. No. 11,542 of 1907.)

DREDGING APPARATUS—Dumping Mechanism for Dipper-Dredges. William Clifford, Duluth, Minn., and Walter Ferris, Milwaukee, Wis.; said Ferris assignor to The Bucyrus Company, South Milwaukee, Wis. (U. S. No. 889,292; June 2, 1908.)

DRILLING MACHINES—Improvements in Portable Drilling Machines. Edward C. R. Marks, London, Eng. (Brit. No. 11,326 of 1907.)

HOISTING APPARATUS—Improvements in or Connected With Mine Hoists, or Hoist-

ing Apparatus and the Like. (Ernest Douglas, Pemberton, Eng. (Brit. No. 17,396 of 1907.)

HOISTING AND CONVEYING APPARATUS. John McMyler, Cleveland, Ohio, assignor to The McMyler Manufacturing Company, Cleveland, Ohio, a Corporation of Ohio. (U. S. No. 891,631; June 23, 1908.)

HOISTING-ENGINE DEVICES—Improvements in and Relating to Controlling Devices for Electrically-Operated Winding Engines. Allgemeiner Elektrizitäts Gesellschaft, Friedr. Karl, Berlin, Germany. (Brit. No. 10,171 of 1907.)

HOISTING-ENGINE DEVICES—Improved Construction of Safety Devices for Preventing Overspeed and Overwinding with Drop-Valve Winding Engines. William Thomas Bell and Arthur J. W. Graham, of Robey & Co., Ltd. Globe Works, Lincoln, Eng. (Brit. No. 14,077 of 1907.)

MINE-CAGE—Cager and Automatic Sump-guard. Grant Holmes, Danville, Ill., assignor to Robert Holmes and Brothers, Danville, Ill., a Corporation of Illinois. (U. S. No. 889,307; June 2, 1908.)

MINE-CAGE SAFETY APPLIANCE—Improved Safety Appliance for Mining Cages and the Like. George J. Richardson, John H. Richardson, Frank R. Simpson and Edward T. Cheesman, Ryton-on-Tyne. (Brit. No. 20,593 of 1907.)

MINE-CAGE SAFETY APPLIANCES—Improvements in Pit Cage Safety Appliances. Charles McNulty, London, and William Farnsworth, Nottingham, Eng. (Brit. No. 18,264 and 18,265 of 1907.)

MINE-DOOR. John Wack, Canton, Ohio. (U. S. No. 892,632; July 7, 1908.)

MINER'S LAMP. August Husson, Oshkosh, Wis., assignor to John A. Thompson, Chicago, Ill. (U. S. No. 892,836; July 7, 1908.)

MINING-CAR-WHEEL BEARING. William C. Fownes, Jr., and Robert J. Gardner, Pittsburg, Penn., assignors to The S. Jarvis Adams Company, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. No. 888,700; May 26, 1908.)

MINE-PUMPS—Valve for Mine-Pumps. Robert W. Murray, Rendville, Ohio. (U. S. No. 890,997; June 16, 1908.)

ROCK-DRILL. James S. Harlow, Mineral, Va. (U. S. No. 888,492; May 26, 1908.)

ROCK-DRILL. Moses Kellow, Penrhyn-draeth, England. (U. S. No. 890,065; June 9, 1908.)

ROCK-DRILL—Turbine-Driven Rock-Drill. Moses Kellow, Penrhyn-draeth, England. (U. S. No. 888,506; May 26, 1908.)

ROCK-DRILL—Percussion Rock-Drill. Robert Anderson, Johannesburg, Transvaal. (U. S. No. 890,012; June 9, 1908.)

ROCK-DRILLING EXPLOSIVE-ENGINE. August B. Wittmann and George L. Rork, Denver, Colo. (U. S. No. 890,546; June 9, 1908.)

ROCK-DRILLING MACHINE or Engine. Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal. (U. S. No. 888,497; May 26, 1908.)

ROCK-DRILLS—Improvements in percussive rock drills, whereby the valve piston travels as short a distance as possible, and the compression of the normal air is reduced to a minimum. Edward Allan Ironside, London, E. C., Eng. (Brit. No. 24,778 of 1907.)

ROCK-DRILLS—Valve for Operating Rock-Drills. George A. Fowler, Georgetown, Cal., assignor of one-half to Edward J. Wilcox, Denver, Colo., and one-fourth to Frank V. Goetz, Clear Creek county, Colo. (U. S. No. 891,472; June 23, 1908.)

ROCK-DRILLS—Improvements in or Connected with Rock-Drills. Henry J. K. Keymer, Corleston-on-Sea, Yarmouth, Eng. (Brit. Nos. 10,248-49-50 of 1907.)

ROCK-DRILLS—Improvements in and connected with Valves for Percussion Rock Drills, Pneumatic Hammers, Direct-Acting Pumps and Engines. A. and Z. Daw, London, Eng. (Brit. No. 18,027 of 1907.)

ROCK-DRILLS—Improvements in or relating to Pneumatic and Steam-driven Rock-Drills. Edward L. W. Bellhouse, Grenoside, and Reuben Jones, Sheffield, Eng. (Brit. No. 27,415 of 1907.)

ROCK-DRILLING MACHINE. William Prelwitz, Easton, Penn., assignor to Ingersoll-Rand Company, New York, N. Y., a Corporation of New Jersey. (U. S. No. 892,082; June 30, 1908.)

SAFETY-LAMPS—Improvements in Safety-Lamps, Particularly Miners' Lamps. George Meyer, Herne-in-Westphalia, Germany. (Brit. No. 1616 of 1907.)

TUNNEL-DRIVING MACHINE. George A. Fowler, Georgetown, Colo., assignor of one-half to Edward J. Wilcox, Denver, Colo., and one-fourth to Frank V. Goetz, Clear Creek county, Colo. (U. S. No. 891,473; June 23, 1908.)

METALLURGICAL MACHINERY AND APPARATUS

ANNEALING-FURNACE. Hugh L. Thompson, Waterbury, Conn. (U. S. Nos. 890,250, 890,251 and 890,252; June 9, 1908.)

ANNEALING-FURNACE. Hugh L. Thompson, Waterbury, Conn. (U. S. No. 890,314; June 9, 1908.)

CHARGING DEVICE for Furnaces, Receiving Vessels, or the Like. Ludwig Mond, London, England. (U. S. No. 891,713; June 23, 1908.)

CRUCIBLE-FURNACE. Edward H. Schwartz, Chicago, Ill., assignor to Kroeschell Brothers Company, Chicago, Ill., a Corporation of Illinois. (U. S. No. 892,012; June 30, 1908.)

ELECTRIC FURNACE. Basil Igevisky, Kiew, Russia. (Brit. No. 5301 of 1907.)

ELECTRIC FURNACE. Léon Dion, Wilkes-Barre, Penn., assignor to The Americus Electro-Hermetic Company, Wilkes-Barre, Penn. (U. S. No. 888,877; May 26, 1908.)

ELECTROLYSIS—Apparatus for Treating Liquids Electrically. Alfred Ord Tate, Toronto, Ont., Can. (Brit. No. 13,891 of 1907.)

EVAPORATION APPARATUS—Improvements in Vaporizers for Mineral-Containing Liquids. Communicated from Maschinenfabrik Aktiengesellschaft G. Sauerbrey, Stassfurt, Germany. (Brit. No. 5011 of 1908.)

EXTRACTING APPARATUS. James E. Porter, Syracuse, and Arthur L. Clark, New York, N. Y., assignors to The Just Mining and Extraction Company, a Corporation of New York. (U. S. No. 887,268; May 12, 1908.)

FURNACE-CHARGING MECHANISM. David Baker, Philadelphia, Penn. (U. S. No. 889,571; June 2, 1908.)

FURNACE for Metallurgical and Smelting Purposes. Kristian Birkeland, Lysaker near Christiania, and Samuel Eyde, Christiania, Norway. (U. S. No. 889,431; June 2, 1908.)

FURNACE—Metallurgical Furnace. William S. Dempsey, New York, N. Y. (U. S. No. 887,777; May 19, 1908.)

FURNACE-TAPPING SPOUT. Charles C. Johnson, Redding, Cal. (U. S. No. 892,263; June 30, 1908.)

FURNACE-WALL. Kinney C. Hoxie, Duluth, Minn. (U. S. No. 886,370; May 5, 1908.)

KILN—Continuously-Operated Drying and Carbonizing Kiln. Richard Beck, Prag-Smichow, Austria-Hungary. (U. S. No. 891,456; June 23, 1908.)

LIXIVIATING APPARATUS. Charles E. Arnold, Wilmington, Del., assignor to the E. I. du Pont de Nemours Powder Company, Wilmington, Del., a Corporation of New Jersey. (U. S. No. 888,685; May 26, 1908.)

METAL-HEATING FURNACE. Jerome R. George, Worcester, Mass., assignor to Morgan Construction Company, Worcester, Mass., a Corporation of Massachusetts. (U. S. No. 886,492; May 5, 1908.)

ORE-REDUCING FURNACE. John T. Jones, Iron Mountain, Mich., assignor of one-half to George A. St. Clair, Duluth, Minn. (U. S. No. 891,549; June 23, 1908.)

ORE-ROASTING FURNACE. William H. Smyth, Berkeley, Cal. (U. S. No. 891,300; June 23, 1908.)

ORE-ROASTING FURNACES—Improvements Relating to Ore-Roasting Furnaces. Eduard W. Kauffmann, Cologne, Germany. (Brit. No. 13,692 of 1907.)

RETORT-FURNACE—Regenerative Retort-Furnace. Oscar H. Elbel, La Salle, Ill. (U. S. No. 885,740; April 28, 1908.)

REVERBERATORY SMELTING-FURNACE. Alva D. Lee, Brookline, Mass. (U. S. No. 888,624; May 26, 1908.)

ROASTING AND SMELTING-FURNACE. Josephus J. Brown, Jr., Troy, Ill. (U. S. No. 888,582; May 26, 1908.)

ROASTING-FURNACE—Rotary Furnace Applicable for Use in Roasting Ores or the Like. Woldemar Hommel, Lee, England. (U. S. No. 888,502; May 26, 1908.)

SINTERING APPARATUS. Eugene B. Clark, Chicago, Ill., and Charles H. Fettel, Hubbard, Ohio, assignors to American Sintering Company, Chicago, Ill., a Corporation of Illinois. (U. S. No. 891,327; June 23, 1907.)

SMELTING-FURNACE. William J. Holzappel, Scottdale, Penn. (U. S. No. 891,256; June 23, 1908.)

ANALYTICAL CHEMISTRY

LABORATORY APPARATUS—A New or Improved Support for Laboratory Crucibles, Basins and the Like. George T. Holloway, London. (Brit. No. 12,787 of 1907.)

Personal

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

R. A. Stewart, of Tucson, Ariz., is in Mexico.

Chas. F. Weiss, of Tucson, Ariz., is visiting a number of mining camps in Mexico.

A. Grothe, of Grothe & Carter, Mexico, City, has returned from a business trip to Chicago.

Chester A. Fulton, of Guanajuato, Mexico, has returned from a business trip to New York.

H. R. Conklin, general manager of the Lluvia de Oro Company, Chihuahua, is in Joplin, Missouri.

E. E. Carter has been appointed manager of Gold Hill & Iowa mines at Quartzburg, Idaho.

Edmundo Girault, of Pachuca, Mexico, is building a cyanide plant at the Natividad mine in Oaxaca.

George M. White and Clive B. Newcomb have opened engineering offices in the Bancario Building in Mexico City.

C. W. Van Law, of Guanajuato, Mexico, is in Pachuca, studying the vacuum filters and air-agitation tanks of the camp.

E. L. Dufourcq has undergone an operation for appendicitis at the American hospital in Mexico City, and is reported to be convalescing.

J. H. Granbery has returned from Georgia where he has been studying railroad conditions with a view to the extension of one of the existing roads.

J. M. Callow started July 9 for Alaska and the Yukon Territory on professional business, expecting to return to Salt Lake City, Utah, the first week in August.

Benedict Crowell, of the firm of Crowell & Murray, Cleveland, Ohio, is at present in Mexico, making an examination of mining properties for Eastern capitalists.

J. Volney Lewis, of Washington & Lewis, New York, has taken up professional work in northern New Jersey that will require about two months for completion.

President E. P. Earle and managing-director Watson, of the Nipissing Mines Company, were at Cobalt recently inspecting the concentrator lately installed on the property.

G. C. Kaufman, general manager of the mining department of the American Smelting and Refining Company, has left New York on a tour of inspection of the company's mines.

Dr. W. C. Heraeus has been awarded the John Scott legacy premium and medal of the Franklin Institute of Philadelphia for his improvements on the Heraeus-Le Chatelier pyrometer.

L. C. Monahan, who has been superintendent of the Mammoth Copper Com-

pany, California, has resigned and has been succeeded by Peter Henderson, formerly assistant manager.

Austin H. Brown, for several years general manager of the Trinity Copper Company has resigned and the position is now filled by R. N. Bishop, with headquarters at Coram, California.

George F. Waddell, formerly assistant superintendent of the Utah Copper Company, has been appointed superintendent of the Steptoe Valley, Smelting and Mining Company's mill at McGill, Nev.

A. E. Drucker, metallurgist with the Oriental Consolidated Mining Company, of Korea is visiting Australia, New Zealand, South Africa, India, Mexico and the United States to study the treatment of gold and silver in those countries.

J. B. Tyrrell, of Toronto, has offered a cash prize of \$100 for the best collection of minerals obtained in the province of Ontario during 1908 by anyone not a collector in a public institution or a dealer in minerals. The collection must not contain less than 30 specimens, properly labeled.

Lloyd B. Smith, instructor in the Pennsylvania State College School of Mines, has accepted a position with Spurr & Cox, Inc. A complete topographic and geological survey of the properties of the Helvetia Copper Company, near Tucson, Arizona, is being made by this firm. The party consists of J. E. Spurr, J. H. Farrell, W. D. Blackburn, and Lloyd B. Smith.

Obituary

Thomas Beddow, long an operator in the anthracite region and a member of the firm of Beddow & McCreary, of Pottsville, Penn., was killed July 7 by the explosion of a boiler at his colliery at Pottsville.

Societies and Technical Schools

Montana State School of Mines—A new metallurgical laboratory, with many improvements, is being added to this school at Butte.

American Electrochemical Society—The sum of \$500 has been paid to the society, and deposited in trust, as a research fund, to be awarded as a prize, under the following conditions: The Pacific Coast Borax Company desires to awaken an interest in research work and experiments which may lead to some improvement in the commercial method of manufacturing ferro-boron, by a direct process from colemanite. It is essential that the process should be sufficiently economical and suitable to be applied on a large scale, so that the finished product may be available for commercial purposes. Commercial ferro-boron, as now made, contains 20 per cent. or more of boron, less than 3 per cent.

of carbon, and sulphur and phosphorus are practically absent. The prize has been deposited with the request that the board of directors award the same for the best practical solution of the problem, under reasonable conditions, to be decided upon by the board of directors.

Canadian Mining Institute—The program for stages 1 and 2 of the summer excursion was given in the JOURNAL July 18. Following is the program for stage 3.

For Stage 3, the Alberta and British Columbia excursion, the program is subject to minor alterations at the discretion of the local committees at the different localities. It is, briefly, as follows: Leave Sudbury Sept. 8, pass Winnipeg Sept. 10. Arrive Medicine Hat Sept. 11 and visit natural gas wells. Leave by special train for Lethbridge, where the afternoon will be spent at the colliery of the Alberta Railway and Irrigation Company. Sept. 12 arrive in Frank, where a short stop will be made to enable the party to see the landslide and coal mine. Arrive before noon at Coleman, where the remainder of the day will be spent in inspecting the mines and plant of the International Coal and Coke Company. Special side excursions to Lille, Hillcrest and Bellevue collieries may be arranged. Sept. 13 leave Coleman for Hosmer. A short stay will be made here to enable the party to inspect the extensive and thoroughly modern colliery established at this point by the Canadian Pacific railway. After arriving at Fernie early in the afternoon, the train will immediately leave for a visit to the mines at Coal Creek. Leave Fernie at midnight for Moyie.

On Sept. 14 the train will arrive at Moyie at 6 a.m., and the morning will be spent at the St. Eugenie mill and mine, this being the largest silver-lead mine in Canada. The train will leave at midday to connect with the steamer leaving Kootenay Landing, for Nelson. Sept. 15 the party will inspect the smelter and refinery plant of the Consolidated Mining and Smelting Company, of Canada. The remainder of the day will be spent at Rossland and visits will be made to the Le Roi, Le Roi No. 2, Centre Star and War Eagle mines. Sept. 16 arrangements will be made for visiting the copper-smelting works of the B. C. Copper Company, the Mother Lode mine and the smelter at Boundary Falls, owned by the Dominion Copper Company. Sept. 17, special train will leave Greenwood early in the morning for Phoenix, where several hours will be spent in visiting the important mines including those of the Granby company, the Brooklyn mine owned by the Dominion Copper Company, and the Snow Shoe operated under lease by the Consolidated Mining and Smelting Company, of Canada. In the afternoon the important smelting works of the Granby company at Grand Forks will be visited.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at
San Francisco, Butte, Salt Lake City, Denver and Indianapolis

REVIEWS OF IMPORTANT EVENTS

San Francisco

July 18—On the day on which the sale was to have taken place Peter M. Rasmussen, of Berkeley, Cal., secured an injunction restraining the Redding Gold and Copper Company, a corporation organized under the laws of South Dakota, but operating in this State, from selling \$26,000 worth of stock owned by him. It was shown to the Court that stock issued Rasmussen was non-assessable, a provision that can be made under the South Dakota laws, but which is not possible under the laws of California. Despite this, an assessment of \$405 had been levied against the stock and because Rasmussen refused to pay it, the mining company advertised his stock for sale. The court held that the assessment was invalid because Rasmussen's stock was non-assessable under the laws of South Dakota. This decision was doubtless just under the circumstances, but it is a well known fact that some hundreds of good mining properties in this State are now idle because assessments were not possible, the incorporation having been made in States where provision is made for non-assessable stock. Under the California laws, the stock may be assessed to pay debts or to continue work. If the money is not paid the stock is sold to the highest bidder or forfeited to the company issuing it.

After a long delay the application of the Quincy Mining and Water Company for patents to certain lands in Plumas county, near Spanish Ranch, has been denied by the Land Office, on the recommendation of the Forestry Department, which had the properties examined by geologists. This is land owned by W. P. Hammon and others, who had invested hundreds of thousands of dollars in that section of Plumas county. It was their intention to organize a company with sufficient capital to build a dozen or more large dredges and work the ground for the gold contained in the gravel. It means, however, that the government experts have decided that the land is more valuable for its timber than for its gold. The Quincy Mining and Water Company has now employed attorneys, mining experts and geologists, it is reported, and will carry the matter through the General Land Office to the Secretary of the Interior, and to the courts, if necessary. It is claimed that the company has complied with all the requirements of the mining laws of the United States and will contest the stand taken by the Government. The company contends that it is engaged

in the legitimate enterprise of gold dredging, but that in order to obtain the necessary capital it had to have absolute patented title to the land. Failing in obtaining this title it could not carry out its plans. A large amount of money is tied up pending the ultimate decision.

The Lecompton mine in Willow Valley district (Nevada City) is to be started up again; the water is being pumped out preparatory to retimbering and developing. The mine was formerly a large producer, but has been idle some time. San Francisco, Nevada and Eastern men have now taken hold of the mine and also acquired the Treadwell and Independence mines adjoining. The necessary machinery is nearly all on the ground.

The mill of the Fairview Mining Company, Papoose, Trinity county, which has been closed for two years, has had 10 of its 40 stamps started up. As the stopes are opened up more stamps will be set dropping. The Fairview is one of the important quartz mines of Trinity county.

J. W. Shanahan is about to install a gold dredger on Weaver creek, near Weaverville, Trinity county, and some of the machinery has already been shipped from San Francisco. The machinery of the dredge at Hornbrook, Siskiyou county, weighing about 300 tons, is to be hauled by team to Hamburg on the Klamath river, in the same county, where it will be installed in a new boat.

Wallace, Idaho

July 15—Mining in the Cœur d'Alene district continues on its uninterrupted course of quiet prosperity. Almost every week new strikes are reported from different points, and in spite of the depression of the metal markets the advances made this year, especially among the smaller prospects are without parallel in previous years. As a matter of fact the hard times, such as they were, have proved a great boon to the district, the benefit of which is only now beginning to be realized. Throughout the winter most of the big mines were closed and several thousand men were thrown out of employment. Many of these were unwilling to leave the district for, as a general rule, conditions throughout the country were a good deal harder than those prevailing in the Cœur d'Alene. The result was that such of the miners as had interests in smaller prospects put in the winter at work upon them, while others were only

too glad to accept contracts on almost any terms involving a small amount of cash and stock on properties where the question of finance had been up to that time of paramount importance.

In addition to this the construction work on the Idaho Northern Railroad, into the north side of the Cœur d'Alene district, is now rapidly nearing completion. As soon as this line has been completed the annual output of the district will be greatly increased. Already there are a number of mines only awaiting railroad facilities to erect mills and start shipments. It is general belief that in the course of a very few years the north side district will far surpass all the rest of the Cœur d'Alene in its output of silver-lead ore. Want of shipping facilities has handicapped the district all along and now that this is at last assured an added impetus has been given to the industry.

Salt Lake City

July 17—The board of directors of the Consolidated Mercur Gold Mines Company, chosen at the late annual shareholders' meeting, has organized with John Dern, president; Hubbard W. Reed, vice-president; G. H. Dern, manager, who, with E. H. Airia, J. E. Frick, Henry W. Bingham and A. W. Chesterton, are directors. While no one connected with the Consolidated Mercur company has given any intimation of possible dividends in the near future, it is believed, nevertheless, that the company will be in condition to return to them in the autumn. Last year was an unsatisfactory one owing to a close-down necessary to complete repairs and the installation of a slimes plant, and it is the policy of the management to get a good treasury surplus before sharing profits with shareholders. The company is now producing from \$70,000 to \$75,000 in gold bullion monthly.

The resumption of smelting operations by the United States Smelting, Refining and Mining Company, is highly pleasing to ore producers, particularly those who have contracts with the smelting company, and have been without a market for the past seven months, the duration of the inactivity of the plant. The United States company is receiving 100 tons of ore per day from the Richmond-Eureka, one of its own system of mines which is located at Eureka, Nevada. Its Bingham mines are to be put back on a producing basis at once. Only one furnace is in

operation at the smeltery at this writing; two more will go in next week, while the treatment of sulphide ores will begin within three weeks. The smeltery is equipped with six lead furnaces, each capable of treating 200 tons per day.

The Godiva, one of the oldest mines in the Tintic district, and which has a record of production approximating \$700,000, is to be reopened. The company was recently reorganized, and plans are being made to sink the shaft from 900 to the 1300-ft. depth.

The Tintic Smelting Company's new smeltery is scheduled to go into commission on July 24, for which event due preparations are being made. Only the lead department will be ready, however, as the copper furnaces will not be completed before autumn.

Those in charge of the mill of the Boston Consolidated Mining Company at Garfield express a great deal of satisfaction about the behavior of the plant. A highly gratifying extraction is being made and the concentrate carries from 20 to 22 per cent. copper. It is very evident that the company made a bad contract with the American Smelting and Refining Company, for a loophole was left for the latter to impose a penalty for the iron which the concentrate contains in generous quantity. President Newhouse and General Manager Hanchett went East for a conference with the smelter officials with the view of getting this changed, and in the meantime shipments of concentrate are being withheld. It has been ascertained that the bins at the mill contain about \$200,000 worth of this product.

The ore and bullion settlements reported by Salt Lake banks last week amounted to \$432,000.

The May Day Mining Company has posted a dividend for July of 1½c. per share, or \$12,000.

Butte

July 16—The hearing of complaints concerning rates on ore shipments, which began before the State Railway Commission in Helena yesterday, is being attended by a number of Butte mining men. The commission, created by act of the 1907 State legislature, is vested with full power to regulate and control freight and passenger rates within the State and is organized along the same lines as the Federal Inter-State Commerce Commission. This is the first hearing held by the commission for the consideration of rates on ore shipments. The Montana Mining Association has demanded a reduction of from 25 to 40 per cent. on ore rates between various points within the State.

John D. Ryan, managing director of the Amalgamated properties, returned to Butte a few days ago after an absence of three months. Mr. Ryan states that the Boston & Montana smelter at Great Falls will not be ready for the treatment

of ore until the middle of August. The Boston & Montana company is operating the Leonard, West Colusa and East Colusa mines at somewhat under their full capacity. It is reported that the East Colusa will be closed down a short time for repairs. At the Mountain View mine no ore is being hoisted and only a small amount of development work is being carried on, awaiting the resumption of operations at the Boston & Montana smelter. The Butte & Boston company is operating the Silver Bow, Berkeley, East Greyrock and West Greyrock mines to their normal capacity. In the Speculator shaft of the North Butte company work has been commenced cutting stations on the 2000- and 2200-ft. levels.

Denver

July 17—In the Strong mine, in the Cripple Creek district, a wonderful rich vein of ore has been opened in the bottom, or 1000-ft. level, which still further emphasizes the fact that there is high-grade gold ore to be found at great depths in that camp, and (as in this case) in the granite which surrounds the breccia area.

The competition between the custom mills treating Cripple Creek ores has recently shown signs of abatement, in the announcement by the largest mill using the cyanide process that it would take no more ore from the open market, and thereafter would simply attend to its contracted tonnage. Now the exponents of the chlorination process announce an advance in treatment charges of 25 to 50c. per ton, effective July 20.

The causes given for this increase are three-fold: First, the shipment of ores from the district of too low grade to pay the treatment charges, thus entailing a loss on the mill; second, the chlorination companies' claim to pay for all ores received within 24 hours after sampling; and third, the benefit of the open rates heretofore in force by the chlorination interests were extended to their shippers who had contracted their ores at higher rates, thus entailing a reduction in revenue to the chlorination mills. The old and new rates are as follows:

Ore Value.	Old Rate.	New Rate.
Up to \$8 per ton.....	\$3.50	\$4.00
\$8 to \$10.....	4.50	4.50
¼ to ½ oz.....	5.00	5.25
½ to 1 oz.....	5.50	6.00
1 to 1½ oz.....	6.00	6.50
1½ to 2 oz.....	6.50	7.00
2 to 3 oz.....	7.00	7.50
3 to 5 oz.....	8.00	8.50
	8.50	8.75

Bender & Co., lessees on Stratton's Independence, have opened into good ore in a pillar of ground in the caved area on the third level. They reached this rich ore by sinking from the second level. The strike is an important one. Lessees working on the surface of the same property are taking out rich ore from the surface near the junction of the Independence and Bobtail veins.

During the present month the Portland

G. Mining Company pays the regular quarterly dividend of \$120,000, the Vindicator \$60,000, and Mary McKinney \$13,000, a total of \$193,000.

Indianapolis

July 20—Jonathan Thomas, assistant State mine inspector, has returned from a tour of the Linton, Clinton and Jasonville mines and reports that he has instituted 30 prosecutions against miners and operators for violating the law. Charges were filed against eight coal companies, some of them answering to as many as ten charges. There were several prosecutions for failure to leave clear the 2-ft. space along all entries in mines.

There were also a number of prosecutions of coal companies for permitting more than 50 persons to work in one air current, and also for driving rooms more than 45 ft. from break-throughs. Six miners were arrested and fined for drilling beyond the cutting or loose end. In every instance pleas of guilty were entered, and the defendants promptly paid fines.

It is reported that the bottom has suddenly dropped out of the activity in the Linton coalfield and that indications point to a continuance of dull times in the mines for several weeks. After two weeks of full time the Vandalia mine No. 9 closed, leaving but four of the nine active mines working, while the Shirley Hill Company announces that it will close the entries, 42 in number, at the Little Giant mine. The Summit mine closed the middle of the week, and will continue closed until the new tippie is finished. Of the eight mines in condition to work, none are working over half time, and as a result 2000 men, heads of families, are idle. There promises, however, to be another spurt of activity in a few weeks, and both operators and miners take an optimistic view of the situation.

Suit has been brought in the Sullivan County Circuit Court to test one provision of the mine law enacted by the last legislature. There are ten veins of Indiana coal, according to geologists, and when the legislature, on March 9, 1907, passed a law compelling operators of mines to have a passageway of 2 ft. between mine track rails and the side walls of the mines, the legislature exempted mines operating in the third and fourth veins. The exemption makes the law practically useless, since nearly all the mines in the Sullivan district operate on one or the other of these veins. The law is alleged to be a sort of sop to miners, as it works against them in a majority of cases, while pretending to favor them. The circuit court held the law constitutional and the State mine inspector took an appeal to the supreme court, hoping for a reversal on the ground that such exemption cannot stand and that law must treat all mines alike relative to such provisions for the safety of men working in mines.

Mining News from All Parts of the World

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

THE CURRENT HISTORY OF MINING

Alaska

SOUTHEAST ALASKA

Alaska Mines Securities Company—This company is starting up its mines at Hadley, which have been shut down since last July, owing to the unsettled condition of the copper market. The company has just acquired the Mamie mines adjoining, formerly owned by the Brown Alaska Company, together with the tramways and general equipment. Ore of a high grade has been discovered in the Mamie; the mine is 400 ft. deep.

Arizona

SANTA CRUZ COUNTY

The old mines of the Patagonia mountains were worked mostly by leasers, whose only interest in the properties was the amount of high-grade ore they could take out with the least development work. Most of the work done was at a depth of less than 150 ft., and consisted of following and gouging the richer streaks of ore that run through the veins. Small drifts, narrow stopes and shapeless holes for which a miner would have trouble in finding a name, twist and turn in all directions through the workings. As depth was acquired and the concentrated values decreased with the broadening of the veins, the leasers abandoned the properties, and they have laid idle for years past. To be profitably worked facilities for treating the ore must be at the mines, as the ore in the larger bodies will not pay for hauling to the railroad and shipping to smelters.

Four Metals—The Red Hill tunnel at this mine, in the Mowry district, when in about 440 ft., cut a ledge that was not expected. Fourteen feet of concentrating sulphide copper ore was cut and so far the tunnel is still in ledge matter, about 14 ft. further, that is streaked with ore. The management estimates that the tunnel must yet be driven about 150 feet to cut the ledge that outcrops on the hill.

Red Cloud—The hoist has been put in place at this mine, in the Harshaw district, owned by Dan Hampton and recently bonded to C. H. Ferry, a New York mining man. Sinking will be commenced soon. The Red Cloud is a copper prospect.

YAVAPAI COUNTY

Coronado Mining Company—This company, near Congress, will soon be producing ore and will have its mill in operation.

Del Pasco—This mine, near Crown

King, has been bonded by Eastern parties, who will develop it at once. In the past the Del Pasco has produced a large amount of high-grade ore but has been idle for a number of years.

Monte Cristo—This mine, on Groom creek seven miles south of Prescott, is being operated by Colorado parties under a bond and lease. The old workings are being cleaned and the mine put in shape to produce ore. It is equipped with a 10-stamp mill and concentrators. The shaft is 300 ft. deep and is equipped with a steam hoist.

Octave Mine—A new discovery has been made at this mine, near Congress Junction. By crosscutting in the foot-wall, an entirely unknown vein has been cut on the eighth level; the new ledge is of the same general character as the other known ledges.

Poland Consolidated—This company resumed operations on July 6, after a shut down of three weeks for the purpose of making needed repairs. The production will be increased.

Silver Cord—Two cars of high-grade silver ore was shipped from this mine recently by lessees. The mine is near Turkey and near the railway. Considerable ore is now exposed and production will be kept up. The mine is opened by both tunnels and shafts.

Arkansas

SCOTT COUNTY

John Madill, of Ebensburg, Penn., has purchased 2000 acres of coal lands about 10 miles from Waldron, on the line of the Kansas City Southern railway, partially developed. Plans have been made for the construction of a number of coke ovens.

California

AMADOR COUNTY

South Eureka—At this property, Sutter Creek, W. H. Finchley, superintendent, drifting is in progress on the ore recently struck on the 2600 level, where the vein is 22 ft. wide. The shaft is to be sunk to the 2700 level. There are 65 men on the payroll, and the 20-stamp mill is crushing 95 tons in 24 hours; 20 stamps are to be added to the mill.

CALAVERAS COUNTY

Black Wonder—This mine, nine miles from West Point, after being closed down for a year, has been reopened and a tunnel is being run.

Marlita Mining Company—This company began work a month ago on its property on the northeast slope of Stockton hill, near Mokelumne hill; a bedrock tunnel has been started to reach the old channel. R. P. Williamson is superintendent.

Golden Era Mining Company—This company has bonded the Blue Bell mine near Glencoe from Miss A. J. Palmer, and work is being done on two tunnels and a shaft. A 40-stamp mill is to be erected.

EL DORADO COUNTY

Woodside-Eureka Mining Company—After several years' idleness, work has been resumed at this mine, Georgetown, under the superintendency of W. E. Everson.

Big Cañon—This mine, shut down years ago, and having a very large body of low-grade ore, is being pumped out preparatory to reworking.

INYO COUNTY

Cliff—Arambula and Carrasco are taking very high-grade ore out of this mine at Beveridge.

KERN COUNTY

LaGross—The Deacon Brothers, who have this mine at Johannesburg under bond, have purchased gas engines, compressor, drills, etc., and are to sink a new 1000-ft. shaft.

LOS ANGELES COUNTY

Red Rover & Topeka Consolidated Mining Company—Edward Brough and associates have taken an option on the properties at Acton, and sinking is to be commenced.

San Gabriel Cañon—Numbers of prospectors and miners are now in this section, and some old mines have been reopened of late.

MARIPOSA COUNTY

Stockton Creek—This property has been leased by the Mariposa Commercial and Mining Company to Rowland Brothers, and a mill is contemplated.

MODOC COUNTY

Hoag District—Bassler & Schauer have purchased the Jamison & Laughlin groups in this district. Grigsby & Jamison are erecting a five-stamp custom mill with cyanide plant.

NEVADA COUNTY

Ancho Mining Company—At this prop-

erty, Graniteville, a wide vein carrying gold has been struck in the lowest tunnel. Henry Overman is manager.

PLUMAS COUNTY

Crescent Hill Mines Company—W. E. Oddie has made final payment on the Crescent Hill group near Quincy, and will form a company to work them under the above name. There are three full locations.

Bullfrog Channel—Roedde & Brunk have discovered exceedingly rich gravel in Bullfrog ravine and are taking out many nuggets.

Megowen—L. J. Stratton and W. H. Blalock have leased this property near Mountain House and are sinking a shaft on the ledge.

SAN DIEGO COUNTY

Buckhorn Mining Company—In this property, Duluth district, F. R. McPherson, superintendent, free-milling gold ore has been reached in the tunnel.

Gem Mines—C. J. Moore and R. M. Wilke, of Palo Alto, have bought from J. M. Mack and Jessop & Sons, of Los Angeles, the Victor, Rincon and Mack & Bristol claims at Mesa Grande. The Victor is well known for its production of kunzite and tourmaline. More extensive work will be carried on than heretofore.

SHASTA COUNTY

Dredges—The dredge at Horsetown has been started up again after being altered to the single lift type, and the ladder lengthened. The Dubois suction dredge is steadily running at the mouth of Clear creek. The United States Dredging Company has its suction dredge running on the Sacramento river opposite Redding.

SHASTA COUNTY

Trinity Copper Company—The late shipment of approximately 700 tons of Trinity copper ore, from the bins at Cram, was sold to the Bully Hill smelter by the Balaklala Copper Company, which holds the contract for all of Trinity ores. The ore was sold to the Bully Hill company, as a fluxing mixture for certain rebellious ores and to favor that company, Trinity ore being low in zinc and high in iron percentages. It was not for a test run of Trinity ore, as some papers have stated. The ore was mined in October, 1907. The Balaklala smelter is running.

SIERRA COUNTY

Brush Creek—This old mine near the Mountain House has been bonded to J. W. Morrell and J. W. Rea. The mine at one time, years ago, paid well, but water drove the miners out. The old shaft will be reopened and the mine pumped out.

Parkay Cañon Mining Company—This company, J. M. Shinn, manager, has bonded the extensive Mountaineer mine

property, north of Sierra City, and commenced development work.

SISKIYOU COUNTY

Wild Cat—Fred Beaudry has repaired the ditches leading to this mine near Calahan, and will soon have the mine in running order.

TRINITY COUNTY

Deodwood—A test run on 100 tons of ore from this mine is being made at the Brown Bear mill. At this latter mine, leasers are now doing much of the work, but the company itself is also developing.

TUOLUMNE COUNTY

Riverside—Men are repairing the mill and building a flume preparatory to starting up this mine, 12 miles from Columbia. J. D. Biggs is superintendent.

Greenstone—At this copper mine near Jamestown, owned by D. L. Mann, men have been set at work.

Eagle-Shawmut Mining Company—The new slime plant at this mine, Chinese Camp, erected by P. H. Craven, has been started up.

Parlin Gold Mining Company—This company has bonded from J. E. Conde the Dreisam mines in the East belt. The Dreisam mines have lately been producing largely.

Colorado

LAKE COUNTY—LEADVILLE

Star of the West—Since work was started on the mine, a few months ago, the production has steadily increased in silver, until now it is on a silver basis. Steady shipments will be continued and the scope of operations enlarged.

Dinero Tunnel—As work progresses, a mineralized area under Sugar Loaf mountain becomes more apparent and ore is expected to be encountered any day. Small streaks are encountered frequently.

Penrose—About 25 tons of iron ore are shipped daily. The ore carries some silver.

Tiger—Samples taken recently from the property in Iowa gulch show some gold. This ore was found only in spots and surrounded by waste. The Tiger is a part of the Sunday property.

South Evans—Several properties in the district are making regular shipments. Notable among these is the Louise property.

Alicante—Much interest centers around Wortman, in this district. Most of the product carries enough gold to make the mining pay. The work has thus far been near the surface; some well defined veins have been encountered. Improved machinery will probably be installed on several of the properties.

Idaho

COEUR D'ALENE DISTRICT

Monarch Mining Company—Shipments

at the rate of 200 tons a day are to begin Jan. 1 from this property, on the north side of the district, according to a statement issued by Manager Spalding. More than 30,000 tons of ore have already been developed in the upper workings and above the 600-ft. level. The ore will go to the Pueblo smelter in Colorado. The property is equipped with a 100-ton mill and it is the intention of the company to increase the capacity to 200 tons during the fall.

Spokane Tunnel Mining Company—A 60-ft. lead has been opened up in this property (on Placer creek) at a depth of about 400 ft. The entire ledge is well mineralized and the men are engaged in drifting. A flume is being constructed at present and it is the intention of the company to install a compressor a little later on.

Snowstorm—A statement has been issued by Manager Greenough to the effect that no dividend will be paid this month. The mine has been shipping ore steadily at the rate of from 400 to 500 tons a day and the proceeds of this are said to have been applied toward the paying off of certain debts of the company.

Imperial Mining Company—A crosscut adit 2000 ft. in length will be started from Sawmill gulch and is designed to give a depth of about 1100 ft. on the vein. Some good carbonate ore has already been opened up in the property. It is estimated that the new tunnel will cost in the neighborhood of \$30,000.

Charles Dickens—This property, near Wardner, is treating ore in its new \$25,000 mill at the rate of about 144 tons a day, or 55 tons more than the guaranteed output of the mill. It is the intention of the company to ship the concentrates to a Colorado smelter as soon as the railroad to the property is open.

East Snowstorm—A strong flow of water, which has driven out the miners, has been encountered in the crosscut being run from the main adit to tap a parallel lead. The crosscut was in 240 ft. when work was suspended, and it was thought the footwall of the large copper vein had been encountered. The flow of water is regarded favorably.

Amador—A receiver has been appointed for this property, a charge having been made against the management. The mine has been shut down. There are many stockholders in the Coeur d'Alene who welcome the receivership of P. F. Smith as tending to show the actual conditions at the property.

Indiana

GREENE COUNTY

The coke tests which have been in progress at the Black creek mines for the last few months are now showing favorable results. The first report showed that

there was a 25-per cent. differential between the Linton (Ind.) and Connells-ville coke. Since that time experts have been working to reduce the differential and it has been decreased so much in fact that the promoters are sanguine that within a short time they will be making an excellent grade of coke.

Application has been made in the circuit court of this county for a receiver for the Southern Railroad Company, the principal coal-carrying road of this territory. It is alleged that this is the first time in the history of the State that application for receiver has been made, alleging insolvency, for the purpose of marshalling the assets and income of a company to pay current taxes.

Michigan COPPER

Atlantic—Preparations to resume shaft sinking at section 16 are about completed. This shaft has been bottomed at the 16th level for some time and all work has been confined to opening the ground from the upper levels. It is now planned to sink indefinitely in the hopes of disclosing the Baltic lode in a more settled condition. The formation throughout the entire depth of the shaft has been very fragmentary, with the vein matter showing only intermittently. The most substantial formation encountered has been in the south drift from the 12th level, which shows the lode in a well organized state; this drift is within 150 ft. of the boundary line. All the levels are being opened on the same horizontal plane as the Baltic mine, and will be connected with the levels from the Baltic shaft; this arrangement will benefit the Atlantic materially, as it will afford ample ventilation and a second means of getting from underground.

Ahmeek—Both shafts are being equipped with a telephone system. The telephones will be placed four levels apart and both shafts, together with the several surface buildings, will be connected by means of an intercommunicating switchboard.

Calumet & Hecla—Sinking is going on in all six of the Osceola amygdaloid lode shafts, and from points on the conglomerate lode (which is 750 ft. to the west), crosscuts have been driven to cut the amygdaloid at depth; from the point of intersection raising, in line with the shaft, has been started. No. 13 shaft, which adjoins the Osceola on the north, is equipped with a new duplex hoisting engine and two 7½-ton skips, the shaft house is equipped with three crushers, capable of handling 2000 tons daily, which is the ultimate capacity of each of these shafts. No. 16 is similarly equipped. Nos. 14, 15 and 17 have temporary hoisting plants, but are being opened on the same scale and when necessary, new equipment will be provided. At No. 18 shaft, the newest of the openings and just south

of the Centennial's southern boundary, sinking and drifting are being carried on; some copper is appearing in the formation. At No. 5 Calumet shaft of the main mine, the electrical pumping installation is progressing satisfactorily. This installation, consisting of four multi-stage centrifugal pumps of 1000 gal. per min. capacity will pump the water from the northern portions of the mine, and will be ready for service early in the fall; all water-way connections between the shafts have been completed. The new boiler house at the mills has gone into regular commission. The old plant has been closed down, and will soon be dismantled.

Dacotah Heights—Diamond drill explorations are being carried on about one-half mile west of Houghton, on the Dacotah tract and a good formation has been disclosed by the drill core. A gang of workmen, engaged in digging a sewer within the village limits of Houghton, opened an amygdaloid formation, well charged with copper.

Lake—The shaft is down more than 250 ft. on its way to the second level, which will probably be cut at a depth of 300 ft. Drifting to the south from the first level continues and the formation is practically unchanged.

Ojibway—Work on the concrete collars of both shafts is nearing completion and when completed work on the permanent skipway will be started; concrete will be used throughout for stringers and ties. No. 1 shaft is sinking at a depth of about 250 ft. and No. 2 is about ready to resume sinking below the first level, a distance of 350 ft. from surface. Drifting to the south at this level continues and the drift is breasted in a uniform formation, well charged with copper.

Osceola—At No. 6 shaft of the Osceola mine a new 6-ton skip has gone into commission; the adoption of this large skip necessitated the installing of a larger hoisting drum and a general strengthening of the surface equipment. The shaft was closed down one week to make these changes. No. 5 shaft is using a 5-ton skip, due to the size of shaft. These two shafts are in fine condition and record shipments are being made daily to the mills.

Missouri

ZINC-LEAD DISTRICT

All Jack Mining Company—This company has been incorporated by O. E. Marshall, H. H. McNeal and F. M. Sharp, of Joplin. It will operate a lease south of the Conqueror mine at Chitwood. A shaft on the lease is already in ore and a mill has been completed.

Chapman & Lennan—This company has been incorporated by G. Y. Chapman, Temple Chapman, and T. F. Lennan, all of Webb City, with \$100,000 capital.

Herald—This company has closed down its mill near Carthage, while its inclined

shaft is sunk about 100 ft. further to the bottom of the orebody. The shaft at present is down 374 ft. on a 45-deg. incline, and drifting is done on top of the orebody.

I Know Lease—There are now four producing mines on this lease on the Taylor land, near Joplin. The lease is owned by C. M. Sheldon.

Jenkins & Co.—This company has taken a 15-acre lease on the Ground Floor tract north of Webb City, and will sink a shaft to find the orebody developed in the old Chicago mine.

McCullagh & Murdock—This company has succeeded in draining the upper levels of its mine at Cave Springs.

Mattes Brothers—This company is sinking a second shaft to the sheet ore on its Jackson tract, southwest of Joplin.

Mikado—This company, which is working sheet ground west of Joplin has built a long tramway from the shaft to its mill, and has increased the capacity of the mill from 150 to 250 tons daily.

Ontario Lease—Ore has been struck at 204 ft. depth on this lease south of Webb City.

Norton Land—On this land, near Joplin, the Helen Mining Company has made a good strike at 135 ft. It is between the Nortonia and the Lucky Jim leases, and is managed by A. J. Baker, of Joplin.

Symmes—This 40-acre lease on the Riseling land, west of Joplin, is being rapidly developed. A 250-ton mill is being built and the ground has been prospected by 25 drill holes. Sheet ore is found at 170 ft., and the mill shaft shows an orebody 18 ft. thick.

Tussing—Hardy & Co. have reopened this old mine near Belleville, and are now producing ore.

Waddell—This company has just completed its 100-ton mill, northwest of Carthage.

United Zinc Company—James Galbreath and associates have made a good jack strike at 60 ft. on this land at Aurora.

Montana

JEFFERSON COUNTY

Elkhorn Electro-Metal Company—This company was recently incorporated for the purpose of erecting and operating an electrolytic plant at the Elkhorn mine at Elkhorn. The proposed plant, with a capacity of 100 tons daily, will use the Baker-Burwell process for the treatment of tailings. As there are now about 125,000 tons of tailings at the mine, and as the present concentrator on the property is operating to the extent of two-thirds its capacity, it is estimated that there will be sufficient tailings to keep the new plant operating for several years. A test plant was erected at the mine some months ago and the runs made indicate that a profit of \$2.50 per ton will be realized. The management states that the new plant will be

completed and ready for work within 60 days. The operations of the plant will be watched with much interest inasmuch as the process is an entirely new one in this country.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Ore Production—Shipments for the week ended July 9 were 2760 tons, as follows: Western Ore Purchasing Company from Rogers Syndicate, 548 tons; Engineers' lease, 345; Eisen, 24; Van Riper, 87; Mohawk Combination, 22; total, 1026 tons. Nevada Goldfield Reduction Company, from Victor, 51 tons; Sandstorm, 54; Little Florence, 70; Jumbo, 55; Commonwealth, 65; Florence-Mohawk, 15; Curtis-Mohawk, 105; Combination Fraction, 40; Lime Point, 20; Hayes-Curtis, 40; Black Butte, 6; Mohawk, 50; Bullfrog, 2; American mill tailings, 25; total, 598 tons. The Combination mill worked 560 tons.

Griffiths-Moore-Stoncham Lease—This lease on blocks 2 and 3 of the Combination No. 2 claim has encountered a vein on the 200-ft. level, which across the entire breast assays \$12.80. The conditions are such that the management confidently expects to get shipping ore with a little more development work.

Mitchell Fairfield Mining and Leasing Company—Contractors on this lease on the Combination No. 3 ground have just completed 151 ft. of a double compartment shaft, timbered with 8x8 timbers in 20 days, which is about the record for Goldfield.

Great Bend—The new vertical shaft has attained a depth of 90 ft., and is going down at the rate of 5½ ft. per day.

White Rock—Sinking has been resumed in the No. 7 shaft and the No. 5 shaft is being pumped out preparatory to sinking.

ESMERALDA COUNTY—RED MOUNTAIN

This district, which is on the eastern edge of the Goldfield district about eight miles from town, is showing no little activity and encouragement. On the Butte Boys property a shaft has been sunk to a depth of 331 ft. and considerable cross-cutting has been done exposing large quantities of milling ore and some stringers which assay high.

The Blackbird company has had a diamond drill prospecting outfit at work for some time and at one point has encountered at a depth of 300 ft. a quartz ledge carrying rich ore. A hoisting plant will be installed and a deep shaft will be sunk.

HUMBOLDT COUNTY—PACKARD

Packard Mining and Milling Company—This company has purchased the Winope group of claims from Geo. D. Whipple, of Goldfield, and is excavating on the

millsite preparatory to installing a mill and hoist.

LYON COUNTY—YERINGTON

The Truckee River General Electric Company has brought its transmission lines into this district, and all the operating mines are now equipped with electric power. There are five copper claims under development.

NYE COUNTY—TONOPAH

Ore Shipments—Ore shipments for the week ended July 9 were all to the mills and were light on account of the holiday. The shipments were from the Tonopah Company, 2950 tons; Belmont, 450; Montana-Tonopah, 1000; North Star, 80; Midway, 100; McNamara, 150; West End, 45; total 4775 tons.

NYE COUNTY—BULLFROG

Homestake—This company's new mill has started up and is now crushing ore. The mill has 25 stamps. The mill building is of steel.

Shoshone—It is reported that the Shoshone mill is to be enlarged in order to treat the ore from Schwab's Tonopah Extension mine at Tonopah.

Campbell Mill—The Campbell-Smith custom mill at Beatty has the foundations completed and the building about all framed. The machinery will consist of 10 stamps, amalgamation, concentration, and cyanide equipment.

NYE COUNTY—MANHATTAN

Black Jack—Work has been started on the Bittroff lease on the 220-ft. level.

Lemon Mill—The machinery is being overhauled in preparation for starting up the 10 stamps and cyanide plant.

Manhattan Consolidated—The shaft has been unwatered and miners have been stopping to fill the contract made to supply 1500 tons of ore to the Peterson mill.

NYE COUNTY—WONDER

Keane Wonder—The second clean-up for the month has been made by the Keane Wonder mill, the brick being worth \$6500, making the month's production \$15,500.

NYE COUNTY—ROUND MOUNTAIN

Solid Gold Lease—This lease on the Daisy has been successfully financed. A mill has been ordered and ground for it has been broken. The mill will have six Merrall quadruple discharge stamps with a guaranteed capacity of 50 tons per day.

Round Mountain Reduction Company—The mill of this company is treating 25 to 30 tons of ore per day so successfully that it is expected that at the approaching meeting of the directors in Denver the necessary steps will be taken for doubling the capacity.

Fairview—The old mill of this company will be taken down and moved to the mine

and its capacity doubled. It will treat the \$12 rock, 2000 tons of which are on the dump.

Oregon

BAKER COUNTY

Angelo—At this mine, in Cable Cove district, three adits are being run, and have opened up a promising orebody. Work is being continued. George M. Diehm is in charge of the work.

Black Jack—Preparations are being made to reopen this mine, near Sumpter. James Manahan, of St. Paul, Minn., is the principal owner.

Present Need—A considerable tonnage of ore has been taken out of this mine, near Prairie City, and a mill test of the ore is to be made. Reese & Williams are lessees.

LANE COUNTY

Riverside—Work has been going on at this mine in the Bohemia district, and ore shipments will begin soon. F. J. Hard is manager.

West Coast—On this company's claims No. 2 adit is now in 400 ft., and work is being pushed under direction of L. D. Ryan, manager. At the recent annual meeting in Portland the following directors were chosen: C. H. Thompson, Portland, Oregon; Charles S. Collins, Nashua, N. H.; Jesse Hatfield, North Adams, Mass.; John W. Wheeler, Orange, Mass.; James E. Pratt, Southington, Conn.; Herbert E. Smith, New Haven, Conn.; C. B. Osgood, New York.

Pennsylvania

ANTHRACITE COAL

Susquehanna Coal Company—An explosion occurred July 15 in No. 1 shaft of this company's Williamstown colliery, by which 7 men were killed and 10 badly injured. It is reported that it was caused by a miner lifting the gauze of his safety lamp just after the explosion of a shot which brought down a large quantity of coal, and also liberated much gas. The timbering and shaft were damaged, and part of the works set on fire. The colliery is near the lower, or southwestern end of the anthracite field. It has always been considered a fiery mine. The district inspectors have begun an inquiry into the cause.

BITUMINOUS COAL

George D. Howell, of Uniontown, Penn., recently completed the purchase of 200 acres of coal land, known as the English property, in Jefferson township, Fayette county, 3 miles from Brownsville. The sale was negotiated by John W. Boileau, Pittsburg, at \$1500 an acre, the highest price ever paid for coal in that vicinity. The property contains the largest body of coking coal in the Redstone district. It lies close to the Redstone branch of the

Pennsylvania railroad and near the Pittsburgh & Lake Erie road, beyond the Alice and Albany mines. An 8-ft. vein lies about 100 ft. below the surface. It is understood that the property will be turned over to the Monongahela River Consolidated Coal and Coke Company.

Pennwood Coal Company—This company has increased its capital stock to \$1,000,000 and has authorized an issue of \$1,000,000 bonds. The company recently bought a tract of 3900 acres of coal land in Somerset county, making its total holdings 5176 acres. The land is on the Pittsburgh division of the Baltimore & Ohio, and the company has mines opened at Rockwood and Garrett. Hugh L. Kirby, Harpers Ferry, W. Va., is president of the company.

South Dakota

LAWRENCE COUNTY

Oro Fino—The Golden Reward announces that this property will resume at once. It is one of the high-grade smelting properties of the early days. Ore will now be shipped to the Denver smelter.

Puritan—The dissenting factions have reached an agreement to sell stock, give the bondholders stock for their bonds and operate the property in Strawberry gulch. There is \$100,000 in bonds outstanding.

Victoria—Work has been resumed under John Simm, and if the development is as anticipated, the 200-ton cyanide mill will be soon in commission.

PENNINGTON COUNTY

Lucky Strike—The annual meeting of this company resulted in the election of the following officers: President, Henry Sorge, Reedsburg, Wis.; vice-president, E. M. Cassady, Whiting, Ia.; secretary, Lee Swift, Tracey, Mont.; treasurer, H. F. Seiter; superintendent, Frank Allen; manager, C. A. Allen all three of Deadwood. It was decided to sink the shaft 200 ft. further.

Utah

JUAB COUNTY

Taylor & Brunton Sampling Company—This company has decided to erect a 600-ton plant in the Tintic district.

MILLARD COUNTY

Ibcx—This property, owned by a syndicate of Salt Lake and Los Angeles men, has recently been equipped with a large new hoisting plant. The shaft, now 300 ft. deep, is to be sunk to 1000 ft. depth. The company owns about 1000 acres of land.

SALT LAKE COUNTY

Yampa—A three-compartment shaft is being sunk at this mine in Bingham which is to be continued to at least the 2000-ft. level below the tunnel, which means 3200

ft. below the surface. The Yampa sulphide orebodies are among the largest in Bingham. The gold in the ore is sufficient to a little more than pay mining costs. The smeltery is treating 800 tons of ore per day. The new converter plant will be ready for commission August 1.

Flagstaff—This company, operating at Alta, is conducting a vigorous development campaign. Energy is being devoted mainly to driving on the Allegan fissure toward the Flagstaff where the former owners of the property found their principal resources on the upper levels in the early days of the camp.

SUMMIT COUNTY

Daly West—This company is producing again and has more than 100 men back on the pay-roll. The mine is to be developed at depth from a drift from the Ontario drain tunnel adit.

Virginia

Oriskany Ore and Iron Corporation—This company, which was chartered recently, is composed exclusively of Virginia interests, which have leased for three years the properties of the Alleghany Ore and Iron Company. The blast furnaces covered by this lease are at Iron Gate, Buena Vista and Shenandoah. The company's ores come from its Oriskany steam-shovel mines and its Reidton and Dixie mines at Vesuvius. R. L. Parrish, Covington, Va., is president; W. W. Taylor, vice-president and general manager; B. T. McPeak, Covington, Va., secretary. The operating force is the outgrowth of the Alleghany Ore and Iron Company, W. W. Taylor having been general superintendent of that company since its incorporation. John W. Stull, who has been in charge of the Oriskany mines, is still superintendent, and O. M. Stull, formerly superintendent of the Buena Vista Furnace, is now superintendent of the Iron Gate stack, which has started up after having been banked for two months.

Washington

FERRY COUNTY

Republic—The first carload of ore from this old mine has been shipped. The mine has been under development for several months by Richard Mulroy, who leased it from Ferry county, which came into possession of the mine for delinquent taxes amounting to about \$40,000, several years ago. Formerly it was the largest mine in the district, and was the scene of much activity when an enormous reduction plant was installed. Mr. Mulroy is working a small, rich pocket in the mine. The ore is gold in silica.

West Virginia

RALEIGH COUNTY

New River Coal and Coke Company—This new company will develop 3000 acres

of New River coal land on the line of the Virginian railway. The Chesapeake & Ohio Railway will also have a branch line on the property. Officers of the New River company are: W. P. Tams, Jr., Macdonald, W. Va., president; James O. Watts, Lynchburg, Va., secretary-treasurer.

WEBSTER COUNTY

Wainville Coal and Coke Company—This company has been organized with headquarters at Martinsburg, W. Va., with the following officers: President, Alexander Parks; secretary, P. R. Harrison; treasurer, S. N. Myers. The company is said to own 3000 acres of coal land on the Baltimore & Ohio Railroad. It is stated that mining operations will begin Sept. 1, with an output of about 100 tons of coal per day.

Wisconsin

ZINC-LEAD DISTRICT

United States Zinc Corporation—Recent improvements made at this company's mills and mines include, besides the mill, a deep well and reservoir and a tramway 1200 ft. long from the mill to the Chicago & Northwestern road.

The concentrating plant consists of crusher, rolls, jigs, revolving screens, centrifugal pump, and is capable of treating 20 tons of mine dirt an hour. The power plant comprises one 250-h.p. hoiler, and two 125-h.p. boilers. The drilling is done by Ingersoll-Sergeant compressor. There is a 100-h.p. mill engine, complete electric-light plant and a pumping plant consisting of one 10x6x10-in. Gardner duplex pump and two Camerons, any one of which is capable, under normal conditions, of handling the entire flow of water.

The company informs us that this mine has been producing an average of about 40 tons per day of raw concentrates, working 40 men single shift, or nine hours per day. For the week ended June 20 the production was 237 tons, which beats the record for the Wisconsin field. All ore taken from the mine is handled automatically until it is loaded in the cars on the tracks of the Chicago & Northwestern Railroad. No teams are used on the premises. After the new roasting and separating plant is completed, it is the intention to work double shift, which will mean a greatly increased output.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending July 11 were as follows: Cobalt Lake, 95,228 lb.; Kerr Lake, 60,674; La Rose, 83,100; Nipissing, 127,007; Nancy Helen, 187,007; O'Brien, 191,307; Peterson Lake, 41,237; Silver Queen, 180,000; total, 965,560 pounds.

Cobalt-Lake—A statement covering the first six months of the year has been

issued, showing that 1222 ft. of drifting, 160 ft. of sinking and 30 ft. of raising has been done, making a total of 1412 ft. No more sinking will be done at present, efforts being directed to drifting at three points under the lake.

Chambers-Fernald—Development is being systematically carried on by W. H. Jeffrey. Shaft No. 2, sunk on the O'Brien vein, which runs across the property into the LaRose, is down more than 90 ft. Drifts will be run along the vein and a crosscut made to the north. Shaft No. 1 is being put down on vein No. 4 between the La Rose and Nipissing and crosscuts will be run when the 100-ft. level is reached. Shaft No. 3 is being sunk on vein No. 7 close to the La Rose.

Little Nipissing—Nothing of value has been encountered on the property owned by this company, but the drifting is being continued. On the Peterson Lake vein, leased by the Little Nipissing, the shaft is down 100 ft. At about 80 ft. the vein left the shaft and crosscutting has been started to reach it.

Nipissing—Another rich find is reported consisting of a calcite and silver vein with an average width of 10 in. and carrying several thousand ounces of silver to the ton. It was struck at 80 ft. on territory opened up this summer lying north of Cobalt. Two or three miles of trending have been done on this location which led to the discovery of several veins.

Silver Leaf—Over \$200,000 was realized from the last two carloads of ore shipped from this mine. The new shaft is down 170 ft., at which point the vein, encountered at 125 ft., shows a width of about 4 in. and carries 500 oz. to the ton. A station has been cut at the 125-ft. level from which point drifting will be started on the main vein.

ONTARIO—MONTREAL RIVER DISTRICT

Cragg Location—A vein 3 in. wide and heavily shot with native silver has been found on this property in Smythe township, and has been stripped for more than 200 ft. Test pits are being sunk.

ONTARIO—SILVER CENTER DISTRICT

Grover & Smith—A large slab of native silver and a rich nugget weighing more than 200 lb. have been taken from this property in Lorraine township.

ONTARIO—DRYDEN DISTRICT

Hutchison Location—A shaft has been put down 10 ft. on this property at Lake Flambeau and good ore is in sight. Camp buildings will be erected and development will be pushed.

Warner Location—This property has been purchased by John Morton, of Port Arthur, Ont., on behalf of a syndicate which will begin operations immediately.

Mexico

CHIHUAHUA

Sau Toy—This company is now shipping from its Santa Eulalia mines about 150 tons of lead ore daily. General manager Donald B. Gillies lately returned from an extended trip to Tonopah and other points in the States.

Otates—Captain Richard Harper and associates, of Los Angeles, Cal., recently spent several days in Chihuahua, en route to Otates where they have started work at a number of old mines.

Socorro—A 100-ton cyanide plant is being installed at this property in the Ocampo district. Col. J. H. Pender is the manager in charge.

Republica—The May output of this company consisted of about 20,000 oz. of bullion and 45 tons of high-grade concentrates, and the monthly product henceforth is estimated at \$60,000. With the proposed enlargement of the concentrating and cyanide plants this figure will probably be doubled within six months. J. W. Malcolmson, the company's general manager, accompanied by several El Paso stockholders, returned from an inspection trip to the property last week.

American Smelting and Refining Company—It is likely that the blowing-in of the new plant near Chihuahua may be deferred, on account of the scarcity of water in the Chuisacar river, from which stream the plant's supply is secured. In the meantime, a stock of ore is being accumulated, a tonnage coming from several tributary camps in this State. The two roasters were put in commission last week, and it is stated that additional roasting facilities may be necessary for the increasing supply of sulphides.

Pinos Altos—W. P. Dunham, of Los Angeles, has begun work at several mines belonging to the Pinos Altos Mines Company in the Ocampo section. E. H. Barton is to direct operations.

Bullion Shipments—The Banco Minero, of Chihuahua reports the following bullion shipments for the week ending June 27: Dolores Mines Company, 70 bars of a value of 151,000 pesos, and Lluvia de Oro, 6 bars of a value of 13,000 pesos.

Santo Domingo Placers—It is reported that J. R. Roslyn and associates are to install several dredges at these locations along the Boquilla river, in the vicinity of Falomir station on the Orient road east of Chihuahua.

Yoquiva—A recent 20-ton shipment from this property, situated in the Rayon district, brought \$17,000 and other high-grade lots are being prepared. The chief metal contents are gold and silver. J. H. & Chas. Qualey are the operators.

La Reina—A recent shipment from this mine, belonging to the Compañia Metalurgica de Torreon, a carload of high-grade silver ore, netted about 9000 pesos. Preparations are being made for starting the amalgamation plant.

arations are being made for starting the amalgamation plant.

Refugio—This property in the Minas Nuevas district is being unwatered, preparatory to the resumption of ore extraction. Juan R. Carey is the new superintendent in charge. McQuatters and Sheppard are the leasing operators.

Sau Pedro—Announcement is made that this company is to resume operations at its mines in the northern part of the State. The properties are developed to a depth of 400 ft. and have produced considerable high-grade gold ore.

Parral Production—The production of the camp for the week ending July 4 amounted to 8125 tons, of which 3815 tons were shipped to outside smelters and the balance treated at local milling plants. The June output was 34,525 tons.

GUANAJUATA

Production—During the last week of June, the office of the Dwight Furness Company shipped concentrates and ore to the amount of \$53,000, which, together with the shipments of others, amounted to over \$67,500. The bullion shipments reached the high mark of \$153,900, which is the highest since silver took a drop. The first week in July showed ores and concentrates shipped through the Dwight Furness Company amounting to over \$100,000, an increase of \$47,000 over the previous week. The bullion shipments amounted to \$156,000, a slight increase, and was divided between Mexico City and Aguascalientes.

SONORA

Cananea Consolidated—The great smelting plant at Cananea resumed operations on the morning of July 11. The new feeding arrangements and the various other improvements, were brought into use without a hitch.

Europe
GREECE

The magnesite deposits of Euboea are being actively worked, and several new deposits have lately been opened. The exports, which were 22,747 metric tons in 1905, increased to 32,134 tons in 1906, and 36,520 tons in 1907. The contracts of the Anglo-Greek Magnesite Company call for deliveries of 42,000 tons this year.

Asia

A British consular report states that the production of the three mines worked in the Keelung district of North Formosa in 1907 was as follows:

	Gold, Oz.	Silver, Oz.	Copper, Tons.
Botanko.....	14,617	3,758	.....
Kinkwaseki.....	15,995	9,259	..... 40
Zuiho.....	11,693	6,151	.....
Total.....	42,310	19,168	..... 40

Metal, Mineral, Coal and Stock Markets

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

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, July 22—The coal trade in the West shows no change, having been almost stationary during the week. The slow improvement reported recently seems to make little progress; but there has been no recession. There has been, perhaps, too much disposition to ship coal to consuming centers, the result being sales at low prices to avoid demurrage charges.

In the East the bituminous trade continues dull, with little prospect of a revival before fall. Anthracite trade is also quiet and without change. The Seaboard trade has been very light. The upper Lake ports are receiving some shipments, but there is still a large accumulation of coal at lower Lake ports awaiting the arrival of normal iron-ore shipments.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to July 11, in short tons:

	1907.	1908.	Changes.
Anthracite.....	2,995,230	2,799,960	D. 195,270
Bituminous.....	20,066,018	16,876,940	D. 3,189,078
Coke.....	7,483,150	3,540,028	D. 3,943,122
Total.....	30,544,448	23,216,928	D. 7,327,520

The total decrease this year to date was 24 per cent.

New York

ANTHRACITE

July 22—There is no change in the hard-coal market except that No. 1 buckwheat is shorter and the demand and supply are now about equal. Prepared sizes and the other small steam coal are in abundant supply. Independent dealers continue to cut circular prices for all sizes. Prices quoted by the principal producers are as follows: Broken, \$4.55 egg, stove and chestnut, \$4.80; pea \$3.25@3.50; buckwheat No. 1, \$2.35@2.50; buckwheat No. 2 or rice, \$1.60@2; barley, \$1.35@1.50; all f.o.b. New York harbor.

BITUMINOUS

There is no change in the general situation except that in certain quarters there is a little better demand. This refers more especially to points around Cape Cod. In New York harbor the demand has not improved and good grades of steam coal are offered at \$2.40@2.50 per ton with few takers.

Transportation from mines to tide is good. In the Coastwise vessel trade there is practically no demand and boats are unsuccessfully seeking business. Freight

rates are at the lowest point in years and large vessels can get no more than 50c. per ton from Philadelphia to points around the Cape; small craft can get 60 @70c. to these points but there is not enough business to supply the number of vessels seeking charters.

Birmingham

July 20—The coal production in Alabama has been materially decreased by the union miners' strike. Although the mines are being kept in operation by the furnace operators and by a few commercial coal companies, at the majority of the places there has been a serious falling off in the output. A number of disturbances occurred and it became necessary to call on the governor for the troops to protect property and the lives of the men who wanted to continue at work. The coke production, as a consequence of the reduction in coal output, shows some decrease.

There is but little demand for coal, and there have been no changes in coal prices recently. The operators reiterate their intention of operating their mines on the open-shop plan, but six of the smaller commercial companies have signed the union wage scale and have mines in full operation.

Chicago

July 21—The coal market continues weak generally, except in the harvesting trade which is improving steadily. Good grades of coal are in demand for this trade, and are as high this year as ever. Eastern coals get some benefit from this increase, as does also Western lump.

Hocking Valley, heretofore off as much as 25c. from circular prices, is now close to circular (\$3.15). Smokeless, selling at a similar discount, is stronger, run-of-mine bringing \$3@3.30. Youghiogeny is moving chiefly on contracts at \$3.15 for 3/4-inch.

Illinois and Indiana coals are stronger in lump; screenings continue strong and lump is weak locally. Lump brings \$1.75 @2.25, run-of-mine \$1.60@1.75 and screenings \$1.45@1.65. Brazil block is stationary at \$2.25@2.35.

Anthracite is very quiet.

Pittsburg

July 21—The operation of the railroad coal mines in the Pittsburg district shows a decline. At the opening of the week not more than 75 per cent. of the mines were

in operation and they are not running full time. A large coal producer declared today that not more than 50 per cent. of the normal output is being produced. Nearly all the tonnage mined is going to the Lake ports for the Northwestern markets. Ohio and West Virginia interests have captured more of this trade than usual. Prices remain at \$1.15 per ton on contract for mine-run coal at the mines. The river coal mines are still operating to nearly their capacity, but production is being decreased owing to the large stocks that have accumulated. There are no immediate prospects of a raise in the rivers, but when they are again navigable shipments will be unusually large.

Connellsville Coke—There is but little change in the coke situation. The H. C. Frick Coke Company is increasing its capacity each week as the Steel corporation is putting more furnaces in blast. Independent interests, however, are operating their plants about the same. No change in prices is noted, furnace coke still being quoted at \$1.65@1.75 and foundry at \$2.10@2.25 at ovens. For prompt shipment these prices may be shaded a trifle. The Courier in its summary for the week gives the production in both of the Connellsville fields at 174,720 tons. The shipments were 6084 cars as follows: To Pittsburg, 2283; to points west of Connellsville, 3270; to points east of Connellsville, 531 cars.

Sault Ste. Marie Canal

The movement through the Sault canals in June continued light. The total freight reported for the season to July 1 was, in net tons:

	1907.	1908.	Changes.
East-bound.....	13,649,105	3,937,509	D. 9,711,596
West-bound.....	4,139,214	2,064,816	D. 2,074,398
Total.....	17,788,319	6,002,325	D. 11,785,994

The total decrease was 66.2 per cent. The number of vessel passages this year was 3295, showing an average cargo of 1822 tons. This is a small figure, and it is evident that few of the larger vessels have been in commission yet. The mineral freights included in the total were as follows, in short tons except salt, which is in barrels:

	1907.	1908.	Changes.
Coal.....	3,741,512	1,761,875	D. 1,979,637
Iron ore.....	11,840,412	2,733,430	D. 9,106,982
Pig and manuf. iron	102,618	86,966	D. 15,652
Copper.....	22,100	27,484	I. 5,384
Salt, in bbl.....	157,085	199,915	I. 42,830

Iron ore was 45.5 and coal 29.4 per cent. of the total freight in 1908; against 66.5 and 21.1 per cent., respectively, last year.

Foreign Coal Trade

British Coal Exports—Exports of fuel from Great Britain, six months ended June 30, long tons; with coal furnished to steamships in foreign trade:

The larger exports of coal this year

	1907.	1908.	Changes.
Coal.....	29,675,774	30,024,552	I. 348,778
Coke.....	416,737	494,900	I. 78,163
Briquets.....	709,702	756,557	I. 46,855
Total exports.....	30,802,213	31,276,009	I. 473,796
Steamer coal.....	9,102,823	9,440,660	I. 337,837
Total.....	39,905,036	40,716,669	I. 811,633

The larger exports of coal this year were 5,318,643 tons to France, 4,609,271 to Germany, 4,179,629 to Italy and 1,745,113 tons to Sweden.

Belgian Coal Trade—Imports and exports of fuel in Belgium, five months ended May 31, metric tons:

Imports:			
	1907.	1908.	Changes.
Coal.....	2,174,546	2,153,984	D. 20,562
Coke.....	152,853	139,519	D. 13,334
Briquets.....	66,508	82,776	I. 16,268
Exports:			
Coal.....	1,799,059	1,838,147	I. 39,088
Coke.....	340,972	345,762	I. 4,790
Briquets.....	176,429	176,982	I. 553

Imports are chiefly from Germany; exports are largely to France and Holland. Changes were small.

German Coal Production—Coal production of Germany, five months ended May 31, metric tons:

	1907.	1908.	Changes.
Coal.....	58,113,174	61,516,204	I. 3,403,030
Brown coal.....	24,691,647	27,003,501	I. 2,311,854
Total mined.....	82,804,821	88,519,705	I. 5,714,884
Coke made.....	8,824,207	8,938,212	I. 114,005
Briquets made.....	6,385,634	7,355,237	I. 969,603

Of the briquets made this year 5,699,578 tons were from brown coal, or lignite.

Welsh Coal Trade—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices at Welsh ports as follows, under date of July 4: Best Welsh steam, \$3.90; seconds, \$3.66; thirds, \$3.54; dry coals, \$3.84; best Monmouthshire, \$3.36; seconds, \$3.30; best small steam, \$2.28; seconds, \$2.10. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, July 22—Some sales of pig iron are reported, but chiefly in small quantities. There are still reports of offers at lower prices, but it is not easy to verify them. Southern iron is reported sold at 25 to 50c. below the price recently quoted of \$12 Birmingham, for No. 2 foundry. There have been some sales of basic iron, chiefly to seaboard and eastern points.

Finished material is generally quiet. The only activity reported is in structural steel, and that is chiefly in inquiries and negotiations. Bridge work is scarce, but there are a number of building projects which will probably materialize, if the price question can be settled.

As a result of the signing of the Amalgamated association bar-iron scale by the Republic Iron and Steel Company all the mills in the Sharon, Penn., district have resumed operation affording employment to about 5000 men.

Iron Ore Movement—Exports and imports of iron ore in the United States for the five months ended May 31 are reported as follows, in long tons:

	1907.	1908.	Changes.
Exports.....	14,040	38,281	I. 24,241
Imports.....	38,767	308,753	D. 230,014

Imports of manganese ore for the five months were 74,646 tons in 1907, and 91,401 in 1908; an increase of 16,755 tons.

Baltimore

July 20—Exports for the week included 878 short tons of copper in ingots, cakes and plates to Hamburg and 25 tons to London. There was also exported 216 lb. of selenium to London. The imports included 765 tons of ferromanganese from Liverpool.

Birmingham

July 20—Manufacturers are holding pig iron at \$12@12.50 per ton, No. 2 foundry. It was reported recently that some iron was being sold in this district under \$12 per ton, but the report was not substantiated. One or two good-sized sales were made recently, but the principal business is in small lots and for immediate delivery. The orders booked during June are being delivered easily. The production in this district has been improved a little by the blowing in of another furnace at Woodward by the Woodward Iron Company. An accident caused one of the furnaces of the Sloss-Sheffield Steel and Iron Company to close down for several days last week. There is some apprehension that the coal miners' strike may affect the iron production. Arrangements have been made for a supply of coal and coke, if necessary, to be shipped in from West Virginia.

The production at the steel plant is holding up well, although there is need for a greater production of certain shapes. The rolling mills of the Tennessee company at Bessemer were closed down for a couple of days because of a short supply of steel. Steel rails are still being shipped out as rapidly as they are produced. More labor is being put to work in this plant. There is no change in conditions at the cast-iron and soil-pipe works in this district, all being active. Foundries and machine shops are still without any appreciable amount of business, but there is hope of an early improvement in the trade.

Chicago

July 21—Business generally has not recovered from the great depression of last autumn. Buying of pig iron is in small lots, and contract requirements are, in

general, ignored and carload lots, up to 500 tons for delivery in 30 to 90 days, rule.

Prices for both Southern and Northern are weaker. No. 2 Southern sells at \$11.50 Birmingham (\$15.85, Chicago) and No. 2 Northern at \$16.75@17.25. Lake Superior charcoal is quiet at \$20@20.50.

For iron and steel products the market is chronically dull. Railroad materials and structural materials show a little life and bars are comparatively strong.

Coke is dull and inquiries for good-sized contracts have nearly disappeared. The best Connellsville coke sells for \$4.90 and West Virginia cokes fetch \$4.15.

Pittsburg

July 21—A decided improvement is noted this week in the iron and steel industry, due partly to the three-weeks' idleness of a number of plants which are now at work on accumulated orders. The general opinion, however, is that there will be no falling off and that the improvement will continue until normal conditions are restored, probably about the beginning of the fourth quarter. The steel plant and the Brown-Bonnell works at Youngstown started up full yesterday; the Valley works, also at Youngstown, and the other plants in the West are scheduled to begin work during the week. The Youngstown Sheet and Tube Company also put its plants on full schedule yesterday. The Carnegie Steel Company has added to its capacity and so has the National Tube Company. Production has been increased at most of the active mills in the Pittsburg district. Last week the American Sheet and Tin Plate Company was forced to close 55 of its tin-plate mills because the hot mills had got ahead of the finishing mills. This does not mean a decline in production as the hot mills had been breaking records. This week all of the idle mills except eight at the National works were put in operation again and the company is operating about 90 per cent. of its capacity. It is running 86, or 47 per cent. of its sheet mills. The independent sheet and tin-plate mills are in satisfactory operation and the outlook is encouraging.

Pig Iron—In addition to a good healthy inquiry for pig iron two important transactions have been closed. One is for 10,000 tons of chill-cast bessemer for deliveries extending through August, September and October. It was bought by a Pittsburg steel interest and will come from a Valley furnace. The price was \$16.90 delivered. The other sale was 8000 tons of basic iron for August delivery, the purchaser being the Pittsburg Steel Company which will start four of its eight new open-hearth furnaces next month at its wire plant at Monessen, near Pittsburg. The United Steel Company, Canton, O., was in the market for 2500 tons of basic iron for delivery over the next three months but it has withdrawn and it is understood the company will buy elsewhere. Several

sales of small lots of different grades are recorded and some good sales are in sight. Prices remain about as follows: Standard bessemer, \$15.75@16; basic, malleable bessemer and No. 2 foundry, \$15@15.25; gray forge, \$14 all at Valley furnaces.

Steel—Conditions remain unchanged. Besemer and open-hearth billets are quoted at \$25 and sheet bars at \$27.50, Pittsburg. Steel bars are firm at 1.40c. and plates at 1.60c. Pittsburg.

Sheets—The steel market is a little stronger, but no large orders are being booked. Prices are the same, black sheets being quoted at 2.50c. and galvanized at 3.55c. for No. 28 gage.

Ferromanganese—Prices continue strong at \$46@47 for prompt delivery.

Foreign Iron Trade

British Iron-ore Imports—Imports of iron ore in Great Britain for the half-year ended June 30 were 3,899,893 long tons in 1907, and 2,926,012 in 1908; a decrease of 973,881 tons. Of the imports this year 2,171,937 tons were from Spain.

German Iron Production—The German Iron and Steel Union reports pig iron production in May at 1,010,917 metric tons, being 31,051 tons more than in April. For the five months ended May 31 the total pig-iron produced in Germany was, in metric tons:

	1907.	1908.	Changes.
Foundry iron	905,274	955,328	I. 50,054
Forge iron	334,559	292,706	D. 41,853
Steel pig	421,198	426,329	I. 5,131
Bessemer pig	200,838	181,746	D. 19,092
Thomas pig	3,449,748	3,237,187	D. 212,561
Total	5,311,617	5,093,296	D. 218,321

The only gains were in foundry iron and in steel pig, which includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys. The largest decrease was in Thomas, or basic, pig. The total loss was 4.1 per cent.

German Foreign Trade—Imports and exports of iron and steel, and of machinery, in Germany, five months ended May 31, metric tons:

	1907.	1908.	Changes.
Imports:			
Iron and steel	305,163	236,330	D. 68,833
Machinery	38,759	36,417	D. 2,342
Total	343,922	272,747	D. 71,175
Exports:			
Iron and steel	1,380,294	1,471,444	I. 91,150
Machinery	123,858	142,068	I. 18,210
Total	1,504,152	1,613,512	I. 109,360

The Steel Syndicate has been pushing the export trade actively this year, to compensate for declining home trade.

Belgian Iron Production—Pig iron production in Belgium in May was 111,590 tons, a decrease of 11,390 tons from 1907. For the five months ended May 31 the total was: Foundry iron, 35,300; forge, 67,850; bessemer and basic pig, 367,630; total, 470,780 metric tons. This is a decrease of 121,500 tons from the corresponding period last year.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, July 22.

At all U. S. Ports in June and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
June 1908..	\$ 8,626,718	\$ 3,409,885	Exp. \$ 5,216,833
" 1907..	23,872,140	2,165,342	" 21,706,798
Year 1908..	53,507,975	26,368,198	" 27,139,777
" 1907..	36,300,732	21,468,647	" 14,832,085
Silver:			
June 1908..	4,437,360	3,366,182	Exp. 1,071,178
" 1907..	5,360,599	3,476,546	" 1,884,053
Year 1908..	25,514,545	21,054,332	" 4,460,213
" 1907..	29,219,209	22,395,611	" 6,823,598

Exports of gold from New York, week ending July 18: Gold, \$1,049,631 mostly to London; silver, \$758,294 to London. Imports: Gold, \$57,000 from South America; silver, \$58,812 from South America, Hamburg, West Indies and Mexico.

Specie holdings of the leading banks of the world July 18, are reported, as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	\$310,163,600
England	\$189,119,970	.....	189,119,750
France	634,022,525	\$182,165,025	816,187,550
Germany	200,355,000	81,395,000	281,750,000
Spain	78,270,000	134,115,000	212,385,000
Netherlands	38,516,500	20,841,000	59,357,500
Belgium	20,413,335	10,216,665	30,630,000
Italy	180,765,000	21,375,000	202,140,000
Russia	561,110,000	38,885,000	599,995,000
Aust.-Hungary	234,225,000	66,745,000	300,970,000
Sweden	19,415,000	.....	19,415,000
Norway	8,160,000	.....	8,160,000
Switzerland	18,675,000	.....	18,675,000

The New York banks do not separate gold and silver. The foreign statements are from the *Commercial and Financial Chronicle* of New York.

Foreign commerce of the United States half-year ended June 30, reported by Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1907.	1908.
Exports	\$ 940,450,372	\$ 877,823,264
Imports	751,279,183	522,451,357
Excess, exports	\$ 189,171,189	\$ 355,371,907
Add excess of exports, silver	.....	4,460,213
Add excess of exports, gold	.....	27,139,777
Total export balance	.....	\$ 386,971,897

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

Silver Market

SILVER AND STERLING EXCHANGE.

July.	Sterling Exchange.	Silver.		July.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
16	4.8700	53 3/4	24 1/8	20	4.8700	53 1/2	24 1/2
17	4.8700	53	24 1/8	21	4.8700	52 3/4	24 1/8
18	4.8700	53 3/4	24 1/8	22	4.8690	52 3/4	24 3/8

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

Messrs. Pixley & Abell report silver shipments from London to the East for the year to July 9:

	1907.	1908.	Changes.
India	£6,566,074	£4,200,158	D. £2,365,916
China	.....	516,400	I. 516,400
Straits	544,012	30,510	D. 453,502
Total	£7,110,086	£4,807,068	D. £2,303,018

The silver market has had a sagging tendency the last week. The Indian bazars have been the principal buyers and their demand being satisfied each day, has resulted in a lower level for quotations.

Copper, Tin, Lead and Zinc

DAILY PRICES OF METALS.

July.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			New York, Cts. per lb.	St. Louis, Cts. per lb.
16	12 3/4 @13	12 3/4 @12 3/4	57 1/2	29 1/2	4.40 @4.45	4.40 @4.45	4.25 @4.30
17	12 3/4 @13	12 3/4 @12 3/4	57 1/2	29 1/2	4.40 @4.45	4.40 @4.45	4.25 @4.30
18	12 3/4 @13	12 3/4 @12 3/4	....	29 1/2	4.40 @4.45	4.40 @4.45	4.25 @4.30
20	12 3/4 @13	12 3/4 @12 3/4	58 1/2	29 1/2	4.40 @4.45	4.42 @4.47	4.27 @4.32
21	12 3/4 @13	12 3/4 @12 3/4	57 1/2	29 1/2	4.40 @4.45	4.42 @4.47	4.27 @4.32
22	12 3/4 @13	12 3/4 @12 3/4	58 3/4	29 1/2	4.40 @4.45	4.42 @4.47	4.27 @4.32

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

Copper—The improvement in business which we reported last week has gone further, substantial transactions having been effected from July 16 to 22, both for domestic and foreign account, and both in electrolytic and Lake copper. The bulk of this business has been for early delivery. Up to the 18th the demand for electrolytic was freely met at about 12 3/4c., but since Monday there has been a stiffer attitude.

The most encouraging factor in the situation is the sustained improvement in the demand for home trade. The large sales for near-by shipment confirm the belief that there are no stocks in the hands of manufacturers. The heavy sales for export indicate that foreign buyers are much less concerned about stocks in public warehouses in Europe than are some interests on this side.

The market closes firm at 12 3/4@13c. for Lake copper, and 12 3/4@12 3/4c. for electrolytic in ingots, cakes and wire bars. The average of the week for casting is 12 3/8@12 3/4c.

A vigorous rise in the London standard market was started during the week, and the closing cables report the market at the highest price reached in this movement, i.e., £58 3/4 for spot, and £59 for three months.

Statistics for the first half of the current month show an increase in the visible supplies of 2000 tons.

Refined and manufactured sorts we quote: English tough, £60 1/2@61 1/2; best selected, £60 1/2@61 1/2; strong sheets, £72 1/2 @73 1/2.

Manufactured Copper—Sheets, cold-rolled, 17½c.; hot-rolled, 16½c. Wire, 14¼c. base.

Tin—The London market was very firm the larger part of the week and closes at £134½ for spot and £135½ for three months.

The quick recovery in the London market from a decline at the beginning of this week had a favorable influence on domestic business, which, however, was mostly confined to dealers. Consumers are still fighting shy and buy only their immediate wants. Spot metal is well concentrated and a premium exacted for it. At the close business is being done at about 29¾c.

Lead—The market is quiet and unchanged at 4.40@4.45c. New York.

After the recent rapid advance, it was not unnatural that there should be a reaction in the London market, but at the close there has been a recovery from the low point, the cables quoting Spanish lead at £12 18s. 9d., and English lead at £13 1s. 3d.

Spelter—A little more business is doing owing to an increase in the demand from galvanizers, and the market closes somewhat higher at 4.27½@4.32½c. St. Louis, 4.42½@4.47½c. New York.

The London market has held the advance throughout the week and closes firm at £19¼ for good ordinaries and £19½ for specials.

Other Metals

Antimony—The market is without interest. Quotations are 8½c. for Cookson's, 8¾ for Hallett's and 8@8¼ for ordinary brands.

Aluminum—Ingots, American No. 1, in large quantities, 33c. per lb. Rods and wire, 38c. base; sheets, 40c. base.

Cadmium—In 100-lb. lots, \$1.25 per lb., at Cleveland, Ohio.

Nickel—According to size of lot and terms of sale, 45@50c., New York.

Quicksilver—New York price is \$44 per flask for large lots; \$45 for jobbing orders. San Francisco, large lots nominal at \$43.50, domestic and \$42, export; small orders, \$45@46. London is £8 per flask, with £7 17s. 6d. quoted by second hands.

Zinc Sheets—Base price is 7c., f.o.b. La Salle-Peru, Ill., less 8 per cent.

Platinum—Prices were reduced \$1 per oz. at which level some sales were made. Quotations now are \$22.50 per oz. for hard platinum, \$20 for ordinary and \$15 for scrap.

Missouri Ore Market

Joplin, Mo., July 18—The highest price paid for zinc ore was \$38 per ton; the assay base price was \$35 per ton for 60

per cent. zinc, the base ranging down to \$34 per ton for medium grades and as low as \$30 for sludge. The average price, all grades, was \$32.08 per ton. The high price for lead ore was \$60 this week, with week-end offerings of \$58@59 and sales as low as \$57 for low-grade ore. The average price, all grades, was \$58.88, owing to a large amount of the ore shipped being settled for on the price of the previous week.

The weaker market has a depressing effect on the output and may tend to discourage operators from resuming production.

Following are the shipments of zinc and lead from the district for the week ending July 18:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Cartersville	2,349,450	776,730	\$60,502
Joplin	1,974,320	258,270	40,969
Duenweg	683,630	127,430	14,698
Oronogo	815,400	2,950	14,507
Galena	617,870	80,340	11,762
Alba-Neck	542,680	.....	9,224
Prosperity	286,630	69,050	6,621
Miami	442,330	.....	5,768
Granby	323,690	30,000	5,400
Cartilage	297,380	.....	5,204
Spurgeon	231,550	67,630	4,761
Aurora	308,810	.....	4,488
Badger	260,550	.....	4,429
Quapaw-Baxter	124,780	39,000	3,020
Zincite	148,850	.....	2,381
Carl Junction	87,330	1,790	1,448
Sarcoite	70,970	.....	1,135
Totals	9,566,220	1,453,190	\$196,317

29 weeks.....266,669,170 41,712,650 \$5,640,148
Zinc value, the week, \$153,531; 29 weeks, \$4,511,056
Lead value, the week, 42,786; 29 weeks, 1,129,092

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1907.	1908.	Month.	1907.	1908.
January	45.84	35.56	January	83.58	46.88
February	47.11	34.92	February	84.58	49.72
March	48.66	34.19	March	82.75	49.90
April	48.24	34.08	April	79.76	52.47
May	45.98	33.39	May	79.56	56.05
June	44.82	32.07	June	73.66	60.48
July	45.79	.....	July	58.18	.....
August	43.22	.....	August	59.54	.....
September	40.11	.....	September	53.52	.....
October	39.83	.....	October	51.40	.....
November	35.19	.....	November	43.40	.....
December	30.87	.....	December	37.71	.....
Year	43.68	.....	Year	68.90	.....

Wisconsin Ore Market

Platteville, Wis., July 18—The base price for 60 per cent. zinc ore this week was \$33@36 per ton. The price paid for lead ore declined further, the best grades selling at \$58@60 per ton. High-grade zinc ore is still scarce, causing the base price to go higher but no premium was paid. All but three roasters have been idle since June 1 and the product of but two of these is offered for sale. The Empire and Acme plants, however, will be put in operation at once by the Wisconsin Zinc Company at Platteville. The carbonate producers at Highland have resumed and are shipping to the Mineral Point Zinc Company.

Shipments, week ended July 18:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	446,140	.....	240,800
Benton	373,980	.....	.....
Hazel Green	329,400	.....	.....
Highland	293,700	122,600	.....
Linden	137,436	.....	.....
Galena	134,800	.....	.....
Livingston	110,000	.....	.....
Mineral Point	85,600	.....	.....
Rewey	60,000	.....	.....
Harker	.....	57,000	.....
Potosi	.....	44,760	.....
Cuba City	.....	88,180	.....
Total	1,971,056	312,540	240,800
Year to July 18	49,078,521	5,986,705	625,065

Chemicals

New York, July 22—The market in general continues dull and little business is being done. The average sales compare favorably with those of previous years at this time except during the active market of 1907.

Arsenic—White arsenic has advanced slightly, due to a better feeling abroad; the price in foreign ports varies from 3½ to 4c., and spot in New York is not offered at less than 3½c. per lb.

Copper Sulphate—The demand is fair and independent dealers are offering moderate quantities at \$4.50 per 100 lb. Standard goods are held firmly at \$4.65 for carloads and \$4.90 for smaller quantities.

Nitrate of Soda—The market is featureless. Quotations are unchanged at 2.30@2.32½c. for spot 95 per cent. and 2.25@2.35c. for other positions of 1908.

Sulphur—Emil Fog & Sons, Messina, Italy, report a reduction of 30,000 tons in the stocks at the end of June compared with June, 1907. Exports of sulphur from Sicily during May amounted to 30,485 tons against 23,260 tons in May, 1907. The total exports were 207,179 tons to the end of May, 1908, against 174,327 tons in a similar period of 1907. The visible stock in Sicily at the end of May was 527,798 tons in 1908; 503,559 in 1907; and 430,213 tons in 1906.

Phosphates—Messrs. J. M. Lang & Co. report shipments of Florida phosphates through the port of Savannah in June as follows: To Great Britain, 7257 tons; Germany, 6957; Belgium, 3300; total, 17,514 long tons.

Mining Stocks

New York, July 22—The Amalgamated Copper dividend, usually awaited with interest, caused no excitement when announced this week. It is 50c., or ½ per cent., the same as last quarter. Boston & Montana paid \$3, also the same as last quarter. On the New York Exchange Amalgamated closed strong at 71½; American Smelting common, 85¼; United States Steel, common, 45½; preferred, 108¾; Utah Copper, 36½.

The curb market reflected some of the strength of the Exchange and coppers were fractionally higher at the close.

Boston

July 21—After a slight reaction last week the market quieted down, but business recovered its activity and strength followed by moderate price recessions today.

Amalgamated reached \$71.50 during the week, closing tonight at \$71 or \$1.25 above a week ago. Butte Coalition on active trading rose \$1.12½ to \$26.12½, with slight reaction. Copper Range has fluctuated between \$74@75; Mohawk rose to \$62, subsequently falling back to \$60, and recovering to \$61.50; North Butte rose from \$72.75 to \$75; on active trading. Old Dominion spurted \$1.50 to \$37.50; Osceola, \$3 to \$103; Parrott, \$1.75 to \$26.37½; Trinity, \$1.75 to \$15; United States Smelting, \$2 to \$38.25; and Utah Consolidated is firm around \$44. Utah Copper is up \$2.12½ to \$36.62½.

Some of the low-priced issues have also been dealt in. Adventure advanced \$1.37½ to \$5.50; Arcadian, 75c. to \$4.25; Boston Consolidated, 75c. to \$12.75; Boston & Corliss, \$1.25 to \$17.25; Isle Royale, 75c. to \$21.50, and Mass, 50c. to \$6.20. On the curb First National has been the feature, selling at \$2.25 to \$6.25, with a fractional setback. The Boston Stock Exchange has furnished a sensation by voting to divorce itself from the curb by not allowing either wires nor any member or firm to be directly represented on the curb. In other words stock-exchange houses cannot be represented on the curb, but must do business direct with curb brokers.

STOCK QUOTATIONS

NEW YORK July 21		BOSTON July 21	
Name of Comp.	Cig.	Name of Comp.	Cig.
Alaska Mine.....	7 ³ / ₁₆	Adventure.....	5 ¹ / ₂
Amalgamated.....	71	Allouez.....	31
Anacoda.....	44 ³ / ₈	Am. Zinc.....	28
Balakala.....	3 ¹ / ₂	Arcadian.....	3 ³ / ₈
British Col. Cop.....	5	Arizona Com.....	19 ¹ / ₂
Butte & London.....	26	Atlantic.....	14 ¹ / ₂
Butte Coalition.....	26	Bingham.....	75
Colonial Silver.....	3 ¹ / ₄	Boston Con.....	12 ³ / ₄
Cum. Ely Mining.....	2	Calumet & Ariz.....	115
Davis Daly.....	2	Calumet & Hecla.....	670
Dominion Cop.....	2 ¹ / ₁₆	Centennial.....	25 ³ / ₈
Douglas Copper.....	4 ¹ / ₂	Con. Mercur.....	44
El Rayo.....	2 ¹ / ₁₆	Copper Range.....	74 ¹ / ₂
Florence.....	3 ¹ / ₁₆	Daly West.....	11
Foster Cobalt.....	42	Franklin.....	9 ¹ / ₂
Furnace Creek.....	14 ¹ / ₂	Greene-Can.....	10 ³ / ₄
Giroux.....	3 ¹ / ₂	Isle Royal.....	21
Gold Hill.....	5 ¹ / ₂	La Salle.....	14 ¹ / ₂
Goldfield Con.....	5 ¹ / ₂	Mass.....	6 ¹ / ₂
Granby.....	1101	Michigau.....	9 ¹ / ₂
Greene Gold.....	1 ¹ / ₂	Mohawk.....	61 ¹ / ₂
Greene G. & S.....	1 ¹ / ₂	Nevada.....	12 ³ / ₄
Greenw'r & D.Val.....	75	North Butte.....	74 ¹ / ₂
Guanajuato.....	1 ¹ / ₂	Old Colony.....	40
Gnggen. Exp.....	150	Old Dominion.....	37
Hanapah.....	1.20	Osceola.....	103
McKinley Dar.....	73	Parrot.....	25 ¹ / ₂
Micmac.....	2 ⁵ / ₈	Quincy.....	88 ³ / ₈
Mines Co. of Am.....	1 ¹ / ₁₆	Rhode Island.....	3 ³ / ₈
Mitchell Mining.....	1 ¹ / ₂	Santa Fe.....	1 ¹ / ₂
Mont. Sho.C.....	.80	Shannon.....	14 ¹ / ₂
Nev. Utah M. & S.....	3	Superior.....	16 ¹ / ₂
Newhouse M. & S.....	5 ¹ / ₂	Tamarack.....	66
Nipissing Mines.....	7 ¹ / ₂	Trinity.....	14 ¹ / ₂
Old Hundred.....	1 ¹ / ₂	United Cop., com.....	6 ³ / ₈
Silver Queen.....	1.09	U. S. Oil.....	24
Stewart.....	3 ¹ / ₂	U. S. Smg. & Ref.....	38
Tennessee Cop'r.....	36 ³ / ₈	U.S.Sm. & Re.,pd.....	46
Tri-Bullion.....	11 ¹ / ₂	Utah Con.....	43 ³ / ₈
Union Copper.....	3 ¹ / ₂	Victoria.....	5
Utah Apex.....	4	Winona.....	6 ¹ / ₂
Utah Copper.....	36 ¹ / ₂	Wolverine.....	132
Yukon Gold.....	3 ³ / ₈	Wyandotte.....	1 ¹ / ₂

*Ex. Div. †Ex. Rights.

‡Last quotation.

N. Y. INDUSTRIAL

Am. Agri. Chem.....	25 ¹ / ₂
Am. Smeit. & Ref.....	84 ¹ / ₂
Am. Sm. & Ref., pf.....	107 ¹ / ₂
Bethlehem Steel.....	19 ¹ / ₂
Colo. Fuel & Iron.....	32 ³ / ₈
Federal M. & S., pf.....	183 ¹ / ₂
Inter. Salt.....	18 ¹ / ₂
National Lead.....	71 ¹ / ₂
National Lead, pf.....	103
Pittsburg Coal.....	127 ¹ / ₂
Republic I. & S.....	21
Republic I. & S., pf.....	74
Sloss-Sheffield.....	60
Standard Oil.....	640
U. S. Red. & Ref.....	127 ¹ / ₂
U. S. Steel.....	45
U. S. Steel, pf.....	108 ¹ / ₂
Va. Car. Chem.....	25

BOSTON CURB

Ahmeek.....	172 ¹ / ₂
Black Mt.....	3 ³ / ₈
East Butte.....	6 ³ / ₈
Hancock Con.....	15 ³ / ₈
Keweenaw.....	6 ¹ / ₂
Majestic.....	.77
Raven.....	.95
Shawmut.....	.88
Superior & Pitts.....	12
Troy Man.....	.55

NEVADA STOCKS. July 22.

Furnished by Weir Bros. & Co., New York.

Name of Comp.	Cig.	Name of Comp.	Cig.
COMSTOCK STOCKS		Silver Pick.....	.19
Belcher.....	.27	St. Ives.....	.32
Best & Belcher.....	.59	Triangle.....	.04
Caledonia.....	.11	BULLFROG STOCKS	
Chollar.....	.15	Bullfrog Mining.....	.03
Comstock.....	26	Bullfrog Nat. B.....	.04
Con. Cal. & Va.....	.23	Gibraltar.....	.05
Crown Point.....	.29	Gold Bar.....	.04
Exchequer.....	.29	Homestake King.....	.42
Gould & Curry.....	.19	Montgomery Mt.....	.06
Hale & Norcross.....	.29	Mont. Shoshone C.....	.80
Mexican.....	45	Original Bullfrog.....	.02
Ophir.....	2.45	Tramp Cons.....	.17
Overman.....	1.07	MANHATN STOCKS	
Potosi.....	.12	Manhattan Cons.....	.08
Savage.....	.29	Manhat'n Dexter.....	.04
Sierra Nevada.....	.36	Jumping Jack.....	.02
Union.....	.41	Stray Dog.....	.02
Utah.....	.04	MISCELLANEOUS	
Yellow Jacket.....	.38	Golden Boulder.....	.08
TONOPAH STOCKS		Bonnie Clare.....	.09
Belmont.....	.93	Lee Gold Grotto.....	.02
Extension.....	.82	Nevada Hills.....	1.75
Golden Anchor.....	.02	Nevada Smelting.....	.75
Jim Butler.....	.30	Pittsburgh S. Pk.....	1.08
MacNamara.....	.70	Round Mt. Sphinx.....	.22
Midway.....	.39		
Montana.....	1.37		
North Star.....	.10		
Tono'h Mine of N.....	7.75		
West End Con.....	.68		

GOLD FID STOCKS

Adams.....	.04
Atlanta.....	.22
Booth.....	.19
Columbia Mt.....	.18
Comb. Frac.....	1.04
Cracker Jack.....	.05
Dia'field B. B. C.....	.19
Goldfield Belmont.....	.14
Goldfield Daisy.....	.75
Great Bend.....	.27
Jumbo Extension.....	.48
Katherine.....	.02
Kendall.....	.15
Lone Star.....	.08
May Queen.....	.06
Oro.....	.00
Red Hill.....	.24
Roanoke.....	.00
Sandstorm.....	.35

Assessments

Company.	Definq.	Sale.	Amt.
Butler-Liberal, Utah.....	July 17	Aug. 6	\$0.02
Caledonia, Nev.....	Aug. 12	Sept. 2	0.05
Chollar, Nev.....	July 8	July 30	0.10
Exchequer, Nev.....	Aug. 11	Sept. 1	0.05
Heveta, Ariz.....	.....	July 20	0.50
Ingot, Utah.....	July 17	Aug. 5	0.01
Iowa Copper, Utah.....	July 13	July 30	0.05
Lead King, Utah.....	July 1	July 28	0.01
Little Chief, Utah.....	Aug. 11	Sept. 1	0.01
Lucky Calumet, Ida.....	July 3	Aug. 13	0.01
Maxfield, Utah.....	July 18	Aug. 17	0.02
Mexican, Nev.....	July 17	Aug. 17	0.10
Missoula Copper, Ida.....	July 25	Aug. 25	0.01
Oro Cobre, Cal.....	July 16	Aug. 3	0.02
Sierra Nevada.....	July 14	Aug. 4	0.10
Signet.....	Aug. 8	Oct. 6	0.01
Talisman, Utah.....	Aug. 1	Aug. 18	0.02
Tomahawk, Nev.....	July 10	Aug. 12	0.01
Wabash, Utah.....	July 10	Aug. 1	0.10
Wheeler, Utah.....	July 16	Aug. 6	0.01 ¹ / ₂

ST. LOUIS July 11

N. of Com.	High.	Low.
Adams.....	.30	.20
Am. Nettie.....	.03	.02
Center Cr'k.....	2.00	1.50
Cent. C. & C.....	68.00	67.00
C.C. & C. pd.....	78.00	76.00
Cent. Oil.....	110.00	100.00
Columbia.....	4.00	3.00
Con. Coal.....	19.00	16.00
Doe Run.....	120.00	110.00
Gra. Bimet.....	.22	.20
St. Joe.....	14.00	12.00

LONDON July 22

Name of Com.	Cig.
Dolores.....	£1 10s 0d
Stratton's Ind.....	0. 0 9
Camp Bird.....	0 12 9
Esperanza.....	1 11 3
Tomboy.....	1 1 3
El Oro*.....	1 4 3
Oroville.....	0 10 6

Cabled through Wm. P. Bonbright & Co., N. Y.

Monthly Average Prices of Metals SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January.....	68.673	55.678	31.769	25.738
February.....	68.835	56.000	31.852	25.855
March.....	67.519	55.365	31.325	25.570
April.....	65.462	54.505	30.253	25.133
May.....	65.971	52.795	30.471	24.377
June.....	67.090	53.663	30.893	24.760
July.....	68.144	.....	31.366	.....
August.....	68.745	.....	31.637	.....
September.....	67.792	.....	31.313	.....
October.....	62.435	.....	28.863	.....
November.....	58.677	.....	27.154	.....
December.....	54.365	.....	25.362	.....
Year.....	65.327	.....	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

Month.	NEW YORK.		LONDON.	
	1907.	1908.	1907.	1908.
January.....	24.404	13.726	24.825	13.901
February.....	24.869	12.905	25.236	13.008
March.....	25.065	12.704	25.560	12.875
April.....	24.224	12.743	25.260	12.928
May.....	24.048	12.538	25.072	12.788
June.....	21.665	12.675	24.140	12.877
July.....	22.130	.....	21.923	.....
August.....	18.356	.....	19.255	.....
September.....	15.565	.....	16.047	.....
October.....	13.169	.....	13.551	.....
November.....	13.391	.....	13.870	.....
December.....	13.163	.....	13.393	.....
Year.....	20.004	.....	20.661	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January.....	41.548	27.380	July.....	41.091	.....
February.....	42.102	28.978	August.....	37.667	.....
March.....	41.313	30.577	September.....	36.689	.....
April.....	40.938	31.702	October.....	32.620	.....
May.....	43.149	30.015	November.....	30.833	.....
June.....	42.120	28.024	December.....	27.925	.....
			Av. year.....	38.166	.....

Prices are in cents per pound.

LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January.....	6.000	3.691	19.828	14.469
February.....	6.000	3.726	19.531	14.260
March.....	6.000	3.838	19.703	13.975
April.....	6.000	3.993	19.975	13.469
May.....	6.000	4.253	19.688	12.938
June.....	5.760	4.466	20.188	12.600
July.....	5.288	.....	20.350	.....
August.....	5.250	.....	19.663	.....
September.....	4.813	.....	19.775	.....
October.....	4.750	.....	18.531	.....
November.....	4.376	.....	17.281	.....
December.....	3.668	.....	14.500	.....
Year.....	5.325	.....	19.034	.....

New York, cents per pound. London, pounds sterling per long ton.

SPE