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## A Trip to the Siberian-Mongolian Frontier

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*SYNOPSIS*—Examination trip to some new placers around the headwaters of the Yenisei River in south-central Siberia. By rail from Petrograd to Krasnoiarsk. Advisable to avoid leading hotels. By steamer up the Yenisei to Minusiensk. Across country by wagon road and mountain trail. These Siberians poor packers. Convict labor building a wagon road. Elk-farming rough on the elk. Camels used for packing. Paddle-wheel, horse-actuated ferry. Placers only recently worked, since for long time it was unknown whether the region was in Mongolia or Siberia. Owner permits inefficient hand-sluicing methods under leasing system. Gravels suitable for hydraulicking. Estimates of costs. The native Soyotes an interest-

who served as my assistant. He was thoroughly and unmistakably British and his nationality served in the later stages of the journey, after war had been declared, to facilitate our passage homeward. He possessed a smattering of Russian, of which he was extremely proud. My own knowledge of the Russian language consisted of two words, *kharohshy*, meaning "good," and *nichi-wo*, meaning "never mind," and it is surprising how far these two words, when judiciously used, can carry one. With this limited knowledge of the language, we succeeded in traveling alone and without interpreters from Petrograd to the mines and only once along the journey did we observe the least inclination on



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THE VILLAGE OF GRIGORIEFFKA



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THE VILLAGE OF OUSA

*ing race. Return down river made on two-deck raft. Projected government improvements. Curious rumors of the war. Behind the scenes in Russia's mobilization.*

In the latter part of May, 1914, I left London to examine some recently discovered alluvials lying in southern Siberia close to the Mongolian frontier and near the headwaters of the Yenisei River. So far as I have been able to ascertain, I was the first foreign engineer to visit this little known district and I offer the following notes of my journey in the hope that they will prove of interest. I was accompanied by a young English engineer

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the part of the Siberians to take advantage of us as strangers. However, ordering meals in some of the wayside towns always contained elements of expectation and uncertainty, for we never knew exactly what our order would bring forth. On one occasion we ordered suckling pig and much to our surprise were served with chicken stew.

### THE RAILWAY JOURNEY

In addition to our ordinary baggage, we had an Empire drill weighing about  $1\frac{1}{4}$  tons, which we brought with us from London. We left Petrograd Sunday, May 31, by the Russian Express, arriving at Krasnoiarsk on the following Saturday evening. Before leaving Petrograd we had ex-

pressed our drill to Krasnoiarsk, a distance of 2700 miles. The drill weighed 2800 lb. and our express bill amounted to 348 rubles. On the train we found that we could secure four second-class berths for the price of two first-class berths; i.e., 190 rubles, and by so doing we secured the whole compartment to ourselves. The only difference between a Russian first-class compartment and a second-class is that in the former there is a mirror, while in the latter there is none. Only Russian grand dukes and American and English "trippers" travel in the mirrored compartments.

The Russian Express leaves Petrograd once a week and there is no dining car attached. Breakfast of tea (always excellent in this country) and fresh bread and butter are served by the train porter. The train stops at intervals at stations long enough for one to procure satisfactory meals at a moderate price. The food is arranged on a long buffet so that one can choose one's meal by simply pointing to it, a happy arrangement for those possessing only two Russian words. The principal and most popular dish along these wayside stations consists of a thick Russian soup made of beet roots. This is the famous *borsch* and is a meal in itself.

#### HOTELS IN KRASNOIARSK

We arrived at Krasnoiarsk at 1 a.m. and drove to the principal hotel expecting to find it closed for the night, instead of which it was a blaze of light. In one corner of the dining room where we went for supper they had erected a stage, and here a Russian girl, dressed in blue tights with large white polka-dots, was giving her conception of an American coon song. The place was crowded. Russian military officers were seated about drinking sweet champagne and tea. All the men wore some sort of a uniform and all seemed to be prosperous and enjoying life.

We were given rooms in the hotel directly over the stage and the band ceased playing only at 6 o'clock next morning. Each Siberian town possesses a hotel of this class, which is the club and meeting place of the community. Smaller and quieter hotels exist in back streets and the traveler will do well to avoid the lights and glitter of these local Savoy-Ritz establishments and go to one of the quiet inns. Russian hotels in general are not uncomfortable, but the traveler should provide his own bedding which he spreads on an iron camp bed in his room. Russian rooms are always overfurnished with chairs; I have counted 12 ranged along the walls of a room which had no other furniture except a bare bedstead, giving the place the air of a deserted lodge room.

#### BY STEAMER TO MINUSINSK

From Krasnoiarsk we journeyed by steamer up the Yenisei to Minusinsk, a two days' journey. These steamers of about 600 tons are clean and comfortable. The cabins are large and fitted with two wide berths, but here again the sleeping bag comes into requisition. The fare, including two first-class cabins, is 21 rubles. The meals are well served and inexpensive. Between these two cities the Yenisei River is about one mile wide and flows through a huge plain of wonderful fertility. The whole district here has an air of prosperity. Each landing stage was piled high with new gaudy-colored farming machinery, some American made, but mostly of Russian manufacture.

Six hours after we left Krasnoiarsk the steamer drew toward a place where stood only a small Russian chapel. As we came in, four long-haired Russian priests lined up on the bank and burst into a Russian chant, apparently one of welcome. Except Black and me, everyone in the steamer, passengers, crew, captain and cook left the boat and crowded into the chapel, where service was held. After service the steamer pulled out to the fervid chanting of the four faithful priests and a boy. At no other place in the world have I witnessed such a display of religious enthusiasm.

Minusinsk is at present the end of steamer navigation. It is a town of about 140,000 inhabitants lying 530 versts above Krasnoiarsk. A railroad is at present being built from it to Archinsk, a station on the Trans-Siberian Ry. Minusinsk is the jumping off place from civilization and at present is an enterprising and prosperous city—it is, in fact, booming. It is the largest trading center of the whole upper Yenisei Valley and its weekly market presents a more animated appearance than that of the larger city of Krasnoiarsk. Next year this



HAND WORK IN THE GRAVEL

town will cease to be the head of navigation, since shallow-draft steamers now being built will run up the river as far as Buluk.

#### ACROSS COUNTRY

From Minusinsk we had to strike across country, meeting the river again after a 12 days' journey. The following is a table of our route, showing the towns and villages passed through:

| FIRST SECTION, BY WAGON OR "TALIEGA" ROAD            |        |       |
|--|--------|-------|
|  | Versts | Miles |
| Minusinsk to Daniloffsky Zavod.....                  | 26     | 16.6  |
| Daniloffsky Zavod to Kazantzevo .....                | 15     | 10    |
| Kazantzevo to Kozleffka .....                        | 3      | 2     |
| Kozleffka to Zheblakhti .....                        | 12     | 8     |
| Zheblakhti to Yermatoffskoye .....                   | 18     | 12    |
| Yermatoffskoye to Salba .....                        | 15     | 10    |
| Salba to Verkhne-Kebezskoye .....                    | 17     | 11.4  |
| Verkhne-Kebezskoye to Grigorieffka .....             | 3      | 2     |
| Total distance Minusinsk to Grigorieffka....         | 108    | 72    |
| SECOND SECTION BY TRAIL                              |        |       |
| Grigorieffka to Verkhne-Ussinsk .....                | 180    | 120   |
| THIRD SECTION BY ROAD                                |        |       |
| Verkhne-Ussinsk to Turansky-Hamlet .....             | 78     | 52    |
| Turansky-Hamlet to Uyuk .....                        | 12     | 8     |
| Uyuk to Buluk (Yenisei River) .....                  | 70     | 46.6  |
| Buluk to Nikolneffsky .....                          | 75     | 50    |
| Total distance Verkhne-Ussinsk to Nikolneffsky ..... | 235    | 156   |

FOURTH SECTION BY TRAIL

|                             |    |    |
|-----------------------------|----|----|
| Nikolneffsky to mines ..... | 20 | 14 |
|-----------------------------|----|----|

TOTAL

Total distance from Minusinsk to the mines, 543 versts, or about 362 miles.

The first stage of the journey from Minusinsk to Grigorieffka, a distance of 72 miles, is over the rolling plains of the Yenisei Valley. The soil is sandy in places but on the whole is rich. It is all under cultivation; wheat and rye flourish. The women work shoulder to shoulder with the men in the field. The abject poverty of the peasant class in many parts of central and northern Europe and the crudeness of cultivation in these places are here remarkable for their absence; the Siberian peasant is content with only the most modern farming implements. One of the striking peculiarities of Siberian farm life, due perhaps to the severity of the winter, is the fact that the farmers and their families do not live on their farms. They congregate in villages or small hamlets, consisting of four or five houses, and early morning sees each farmer and his whole family on the road going to their day's work in the fields.

OVER MOUNTAIN TRAILS

Grigorieffka is the last village on the plains; here the road ends and a trail begins, which crosses the Sayan Mountain Range and is about 120 miles long. We had ar-

the trail, we found it to be but an ordinary mountain trail with a few stretches of marshy ground. We were two days covering it.

CONVICT LABOR ON NEW ROAD

The government is now building a magnificent post road over these mountains. This is 24 ft. wide, heavily macadamized, with easy grades and with post houses at every 20 versts. The road is about one-third built and it is expected it will be completed in two years. About 3000 convicts of both sexes are working upon it and the absence of all guards is a surprising feature. Yet an escaping convict cannot proceed far in this district, for without a passport he or she would soon be gathered back into the fold again.

I noticed one convict working on the road quite alone. He wore a cap of a striking light-blue and shaped after the fashion of the French cap of liberty—it was the mark of the murderer. It was the only sign or mark I saw, all the other convicts being dressed in ordinary peasant costume.

The building of this road is an example of the awakening of the Russian government to the importance of the district. A Belgian company has already been organized to transport freight over this highway by motor truck.

The district through which this trail leads is one of



Typical gravel deposit.



Bottom lands near the border.

CHARACTER OF THE GRAVEL

ranged from Minusinsk by telegraph for sufficient horses to pack our freight over the trail and for this we were prepared to pay the current packing rates. The drill arrived at Grigorieffka some hours before we did and we found it surrounded by all the packers in the neighborhood, who were gazing open-mouthed at the 5-ft. long casings as if they had been 12-in. guns. These casings they flatly refused to pack, claiming that it was impossible to carry them over the trail. After a long conference among themselves, they agreed to pack our 60 poods of freight over the 180 versts of trail for 600 rubles, which was exorbitant. We finally found an outsider or "scab" with whom we made a contract to pack our material over the trail and deliver it 156 miles beyond by wagon to the river for the sum of 350 rubles. This was the only attempt at extortion which we experienced during our trip.

When all the packers in Peru are dead, the Siberian packer in this district will be the worst packer in the world. His horses are of a fair size, yet they pack only 125 lb. to the horse. They also employ two men to every four animals.

In spite of the tales we had heard of the roughness of

surpassing beauty and its forests of fir and birch without undergrowth or brush of any kind remind one of the well-cared-for parks of English homes. We passed acre after acre of wild flowers of all colors, some of the yellow poppies rivaling those of California in color and size.

The village of Ousa lies at the end of the trail and is a characteristic Russian village; it is built of logs and has a population of about 10,000. There we took wagons or *taliegas* and drove through a more or less arid region for about 156 miles, when we arrived at the Yenisei again.

ELK FARMING

This region stands out in my memory as the home of the queerest sort of farming that I have ever seen, a craze, as it were, which rivals our own Belgian-hare industry of happy memory. It is elk raising.

The Chinese, who cling to their medieval system of medicine, still employ in their "prescriptions" ingredients which smack of witchcraft and superstition. The horn of the elk, while in velvet, is the most popular medicine of these people who have for years been sending agents all through southern Siberia to buy up elk horn in this condition. The price has risen so high and the demand is

so on the increase that the peasant has found it to his profit to raise elk for their horns. He farms elk as his principal industry; wheat and rye are only secondary. Even villages have their community elk farms—the country has gone elk-farming mad!

Each farm consists of an inclosure of from one to 10 acres surrounded by a fence 10 ft. high, wherein the elk are pastured. The elk are bred and are supplemented from time to time by wild elk which are run down in the snow in winter by peasants on snowshoes.

The horns when sold *must* be in the velvet and have the blood in them. The Chinese pay for horns in this condition at the rate of 9 rubles a pound; 12 rubles per pound is paid if the elk has been shot and has also its skull bones. A pair of antlers weighs up to 60 or 70 pounds.

#### HARD ON THE ELK

Arriving at a village one evening at dusk, I heard proceeding from a corral some most heart-rending cries. On reaching the corral I found a couple of peasants with a poor elk on its back. They were slowly and callously hacking at its horns with a dull saw; at every stroke of which the poor brute shrieked in agony. The operation took fully half an hour and after it was over the horns were shown me and the fresh-cut surfaces oozed blood. The Russians claim that this operation does not hurt the elk, which only screams in fright; and that it is, in reality, good for him! These horns are boiled in a solution of weak tea and delivered to the Manchurian agent for shipment to Peking. Many thousands of elks undergo this torture each year and the demand for horn is still increasing.

#### CAMELS LIKE TEA

Arriving at the Yenisei River one evening at nightfall, we saw our first herd of camels—40 fat animals standing knee deep in the river and looking all the world as if they had just escaped from a circus. Camels are used in this district for packing during the winter. They carry a load of 600 lb. at the rate of five versts per hour. They sell for about 100 rubles each. With a load of 600 lb. they can make a four days' journey without food, being given from time to time a little weak tea.

#### NO ONE-HORSE FERRY

Crossing the Yenisei is not without its perils and excitements. Arriving next morning at the crossing place, we hailed the ferry, which happened to be on the other side. In answer to our hail, there shot out from the opposite bank a scow on which two miniature paddle wheels were revolving furiously and kicking up much water and foam. No smoke or steam could be seen issuing and its motive power was a puzzle to us until it came nearer, when it was seen that three horses on a raised platform were pulling a sweep attached to a gear which in turn revolved the paddles so joyously.

We and 12 other outfits crowded aboard this 3-hp. ferry, loading the scow to its gunwales. In midstream some of our own horses became tangled up with the motor horses and stopped the paddles. When we got under way again we had drifted two miles down stream, but landed, fortunately, without being upset. These horse-propelled ferries are common on the upper Yenisei.

#### THROUGH ARID COUNTRY

From Buluk on the river, to the village of Nikolneffsy, a distance of 50 miles, the road leads through an arid region broken half-way by the only water hole along the route. There we had our first glimpse of the Soyotes, a people who will be described later. We were struck by the excellence of the Soyot cattle and herds. Leaving the water hole, we crossed a wide flat plateau dotted by half a dozen alkali lakes and looking exactly like the region about Mono Lake in California. These lakes furnish the district with salt.

We were overtaken near one of them by a hail storm of such violence that we were obliged to cover our horses with canvas to prevent their bolting. We ourselves took refuge beneath the wagons. Hailstones as big as eggs driven along by the unbroken fury of the wind are not without danger. These large hailstones, I noticed, were made up of an aggregation of small particles frozen into one mass. Next day in the forest, evidence of the storm was seen in the carpeting of small branches and twigs cut off from the trees. We reached camp at nine that night in a rainstorm and next morning after driving a few versts, we reached the village of the mine and were henceforth among friends and no longer guideless.

#### UNWORKED PLACERS IN DISPUTED TERRITORY

The mine which we had come to inspect belonged, we afterwards found, to that now rare if not almost extinct group, the virgin alluvial. Its unworked state is due partly to the fact that it lies in a sort of no-man's land, a strip near the boundary of Mongolia and Siberia. The people of each country thought the land belonged to the other.

Until recently, all maps of this region gave the border line between the two countries as extending along the principal mountain ridge of the property in question; in some cases it was put at 100 miles north of this ridge. At present the border is accepted as a line from 100 to 150 versts south of the ridge, thereby placing all the territory covered by the claims within Siberia proper. The history of this misplaced boundary and of the treaties about it goes back to 1616 and is too long to be given here. The Soyotes have always inhabited the strip and, being of a non-Russian race and type, have caused geographers to mark the area in question with the color designating Chinese territory. Russia, however, has always claimed it and since 1911 has formally possessed and occupied it.

#### LEASING METHODS FOLLOWED

It is not the purpose of this paper to describe the mines in detail. I hope in a later paper to do that. Suffice to say that the gravels, especially those of the higher creeks, are rich. Lessees are permitted to work by Russian hand methods on some of the creeks and the gravel of one creek from operations extending from Apr. 1 to July 21 averaged \$2.93 per cu.yd. of product washed. Another gave \$3.03 per cu.yd. of product washed. Of course, only the best gravel has been put through the sluices. All the creeks, of which there are about 25, belong to one man.

#### HYDRAULICKING POSSIBLE

Physical factors, together with the high freight rate, £15 per ton from London, render the dredging of these de-

posits quite out of the question. They can, however, be cheaply and effectively hydraulicked, as there is at present sufficient water for this purpose obtainable under heads up to 800 ft. Fortunately also, the gravels rest on steeply inclined bedrocks. The gold is coarse and numerous nuggets occur. On July 2 of this year a nugget weighing 1 pfunt 12 zolotniks and having a value of \$260 was found in one of the creek beds. Nuggets as big as hazel nuts are common. The complete absence of all fine gold in the clean-ups is due to the crudeness of the gold-saving devices and is no proof of its absence in the gravels. The fineness of the gold is 871.

SYSTEM AND COSTS

The tributers are allowed by the owner to hand-sluice under the following agreement: The owner allots each "company," consisting of five to 10 men, a definite stretch of ground upon which to work. All the gold obtained is supposed to be turned over to the agent of the owner, who pays the tributers for it at the rate of 3.22 rubles

a figure covering all administration expenses, horses and feed, taxes and also the wages of the following men needed in all large camps: One cook for each 10 men, 25 rubles per month; one watchman, 30 to 45 rubles; one hostler, 40 to 45 rubles; one storekeeper, 50 rubles; one foreman, 50 rubles; one superintendent, 175 rubles. This figure of 100 rubles per month per man is applied only where over 500 workmen are employed.

Each workman can mine, i.e. dig, 20 cubic arsheen, 9.4 cu.yd. per day. To mine, wash and remove tailings would require the following crew:

|   |  |              |
|---|--|--------------|
| For gravel—                                       |  | Rubles       |
| Three men mining at 3.84 rubles per day.....      |  | 11.52        |
| Two men wheeling .....                            |  | 7.68         |
| One man washing .....                             |  | 3.84         |
| <b>Total for 28 cu.yd. (3x9.4).....</b>           |  | <b>23.04</b> |
| This is 82 kopecks per cu.yd., or 41c. per cu.yd. |  |              |
| For turf—   |  | Rubles       |
| Three men mining .....                            |  | 11.52        |
| Two men wheeling .....                            |  | 7.68         |
| <b>Total 28 cu.yd.....</b>                        |  | <b>19.20</b> |
| Or 70 kopecks or 35c. per cu.yd.                  |  |              |

If the ground is half turf and half gravel this averages 76 kopecks, about 40c. per cu.yd.

When employing horses and carts, the gravel costs 42c. per cu.yd., and this method must be employed when the haul is over 350 ft.

THE SOYOTES

The native inhabitants of this border region are most interesting and warrant a brief description. They have three different names: the Russians call them Soyotes, the Mongolians and Chinese, Uriankhi, while they call themselves Tubaulus or Tuva-ulus.

They are a nomadic people living during the winter in the sheltered mountain defiles and inclosed forest glades and in the summer on the open mountain terraces. Spring and autumn find them on the steppes and bottom lands of the valleys adjoining the Yenisei. These migrations are prompted by the need of new pasturage for their cattle and flocks. They most probably belong to the Fiuirk tribe with an admixture of Mongolian elements. They have many words and customs in common with the Russian Katchinsk Tartars and Kirghizes. Their religion is Buddhist Lamaism, and at the same time they are zealous Shamanists (Siberian sorcerers). Their Lamaism, however, belongs to that variety of Tibetan Buddhism which believes in, fears and worships evil spirits. The cattle breeders live in tents made of inch-thick felt mounted on a lattice framework. These tents are well made, warm in winter and cool in summer. They are about 10 to 15 ft. in diameter. The reindeer breeders have a conical hut similar to an American wikiup and made of birch bark and skins. Men and women dress in the same way—in a cloak and breeches. They wear furs and sheepskins in winter and in summer cotton and even rich Chinese silk. They are fond of bright colors and usually dress in red. They are picturesque in their high, pointed fur hats and their long, flowing red cloaks. They are usually well mounted, and train and take excellent care of their horses. Their worst failing is horse stealing, which is not a crime with them, but something to be commended. On the strength of the adage "set a thief to catch a thief" all the Russians living in the district employ Soyotes to take care of their horses and cattle. The Soyotes name their children after the first object met with by the woman after the birth of the child and consequently some queer and some poetical names are recorded. They are a quiet



DRILLING ON THE UPPER CREEKS

per zolotnik. The difference in the actual value of the gold, 4.50 to 4.80 rubles per zolotnik, and this price constitutes the owner's profit. After all expenses of road-making, administration, marketing of gold, etc., have been deducted, there remains to the owner only a profit of 30 kopecks per zolotnik, or a little over 5% of the gross output. Much gold is lost by theft, only one-third to one-half of the gold that is found being actually turned in. There is a further loss of from 30 to 35% gold in the *batura*, which is an exceedingly inefficient gold saver. The cost of *batura* working is high. The current wage in this district is 1.50 rubles per day, but if we assume that each workman costs 100 rubles per month, or 3.84 rubles per day for 26 working days per month, we assume

people, submissive to their authorities, kind to their wives and children, but thieves and liars all. They are inclined to be lively by nature, but they are shy in the presence of their authorities and of strangers. Ideas of morality are not strongly developed among them.

Until stopped recently by the Russians, torturing as a form of punishment was maintained among them. This included burying alive in the ground, beating in the face until unconscious and freezing off the hands and feet.

They are an independent tribe but for centuries have paid annual tribute to Mongolia. This tribute consists of furs of eight kinds: Squirrel, sable, lynx, otter, panther, wolf, marten and fox. The amount of tribute is fixed by the native rulers and is levied on each tent; it varies from 10 squirrel skins to 10 sables.

This border region is a most beautiful, well watered country, reminding one of northern California before the Gringo came. Here the country is new and all kinds of wild game plentiful. Indeed, it is a hunter's paradise, for in the mountains there are elk, caribou, roebuck or *maral*, weighing up to 320 lb., wild goats, mountain sheep, antelope, reindeer, musk deer and boars. Of pelt animals there are found the bear, lynx, wolf, fox,

for 200 rubles. We left Buluk on Aug. 11 and traveled about 100 versts the first day, when we tied up for the night. Here we were passed by a native in a canoe who told us that the "whole world was at war," a statement which we immediately put down as a vodka dream.

We had a common fire on board at which passengers and crew all took turns in cooking their meals. Each night we tied up and some days also, owing to upriver winds, we had to tie up or be blown upstream. We gathered passengers as we went down and had at last about 30 people on the platform, three horses, two cows and several wagons on the lower deck. One of the cows fell overboard and was rescued amid great excitement by the combined efforts of passengers and crew. We passed many families of young wild geese, some of which we shot; they proved most delicious eating. We were passing through a country of deep gorges on these upper reaches, gorges whose sides reached, in some cases, to 3000 ft. above the river. The rocks were mostly red sandstone, schist and a fine-grained greenstone. Sometimes we passed cliffs of blue limestone.

About 300 versts below Buluk we shot the much-dreaded rapids. They are about 200 yd. in length, while



THE RAPIDS OF THE UPPER YENISEI RIVER

sable, winter weasel, polecat, Siberian polecat, squirrel, marmot and otter. As there exist no game laws of any kind, in a few years, under the relentless killing now going on, these animals will all be exterminated.

#### RETURN BY RAFT

We finished our examination on Aug. 10 and started homeward. I had sent a man a few days before to buy a raft at Buluk and so when we arrived at the village on the river we found our raft and crew awaiting us.

The raft was about 60 ft. long and about 20 ft. wide. It was made of logs about 18 in. in diameter held together by twisted branches and by pegs. In the center was a platform extending the full width of the raft, about 10 ft. deep and raised about 6 ft. above the "lower" deck. The raft was furnished with a long sweep fore and aft and also possessed side sweeps. Its crew consisted of 12 men and a captain; the captain of an ocean liner could not take his calling more seriously or give orders with more dignity than did ours.

The captain agreed to take us and our freight to Minusinsk and to give us choice of the platform for our tent



A STOPPING PLACE ON THE RIVER

the river is only 100 ft. wide. The lower deck was quite under water during the passage, all the crew having scrambled on the captain's bridge. We got through safely, but one of our lady passengers fainted. The government is building a rail portage around these rapids and from here up, small steamers will run next year. The government has also appropriated half a million rubles for improving this river and the work is being well done. Beside this portage, sunken rocks and boulders are being cleared from the channel further downstream. On Aug. 17 we passed through the last gorge and came suddenly into the great valley of the Yenisei. We were then about 120 versts above Minusinsk and the last rock we saw was the familiar uptilted red sandstone. After leaving the gorges all rocks are covered by the deep rich soil of the Yenisei plains.

#### RUMORS OF WARS

Rumors of wars reached us from various up-river passengers. Each native told us different stories but the most popular tale was that Russia was at war with Italy! We also heard that Russia was fighting China.

It was not until we reached Minusinsk that the whole truth came to us and we were days trying to get accustomed to its full significance.

The steamer from Minusinsk to Krasnoïarsk was filled with a cheerful crowd going to the front. We pulled up once at a bank crowded with people and took on some more soldiers. When we drew off, the crowd left the bank except one poor woman dressed in black who, kneeling at the water's edge, held out her hands as if in supplication to the parting steamer. We saw on our rear deck a six-foot "boy" blubbering openly and shamelessly. It was her only son going to the front and we watched the figure on the beach until it became a black dot.

Krasnoïarsk was full of soldiers. Soldiers, everywhere, and each day the trains brought in more soldiers from the steppes, from the north, from the Baikal region, all big, happy, healthy men eager to fight. We were behind the scenes in the Russian mobilization and were impressed by the wonderful fighting machine that Russia has at her disposal and by the smoothness with which she assembled it. Within two weeks of the outbreak of war she had mobilized over 3,000,000 men on her first line of defense without disarranging any of her railroads. She has another 3,000,000 ready on the second line of reserves, and her total fighting force, including all who have had military training, is 16,000,000.

#### ROUNDAABOUT WAY HOME

Arriving at Petrograd without incident, we found that our only way home to England was via Norway and Sweden. This trip occupied eight days. We were stopped in the North Sea by a British cruiser which looked us over and allowed us to proceed. We arrived in London Sept. 6.

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## American Institute of Chemical Engineers

### SPECIAL CORRESPONDENCE

The seventh annual meeting of the American Institute of Chemical Engineers was held in Philadelphia, Dec. 2 to 5, 1914. At the business meeting, Dr. George D. Rosengarten of Philadelphia was elected president for the ensuing year. The session was opened by an address by Mayor Blankenburg. The papers on the first day were: "The Manufacture and Application of the Artificial Zeolites (Permutite) in Water Softening," by D. D. Jackson; "Feldspar as a Possible Source of American Potash," by Drs. A. S. Cushman and George W. Coggeshall; and in the evening, addresses by Dr. George Otis Smith on "Distribution of Industrial Opportunities" and Jokichi Takamine on "The Chemical Industries of Japan."

Mr. Jackson's paper contained an account of what has been done toward a practical realization of the theoretical possibilities discussed in previous publications on permutite, and showed that this water-softening process has reached the commercial stage in the United States.

The Wednesday excursions were to the Atlantic Refining Co. and the United Gas Improvement Co. The Thursday excursions were to the Welsbach Works at Gloucester, with luncheon as the guests of the company, and in the afternoon to the New York Shipbuilding Co. and Farr & Bailey's linoleum works. A subscription dinner was held at the Hotel Adelpia in the evening with addresses

by the retiring president (M. C. Whittaker), the president elect, and others.

Friday promised to be a day of great interest to the metallurgists, but the Sadtler paper on ore flotation was withdrawn on advice of counsel, owing to the approaching Minerals Separation litigation, and Dr. Edward Gudeman's paper on "Aspects of Some Chemical Industries in the United States" was read by title only, leaving the field to J. V. N. Dorr's "Hydrometallurgical Apparatus and Its Use in Chemical Engineering."

Doctor Whittaker in introducing Mr. Dorr said that the economy of the cyanide process was well known to chemists, so he had brought the chief offender there to tell how it was done.

Mr. Dorr said he felt apologetic over coming to talk about his apparatus, but the president had urged him into it, and since he was going to talk he had to talk about that with which he was familiar. The greatest differences between the metallurgy of today and of 30 or 40 years ago was the increase in the scale of operations, due to general advance in engineering knowledge; an increased demand for metals; and the exhaustion of the small, high-grade deposits.

Concomitant with this have been those things which made it possible: Mechanical operations substituted for hand; and continuous processes supplanting intermittent.

The cyanide process borrowed extensively from the chemical industries. The tube mill came from cement grinding; the dust collectors of the early cyanide and chlorination plants came from the flour mills; the Paehua tank came from the powder industry; and so on. On the other hand, the Kelly filter press has been adapted by the sugar refiner, and the Merrill sluicing press by aluminum manufacturers.

Mr. Dorr then discussed the Dorr classifier (incidentally bringing in an interesting account of tailings disposal at the old Lundberg, Dorr & Wilson mill) with a discussion of the theory of washing and of leaching by this apparatus; the Dorr thickener; and the Dorr agitator. Among the notable points was his mention of a thickener built by the Arizona Copper Co., 130 ft. in diameter by 6 ft. deep.

Papers on the "Hardwood Distillation Industry," by E. H. French and James R. Withrow, and the "Need of Uptodate Manufacturing Statistics," by Bernard Hesse, were also read in the morning. In the afternoon, excursions were made to the Commercial Museum, probably the finest institution of this sort in the world, with addresses by Dr. W. P. Wilson and others of the staff on its activities, and to the chemical and engineering laboratories of the University of Pennsylvania.

With the apparent breakdown of the evening's program, G. W. Thompson, of the National Lead Co., and Dr. H. A. Huston, of the Potash Syndicate, came to the rescue: the first with a careful study on the influence of the way paint is applied to paint defects, his idea being that most of the trouble with paint arose not in the materials, but with the labor; the second with some wonderfully fine motion pictures of the mining and preparation of the Stassfurt products.

On Saturday the Institute visited the Barrett Manufacturing Co.'s plant. The meeting place for next year was not fully decided upon, but it appears that there will be two meetings, one in San Francisco in early September, and one, probably in New York, in December.

# Accident Prevention by the New Jersey Zinc Co.\*

*SYNOPSIS*—A discussion of the causes of accidents in metal mining, and of the bonus system by which the New Jersey Zinc Co. has greatly decreased them in its operations at Franklin Furnace, N. J.

Although the following methods for the recording of accidents and the stimulation of safety measures are probably well known, yet it seems that the already voluminous amount of literature on safety work contains comparatively few references to the results which may be obtained in metal mining, and, therefore, this discussion is tendered with the hope that it will encourage the interchange of ideas as to what may be accomplished in mining through interest in "Safety First" measures and will add in a small degree to the bibliography of the mining branch of safety work.

## INHERENT RISKS IN METAL MINING

Unlike factories and other industrial establishments which have their greatest risks from moving machinery, the metal mines suffer greatly from risks such as "falls of ground," "handling explosives," "the loading of cars from chutes and subsequent tramping," etc., in which the supervision and the education of the workman are absolutely necessary for his safety since no mechanical contrivances can protect him. With the realization that any marked reduction in the number of mining accidents, and the consequent loss of time to the workmen and loss of more or less experienced labor to the company, would probably be attained by the education of the workmen in taking an intelligent interest in their own safety and that of co-workers, the New Jersey Zinc Co., in its mines at Franklin Furnace, N. J., departed this year from its former system of looking entirely to the foremen and bosses for safety and first-aid work and instituted a plan which seems to stimulate the interest of both boss and men. It will perhaps be better to consider the details of this plan after describing the methods which had been previously employed and noting the conditions to which it applied.

The mine at Franklin Furnace, N. J., employs 350 to 450 men (excluding the mill, machine shops and power plant) and produces annually about 500,000 tons of zinc ore and about 250,000 tons of rock fill or waste. The ore is composed chiefly of the combined oxides of iron, manganese and zinc and the silicate of zinc. The waste rock is principally a highly crystalline limestone, so that the safety of the workmen is in no way endangered by the silicosis problem which must occupy the attention of many of the Western metal mines.

## MINING METHODS AT FRANKLIN FURNACE

Shrinkage methods of stoping are in general employed to mine the ore, and the property is cross-sectioned by the stope slices (whose widths are 17 ft. and lengths equal to the horizontal distance across the orebody), with ore pillars of an average of 35 ft. left standing between each stope slice. As a rule, the mining of ore in stopes is car-

ried upward a height of 50 ft., with sufficient of the broken ore left in the stope for an upper surface to be about 6 ft. from the solid back on which the miners are working; then the broken ore is drawn out, timbers recovered, and waste rock packed into the empty chamber up to the elevation of the level above. Set timbers are then placed on the rock filling and the mining of the ore continues on top of these timbers for the progress of the stope another lift; and so the stope slices progress upward from the bottom of the orebody. In the future the remaining intermediate pillars of ore will be recovered by some caving systems of mining, starting at the upper portion of the orebody and working downward.

The New Jersey Zinc Co. has for six years had its own hospital with the staff of a surgeon, a head nurse, four nurses, an orderly and two domestics. The hospital is modernly equipped for minor and major operations and X-ray work, has four private rooms and a wardroom accommodating five patients, and is equipped with an automobile ambulance.

The company provides a Neighborhood House with its director, visiting nurses and teachers to look after the sociological needs of the community and provide clean recreation. For over six years the mine has been equipped with three Fleuss oxygen-breathing apparatus for mine-rescue work, and the shift bosses and foremen have been instructed in the use of this apparatus, but fortunately there has been no need of earnest work with it; and the Draeger pulmotor has been a part of the equipment for over three years and has, so far, been unnecessary.

Until the beginning of this year the active first-aid and safety work devolved entirely upon the foremen and bosses, who were trained in bandaging and the general principles of first-aid work and administered as was necessary until delivery of the injured man at the hospital. It was naturally a boss' duty to supervise the proper and safe performance of the work done by each man in his gang, and we felt that our shift bosses were more than ordinarily interested in the protection of their men. Yet we appreciated that failing in human nature which prompted a supervisor to feel that the results of an accident due to disobedience of explicit directions or due to crass stupidity were amply deserved and did not excite sympathetic interest if no serious disability or fatality occurred. For instance, I recollect that at one time there seemed to be an epidemic of men pulling tram cars directly upon their own feet, which were run over by the car wheels, and it was naturally difficult for the shift bosses to get the same attitude toward their men as a governess has toward her ward, for those who work in a mine are supposed to exhibit the discretion and common sense of maturity. However, that such is not the case is shown by the following examples:

## THE PROBLEM OF BONEHEADEDNESS

At a certain point on one of our main underground electric haulage tracks, where the overhead weight made timber sets necessary with the posts close to the clearance of the ears, several accidents occurred from men trying to stand between the posts and the ears instead of passing

\*An address delivered by E. F. Tillson before the New York Section of the Mining and Metallurgical Society of America, Sept. 19, 1914.



behind the posts where there was plenty of room. To overcome a repetition of these accidents, we delegated a workman to be stationed at this point to keep men from such an accident, and lo, he was the next one so injured!

Just recently an experienced miner performed an act so lacking in common sense that it seems unaccountable. Contrary to orders he mounted his rock drill to deepen a drill hole of the round he had fired the previous day, which had not broken its burden, and as a result some of the dynamite which remained in the hole was ignited by the percussion of the drill steel or sparks which it made against the rock, and the explosive burned with fumes which drove the miner from the working place, but did not injure him. Upon his return to this working place he again placed the drill steel in the same hole and some of the explosive which remained from the burning this time exploded and peppered the miner's face with rock and will probably cause the loss of an eye.

So in order to stimulate the shift bosses with such zeal and close attention in their safety supervision as would be expected in the attitude of a kindergarten teacher toward her pupil, we offered in April, 1913, a prize of \$200 at the end of the year to the mine shift boss or timber boss having the best record for freedom from serious accidents, whose value was rated by the company's doctor in accordance with his prognosis rated against the total shifts of labor supervised by that boss. A table of prognosis values was formulated with due regard to the relative values of fatalities, total disabilities and major injuries as shown in the New Jersey's employers' liability and compensation laws, and the probable length of time of disability was considered in setting values for minor injuries. The following table is a list of injuries and the values applying to them, among which is a demerit of 50 points for the failure of a boss to report an accident.

VALUATION OF INJURIES FOR SAFETY WORK

| Diagnosis                            | Length of Disability | Numerical Basis |
|--------------------------------------|----------------------|-----------------|
| Loss of life.....                    |                      | 200             |
| Total disability.....                |                      | 200             |
| (a) Loss of both eyes.....           |                      | 150             |
| (b) Loss of both arms.....           |                      | 125             |
| (c) Loss of both legs.....           |                      | 100             |
| (d) Broken back.....                 |                      | 100             |
| Loss of arm or leg.....              |                      | 75              |
| Loss of eye.....                     |                      | 60              |
| Fracture of femur.....               | 3 months             | 50              |
| Compound fracture of arm or leg..... | 3 months             | 7-30            |
| Loss of thumb or big toe.....        |                      | 7-30            |
| Simple fracture of arm or leg.....   | 2 months             | 7-15            |
| Loss of fingers or toes.....         |                      | 1-10            |
| Injuries of joints.....              | 1-4 weeks            | 1-10            |
| Lacerated wounds.....                | 1-3 weeks            | 15              |
| Contusions.....                      | 1-2 weeks            | 50              |
| Abrasions.....                       | 1-10 days            |                 |
| Scalp wounds.....                    | 1-10 days            |                 |
| Dislocations.....                    | 2 weeks              |                 |
| Failure to report accident.....      |                      | 50              |

Although we realized that chance played an important part in the winning of this prize, inasmuch as many accidents have the same potentialities but result in sometimes trivial and sometimes serious injuries, nevertheless, in view of the fact that the failure of a boss to win reward did not deprive him of anything which he had previously enjoyed, it seemed such a prize would prove a stimulus to devote attention to safety work so as to improve their chances of winning. It was gratifying to note that this prize went to a man whose work lay in a comparatively hazardous territory, so far as treacherous ground was concerned, and also fell to a man who was conspicuous in his interest and precautions for safety.

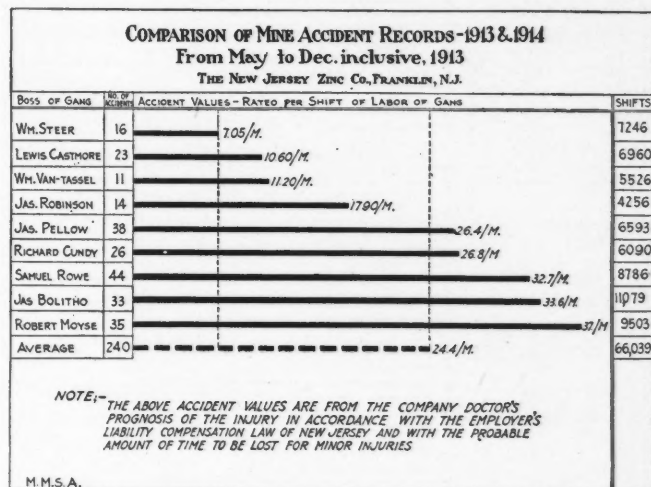
The accompanying illustrations show the comparative standing of mine bosses contesting for the above prize, and sheets 1 and 2 show graphically that during the last

eight months of 1913, when this prize system was operative, accident prevention compared most favorably with that of the first four months of the year, when no such plan was in operation, for:

(1) The number of accidents per 1000 shifts of labor worked had fallen from 6 to 4.9, or a reduction of 18.30% under the prize scheme.

(2) The number of disabilities (accidents requiring any loss of time subsequent to the date of injury) per 1000 shifts of labor had fallen from an average, for the first four months of the year 1913, of 2.24 to an average of 1.84 for the last eight months, or a reduction of 17.8%.

(3) The shifts of labor lost owing to the disabilities of accidents rated per 1000 shifts of labor worked in mines were 18.35 as an average of the four months previous to the above plan and averaged 17.30 afterwards for the next eight months, and showed a decrease of 5.7 per cent.



(4) There were, during the first four months, only three gangs, totaling 2469.4 shifts of labor, who had perfect freedom from disabilities, while during the last eight months there were twelve gangs, totaling 9126 shifts, who had perfect scores; therefore, the scores in the latter period of time were about four times as good as in the former.

However, it seemed that we could improve on the lump sum reward by making the prize a monthly rather than an annual one, and thus reduce the element of chance in affecting throughout the entire year the reward of a man who has been zealous in his safety work and has shown excellent records for most of the months only to have the misfortune of the spoiling of his chances by some serious but unpreventable accidents in one or two months. Furthermore, we abandoned the elaborate evaluation of accidents by prognosis of injuries for several reasons:

(a) The same latent potentialities exist in the causes of many accidents whose resulting injuries are widely diverse in seriousness, so that the factor of fortune or misfortune affected the score too vitally.

(b) The personal element of a doctor's prognosis is often embarrassing to him as he feels he must be on guard not to show favoritism.

(c) The clerical labor involved must to a great degree be borne by the doctor, who could spend his time to better advantage.

THE MONTHLY BONUS PLAN

To improve upon the \$200 annual lump prize plan we arranged for a monthly distribution of a \$10 bonus to each underground timber boss or shift boss who, during 1914, had less than 1.20 disabilities per 1000 shifts of labor worked in his gang each month; and this rate was made arbitrarily as one which was capable of attainment, but indicative of considerable improvement in safety work. Such a scheme has an impulse for safety which is ever present, since it means that a boss can usually increase his salary 10% by devoting his spare time and

**SHEET-1**  
COMPARISON OF MINE ACCIDENT RECORDS - 1913 & 1914  
THE NEW JERSEY ZINC CO., FRANKLIN, N. J.

| MONTH                | SHIFTS LABOR | NO OF ACCIDENTS | DISABILITIES | DISABILITIES OR ACCIDENTS REQUIRING 10% OF TIME, RATED PER 1000 SHIFTS LABOR WORKED | RATE |
|----------------------|--------------|-----------------|--------------|---|------|
| JAN. 1913            | 8724         | 45              | 16           |   | 2.06 |
| FEB. "               | 7947         | 48              | 17           |   | 2.14 |
| MAR. "               | 8545         | 50              | 19           |   | 2.23 |
| APR. "               | 8683         | 60              | 22           |   | 2.54 |
| TOTAL 4 MONTHS 1913  | 33,901       | 203             | 76           |   | 2.24 |
| MAY 1913             | 8947         | 52              | 24           |   | 2.68 |
| JUNE "               | 8454         | 46              | 18           |   | 2.13 |
| JULY "               | 8722         | 40              | 15           |   | 1.72 |
| AUG. "               | 9461         | 51              | 15           |   | 1.59 |
| SEP. "               | 9084         | 45              | 23           |   | 2.53 |
| OCT. "               | 10,732       | 44              | 11           |   | 1.03 |
| NOV. "               | 9974         | 46              | 18           |   | 1.81 |
| DEC. "               | 10,425       | 47              | 15           |   | 1.44 |
| TOTAL 12 MONTHS 1913 | 75,803       | 371             | 139          |   | 1.84 |
| TOTAL 1913           | 108,704      | 574             | 215          |   | 1.96 |
| JAN. 1914            | 10,650       | 43              | 15           |   | 1.41 |
| FEB. "               | 9197         | 44              | 18           |   | 1.96 |
| MAR. "               | 10,002       | 76              | 18           |   | 1.80 |
| APR. "               | 10,042       | 53              | 9            |   | 0.90 |
| MAY "                | 10,664       | 77              | 9            |   | 0.84 |
| JUNE "               | 10,612       | 61              | 9            |   | 0.85 |
| JULY "               | 11,336       | 75              | 10           |   | 0.88 |
| AUG. "               | 12,380       | 73              | 9            |   | 0.73 |
| SEPT. "              | 12,250       | 72              | 15           |   | 1.14 |
| TOTAL 9 MONTHS 1914  | 98,227       | 574             | 112          |   | 1.13 |
| OCT. 1914            |              |                 |              |   |      |
| NOV. "               |              |                 |              |   |      |
| DEC. "               |              |                 |              |   |      |
| TOTAL 1914           |              |                 |              |   |      |
| M. M. S. A.          |              |                 |              |   |      |

**SHEET-2**  
COMPARISON OF MINE ACCIDENT RECORDS - 1913 & 1914  
THE NEW JERSEY ZINC CO., FRANKLIN, N. J.

| MONTH                | SHIFTS LABOR | NO OF ACCIDENTS | SHIFTS LOST | SHIFTS LOST OWING TO ACCIDENTS, RATED PER 1000 SHIFTS OF LABOR WORKED | RATE  |
|----------------------|--------------|-----------------|-------------|---|-------|
| JAN. 1913            | 8724         | 16              | 156         |   | 17.88 |
| FEB. "               | 7947         | 17              | 96          |   | 12.09 |
| MAR. "               | 8545         | 19              | 172         |   | 20.15 |
| APR. "               | 8683         | 22              | 198         |   | 22.83 |
| TOTAL 4 MONTHS 1913  | 33,901       | 203             | 622         |   | 18.35 |
| MAY 1913             | 8947         | 24              | 187         |   | 20.90 |
| JUNE "               | 8454         | 18              | 139         |   | 16.45 |
| JULY "               | 8722         | 15              | 111         |   | 12.74 |
| AUG. "               | 9461         | 15              | 116         |   | 13.70 |
| SEP. "               | 9084         | 23              | 170         |   | 18.74 |
| OCT. "               | 10,732       | 11              | 234         |   | 21.80 |
| NOV. "               | 9974         | 18              | 162         |   | 16.24 |
| DEC. "               | 10,425       | 15              | 194         |   | 18.60 |
| TOTAL 12 MONTHS 1913 | 75,803       | 139             | 1313        |   | 17.30 |
| TOTAL 1913           | 108,704      | 215             | 1935        |   | 17.65 |
| JAN. 1914            | 10,650       | 15              | 200         |   | 18.77 |
| FEB. "               | 9197         | 18              | 132         |   | 14.37 |
| MAR. "               | 10,002       | 18              | 198         |   | 19.80 |
| APR. "               | 10,042       | 9               | 212         |   | 21.08 |
| MAY "                | 10,664       | 9               | 124         |   | 11.64 |
| JUNE "               | 10,612       | 9               | 135         |   | 12.72 |
| JULY "               | 11,336       | 10              | 92          |   | 8.12  |
| AUG. "               | 12,380       | 9               | 97          |   | 7.83  |
| SEP. "               | 12,250       | 15              | 133         |   | 10.85 |
| TOTAL 9 MONTHS 1914  | 98,227       | 112             | 1323        |   | 13.48 |
| OCT. 1914            |              |                 |             |   |       |
| NOV. "               |              |                 |             |   |       |
| DEC. "               |              |                 |             |   |       |
| TOTAL 1914           |              |                 |             |   |       |
| M. M. S. A.          |              |                 |             |   |       |

interest in the continual education and training of his men in safety measures, and encourages him to persist in his instruction of the stupid and ignorant, as well as disciplining of the careless and disobedient. That such has been the case is shown by consideration of the number of bonuses which would have been paid in the two periods of 1913 and until Oct. 1, 1914, if such a monthly bonus rating had been operative for that entire period of time. During the first four months of 1913 eight bonuses would have been paid out of a possible 32, or the standing was 25% "hits"; and in the latter eight months of the year 26 bonuses would have been paid from a possible 64, or the standing was 40.7% "hits." During the first nine months of 1914 we have paid 46 bonuses out of a possible 80 and the record of achievement shows that our bosses are now succeeding 57.5% of the time, also that 29 times out of the 46 there were no disabilities or 36.3% of possible shots were "bull's eyes."

But a teacher rarely accomplishes much without the cooperation of his pupil, and neither will a boss be able to train his labor in safety methods without their interest; so the scheme was inaugurated in January, 1914, of making a monthly rating of the number of shifts of labor lost through accidents (rated per 1000 shifts of labor worked) in each gang of the underground and surface mining operations; and of that gang, respectively, having the best record each month each member was rewarded with a cigar, specially marked so as to denote that it had been given by the New Jersey Zinc Co., for excellence in safe work. Although our mine labor was about 90% of such nationalities as Russians, Poles, Slavs, Lithuanians and Hungarians, it was encouraging to note the pleasure and interest evinced by the men who received these cigars and their pride and understanding in regard to the matter. That this distinctive token means something to the men is shown by the fact that during the first nine months of 1914 there have been 29 gangs of the 80 underground gang-months who have won the cigars by a clean record with no loss of time through accident, although 26,289 shifts of labor were worked; and in addition there were 11 open-cut gangs who won cigars, of which nine gangs had a clean record with 5839 shifts of labor. So there were 38 gangs of men in the mine during January to October, 1914, who worked 32,128 shifts in 232 working days, or the equivalent of about 138 men worked for nine months, grouped in gangs, without loss of time from accident. In 1913 there were about one-half as many gangs with perfect "no lost-time" records in 12 months, and less than half as many shifts of labor were included in these gangs; so there has been an improvement in 1914 of about 250% over 1913.

As a result of this personal stimulus there has been a conservation of the laborer's earning powers with profit to his home, and, on the other hand, the employer has greatly benefited because there have been fewer changes in the personnel of his plant with the consequent loss of time, production and efficiency.

In conjunction with the bonus schemes just described other means were taken to educate the men in safety and first-aid work, and to impress the men with the knowledge that the company was doing its utmost to protect them, and that in order to succeed they must use such safeguards as were furnished by rules, instructions and mechanisms. In the mining department a first-aid corps of eight members was formed by the appointment by the mine foreman of two new members bi-weekly to succeed two retiring members. This corps meets once a week to receive instruction from the company doctor and its members are paid their regular hourly rate for such time. At the end of the eighth week of service membership expires, and if the doctor considers a retiring member proficient the latter receives a first-aid badge as a mark of his eligibility to serve in the Workmen's Safety Committee. The above apprentice course does not pretend to fit a man for the handling of accidents in the mine and he is not given access to the emergency kits in the different shift-bosses' territories, but it does intend interesting him in the proper care of himself and others and not only furnishes an index of the men who will prove most helpful as an influence for good on the Workmen's Safety Committee, but also forms a basis for the organization of first-aid and rescue teams in the different territories so as to assist the shift bosses in the care of

accidents. During the first nine months of 1914 there have been 41 qualified graduates of the first-aid committee and the formation of rescue teams is in hand, with the idea of training them so thoroughly as to warrant their access to emergency kits and care for the injured who come to their notice. These men will receive training in fire fighting, oxygen-helmet rescue work and competitive drills, and it is hoped that frequent prize competitions among themselves and with foreign plants will keep their interest alive.

MAKE-UP OF THE WORKMEN'S COMMITTEE

The members of the Workmen's Safety Committee are appointed, two bi-weekly, by the head of the mining department and serve four weeks, holding weekly meetings with the department head, or his representative, to discuss the nature of the accidents which have occurred the previous week and to take a tour of inspection through some portion of the mine, thus devoting an entire shift. Suggestions are encouraged from the men, but probably the most important results are due to their education and prompting of interest in the protection of themselves and others, as well as to the subtle spur to the supervision of the bosses, caused by the inspection and possible criticism of their territories by a workmen's committee. Each member is active for four weeks and then exchanges his

lectures, showing safe and dangerous practices, we have not as yet found a sufficient supply of such material pertinent to metal-mining practices to insure the proper development of a series of lectures.

It is noticeable that our safety organization does not require the formation of a special safety department, but places the responsibility upon the heads of departments with the expectation that they will exhibit the same zeal in safety as they do in production. In this way are avoided many occasions of staff friction between operating and safety control; and the work of the company is accomplished more efficiently because there is no division of authority in any department, and because the head of operations is best qualified to select the proper time for taking safety measures without undue increase of floating gangs and without waste of time. The success of this scheme really depends upon the earnestness of "the man higher up," for if he requires of his subordinates the same interest and results in safety work as he expects in production, the returns will be comparable.

In order to work intelligently in the development of safety work, it is highly important that each department head have sufficient clerical aid to attend to the routine of bulletins, the abstracting of safety literature, and most especially the recording of all accidents, with classification of their causes, of their disposition among the various

MINE ACCIDENT RECORD FOR 1914

|  | R. J.<br>Moyses | Wm.<br>Steer | Total<br>Under-ground | Surface<br>and Misc'l's. | Total<br>Open Cuts | Grand Total<br>Mining |
|--|-----------------|--------------|-----------------------|--------------------------|--------------------|-----------------------|
| January  |                 |              |                       |                          |                    |                       |
| No. of accidents.....  | 10              | 3            | 44                    | 0                        | 1                  | 45                    |
| No. requiring loss of time.....                              | 6               | 1            | 18                    | 0                        | 0                  | 18                    |
| Time lost by accidents.....                                  | 40 + (0)        | 10 + (0)     | 85 + (71)             | 0                        | 0                  | 85 + (71)             |
| Shifts labor worked.....                                     | 910.1           | 912.1        | 6817.1                | 665.2                    | 1242.2             | 8724.5                |
| Lost time, accidents rated per 1000 shifts labor worked..... | 6.60            | B. 1.10      | 3B. 2.64              | 0                        | 0                  | 2.06                  |
| Time lost by accidents per 1000 shifts.....                  | 43.90           | 10.97        | 12.46                 | 0                        | 0                  | 9.75 *17.88           |
| February   |                 |              |                       |                          |                    |                       |
| No. of accidents.....  | 5               | 4            | 43                    | 1                        | 4                  | 48                    |
| No. requiring loss of time.....                              | 2               | 2            | 14 + 2F               | 0                        | 1                  | 15 + 2F               |
| Time lost by accidents.....                                  | 13 + (0)        | 2 + (0)      | 63 + 3F + (32)        | 0                        | 1                  | 64 + 3F + (32)        |
| Shifts labor worked.....                                     | 965.4           | 795.3        | 6295.6                | 620.2                    | 1031.3             | 7947.3                |
| Lost time, accidents rated per 1000 shifts labor worked..... | 2.07            | 2.52         | 1B. 2.54              | 0                        | 0.97               | 2.14                  |
| Time lost by accidents per 1000 shifts.....                  | 13.48           | 2.52         | 10.00                 | 0                        | 0.97               | 8.06 *12.09           |

\* Time lost by accidents per 1000 shifts labor, including lost time caused by accident of previous months.

active badge (showing a red enamel border) for an exempt one (with a blue enamel border), but receives his usual pay for time devoted to active service; and is privileged as an active member to attend the scene of an accident, in the interests of safety work, when his absence from regular work does not cause injury to the company property or working operations. When any serious accident takes place, the Safety Committee visits the scene to discuss causes and remedies and the committeemen are asked to spread the news to the other workmen of how the accident took place so that they may profit by the example and, if the accident was preventable, avoid the same pitfalls. The exempt members of the Workmen's Safety Committee are requested to take an active interest in safety work and to contribute suggestions to the safety suggestion box, also to caution any workman endangering his own safety or that of anyone else.

The heads of departments are expected to make quarterly tours of inspection throughout the entire plant, accompanied if possible by a safety inspector from some other plant, and then hold a meeting to discuss any improvements and receive suggestions of practices elsewhere as noted by the department heads or visiting safety inspector.

Although we have hopes of supplementing this safety campaign by frequent stereopticon and moving-picture

gangs, and of the number involving loss of time and the amount of time so lost. Our system of recording accidents is as follows, and we feel that we have obtained, during 1914, knowledge of almost all the accidents, including trivial ones such as grazed knuckles, and are sure that at least 30% more have been reported than in the previous year.

Blanks are furnished to the shift bosses for them to fill out with the following information concerning injuries sustained by any workmen of their gangs. These show whether they were injured in company work or off shift, stating particularly if the latter condition existed, so that the company will have information to disprove fraudulent claims for injuries in their employment; and give name, pay-roll number, address, age, occupation, place where accident occurred, date and hour of accident, where taken after accident, supervisor of the work, witnesses, description of the injury, manner in which the accident happened, and suggestions as to how it might have been avoided. These reports are kept by the mine foreman, who investigates the matter and makes a copy of the report, which is then forwarded to the time office, where information is entered as to weekly wages, weekly rate of half-time, nationality, length of time man had been employed at the work in which he was injured, how long he had been in the service of the company, and as

to whether he was married or single; and the report is then sent to the main-plant office, where the above information is typewritten in duplicate on large accident-report sheets and these are supplied with the added information of the probable length of disability (shown by the surgeon's prognosis), and the actual time of disability

plant office and the copy is sent to the main company office. The State of New Jersey requires the immediate reporting of accidents to the Department of Labor, at Trenton, on a special form.

The shift bosses are also equipped with forms admitting men to hospital service and these they fill out with the

**Comparison of Mine-Accident Records 1912, 1913 and 1914**

THE NEW JERSEY ZINC CO., FRANKLIN, N. J.

| Analysis of Mining Dept. Accidents...                            | 1912  |      |           |          |      |       | 1913   |           |          |       |       |       | Jan.-Oct., 1914 |          |           |      |       |       |       |      |       |     |       |
|--|---|------|-----------|----------|------|-------|--------|-----------|----------|-------|-------|-------|-----------------|----------|-----------|------|-------|-------|-------|------|-------|-----|-------|
|  | Killed  |      | Injured   |          |      |       | Killed |           | Injured  |       |       |       | Killed          |          | Injured   |      |       |       |       |      |       |     |       |
|  | Number and per cent. of underground men killed or injured |      | Seriously | Slightly |      |       |        | Seriously | Slightly |       |       |       | Seriously       | Slightly | Trivially |      |       |       |       |      |       |     |       |
| By fall of rock or ore from roof or wall...                      | 3   | 75%  | 8         | 30.8%    | 57   | 17.5% | 3      | 100%      | 4        | 22.2% | 30    | 16.1% | ..              | ..       | ..        | 3    | 27.3% | 11    | 13.0% | 33   | 7.8%  |     |       |
| By rock or ore while loading at working face.....                | ..  | ..   | ..        | ..       | ..   | ..    | ..     | ..        | ..       | ..    | 7     | 3.8%  | ..              | ..       | ..        | ..   | ..    | 1     | 1.2%  | 1    | 0.2%  |     |       |
| By timber or hand tools.....                                     | ..  | ..   | 4         | 15.4%    | 75   | 23.0% | ..     | ..        | 3        | 16.7% | 39    | 21.0% | ..              | ..       | ..        | ..   | ..    | 1     | 9.1%  | 18   | 21.2% | 121 | 28.7% |
| By explosives.....   | ..  | ..   | 1         | 3.9%     | 2    | 0.6%  | ..     | ..        | 2        | 11.1% | 1     | 0.5%  | ..              | ..       | ..        | ..   | ..    | 2     | 18.2% | 1    | 1.1%  | 1   | 0.2%  |
| By hauling (mine cars, locomotives, breaking of rope, etc.)..... | ..  | ..   | 5         | 19.2%    | 47   | 14.4% | ..     | ..        | 5        | 27.8% | 29    | 15.6% | ..              | ..       | ..        | ..   | ..    | 2     | 18.2% | 12   | 14.1% | 69  | 16.3% |
| By falling down chute, winze, raise, stope, etc.....             | 1   | 25%  | 3         | 11.5%    | 10   | 3.1%  | ..     | ..        | 1        | 5.6%  | 6     | 3.2%  | 1               | 100%     | 1         | 9.1% | 13    | 15.3% | 16    | 3.8% | ..    | ..  |       |
| By run of ore from chute or pocket...                            | ..  | ..   | 5         | 19.2%    | 98   | 30.1% | ..     | ..        | 1        | 5.6%  | 49    | 23.6% | ..              | ..       | ..        | ..   | ..    | 1     | 9.1%  | 12   | 14.1% | 92  | 21.8% |
| By drilling (machine or hand drills)...                          | ..  | ..   | ..        | ..       | 28   | 8.6%  | ..     | ..        | ..       | ..    | 15    | 8.1%  | ..              | ..       | ..        | ..   | ..    | ..    | ..    | 11   | 13.0% | 34  | 8.2%  |
| By machinery (pumps, hoisting engines and haulage).....          | ..  | ..   | ..        | ..       | 4    | 1.2%  | ..     | ..        | 1        | 5.5%  | 7     | 3.8%  | ..              | ..       | ..        | ..   | ..    | ..    | ..    | ..   | ..    | ..  | ..    |
| By stepping or falling on nail or spike...                       | ..  | ..   | ..        | ..       | ..   | ..    | ..     | ..        | ..       | ..    | 1     | 0.5%  | ..              | ..       | ..        | ..   | ..    | ..    | ..    | 1    | 1.1%  | 5   | 1.2%  |
| By sledging chunks and mucking...                                | ..  | ..   | ..        | ..       | 5    | 1.5%  | ..     | ..        | 1        | 5.5%  | 2     | 1.1%  | ..              | ..       | ..        | ..   | ..    | 1     | 9.0%  | 5    | 5.9%  | 50  | 11.8% |
| Total.....   | 4   | 100% | 26        | 100%     | 326  | 100%  | 3      | 100%      | 18       | 100%  | 186   | 100%  | 1               | 100%     | 11        | 100% | 85    | 100%  | 422   | 100% | ..    | ..  | ..    |
| Rate per 1000 employees on 300-day-year basis.....               | 14.55   | ..   | 94.6      | ..       | 1188 | ..    | 9.03   | ..        | 54.2     | ..    | 560   | ..    | 3.86            | ..       | 42.5      | ..   | 328   | ..    | 1630  | ..   | ..    | ..  | ..    |
| Per cent. decrease in underground accident rates.....            | ..  | ..   | ..        | ..       | ..   | ..    | 38.0%  | ..        | 42.7%    | ..    | 52.9% | ..    | 57.3%           | ..       | 21.6%     | ..   | 41.4% | ..    | ..    | ..   | ..    | ..  | ..    |

Number and per cent. of surface men killed or injured

|   |       |      |       |     |      |    |       |                                  |       |      |       |      |       |    |       |      |       |      |      |    |       |    |       |
|---|-------|------|-------|-----|------|----|-------|----------------------------------|-------|------|-------|------|-------|----|-------|------|-------|------|------|----|-------|----|-------|
| By falls or slides of rock or ore.....                            | 1     | ..   | ..    | 2   | ..   | .. | ..    | ..                               | 2     | ..   | ..    | ..   | ..    | .. | ..    | ..   | ..    | ..   | ..   | 1  | 2.4%  |    |       |
| By haulage (cars, locomotives, etc.)...                           | ..    | ..   | ..    | ..  | ..   | .. | ..    | ..                               | 1     | ..   | ..    | ..   | ..    | .. | ..    | ..   | ..    | ..   | ..   | 6  | 14.3% |    |       |
| By falls of persons.....  | 1     | ..   | ..    | ..  | ..   | .. | ..    | ..                               | 2     | ..   | ..    | ..   | ..    | .. | ..    | ..   | ..    | ..   | ..   | 7  | 16.7% |    |       |
| By timber or hand tools.....                                      | ..    | ..   | ..    | 4   | ..   | .. | ..    | ..                               | ..    | ..   | 2     | ..   | ..    | .. | ..    | ..   | ..    | ..   | ..   | 1  | 14.3% | 20 | 47.6% |
| By drilling.....  | ..    | ..   | ..    | ..  | ..   | .. | ..    | ..                               | ..    | ..   | ..    | ..   | ..    | .. | ..    | ..   | ..    | ..   | ..   | 1  | 14.3% | 3  | 7.1%  |
| By mucking.....   | ..    | ..   | ..    | ..  | ..   | .. | ..    | ..                               | ..    | ..   | ..    | ..   | ..    | .. | ..    | ..   | ..    | ..   | ..   | 1  | 71.4% | 5  | 11.9% |
| Total.....  | 2     | 100% | ..    | 6   | 100% | .. | ..    | ..                               | 2     | 100% | 6     | 100% | ..    | .. | 1     | 100% | 7     | 100% | ..   | 42 | 100%  | .. | ..    |
| Rate per 1000 employees on 300-day year basis.....                | 133.3 | ..   | ..    | 400 | ..   | .. | ..    | ..                               | 44.4  | ..   | 133.2 | ..   | ..    | .. | 14.7  | ..   | 103   | ..   | 617  | .. | ..    | .. | ..    |
| Per cent. decrease in surface accident rates.....                 | ..    | ..   | ..    | ..  | ..   | .. | 100%  | ..                               | ..    | ..   | 66.7% | ..   | ..    | .. | 67.0% | ..   | 22.6% | ..   | ..   | .. | ..    | .. | ..    |
| Grand total mining.....   | 6     | ..   | 26    | ..  | 332  | .. | 3     | ..                               | 20    | ..   | 192   | ..   | 1     | .. | 12    | ..   | 92    | ..   | 464  | .. | ..    | .. | ..    |
| Total mining rate per 1000 employees, 300 days.....               | 20.70 | ..   | 89.70 | ..  | 1145 | .. | 7.96  | ..                               | 53.10 | ..   | 509   | ..   | 3.06  | .. | 36.70 | ..   | 281   | ..   | 1420 | .. | ..    | .. | ..    |
| Per cent. decrease in total mine accident rates.....              | ..    | ..   | ..    | ..  | ..   | .. | 61.6% | ..                               | 40.8% | ..   | 55.5% | ..   | 61.6% | .. | 30.8% | ..   | 44.8% | ..   | ..   | .. | ..    | .. | ..    |
| Number of accidents without disabilities and total accidents..... | 131   | ..   | 495   | ..  | ..   | .. | 359   | ..                               | 574   | ..   | ..    | ..   | 464   | .. | 569   | ..   | ..    | ..   | ..   | .. | ..    | .. | ..    |
| Rate of total accidents per 1000 employees, 300 days.....         | ..    | ..   | 1707  | ..  | ..   | .. | ..    | ..                               | 1222  | ..   | ..    | ..   | ..    | .. | 1740  | ..   | ..    | ..   | ..   | .. | ..    | .. | ..    |
| Number of days mine was operated.....                             | ..    | ..   | 300   | ..  | ..   | .. | ..    | ..                               | 307   | ..   | ..    | ..   | ..    | .. | 232   | ..   | ..    | ..   | ..   | .. | ..    | .. | ..    |
| Average number of men underground per day.....                    | ..    | ..   | 275   | ..  | ..   | .. | ..    | ..                               | 324   | ..   | ..    | ..   | ..    | .. | 335   | ..   | ..    | ..   | ..   | .. | ..    | .. | ..    |
| Average number of men, day, surface, excluding office.....        | ..    | ..   | 15    | ..  | ..   | .. | ..    | ..                               | 44    | ..   | ..    | ..   | ..    | .. | 88    | ..   | ..    | ..   | ..   | .. | ..    | .. | ..    |
| Length of working shift in hours.....                             | ..    | ..   | 10    | ..  | ..   | .. | 10    | from Jan.-June; 8 from July-Dec. | ..    | ..   | ..    | ..   | ..    | .. | 8     | ..   | ..    | ..   | ..   | .. | ..    | .. | ..    |

shown on the pay-roll sheets, also the dates that claims and settlements are made and their amounts, also the dates and amount of "surgeon's charges," "hospital charges," "sundry charges," and "compensation," and the "total burial expenses" and "total expenditures" are finally given. One of these reports is kept on file in the main-

date, name, pay-roll number and occupation of any man injured in company work, no matter how slight the injury. In case of serious injuries first-aid is given, stretchers are employed if necessary, and the injured men are sent to the hospital in the company's ambulance. However, if the injuries are so slight as not to incapacitate the men,

bandaging is performed by the shift boss (who carries in a tin tube on his person sterile roller bandages and gauze pads) the men receive their hospital slips at the end of the shifts. Since the hospital has dispensary hours at night as well as day, it is possible for men to report there for the inspection and dressing of wounds without interfering with attendance to work, and the shift bosses permit no men to return to work until they bring hospital discharge slips from the company surgeon, bearing the dates when they are considered fit for work. Thus the responsibility for the cleanliness of wounds, however slight, and resulting cases of blood poisoning, is placed where it belongs, directly upon the surgeon, and he has control over the injured men, since they cannot get work until he has had an opportunity for a final examination of their injuries and has formally discharged them. The shift bosses' supervision of the steadiness of their workmen is also aided, as they can note whether men have stayed away from work longer than their injuries warranted and can fairly exercise such discipline as seems proper. This system of reporting accidents seems quite efficient, for the shift bosses do not rely solely upon the voluntary reports of their men, but also question and report any man who exhibits an injury, and if a man fails to report his injury it usually becomes known ultimately and results in the severe disciplining of such man by laying off from work for a period of time or else by his dismissal.

In classifying accidents as to their causes, we have adopted the heading employed by the U. S. Bureau of Mines in its accident reports, and the accompanying table shows the comparison for 1912, 1913 and the first nine months of 1914, during which period we have amplified its classification of "Killed," "Seriously Injured" (with disability of 20 days or more), and "Slightly Injured" (with disability of from 1 to 19 days), by the added group of "Trivially Injured," which includes all accidents in which men returned to work the day following the accident. It should be noted that two systems of safety work have been tried since 1912, as has been previously described, and the results have been very gratifying, for in 1913 the decreases in accident rates per 1000 men employed for a year of 300 days were as follows:

|                         | Fatal,<br>per Cent. | Serious,<br>per Cent. | Slight,<br>per Cent. |
|-------------------------|---------------------|-----------------------|----------------------|
| Underground mining..... | 38                  | 42.7                  | 52.9                 |
| Surface mining.....     | 100                 | (Increase)            | 66.7                 |
| Total mining.....       | 61.6                | 40.8                  | 55.5                 |

Since the changes in safety organization made at the beginning of 1914, the results have been still more gratifying, for the accident rates now show a considerable decrease from those in 1913 as the following percentages demonstrate.

Decrease of accident rates in the average of the first nine months of 1914, as compared to the average of 1913:

|                         | Fatal,<br>per Cent. | Serious,<br>per Cent. | Slight,<br>per Cent. |
|-------------------------|---------------------|-----------------------|----------------------|
| Underground mining..... | 57.3                | 21.6                  | 41.4                 |
| Surface mining.....     | (None possible)     | 67.0                  | 22.6                 |
| Total mining.....       | 61.6                | 30.8                  | 44.8                 |

But still more marked is the reduction of accident rates shown by comparison of 1914 with 1912, and it should be remembered that the comparison would be more marked if the figures for the period of safety work did not include the first four months of 1913, when such work had not been inaugurated, and if the safety movement had been in progress for a period of time longer than 17 months.

The following percentages exhibit the decrease of accident rates, as based on 1000 employees for a 300-day year, from December, 1912, to October, 1914:

|                         | Fatal,<br>per Cent. | Serious,<br>per Cent. | Slight,<br>per Cent. |
|-------------------------|---------------------|-----------------------|----------------------|
| Underground mining..... | 73.7                | 55.2                  | 71.7                 |
| Surface mining.....     | 100                 | (Increase)            | 74.3                 |
| Total mining.....       | 85.2                | 59.2                  | 75.3                 |

It is possible that some credit for the above reduction in accident rates is due to a change in July, 1913, from a 10-hr. to an 8-hr. working shift, with a chance of a laborer becoming less fatigued and careless from such a condition, but on the other hand, the system of reporting accidents now is so improved over the old methods that the actual decrease in serious and slight accidents must have been even greater than the above figures indicate.

In order that the mine foreman and his assistants may be conversant with the causes of accidents which need the most attention, they keep a chart showing a list of the various classifications with columns ruled for the shift bosses, and so keep an open list for each month of the fatal, serious, slight, and trivial accidents credited to each boss' supervision. Such information is summarized on sheets and the percentage of various accident causes shows "falls of rock or ore" to be the most serious, with accidents from "hauling or tramming" next in importance, and the "falls of persons down chutes, raises and stopes" third.

The "handling of timber and hand tools" has sometimes been a source of serious accident, but plays a more important part in the causing of slight injuries, where it is rivaled by "runs of ore from chutes and pockets" and by "drilling operations." These respective positions of importance compared very similarly to those noted by the U. S. Bureau of Mines, as applying to the metal mines of the country, and we are gratified that at last our fatality rate has fallen to 3.06, a point below the average of either the coal- or metal-mining industries, whose rates were quoted as 4.36 and 4.09, respectively, for 1912, which is the latest for which the Bureau of Mines has published figures. It is only fair to the record of fatalities and serious injuries to call attention to the fact that this mine is an orebody which possesses the peculiar and unusual condition of a state of internal stress, so that ground which appears and sounds solid to all tests will suddenly crack with an explosive noise and will fall in masses from a fraction of a pound to many tons in weight, therefore the accidents from "falls of ore and rock" are extremely hard to control.

⌘

### Nickel-Plating Aluminum

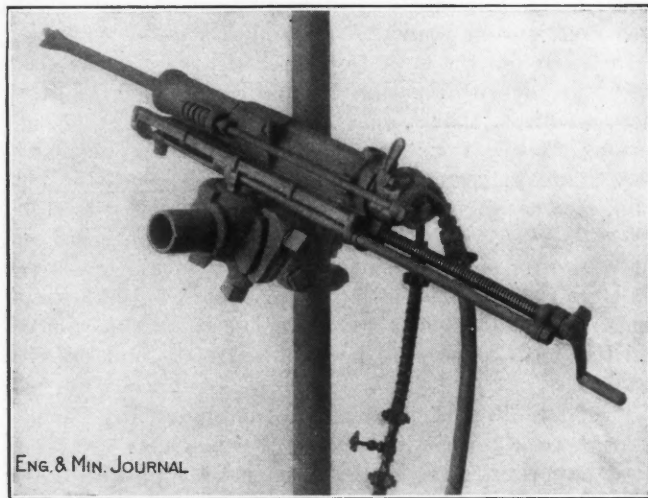
A communication has recently been presented to the Académie des Sciences by M. Le Chatelier, in which the author states that he has succeeded in nickel-plating aluminum, hitherto unaccomplished. This has considerably prevented the extension of employment of this metal, which lends itself to so many purposes, since its dull appearance, especially after prolonged use, has been much against it. The difficulty has been surmounted by a preliminary scouring of the aluminum in a bath of hydrochloric acid containing iron. The iron precipitated on the surface of the aluminum forms a kind of network, and when the piece of metal is then passed into the nickel bath the nickel becomes fastened in this network and adheres strongly to the aluminum.

# Modern American Rock Drills--VIII

BY L. O. KELLOGG

**SYNOPSIS**—Sullivan Machinery Co. now making a mounted hammer drill, hand-fed, with water attachment. Rotation effected as in Sullivan rotating plugger.

Since this series of descriptions was begun, the Sullivan Machinery Co. put on the market a mounted hammer drill with water attachment, which is more nearly comparable with the Leyner than with any other model.



SULLIVAN MOUNTED HAMMER DRILL

It uses the same system of rotation as does the Sullivan automatically rotating plugger, also recently brought out, and described in Part VII of this series. It differs, however, from this rotating plugger or sinker in several particulars, especially in its valve action, and to some extent, in the system of water control, in the arrangement of the

of the valve is turned down to a slightly smaller diameter at *F*. By this means, a differential pressure is obtained, tending constantly to force the valve forward to the position shown in the illustration.

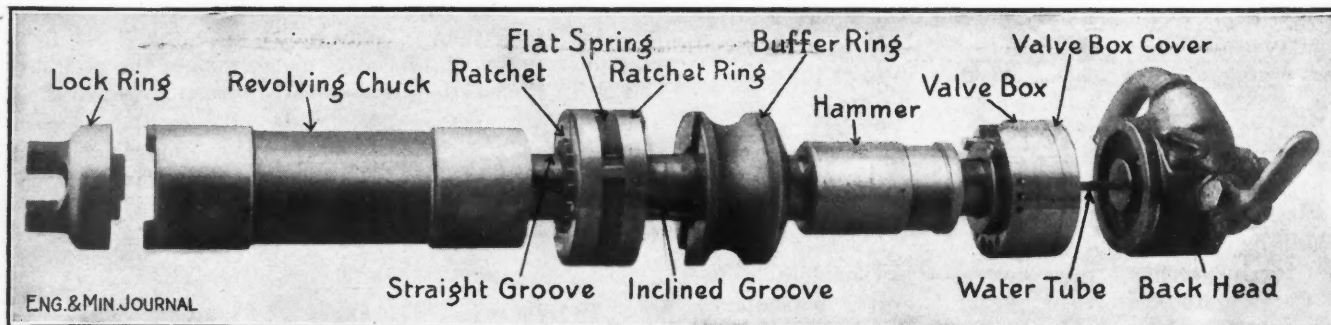
There is a groove, or spooled-out portion, in the main part of the hammer; as the hammer moves forward on its useful stroke, this groove establishes communication between a constant-pressure port in the cylinder wall and an intermittent-pressure port in the cylinder leading to the port *E*. The valve area thus subjected to backward pressure is greater than that subject to forward pressure so that the valve is thrown back, reversing the air supply and consequently the direction of movement of the hammer.

The rear end of the hammer is reduced in section to enter the valve itself and is grooved longitudinally to cushion its return. The same device is employed on the hammer of the DA-21 stoper.

All the exhaust takes place through the port along the top of the cylinder wall; this connects with a large radial port tapped to take an ell which will deflect the blast of the exhaust as may be desired.

The air-and-water control is ingenious; it is effected with a single throttle valve. This in its first position admits air to the drill steel only and thus to the bottom of the hole. In its second it admits both air and water to the steel. In its third it admits air to the valve and cylinder so that the hammer reciprocates, the air and water-supply to the dull steel being maintained. In closing, the action is just reversed. Thus the bottom of the hole is thoroughly cleaned by water and air, and then by air alone, just after drilling stops. This obviates the danger that water may find its way into the cylinder.

The operation of the water and air control is as fol-



ROTATING AND STRIKING MECHANISM OF SULLIVAN MOUNTED HAMMER DRILL

front-head parts, and in the lubricator, as well as in the particulars arising from the difference in type.

The valve is a hollow, axial, spool valve set at the back of the drilling cylinder, similar in appearance to that of the DA-21 Sullivan stoper, described in Part VI. In its action, however, it corresponds more closely with the DA-15 and the DC-19 machines of the same company. The valve proper works in a valve box and a valve-box cover, the several ports being contained in these last two parts. These three parts are held against the back end of the cylinder by the back head. The port *D* in the valve-box cover is subject to constant pressure, and the back end

lows: As the throttle is turned to start the machine, live air is admitted to the port *C*, and thus to the port *B*, then around the nozzle and into the end of the water tube, which extends through the machine and into the shank of the drill steel in the usual manner. The water is admitted through suitable passages to the space under the gland plug cap, and then passes through the port *A* to the nozzle, where it is taken up by the air from the port *B* and carried into the water tube along with it. This admission of the water is also controlled by the throttle valve. A final turn of the throttle connects the air supply with the ports to the spool valve.

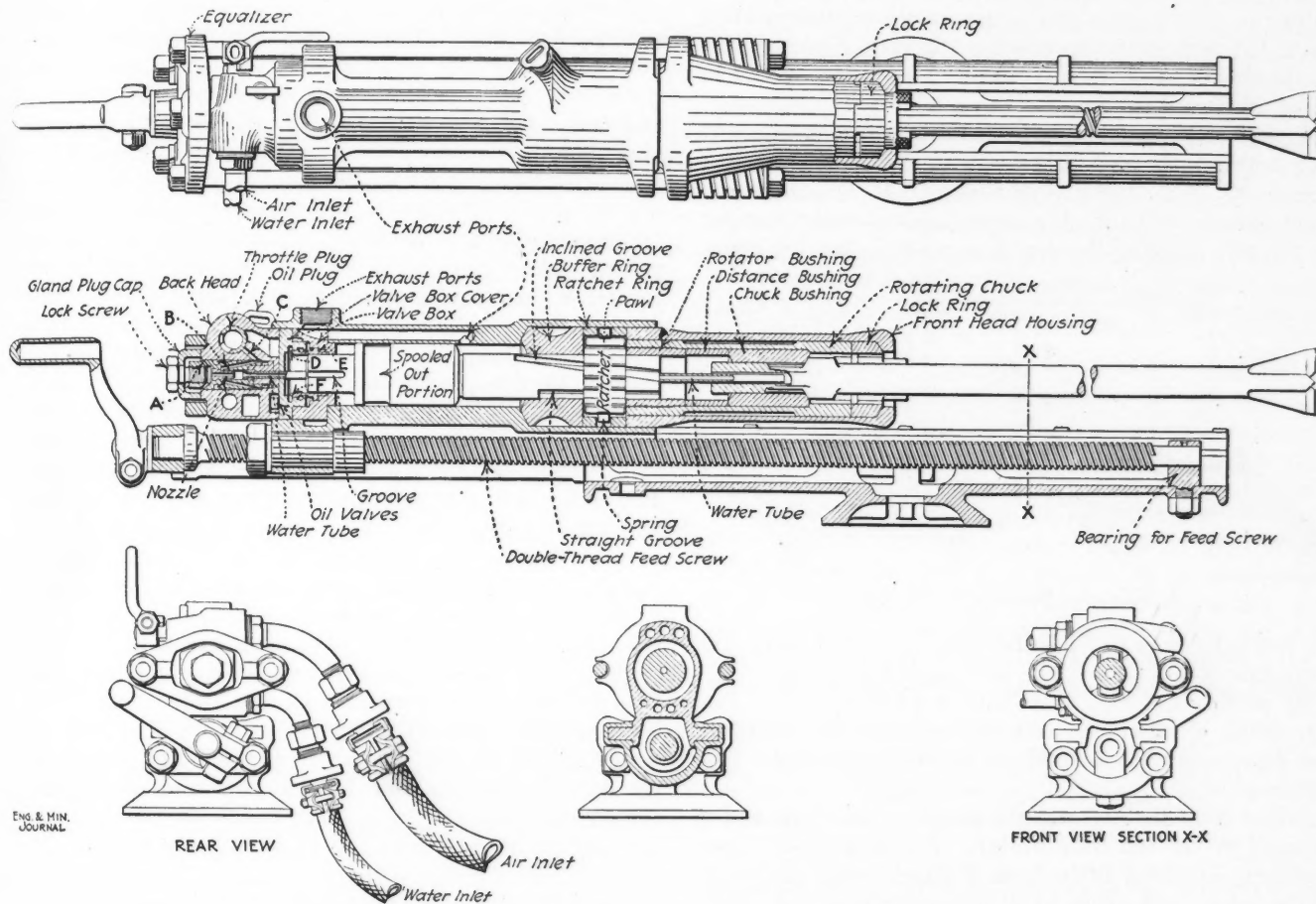
The lubricator is also situated in the back head. In its general principles it resembles other Sullivan lubricators, such as that used on the automatically rotating plugger, but it is set somewhat differently and differs in its shape. Two small check valves working in opposite directions communicate with an oil chamber on one side and are subjected to pulsating air pressure on the other, so that oil is drawn out and into the air current, thus circulating through the machine. The oil plug for filling this chamber is at the top of the back head.

The front end of the hammer is of smaller section and

springs being applied at the front end, while an equalizer across the back bears on the back head. There are grooved lugs on the sides of the cylinder, in which the side rods fit, thus holding the back head and chuck housing in alignment with the cylinder.

It will be noted that the cross-section of the machine is made as small in its overall dimensions as is possible. This is in order that it may be set close to the rock sides or the back when drifting, or when doing other close work.

The water-supply is obtained either from a gravity head, a pump, or from a tank under air pressure, as in



PLAN, SECTIONS AND ELEVATIONS OF SULLIVAN SHELL-MOUNTED HAMMER MACHINE

in it both straight and inclined grooves are machined, which operate to rotate the steel just as in the case of the rotating plugger. Most of the front-head mechanism is contained in a housing which fits under the forward end of the cylinder. This housing bears against the ratchet ring, the ratchet ring bears against a buffer ring, and the buffer ring in turn bears against a shoulder on the inside of the cylinder itself. The chuck revolves in the front-head housing, and itself contains a chuck bushing for the shank of the steel, a distance bushing, and at the back a rotator bushing to engage the straight grooves of the hammer.

The hollow drill steel used has a lugged shank, which is held in the chuck by a lock ring. After inserting the steel the two projecting knurled lugs of this lock ring are twisted with the fingers, and the steel is thus fastened in the chuck.

The front head, cylinder and back head are held together with side rods in the usual manner, the helical

case of the Sullivan piston machine with water attachment and the Leyner.

The machine weighs 145 lb., has a  $2\frac{1}{8}$ -in. working stroke and a cylinder  $2\frac{1}{2}$  in. in diameter.

(To be concluded)

### Embargo on Italian Exports

According to press dispatches the Italian Government has placed an embargo on the export of the following among other commodities: Coal, petroleum, benzine, glycerin, lubricants, copper, aluminum, lead, silicon, sodium nitrate, sulphuric acid, nitric acid, calcium carbide, acetone, sulphuric anhydride, picric acid, and sodium carbonate.

**Pitchblende is Now Being Mined in India** at Abraki Pahar, in the Gaya district, in the province of Orissa, according to M. C. A. Crump, of Bombay. The pitchblende is found in small quantities in a deposit of pegmatite, which has been mined for mica.

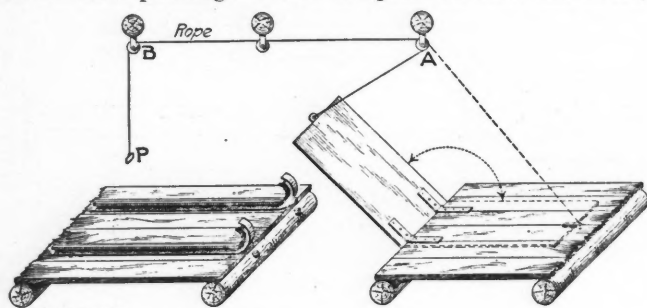
## Details of Practical Mining

### Safety Door for Dump

By H. H. HODGKINSON\*

Underground trammers will persist in leaving open the doors over ore chutes, exposing others to the danger of falling in. Often the chutes are in the main traveling roads, the cars dumping between the rails. Such places should always be provided with doors, and they should be closed when not in use.

A piece of 1/4-in. iron plate 22x42 in. will make a handy door between the rails when a 2-ft. gage track is used. A piece of 3/8-in. hemp rope about 18 ft. long and two small pulleys will not only save time and make it easier for the men pushing the cars to open and close the doors,



A SAFETY DOOR FOR DUMPS

but will help them to remember that they must do it. The arrangement is shown in the accompanying sketch.

By pulling the rope at *P* with a quick jerk, the door will swing all the way back and rest on the platform, and when in the latter position another jerk at the rope will close it.

Pulley *A* is directly over the hinges of the door and is fastened to the cap of a timber. Pulley *B* is also fastened to a cap about 12 ft. from *A* directly over the center of the track. The rope at *P* hangs down in the center of the track and is low enough to touch the trammers on the shoulder. The rope should always be long enough to enable the trammers to open the door just before they reach the dump, thus avoiding delay.

### Copper Country Sand Filling

Sand filling has proved successful in the Copper Range group of mines in Michigan, it having been demonstrated conclusively that it is economical and safe. While particularly adapted to Copper Range conditions, several other mines of this district are contemplating installing the system. The Quincy already is making experiments to test its feasibility. It is figured that the method will not only make a large saving in timber costs but will help to prevent air-blasts. In the Copper Range mines the system has largely replaced the rock-filling method which Manager Denton introduced at the Champion mine some years ago, and which has come into rather general use, more or less modified, at various properties where good rock-pickers could be secured.

\*Mining engineer, Franklin Furnace, N. J.

### Record of Temple-Ingersoll Drills on the Mesabi Range

For five months, during 1913-14, some interesting drilling was done at the Virginia mine on the Mesabi range, under the direction of J. H. Eby, at that time superintendent. The machines used were Type 5-F Temple-Ingersoll drills, on tripods. It may be well to recall here that these drills employ both air and electricity in their operation, but not in the manner of some other electric air drills. The air is not used once and exhausted, but constitutes the manner of transmitting the electric power. The air circuit is a closed one, the air being returned for use again, excepting that small portion that escapes through leakage. The drill is connected to a separate carriage, holding the pulsator and motor, by two lines of air hose, acting as the supply and return lines.

At the Virginia mine the drills were operated on a 220-volt three-phase alternating current. They were manned by a runner, at \$3 per day, and two helpers at \$2.40 per day each. All the holes drilled were over 10 ft. deep and the majority over 24 ft. deep. Some of the holes were vertical and some were as flat as 5° from the horizontal. Incidentally, according to Mr. Eby, experience proved that cruciform steel was best adapted to the work, the great difficulty being in keeping the holes clear of sludge. The material drilled varied from soft hematite to extremely hard taconite. In the latter rock, three hand drillers, two striking and one turning, with an ample supply of sharp steel could drill not over 1 ft. per hr. Fissured ground was common, and the ore was exceedingly irregular, with hard seams in the soft ore. The softest ground was the most difficult to drill because of fissuring and caving.

The following tables show the data obtained from five months' operation:

TABLE 1—HOLES DRILLED

|                          |      |
|--------------------------|------|
| Number .....             | 848  |
| Solid taconite .....     | 826  |
| Fissured taconite .....  | 402  |
| Hard ore, solid .....    | 2346 |
| Hard ore, fissured ..... | 518  |
| Soft ore, solid .....    | 3875 |
| Soft ore, fissured ..... | 1130 |
| Total .....              | 9097 |

TABLE 2—TIME DRILLING

|                             |         |
|-----------------------------|---------|
| Machines in place .....     | 1465    |
| Delays, long moves .....    | 39      |
| Power off .....             | 140 1/2 |
| Dull steel .....            | 11 1/2  |
| Bad order of machines ..... | 56      |
| Net working time .....      | 1218    |

TABLE 3—COSTS

|                     |           |
|---------------------|-----------|
| Labor .....         | \$1183.75 |
| Repairs .....       | 25.00     |
| Power .....         | 68.10     |
| Total .....         | \$1276.83 |
| Cost per foot, 14c. |           |

The cost of drilling the same footage by hand on company account would have been 29c. per ft. This figure was obtained from four years' costs of the same class of work and covering the same amount of each class of ma-

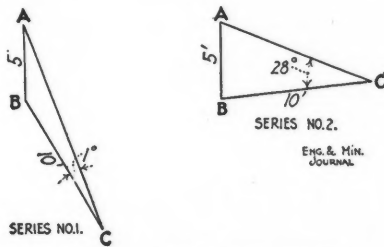


terial, but not taking into account the flat holes that could not be drilled by hand. These costs indicate a saving of 15c. per ft. by the use of this drill. Mr. Eby makes the interesting statement that it requires as much skill, if not a little more, to operate and properly handle this drill as it does any other. The costs given above include all the troubles incident to securing competent crews to handle the machines, and he believes that if operated regularly as efficiently as these were during the last month of work, the cost per foot could be reduced still further, perhaps to as low as 11 cents.

### Triangulating from Two Plumb Wires

BY ALBERT G. WOLF\*

In carrying the bearing forward from two plumb wires in shaft plumbing, two methods are used. In one the transit is set up directly in line with both wires; in the other it is set to one side of them, the distance from the



DIAGRAMS OF TWO METHODS OF SETTING UP

transit to each wire and the horizontal angle are measured and the triangle is calculated. In the first method the number of measurements is less than in the second and calculations are eliminated, but as a rule it takes longer

great distance from them, will give the best results; for if the instrument is in line with the two wires an error in chaining will make no difference in the bearing and no horizontal angle is involved. To show exactly the relative errors involved, two series of triangles of three each have been assumed and errors in azimuth calculated for assumed errors in measurement of the various parts of the triangles.

In the first series the following assumptions have been made: Distance between wires, 5 ft.; short leg of triangle, successively, 10 ft., 25 ft. and 50 ft.; angle at instrument, 1°. In the second series: Distance between wires, 5 ft.; short leg of triangle, 10 ft., 25 ft. and 50 ft.; angles at instrument, 28°, 11° and 5°, respectively. The vertex angles of isosceles triangles with 5-ft. bases and sides 10, 25 and 50 ft. would be 28° 57' 18", 11° 28' 42" and 5° 43' 54", respectively, so it can be seen that the angles assumed in the second series approach nearly the maximum for triangles with the base and short side assumed. Errors of measurement assumed in each side are 0.02 ft. and in the angle at the instrument, 30". The result in error in azimuth is calculated for each assumed error in measurement separately and the results are tabulated.

An inspection of the table shows that a small error in measuring either leg of a triangle in the first series makes an immaterial difference in azimuth, while in the second series an equal error in measuring makes an appreciable difference from the true azimuth. An error in measuring the angle at the instrument or the distance between wires, in either series, makes a large error in azimuth, but the error in a triangle of the first series is smaller than the error in a corresponding triangle of the second series. Now, referring to the first series of triangles only, it can be seen that the distance from the instrument to the wires makes no appreciable difference

ERRORS IN AZIMUTH, RESULTING FROM ERRORS IN MEASUREMENTS IN TRIANGULATION PLUMBING

| Error assumed.....<br>In..... | Series No. 1. Triangle with Small Angle C |  |                       | Resultant Errors                          | Angle measured (C)                      |   |
|-------------------------------|---|--|-----------------------|---|---|---|
|                               | 0.02 ft.<br>Short leg                     | 0.02 ft.<br>Long leg                         | 0.02 ft.<br>Base line |   |   |   |
|                               | Short Leg                                 | Lengths of Sides<br>Long Leg<br>(Calculated) | Base Line             |   |   |   |
|                               | 10 ft.                                    | 14.6954 ft.                                  | 5 ft.                 | in A = 14.4"<br>in B = 14.4"              | in A = 1' 00"<br>in B = 1' 30.1"        | C = 1° 0' 0"<br>A = 2° 0' 1.1"<br>B = 176° 59' 58.9"    |
|                               | 25 ft.                                    | 29.9771 ft.                                  | 5 ft.                 | in A = 14.5"<br>in B = 14.5"              | in A = 1' 12"<br>in B = 1' 26.5"        | C = 1° 0' 0"<br>A = 5° 0' 22"<br>B = 173° 59' 38"       |
|                               | 50 ft.                                    | 54.9157 ft.                                  | 5 ft.                 | in A = 14.6"<br>in B = 14.7"              | in A = 2' 25.7"<br>in B = 2' 40.5"      | C = 1° 0' 0"<br>A = 10° 3' 3.5"<br>B = 168° 56' 56.5"   |
|                               |   |  |                       | Series No. 2. Triangle with Large Angle C |   | C = 28° 0' 0"   |
|                               | Short Leg                                 | Lengths of Sides<br>Long Leg<br>(Calculated) | Base Line             |   |   |   |
|                               | 10 ft.                                    | 10.5498 ft.                                  | 5 ft.                 | in A = 18' 54.2"<br>in B = 49' 37.5"      | in A = 36' 50.3"<br>in B = 1° 30' 25.9" | C = 28° 0' 0"<br>A = 69° 52' 29.4"<br>B = 82° 7' 30.6"  |
|                               | 25 ft.                                    | 26.039 ft.                                   | 5 ft.                 | in A = 8' 47.6"<br>in B = 24' 9.2"        | in A = 42' 45.6"<br>in B = 1° 46' 43.3" | C = 11° 0' 0"<br>A = 72° 33' 45.3"<br>B = 96° 26' 14.7" |
|                               | 50 ft.                                    | 52.2612 ft.                                  | 5 ft.                 | in A = 2' 26.8"<br>in B = 22' 54.6"       | in A = 24' 11.8"<br>in B = 29' 57.7"    | C = 5° 0' 0"<br>A = 60° 38' 24.5"<br>B = 114° 21' 35.5" |

to make the set-up. It is not the purpose of this discussion, however, to argue the respective merits of the two methods, but to point out the conditions under which the triangulation method can be used, when necessary or desired, with the least liability to error.

It is evident that a triangle with a small angle at the instrument, this angle small by reason of the instrument's being nearly in line with the two wires, not, however, at a

in the error in azimuth when an error in measuring to the wires is made, but an error in azimuth caused by an error in measuring either the distance between the wires or the angle at the transit increases rapidly as the distance from the instrument to the wires increases. In any set-up, therefore, the most serious errors to be avoided are those liable in measuring the distance between the plumb wires and the horizontal angle at the instrument. A check on the accuracy of the former is obtained by measuring be-

\*Mining engineer, Buckhorn, Nev.

tween wires at the collar of the shaft, or point of suspension, and at the level of the set-up. The error in measuring the angle is reduced to a minimum by repeating the measurement and taking the average. An error in tapping either of the legs of any triangle as large as the error assumed is not liable to be made if the work is checked and care is taken to hold the tape level.

In conclusion, the set-up least liable to result in an error in azimuth in triangulating from two plumb wires is one near the wires and in such a position that the horizontal angle measured at the transit is small.

### Electro-Percussive Welding

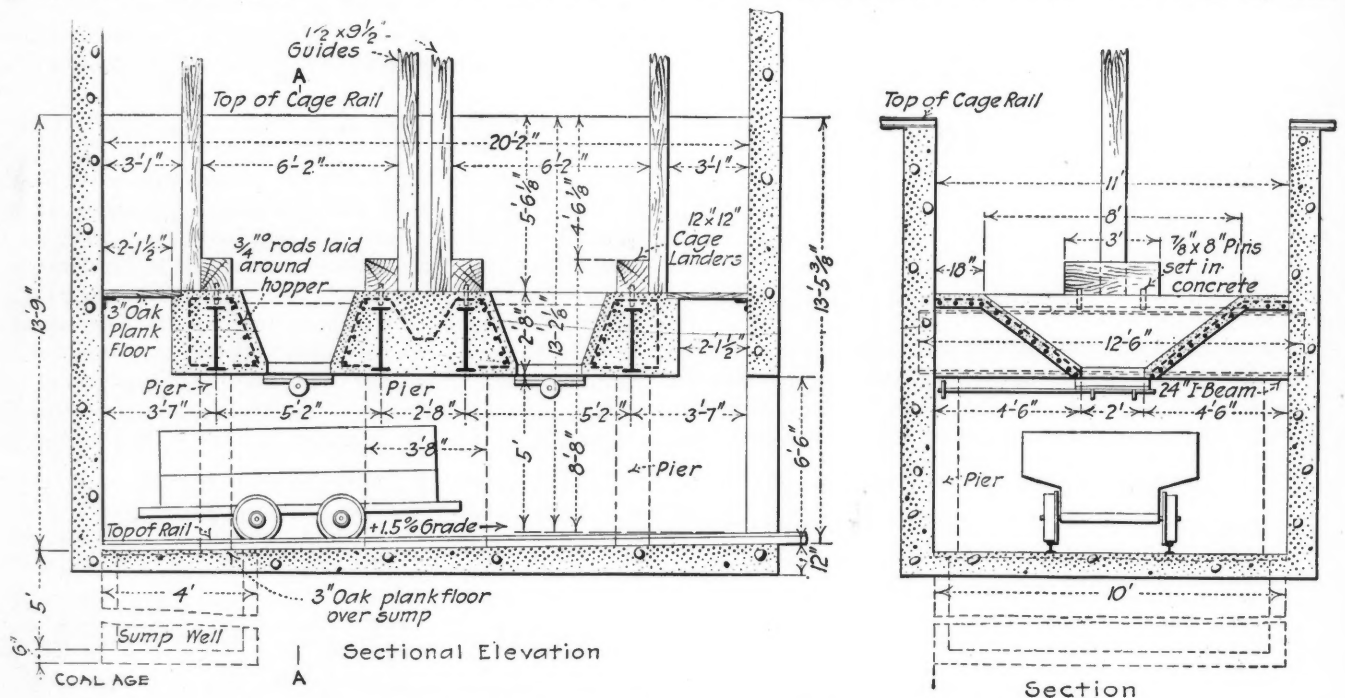
A paper on this subject by C. E. Skinner and L. W. Chubb, of the Westinghouse company, was presented at the twenty-sixth general meeting of the American Electrochemical Society, held on Oct. 12 and 13, at Niagara Falls. The paper states that in the process of

into thin foil. Any alloy formed at the weld must range from 100% copper on one side to 100% aluminum on the other; but possibly the brittle combinations are so thin that the joint as a whole is flexible and ductile. This joint between aluminum and copper is of great importance, as copper lead wires, which solder and connect easily, can readily be attached to aluminum coils.

### Débris Hoppers under Shaft Hoisting Compartments

The main shaft of the Bunsen Coal Co., of Danville, Ill., contains two hoisting compartments (*Coal Age*, Nov. 7, 1914). The shaft is vertical, of rectangular section, 20 ft. 2 in. by 11 ft., 204 ft. from collar to bottom level, with a 21-ft. sump below this.

The hoisting compartments terminate below in a horizontal concrete and steel partition, constructed as shown in the accompanying illustration. This is in the form



LONGITUDINAL AND TRANSVERSE SECTIONS OF SUMP UNDER MAIN SHAFT

electro-percussive welding two wires are welded together by causing a condenser discharge to pass between the ends of the wires in the moment when they are pressed together by mechanical force. The generation of the heat is so localized, so sudden, and so intense, that there is no time for unequal heat conduction through the shanks of the wire, and the ends will be melted and even vaporized whether the melting point is high or low. For this reason metals of different kinds can be welded together independent of their electrical resistance, melting point, or heat conductance.

Any combination of metals which has ever been tried will weld together, but the joints will not be permanent with such combinations as aluminum and tin or lead and iron. Many alloy metals are hard and brittle. As an example, there are alloys near both ends of the copper-aluminum series which are unworkable, and yet electro-percussive welds between these two metals are so ductile that they may be worked in a die, forged, or rolled

of a double hopper and below it sufficient room is left to permit a standard car to be run in. A heavy steel sliding gate at the bottom of each hopper is operated by means of a chain and wheel at the side of the sump. By this means the accumulated droppings from hoisting operations can be run out as desired into a car. When a car is filled it can be pulled by motor through a concrete-lined tunnel on a sharp incline up to the haulage road.

The walls and floor of the sump are of concrete 12 in. thick. At the low end of the sump bottom, extending across the full width of the shaft, is a well 4 ft. wide, which catches all seepage water and provides ample room for a pump-suction line.

**A Refractory Furnace Lining** may be made from asbestos and water-glass, according to the "Brass World." It is useful for patching or plugging cracks, as it does not crumble as readily as other similar compositions made from clay. The materials used are fine asbestos, 40%, and sodium water-glass, 60%. The asbestos and water-glass are mixed to a paste with water so that it can be worked.

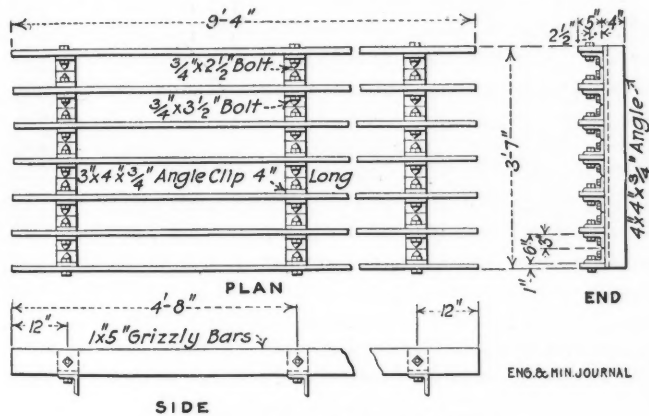
# Details of Milling and Smelting

## A Handy Grizzly for Heavy Work

BY KENNETH C. BROWNE\*

I designed a grizzly for a mine in northern New York to handle the run-of-mine ore which was dumped from a skip to the upper end of the screen, inclined at about 35°, the oversize at the lower end being fed to a 15x24-in. Blake-type crusher. This screen was subjected to blows from chunks of ore weighing sometimes 100 to 150 lb., and falling approximately 2 ft., but after long service showed none of the faults of the usual types.

This design can be applied to any similar condition, but in this case the screening area was approximately 4 ft. wide and 9½ ft. long on the incline, and the spaces in the screen were 6 in. in width. Previous experience demonstrated that with these wide spaces on the old-type grizzly, with rods passing through the center of the bars,



GRIZZLY FOR HEAVY WORK

these rods arrested the progress of the ore and often caused pieces to pass over the screen which should have gone through, and the result was reduction of screening capacity and quick destruction of the rods. Therefore such obstructions were eliminated as far as possible, the bars being supported from beneath, which reduces the above mentioned effect more and more as the bars are made higher and materially increased the screening efficiency.

We used seven bars of 1x5-in. soft steel 9 ft. 4 in. long, giving a screen 9 ft. 4 in. by 43 in. over all. Careful work in the machine shop was necessary, but no difficulty was encountered in constructing or in assembling this screen in place. Three extra-heavy angles, 4x4x3/4-in., were used for transverse members, being cut to proper length to drop into the screen area, and serve simply to hold the bars in their proper respective positions. The whole grizzly remained in place due to its weight, being supported at the upper end by a timber and at the lower end by a rail abutment which also prevented longitud-

inal motion. The construction of the grizzly is shown clearly in the drawing. It was put together entirely with 3/4-in. bolts to allow ready replacement of any part.

We found it possible to replace bars in a short time, and by boring the bars accurately from a template they can be turned over or reversed end for end, or both, removed and straightened, and in almost every case the 5-in. bars could be worn down to 2 in. in height between the supports before discarding. Bars worn so badly as to be materially weakened were often replaced by new ones in the center and the worn ones put at the side where the strain was less. Angle clips and angle supports were readily replaced and new bolts inserted at a moment's notice.

This screen never lost its shape, and the spacing of the bars always remained correct. Repairs were few, and at the end of a year the screen had handled about 100,000 tons and was giving good service with some of the original parts still in use.

## Bosh of Lead Furnaces

With respect to the angle of bosh in lead blast furnaces, discussed by Irving A. Palmer in a paper before the Salt Lake meeting of the American Institute of Mining Engineers, L. D. Anderson of Midvale, Utah, comments in the November *Bulletin* as follows:

A rebuilt furnace of only 10° or 11° of bosh has been running beside furnaces having the old angle of over 20°. As far as observed, the new furnace seems to run much hotter and obtain a larger percentage of the lead contents as direct bullion output. The matte fall, however, is considerably smaller, and it is necessary to carry more sulphur on the charge in order to maintain this fall high enough to insure clean slags. Judging from slag analysis and percentage of matte fall, the narrow furnace burns off half and even more of the sulphur as SO<sub>2</sub>, as compared to a third or less for the wider furnace. In these instances, both furnaces are 48 in. at the tuyere, the difference in width being in the stack. The narrow furnace would appear to be superior to the wider furnace in that it has less tendency to form awkward hanging crusts, its crucible stays hotter and, considerable heat being supplied by the combustion of sulphur, a noticeable saving in fuel consumption can be effected. These remarks apply to rather coarse charges; for fine charges the difference would not be so marked.

The matter of the correct furnace shape is yet far from being settled. Every metallurgist has undoubtedly noticed that often after a furnace has been in blast for some time its work improves and its slag becomes surprisingly clean. Furnaces have been observed with crusts in them so heavy as to make it almost imperative to take them out of blast, yet they produced slags so clean as to make the metallurgist reluctant to disturb them, until finally blowing out became necessary on account of reduced tonnage. Experiences of this kind lead to speculations as to whether better reductions might not be obtained by making the shaft walls converging instead of diverging, somewhat after the lines of the iron-blast furnace. In other words, why not make the furnace of the ideal shape at the outset, instead of waiting for it to form its own "natural" shape, and running all the chances of irregularity in the formation of the crust?

Mr. Palmer's remarks on the desirability of a freer exchange of blast-furnace experiences were warmly seconded by Mr. Anderson. Independent smelters, he said, are freely visited by officials of the larger corporation.

\*Mining engineer, New York City.

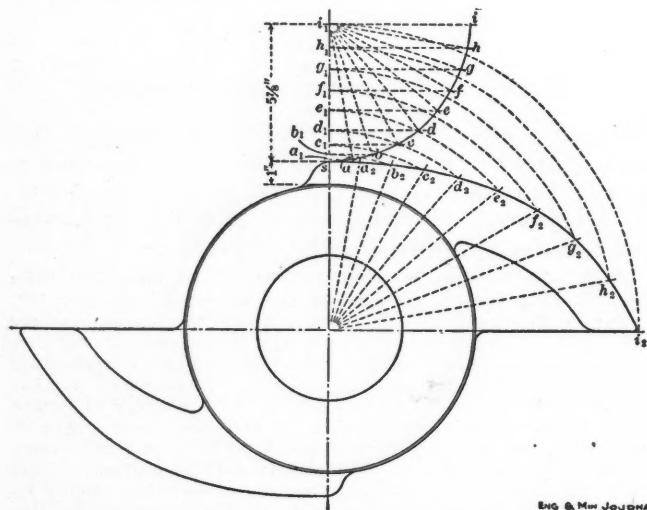
The industry as a whole suffers from a policy of uncommunicativeness. The handling of the blast furnace, after all is said and done, becomes finally a matter of personal judgment; exchange of ideas on details can therefore have scarcely any effect on competition.

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### Improved Cam for Stamp Mills

An improved form of cam for use in stamp batteries has been designed by Arthur B. Foote, of Grass Valley, Calif., and described in *Bull. of A. I. M. E.*, December, 1914. The cam at present in use lifts the tappets with an involute form of curve, to which the surface of the tappet is always tangent. Moreover, the line of contact between tappet and cam, if produced, would pass through the center of the stamp. While this is a desirable feature, the inventor had believed that it would be more desirable if the cam were to pick up the stamp without shock, and gradually increase the upward velocity throughout its movement. The involute cam attempts to impart instantly a high upward velocity to the stamp, starting it from a state of rest, and the result is a destructive blow, a good deal of noise, and much wear and vibration.

The new form is one which is designed to lift the stamp with a motion similar to that of the piston of an engine



IMPROVED STAMP-MILL CAM, WITH INVOLUTE CURVE

between the end and middle of its stroke; in other words, harmonic motion, from the point of zero to maximum velocity. The curve will give this ideal motion only when the stamp is set for the exact drop for which the cam was designed, but the improved cam will not be as bad as the involute until the drop is reduced one-half. In other words, if a cam is designed for a 6-in. drop, it will be some improvement over the usual form of cam until the drop is only 3 inches.

Any cam, of course, must lift its stamp in the same number of degrees of revolution, and therefore this new form, starting the stamp slowly, must end up by going faster, the average speed being the same. With this design, the surface of the tappet is not tangent to the surface of the cam throughout the lift. The possible consequences of this were studied with a full-sized model, and did not seem serious, since the engagement between the surfaces was an easy sliding motion instead of a blow. If the drop is shortened, the blow becomes more and more

pronounced, but the surfaces also become more and more nearly tangent.

Five cams of this design have been running in one of the mills of the North Star Mines Co. for over a month, fulfilling every expectation. Holding the hand on the tappet it is impossible to feel the cam strike it, although the mill is running 107 drops per minute.

The accompanying drawing shows the method of laying off the curve of the cam, which will give approximately harmonic motion to the stamp. The spaces  $sa_1$ ,  $a_1b_1$ ,  $b_1c_1$ , etc., represent the distances traveled by the cam in equal intervals of time.

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### Desilverizing Copper Matte with Lead

Desilverizing copper matte in a metallic lead bath is an old process not often encountered in these days of converting plants and electrolytic refineries. The process depends upon the decomposition of the silver sulphides and the absorption of the silver by the lead. It was seldom completely accomplished in one operation, the "smelting-in" being usually repeated two or three times. The description by Manuel Eissler<sup>1</sup> of the process as practiced at the Tsubaki works in Japan is interesting.

At the Tsubaki mine there is a large body of silver ore which contains some lead, silver sulphide and metallic silver. This silver ore is smelted principally with copper ores purchased from outside mines. The imported copper ores contain about 4% of copper and 45% of sulphur. The first matte obtained from the blast furnaces contains about 20% of copper.

The matte is drawn from the forehearth into a near-by hole in the ground, lined with brasque and covered with a dome of fireclay. In the bottom of the cavity is about half a ton of molten lead. This lead is produced from the litharge resulting from the cupellation process. After the matte is introduced, more lead bars are put in until the requisite quantity is obtained. A log of wood is then placed on top of the bath and pushed to the bottom by means of an iron tool introduced through a hole in the cover and kept in position by a crosspiece held down by two men. This submerged wood causes an active ebullition in the bath and a thorough stirring of the lead with the matte. The bath is then allowed to settle; the matte is returned to the blast furnace; the lead bath is skimmed clean and the metal ladled into molds. To keep the bath in a fluid condition a few pieces of wood and charcoal are kept burning on the top. There are two cavities, one on each side of the forehearth, and they are used alternately for treating the matte in this manner. The lead bars produced contain 570 oz. of silver to the ton, and as the lead is impure it is next sent to the liquation furnace.

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**A New Type of Electrolytic-Tank Construction** has recently been patented by William Thum, of Hammond, Ind. (U. S. Pat. 1,095,748). There is an independent bridge structure to take the weight of the electrodes, so that the tank is entirely relieved of it. This allows a much lighter form of tank construction, together with a substitution of asphalt or other linings for the usual hard-lead lining. A bridge type of tank side was proposed several years ago to take the weight of the plates, with the object of leaving out the tank partitions, allowing a side-to-side circulation of the electrolyte, instead of from end to end.

<sup>1</sup>"Copper Smelting in Japan," *Bull. of A. I. M. E.*, November, 1914.

# The Cost of Doing Things

## Details of Costs at El Tigre

The following tabulations give full details of the costs at the Tigre Mining Co., El Tigre, Sonora, Mexico, during 1913, as shown in the report published by the holding company, the Lucky Tiger-Combination Gold Mining Co., Kansas City, Mo.:

|                               | ORE TREATED AND SHIPPED |            |            |       |       |  |
|-------------------------------|-------------------------|------------|------------|-------|-------|--|
|                               | Dry Tons                | Ounces Au. | Ounces Ag. | % Cu. | % Pb. |  |
| Shipping ore.....             | 932                     | 0.488      | 285.16     | 2.32  | 12.05 |  |
| Mill ore.....                 | 68,528                  | 0.109      | 28.40      | 0.05  | 0.23  |  |
| Total .....                   | 69,460                  | 0.113      | 31.85      | 0.166 | 0.772 |  |
| Old dump tails cyanided ..... | 21,778                  | 0.079      | 13.62      |       |       |  |

### DETAILS OF MINING COSTS

|  | Per Ton Produced |
|--|------------------|
| Development direct:                      |                  |
| Contractors .....                        | \$0.148          |
| Day's pay men .....                      | 0.001            |
| Air drills .....                         | 0.138            |
| Nippers and shovelers .....              | 0.001            |
| Stopping direct:                         |                  |
| Miners .....                             | 0.920            |
| Nippers and shovelers .....              | 0.145            |
| Air drills .....                         | 0.216            |
| Contractors .....                        | 0.017            |
| Filling, breaking waste .....            | 0.000            |
| General tramming .....                   | 0.399            |
| Timbering .....                          | 0.445            |
| Hoisting .....                           | 0.026            |
| Pumping .....                            | 0.000            |
| Sorting:                                 |                  |
| Underground .....                        | 0.242            |
| On patio .....                           | 0.163            |
| Blacksmithing .....                      | 0.132            |
| Sampling and assaying .....              | 0.093            |
| Surveying .....                          | 0.011            |
| Superintendence .....                    | 0.175            |
| Mine construction .....                  | 0.005            |
| Diamond drilling .....                   | 0.120            |
| Total .....                              | \$3.397          |
| Charged to development .....             | \$0.592          |
| Charged to mining .....                  | 2.805            |
| Total tons of ore produced .....         | 69,460           |
| Total tons broken (ore) .....            | 56,081           |
| Total feet of development .....          | 4,984            |
| Total cost per foot of development ..... | \$8.25           |

Of the total cost, \$2,451 was for labor, 31.5c. for explosives, 9.2c. for lighting, 37.6c. for general supplies, 16.3c. for power,

### MILLING COSTS

Total mill extraction, 92.8%.

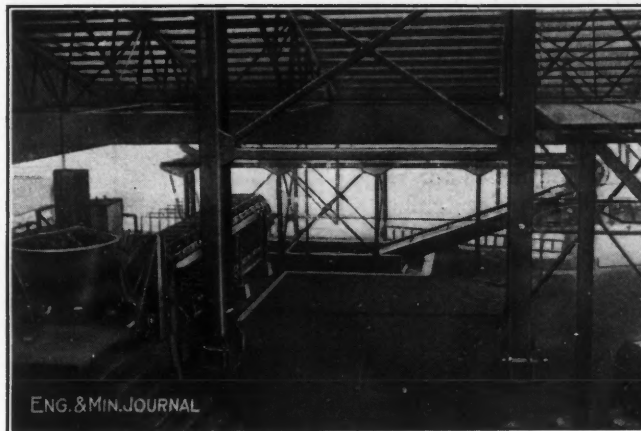
|   | Per Ton |
|---|---------|
| Sorting 68,528 tons.....  | \$0.054 |
| Old mill:   |         |
| Crushing .....  | 0.324   |
| Regrinding .....  | 0.305   |
| Concentrating .....   | 0.936   |
| Total for 10,526 tons.....  | \$1.565 |
| This cost is made up of 46.5% labor, 27.6% power, 14% repair parts, 3.2% superintendence and clerical work, 1.5% assaying and sampling, 5.5% chemicals and pebbles, 1.7% miscellaneous supplies.                      |         |
| Stamp mill:   |         |
| Crushing .....  | \$0.550 |
| Regrinding .....  | 0.176   |
| Concentrating .....   | 0.415   |
| Alterations .....   | 0.002   |
| Total for 56,510 tons.....  | \$0.923 |
| This cost is made up of: General labor, 37.4%; power, 22%; repair parts, 17.2%; superintendence and clerical work, 2.3%; sampling and assaying, 2%; chemicals and pebbles, 17.6% and 1.5% for miscellaneous supplies. |         |
| Cyanide plant:  |         |
| Conveying and screening tailings.....   | \$0.120 |
| Tube milling .....  | 0.540   |
| Classification, elevating and dewatering.....   | 0.217   |
| Treatment .....   | 1.728   |
| Filtration .....  | 0.242   |
| Precipitation .....   | 0.202   |
| Melting .....   | 0.239   |
| Dam and retreatment .....   | 0.061   |
| Experimental .....  | 0.028   |
| Alteration .....  | 0.002   |
| Total for 86,536 tons.....  | \$3.379 |

This cost is made up of 16.8% for general labor, 11.6% for power, 6.7% repairs, 1.6% superintendence and clerical work, 1.1% sampling and assaying, 59.4% chemicals and pebbles, and 2.8% for miscellaneous supplies.

Miscellaneous costs not charged to mining and milling are herewith given in detail. Cost of tramming to concentrator: Labor, 7.3c.; light, 0.2c.; supplies, 1.7c.; total, 9.2c. per ton. Marketing costs amounted to \$1.76 per ton of ore produced for bullion from ore and tailings and \$2.74 per ton of ore produced for marketing concentrates and shipping ore. General expenses amounted to 60.2c. per ton of ore produced and some of the principal items were: General office salaries, 11.1c.; general office expense, 3.5c.; mail service, 1.1c.; road repairs, 5.4c.; fire insurance, 4.8c.; school expense, 1.4c.; legal expense, 1c.; camp maintenance, 5c.; taxes, 2.2c.; administration, 17c.; construction and improvement of buildings, 1.3c.; auto maintenance and operation, 1.2c.; and outside mine examinations, 1.5c. per ton of ore produced.

## Cost of Casting Machines for Converter Plant

According to Bull. 91 of A. I. M. E., "Unit Construction Costs from the New Smelter of the Arizona Copper Co.," by E. Horton Jones, the total cost of installing two casting machines at this plant was \$31,750.69, made up



CASTING MACHINE, ARIZONA COPPER CO.

of: \$520.82 for excavation, \$3516.73 for foundations, \$27,477.25 for cost and erection of machines, and \$235.59 for repairs. The excavating work consisted of making two deep rectangular cuts in sand, gravel and big boulders, amounting to 512 cu.yd. This work was performed with picks and shovels, and the dirt loaded into carts and hauled 600 ft. at a total cost of \$1.02 per cu.yd., 94% of the cost was for labor. The foundations for each machine consisted of a rectangular sump with plain concrete floor inclosed by reinforced-concrete retaining walls. The walls were about 6 in. thick, 8 ft. high, reinforced with 5/8-in. and 3/4-in. rods. The concrete was mixed, 5 parts sand and gravel to 1 of cement, hauled in cars 150 ft., dumped and handled 150 ft. to site in wheelbarrows. All the vertical surfaces of the concrete work were formed. Total

amount of concrete, 291.9 cu.yd., which was done at a cost of \$12.05 per cu.yd., of which 46.2% was for labor.

|  |                    |
|--|--------------------|
| Two casting machines.....                | \$18,657.89        |
| Two 11-hp. and four 20-hp. motors.....   | 2,933.88           |
| Two jib cranes.....                      | 327.22             |
| Two radial cranes.....                   | 1,167.91           |
| Two traveling switches.....              | 135.75             |
| Two brakes for ladle tipping motors..... | 176.51             |
| Four circuit breakers.....               | 103.50             |
| Molds, etc. ....                         | 708.55             |
| <b>Total .....</b>                       | <b>\$24,211.21</b> |

The cost of casting machines and erecting, \$27,477.55, covers all the material composing two casting machines and all labor required to erect on their foundations ready to operate. Each machine has a steel cradle, to receive a ladle of molten copper. This cradle is controlled from a pulpit and is tipped by a 20-hp. motor. It is set high enough to pour into a casting spoon of 1½-in. cast iron. Approximate dimensions are 2 ft. wide, 3 ft. 6½ in. long and from 7 in. to 1 ft. 5½ in. deep. This casting spoon pours into the molds which are attached to a heavy steel conveyor. There are 39 molds made of 2½-in. cast iron reinforced with ⅝-in. perforated plate. Their inside dimensions are 2 ft. 4 in. x 1 ft. 6¼ in. x 3¼ in. deep. From the pulpit, by use of power from a 20-hp. motor, the conveyor with the molds moves along under a spray of water from needle holes in pipes placed above them until they reach the end of the conveyor, where a device in the bottom of the molds loosens the ingots, allowing them to drop into a tank of water. This bosh is made of ⅝-in. plate 3x3 and 4x3 angles. It is 7 ft. wide, 23 ft. 5¾ in. long, and varies in depth from 7 ft. 10 in. to 2 ft. 10 in. The copper bars are removed from here by a steel drag conveyor operated by a 11-hp. motor, controlled from the pulpit. When the bars leave the bosh and fall onto the striking plate, they are handled by a radial crane whose moving end travels on a 40-ft. curved I-beam. Along the radial crane beam travels a small air hoist capable of picking up a ton. It operates under an air pressure of 16 lb. A jib crane is so located, attached to a building column, that it can handle the molds for removing and replacing. It has a 3000-lb. capacity triplex block and 8-in. I-beam trolley.

### Cost of Stocking Ore

There are presented here some tables showing the cost of stocking and rehandling ore at a Michigan iron mine, over a period of several years. In Table I is given the cost of stocking distributed per ton stocked and per ton shipped for the year. This cost includes erecting the trestles and replacing the trestle timber destroyed the previous year. This trestle was 45 ft. high. During 1906, 1907 and 1908 the ores was trammed by hand. For the last three years an electric locomotive was used.

TABLE I—COST OF STOCKING

| Season                    | Cost of Labor | Cost of Supplies | Total Cost | Tons Stocked | Cost per Ton Stocked | Cost per Ton Shipped |
|---------------------------|---------------|------------------|------------|--------------|----------------------|----------------------|
| 1906.....                 | \$2698        | \$324            | \$3022     | 46,068       | \$0.0653             | \$0.0181             |
| 1907.....                 | 2006          | 352              | 2358       | 61,850       | 0.0381               | 0.0132               |
| Increase in wages in Jan. |               |                  |            |              |                      |                      |
| 1908.....                 | 837           | 226              | 1063       | 23,220       | 0.0457               | 0.0076               |
| 1909.....                 | 2655          | 769              | 3424       | 58,919       | 0.0581               | 0.0143               |
| 1910.....                 | 2410          | 534              | 2944       | 55,067       | 0.0535               | 0.0120               |
| 1911.....                 | 1269          | 76               | 1345       | 37,245       | 0.0361               | .....                |

In Table II the cost of loading distributed per ton loaded and per ton shipped for the year are given. The loading was intermittent and poor switching arrangements for the cars caused considerable delay. The stock-

pile was built on a 2-in. plank floor. Loading was carried on with a 45-ton shovel. In 1909 and 1910, exten-

TABLE II—COST OF LOADING

| Season    | Cost of Labor | Cost of Supplies | Total Cost | Tons Loaded | Cost per Ton Loaded | Cost per Ton Shipped |
|-----------|---------------|------------------|------------|-------------|---------------------|----------------------|
| 1906..... | \$1337        | \$361            | \$1698     | 52,923      | \$0.0321            | \$0.0102             |
| 1907..... | 1297          | 376              | 1673       | 49,245      | 0.0340              | 0.0093               |
| 1908..... | 494           | 88               | 582        | 23,099      | 0.0252              | 0.0041               |
| 1909..... | 1318          | 334              | 1652       | 50,576      | 0.0326              | 0.0069               |
| 1910..... | 1082          | 497              | 1579       | 50,564      | 0.0312              | 0.0064               |

sive repairs were made to this, wooden parts being replaced with steel; the cost of this is included.

### Retimbering Shaft in Lake Superior Iron District

By E. S. DICKINSON\*

The size of shaft was 6x16 ft. inside of the timbers, the timbers 12x12 in. In 1906 it was retimbered from 40 to 190 ft. deep. The cost was \$87.53 per set.

|   | Total Cost       | Cost per Ft.    |
|---|------------------|-----------------|
| Timber .....  | \$728.58         | \$48.57         |
| Framing .....   | 462.84           | 30.86           |
| Timbering (placing timber and taking out old timber)..... | 996.91           | 66.46           |
| <b>Total .....</b>  | <b>\$2188.33</b> | <b>\$145.89</b> |

This timber was painted on all joints with carbolineum.

In 1909, retimbering 78 ft. cost as follows, the timber being painted all over with carbolineum.

|   | Total Cost       | Cost per Set    |
|---|------------------|-----------------|
| Timber .....  | \$944.98         | \$75.67         |
| Framing .....   | 206.69           | 15.90           |
| Timbering (taking out old and putting in new timber)..... | 518.86           | 39.91           |
| <b>Total .....</b>  | <b>\$1670.53</b> | <b>\$128.48</b> |

In another case retimbering from surface to 50 ft. in depth cost:

|  | Total Cost       | Cost per Set    |
|--|------------------|-----------------|
| Timber and other supplies.....                       | \$680.86         | \$75.65         |
| Framing team shops, etc.....                         | 343.44           | 38.16           |
| Timbering (removing old and placing new timber)..... | 349.75           | 38.86           |
| <b>Total .....</b>                                   | <b>\$1374.05</b> | <b>\$152.67</b> |

The timber was badly squeezed, making it necessary to jack all new timber into place. Surface caved and had to be held back.

### Laying a 4-In. Wood Pipe Line

This 4-in. pipe line was laid in the Michigan iron region in a ditch 6 ft. deep, and old iron pipe removed. The soil was sandy, tunneling under railroad track was required and a team and scraper were used to refill ditch.

|                                      | Total Cost      | Per Ft.        |
|--------------------------------------|-----------------|----------------|
| 2070 ft. of wood pipe.....           | \$627.02        | \$0.303        |
| Digging and filling ditch.....       | 222.05          | 0.107          |
| Removing old pipe and laying new.... | 102.56          | 0.050          |
| Teaming .....                        | 12.93           | 0.006          |
| Repairing leak in pipe .....         | 8.74            | 0.004          |
| <b>Total .....</b>                   | <b>\$973.30</b> | <b>\$0.470</b> |

### Cost of Keeping Live-Stock

With baled hay at \$21 to \$25 per ton, and corn at \$1 per bushel, at the barn, it cost a total of \$861.44 to keep three head of stock at the Montgomery mine, Candor, N. C., for a period of 16 months. This is at the rate of 58.9c. per head per day, and covers all expense chargeable to teaming, including feed, shoeing, harness repairs, etc. One head was a buggy horse and the other two were big, heavy mules.

\*Iron River, Mich.

# New Smelting Works of the Mond Nickel Co.\*

*SYNOPSIS*—A description of the new smelting plant of the Mond Nickel Co., Ltd., at Coniston, Ont. The new works comprises two blast furnaces, 50x240 in., and two Peirce-Smith converters. The plant is operated by electric power purchased from a neighboring power company on the Wanapitei River.

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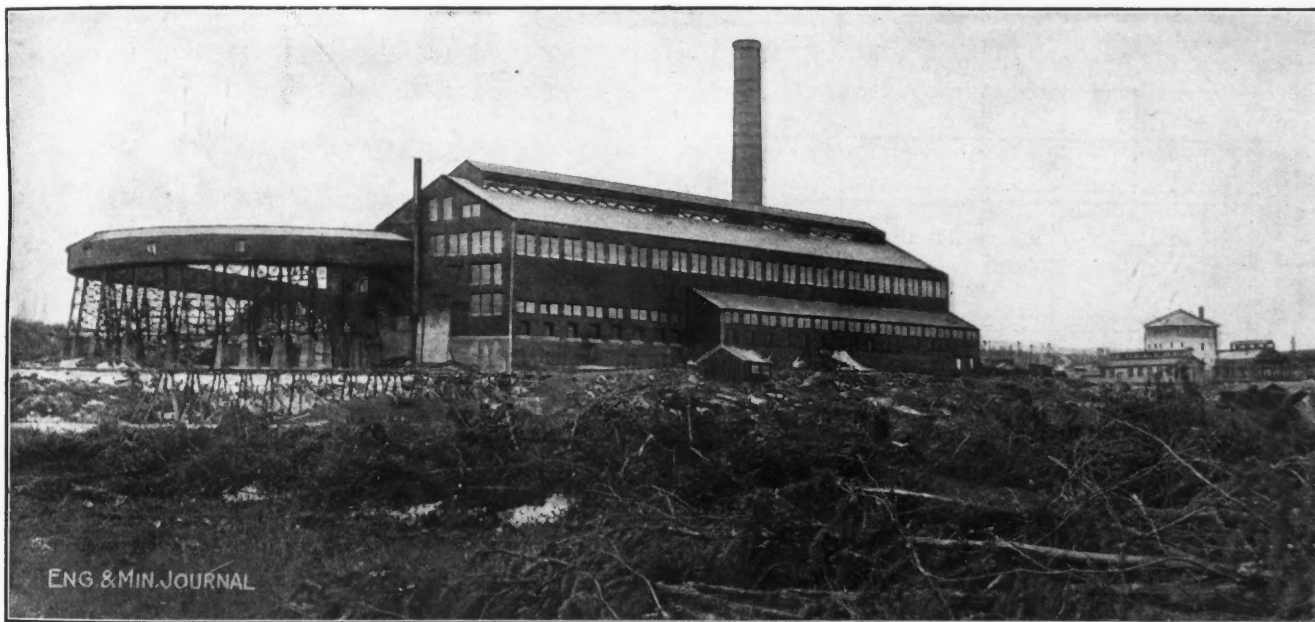
At Coniston, Ont., about seven miles east of Sudbury, the Mond Nickel Co., Ltd., has recently completed a new smelting works for the treatment of its copper-nickel ores, most of which come from the Victoria and Garson mines.

The Mond Nickel Co. owns about 4500 acres of mining land in fee simple and controls about 2500 acres under lease, a total of 7000 acres, situated in the townships of Blezard, Denison, Snyder and Garson, in the Sudbury district of Ontario. Additional areas are also under option to this company. The ores mined are deposits of

A new townsite has been laid out, north of the Canadian Pacific line and about one mile from the smelting works. Coniston is to be a model town provided with every modern convenience.

## GENERAL STATEMENT OF EQUIPMENT

The main smelting building has a concrete substructure resting on bedrock and a structural-steel superstructure. In this building are placed two new water-jacketed blast furnaces, 50x240 in., and two Peirce-Smith basic converters, 10 ft. by 25 ft. 10 in. Provision has been made for an additional blast furnace, which will be added when required. The power building is a brick-and-steel structure with tile roof, situated on the hill above the smelting works. The ore bins are placed beyond this, and a rockhouse stands southeast of the smelting building, over the lower tracks. A semi-circular track leads from beneath the ore bins to the charging floor of



MOND NICKEL CO.'S NEW SMELTING PLANT AT CONISTON, ONT.

nickeliferous pyrrhotites, containing some chalcopyrite; they occur in norite and contain about 2.3% nickel and 1.75% copper, besides small amounts of gold, silver, platinum and palladium. For many years the company's ores were smelted at Victoria Mines; the old works comprised two 44x180-in. blast furnaces and two electrically operated 84x126-in. converter stands. The old plant was built in 1900 and was operated by electric power obtained from the Wabagishik Falls, on the Vermilion River.

The site for the new plant at Coniston is a rocky hillside, overlooking a large swampy flat, which gives ample storage room for large slag piles. The roast yards are situated about three-fourths of a mile from the main smelting building, on the other side of the ridge.

\*Excerpt from "The Copper Smelting Industries of Canada," by Alfred W. G. Wilson, chief of the metal-mines division, Mines Branch, Can. Dept. of Mines.

the main building; it is carried over the slag tracks on a steel trestle resting on concrete piers.

Spur lines connect both the Canadian Pacific and the Canadian Northern railways with the roast yards, the smelting yards and ore bins. Ores from the mines to the north will come into the roast yards over the tracks of the Canadian Northern Ry. and can be delivered directly to the yards or shunted over the company's spur line to the smelting-plant bins. Ores from the west will be diverted to the Mond Nickel Co.'s spur line at Coniston, and can be run either to the bins or to the roast yards. Ores from the roast yards can also be conveyed over the spur line to the bins on the high line above the smelting works.

The main smelting building is of steel construction with a concrete substructure, 90x360 ft., resting upon solid rock; there is a monitor on the roof running the length of the building. A lean-to shed, 21x240 ft., on the north-

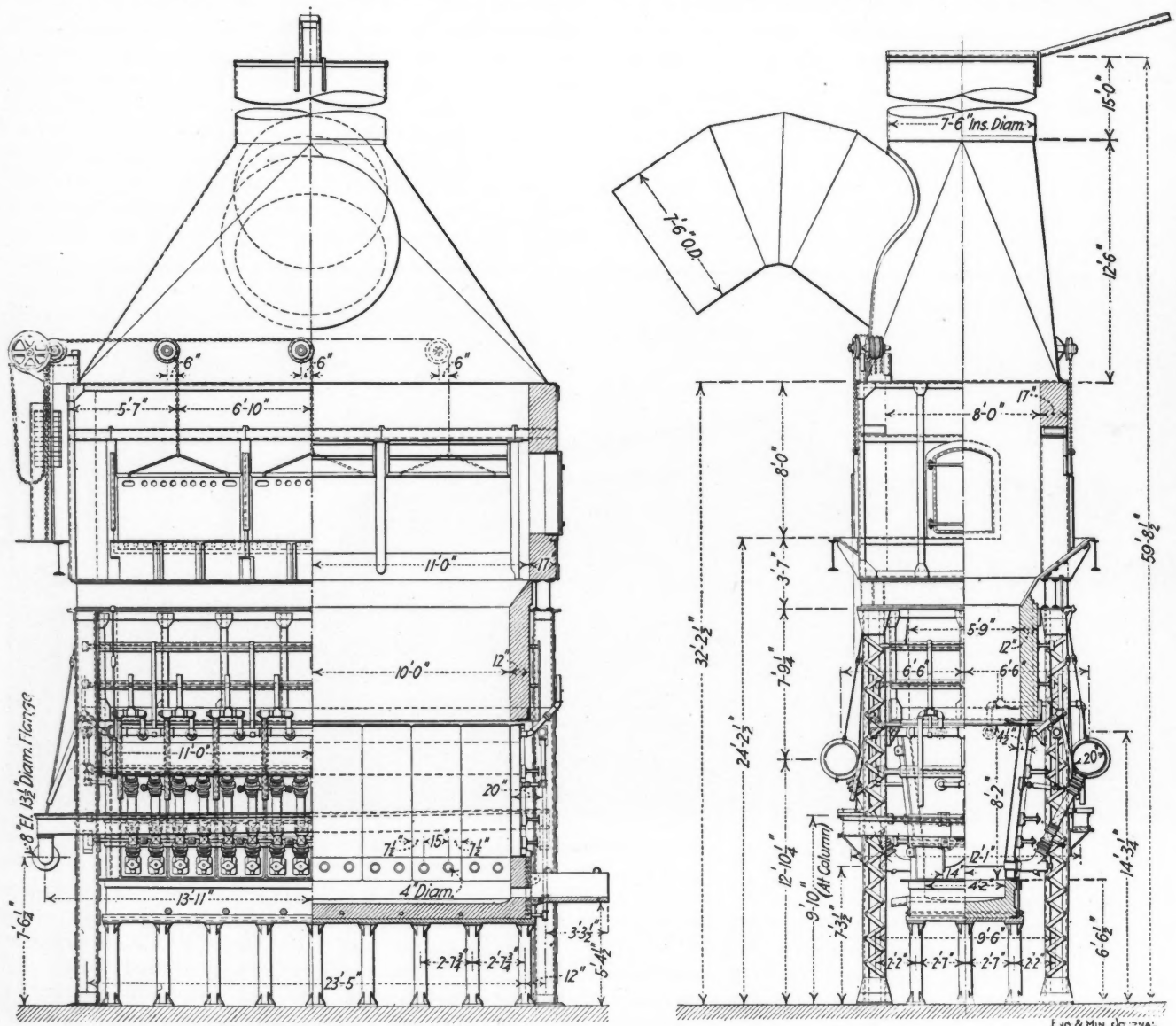
west side, houses the converter plant; a similar lean-to on the southeast, about 30x210 ft., covers the slag track and the main flue. A slag cut on the southeast side is provided with a standard-gage track; the tapping floor is 14 ft. higher, and the charging floor 24 ft. 2.5 in. above this. The furnace platform is 24 ft. in width and 210 ft. in length. The matte floor on the northwest side is 10 ft. below the level of the furnace floor and about 56 ft. in width.

THE MOND BLAST FURNACES

There are two Allis-Chalmers rectangular water-jacketed copper blast furnaces, 50x240 in., each furnace being

on three rows of nine supporting columns, each 5 ft. in height; it consists of a rectangular steel I-beam frame about 6 ft. in width, 21 ft. 9 in. in length, and 25 in. deep; the sole plate is of cast iron in four sections. This crucible box is lined with chrome brick around the sides, ends and bottom, reducing the internal width to 4 ft. 2 in.

Above the crucible there is a single tier of water-jackets, eight on each side, 8 ft. 2 in. in height. The width of the furnace is 4 ft. 2 in. at the tuyeres; at the top of the water jackets, 5 ft. 9 in. The furnace has thirty-two 4-in. tuyeres, 16 on each side. Each side jacket is 30 in. wide and carries two tuyeres. The total tuyere area is 402.28 sq.in. and the hearth area 83.33 sq.ft., or 4.82



BLAST FURNACE OF THE MOND NICKEL CO., LTD., CONISTON, ONT.

provided with a brick-lined steel crucible and a brick top above the single tier of jackets. The height of the furnace is 32 ft. 2.5 in. to the base of the hood; the hood measures 12 ft. 6 in., giving a total height of 44 ft. 8.5 in. A gooseneck, 7 ft. 6 in. in diameter, connects each furnace with the main flue, and a straight stack, closed by a damper, rises 15 ft. above the hood.

Each furnace is carried on structural-steel columns, the jackets being hung from I-beams. The crucible rests

sq.in. of tuyere opening per square foot of hearth area. The water space in the jackets is 4½ in.

The throat of the furnace above the water jackets is built of ordinary brick and lined with firebrick, forming a jacket 12 in. thick. The top of the brickwork is 3 ft. 7 in. below the charging floor, the available ore column being 13 ft. The space between the charging floor and the brickwork is bridged by inclined apron plates. At the ends of the furnace the brickwork is carried to the top



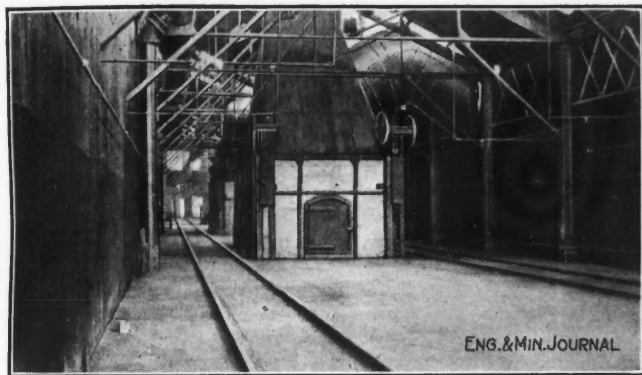
of the furnace, 8 ft. above the charging floor. The charge doors along the sides of the furnace are operated by counterweights.

The furnaces are placed parallel to the length of the building. Space has been provided for three, but only two have been installed. The settlers are of the circular type, about 15 ft. in diameter, and are placed between the furnaces.

#### FLUE SYSTEM AND STACK

The main flue is rectangular in cross-section, 10x15 ft., and is built of steel. It leads to a dust chamber, 30x50 ft., built of stack brick and connecting with the base of the stack. The main stack rests on bedrock; the lower 25 ft. of the stack is square in section and is built of red brick; the upper cylindrical portion, about 16 ft. in diameter, is built of Custodis stack brick. The height is about 200 ft.

The main flue is provided with 27 hoppers, placed at 7.5-ft. centers, in sets of two, between the main bents of the supporting structural-steel work. There are also four large hoppers placed between the main flue and the brick dust chamber. The bottom of the dust chamber is fitted with six rows of steel hoppers, nine to a row, the



BLAST FURNACE FEED FLOOR AT CONISTON, ONT.

distance from center to center being 56 in. Each hopper is provided with a circular discharge gate 13 in. in diameter, closed by a lever-operated slide. The hopper chutes beneath the dust chamber deliver to a common space, so arranged that the flue dust can be run into a V-shaped auxiliary hopper of sheet steel hanging above a standard-gage track in the slag cut. Six chutes deliver from this hopper to a car placed beneath.

#### THE CONVERTING PLANT

The converters installed in the new smelting works are the Peirce-Smith type of basic converter, the shells being 10 ft. in diameter and 25 ft. 10 in. in length. Two have been installed.

The lining of each shell consists of 16-in. silica brick and 9-in. magnesite brick at the bottom; 9-in. magnesite brick at the top, and at the tuyeres, special 18-in. magnesite brick. Each shell is provided with 30 tuyeres, placed 14 on one side of the stack and 16 on the other, none coming directly below it. The blowing stack is 3 ft. 7 in. in diameter, but the lining reduces the free space to 2 ft. 9 in. It is placed near the median riding track, its center being 11 ft. 2 in. from the end of the shell opposite the bustle pipe. The pouring spout is placed 7 ft. 7.5 in. from the same end and about 77° of arc below the stack.

The ends of the shell serve as annular tracks upon which it may be rotated, and a third riding track placed 7.5 in. to one side of the middle of the shell has also been provided. The tracks rest on rollers carried on cast-iron bearing plates, bolted to a concrete foundation. The shell is turned by steel ropes, pulled by a sliding gear operated by an electric motor and a worm screw with an 8-ft. stroke. The converter floor is served by two 50-ton Whiting cranes.

#### BLOWING EQUIPMENT

Electric power to operate the works is purchased from the Wahnapeite Power Co., which has two power stations on the Wahnapeite River, not far from Coniston.

In the power building at the smelting works, foundations have been laid for three Connersville and two Nordberg blowers. The blowing machinery at the Victoria Mines plant was to be transferred to the new works, and one new Connersville and one Nordberg were to be added. The Connersville blowers at the old plant each had a capacity of 15,340 cu.ft. per min. at 40-oz. pressure when running at 130 r.p.m. Each was belt-connected to a 200-hp. constant-speed motor, taking current at 550 volts and running at 580 r.p.m. The air pressure at the furnaces was about 38 oz. Air for the converters was supplied by the Nordberg duplex air compressor, having a capacity, at 82 r.p.m., of 6000 cu.ft. of free air per min. compressed to 12-lb. pressure. The low-pressure cylinder is 34 in. in diameter and the stroke 42 in. This machine was driven by a constant-speed, 315-hp. induction motor, running at 345 r.p.m., receiving current at 550 volts. The blowing engine is fitted with mechanical-inlet corliss valves and poppet discharge, and is regulated by the air pressure from the receiver through floating levers to the governor.

### Tom Reed Gold Mines

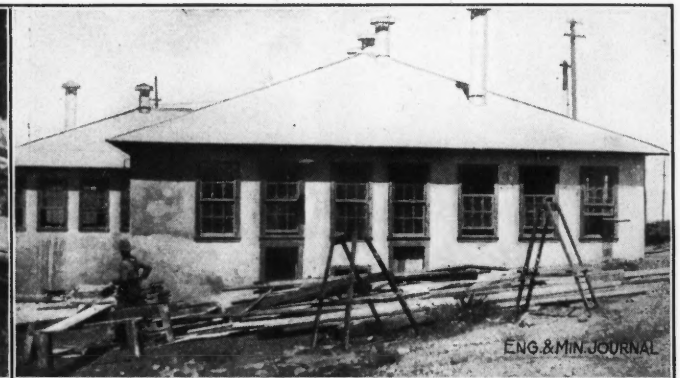
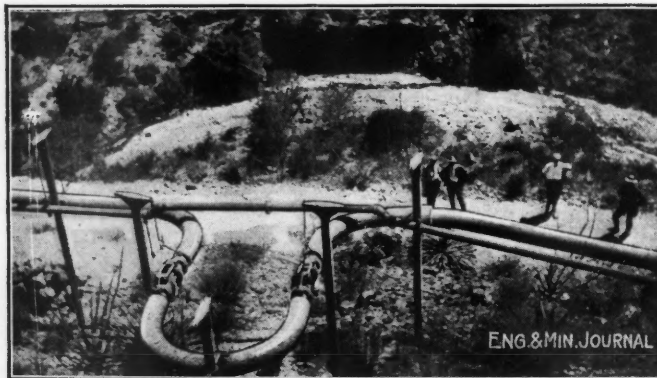
According to the annual report of the Tom Reed Gold Mines Co., Oatman, Ariz., for year ended Apr. 1, 1914, it made a net gain of \$629,981 from the 48,100 tons of ore yielding \$1,146,053 in bullion, and scraps treated that yielded \$12,874 in bullion; total gross bullion production, \$1,158,927. Mint and express charges on bullion were \$5291, making net bullion returns \$1,153,636. Other income totaling \$13,270 made a gross income of \$1,166,906 before deducting operating expenses. These charges amounted to \$536,925, made up as follows: Production expenses, \$296,863; general, administration and taxes, \$60,824; depreciation of plant and mining claims, \$174,198 and \$5040 for extraordinary charges. The total cost per ton was \$8.662, consisting of \$7.529 for direct charges and \$1.133 for indirect charges. Direct charges were: Mining, \$4.153; milling, \$1.664; cyaniding, \$1.557, and marketing, 15.5c. per ton. Indirect charges consisted almost entirely of depreciation. Dividend payments for the year were \$618,497; current assets and stores on hand amounted to \$179,702, while current liabilities were \$32,081, leaving a balance of \$147,621 in current assets. Mine development totaled 5695 ft. for the year, of which 465 ft. were shaft sinking. It is stated that the stopes contain more broken ore than they did a year ago, also that the development work was farther ahead of stoping than at any other time.

## Photographs from the Field



### STAR OF THE CONGO MINE, IN KATANGA, BELGIAN CONGO

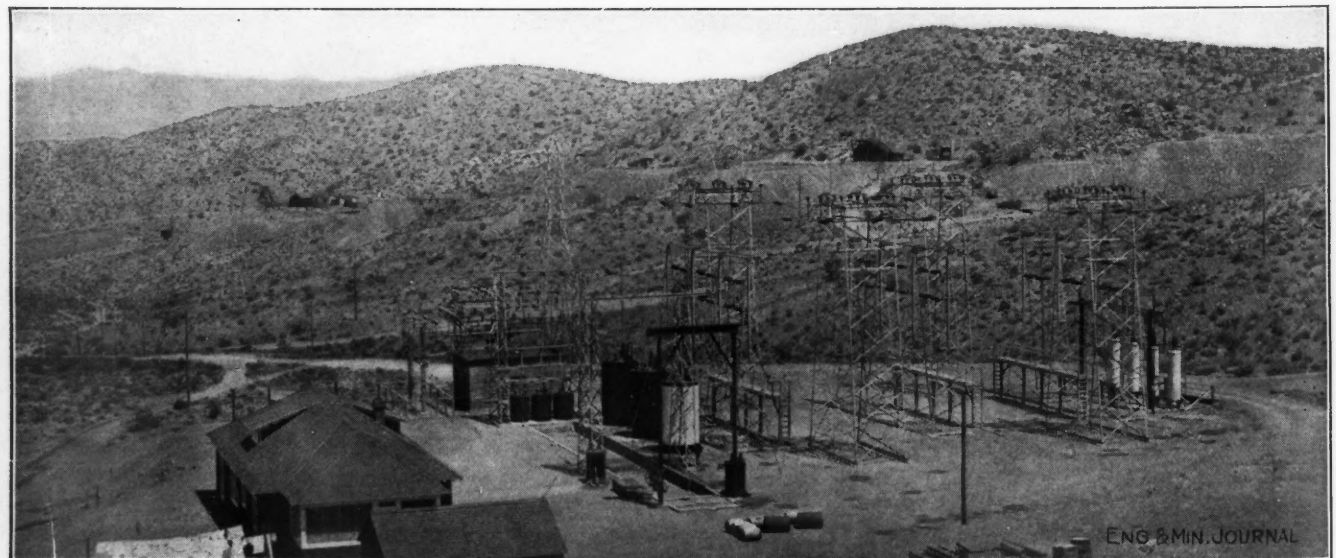
One of the large mines of the Union Miniere du Haut Katanga. The copper ore is worked principally through open pits. The ore zone is 4000 ft. long, 500 ft. wide, and has been proved to a depth of several hundred feet. Bucyrus steam shovels are used in the surface mining.



### NEW INSTALLATIONS AT THE COPPER QUEEN MINES, BISBEE, ARIZ.

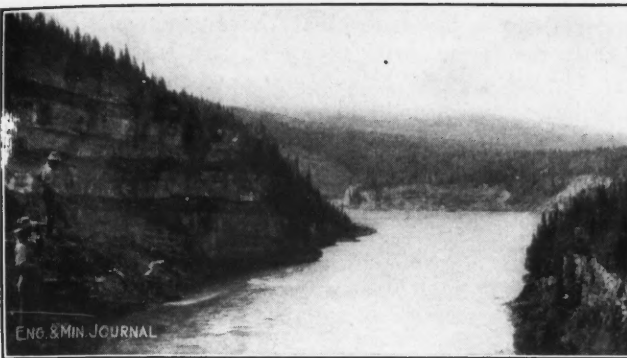
A large expansion joint installed in the water-supply line.

New change house for the convenience of miners at the Sacramento mine.



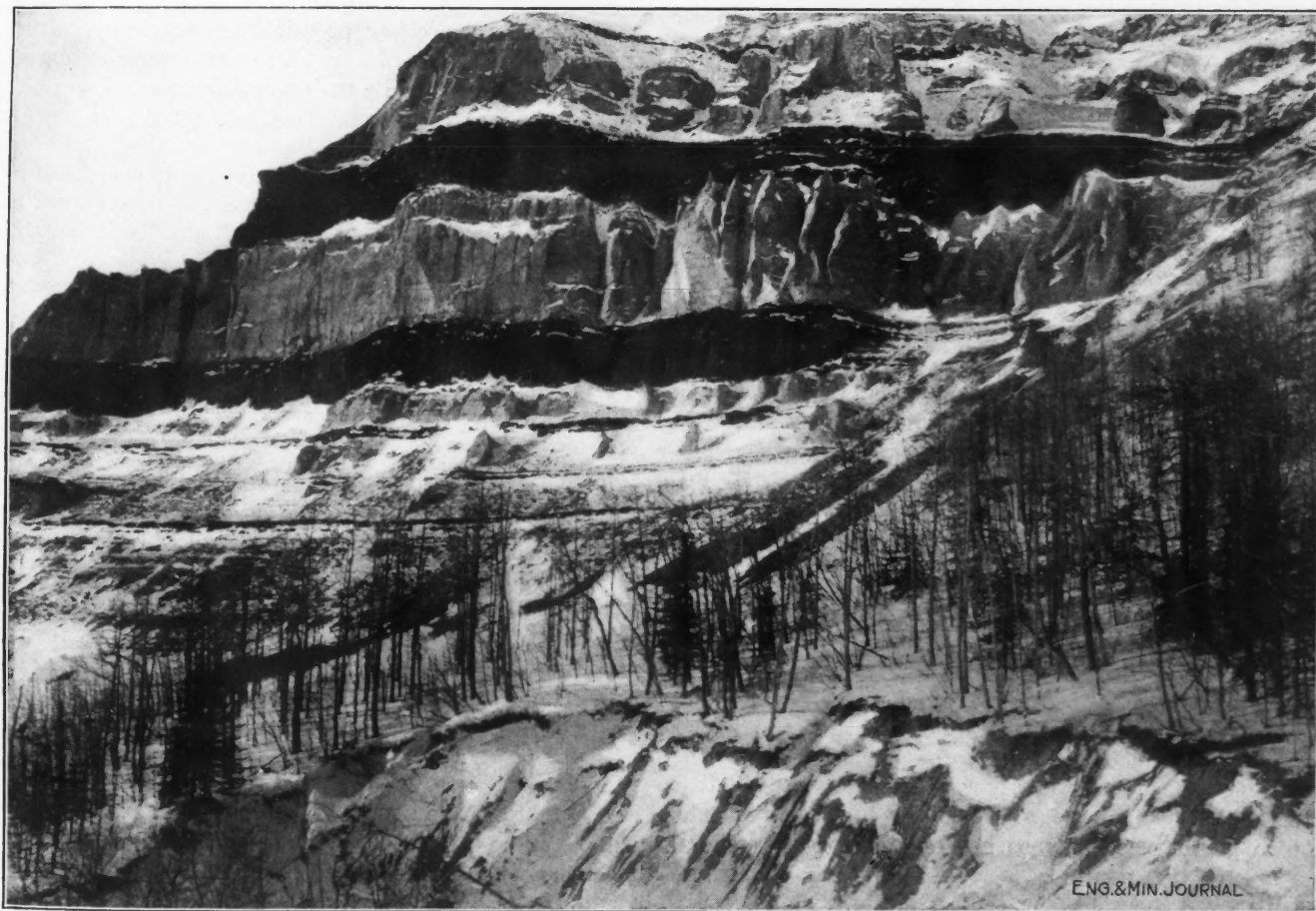
### STATION OF THE SOUTHERN SIERRA POWER CO., JOHANNESBURG, CALIF.

A type of the transformer stations in the West which supply hydro-electric power for mines and placer operations.



THE NORTHWESTERN BRITISH COLUMBIA GOLD COUNTRY

A district of growing importance, now being actively prospected. Outfits are packed in on horses, or go on scows up the rivers. In the Laird, Findlay and Parsnip River fields good results have been obtained. Peace River has produced many rich bar deposits.



OUTCROP OF COAL BEDS IN NENANA FIELDS, NEAR FAIRBANKS, ALASKA  
 A good grade of lignite. Some of the beds reach a thickness of 40 feet.

## Correspondence and Discussion

### Shall the A. I. M. E. Be Able to Express Itself?

Certain amendments to the constitution of the A. I. M. E. are to be settled at the forthcoming annual meeting. These are based upon the following proposal:

To the Board of Directors  
Of the American Institute of Mining Engineers.  
Gentlemen:—

In accordance with Article X, Sec. 1, of the Constitution, we, the undersigned members of the American Institute of Mining Engineers, propose the following amendment to the Constitution:

Article VIII, Sec. 2, all the words beginning with "neither" on the 2d line, and ending with "Directors" on the last line, be omitted, so that the Section as amended shall read:

Sec. 2. The Institute shall not assume responsibilities for any statements of fact or opinion advanced in the papers or discussions at its meetings.

instead of  
Sec. 2. The Institute shall not assume responsibilities for any statements of fact or opinion advanced in the papers or discussions at its meetings. Neither the Board nor the Institute shall officially approve or disapprove any technical or scientific opinion, or of any proposed enterprise which is outside of the management of the meetings, discussions and publications of the Institute, and the conduct of its business affairs by the Board of Directors.

Article VIII, Sec. 3, omit all the words after "Institute" on the 2d line, and ending with "reports" on the last line, so that the Section as amended shall read:

Sec. 3. Special committees may from time to time be appointed by the Board to make investigations and prepare reports for presentation to the Institute.

instead of  
Sec. 3. Special committees may from time to time be appointed by the Board to make investigations and prepare reports for presentation to the Institute, but no action shall be taken binding the Institute for or against the conclusions embodied in any such reports.

Respectfully submitted,

Eli T. Conner, Howard W. DuBois, J. Edward Spurr, S. W. Warriner, Morris Williams, Edward B. d'Invilliers, J. B. Dilworth, Walter Gilman, F. Lynwood Garrison, T. A. Rickard, Thomas T. Read, J. F. Kemp, R. V. Norris, L. H. Taylor, Jr.

The above amendments will be submitted to the Institute membership next week, together with a statement of the arguments pro and con, prepared by a committee appointed by the Institute directors. We have received numerous communications upon this subject. Out of these we have selected two for publication, which will give members of the Institute a fair idea of the views of the supporters and opposers of the proposed amendments.

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### The Opposition's Case

These amendments remove the present prohibition of action by the Institute or the Board of Directors for or against anything not comprised in its declared purposes—namely, the holding of meetings, the reading, discussion and publication of papers, etc. These purposes are stated in the Certificate of Incorporation, and apparently that document must be amended before amendments to the Constitution can have any effect. It has been said that other methods than those enumerated in the certificate, which might reasonably be held adapted to the general purposes of the Institute, are not prohibited simply because they are not mentioned in the certificate. This proposition is familiar to lawyers; but its application depends largely upon three questions: (1) Was it the intention

of the framers of the certificate to exclude such other methods? (2) Would their employment impair the efficiency of the methods explicitly mentioned? (3) Do the new methods proposed meet the approval of all members, or is there considerable objection to them? In the present case, all these questions must be answered in such a way as to necessitate a strict construction of the certificate.

For there is no doubt that the amendments seek to change the immemorial policy of the Institute, which was formed for the attainment of certain enumerated ends by certain means and no others. The Certificate of Incorporation has been amended once, and certain other means have been specifically added. A similar amendment would be required to increase that list.

The list itself may be liberally construed so as to include acts fairly auxiliary to the authorized activity. But taking sides on scientific, political, commercial or even professional questions is not only not helpful, but positively injurious to the efficiency of the ordained functions of the Institute.

Let us speak plainly. The intention of these amendments is to make the Board of Directors free to express for the Institute or let the Institute express for itself through a mail-ballot, opinions on all subjects deemed pertinent to the welfare of mining, metallurgy, miners and metallurgists, employers and employees. At present we have full and free discussion, but no judicial decision. The Institute is a forum, but not a tribunal.

Of course, if these amendments are adopted, the questions on which the Directors will be asked to exercise their new freedom will be important ones, that is, they will be questions on which the members of the Institute will be divided. The effect of official action on any such question will be: First, to stop further free discussion of that question, because the defeated party will not bring additional facts or arguments before a prejudiced tribunal, and secondly, to alienate those members who feel that the authority of the Institute has been used against their views or interests. Sooner or later, the methods of politics will creep in. Parties will work and plan and make up tickets to secure a majority of the Board of Directors.

Let us speak more plainly yet. Last year the Institute Committee on Mining Law arranged a session for debate on that subject, the purpose of which was well known to be the support by the Institute of the movement for the amendment of the "law of the apex" by abolishing its "apex" and "extralateral right" provisions. The result was a series of papers and discussions all on one side, with the single exception of a member on the other side, who sent in a paper at the special request of the Chairman, saying that he didn't suppose it would do any good. Meanwhile, several able papers on the other side appeared in technical journals, where their authors felt that they had an impartial hearing. These papers contain many facts and arguments in favor of the present law which were not mentioned at all in the one-sided Institute session.

No great harm was done; for the session could take no action. But if these amendments pass, we may look for an earnest effort to put the Institute on record against the "apex law."

Take another burning question—the relation of the United States to the natural resources of the public domain, especially within existing states and territories. Many able and zealous members of the Institute are workers in executive departments of the Government, and doing splendid work. But they are claiming an ever wider field of authority and activity for the Federal Government, as against both the sovereignty of the states and the individual liberty of citizens. Their views are bitterly denounced by many land owners, mine owners and managers, and private engineers. In more than one state, the interference of the Federal officials and experts has produced widespread irritation. No matter which side is right, the Institute cannot afford to take either side. How would its primary aim, the interchange of knowledge, be affected by a state of feeling which made operators refuse information to its members, or cities cease to welcome its meetings, or labor unions denounce it, or politicians flatter or abuse it?

The object of the Institute is to draw its members together, not to divide them into parties branded respectively as victorious or defeated.

There is no objection to the expression of opinion by individual members. This is what was done in the case of the Panama Canal; and the result was as effective as it deserved to be—no less, no more. It had the weight of the reasons and character of the men who signed it; and it gave no cause of complaint to those who did not agree with it.

The foregoing objections to these amendments, and many others which the space prescribed for this article does not permit me to mention, are not in the least degree imaginary. They are based on the experience of 43 years, including both systems.

R. W. RAYMOND.

Washington, Conn., Nov. 30, 1914.

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### The Affirmative View

In 1911, Charles Kirchhoff, when president of the Institute, introduced the custom of monthly meetings of the council, as the governing board was then called, and of the directors, who had come into existence with the necessary incorporation of the Institute, when it became part owner in the United Engineer Society's building in 1905. At Mr. Kirchhoff's suggestion, the members of the council and the directors dined together before the meeting and later assembled in the Institute's rooms at 8:30 in the evening.

This custom has continued ever since and with the revision of the constitution and bylaws in 1912 and the combination of the two bodies, the council and directors, into one board of directors, has proved one of the greatest improvements that could have been introduced into the methods of conducting the Institute's business. Since the organization of the technical committees, their chairmen are often specially invited to the dinner and subsequent meeting; as are also visiting members, whether Americans or from abroad. From 12 to 25 officers and members sit down together at table and subsequently reassemble to take up the Institute's business. The

invitation to guests has often been extended to attend the business meeting and informally assist with advice. The directors resident near headquarters or who, when living at a distance, can so shape their engagements as to be in New York at the monthly meetings, do so, with the result that in the 10 working months (July and August not being considered working months), the business and the policy of the Institute are discussed and shaped by a representative body of appropriate size.

Experience in the last four years has abundantly shown that the directors take their duties very seriously and with great devotion to the best interests of the society. There is no reason to anticipate any change in these conditions in future years, but they have an important bearing upon the proposed greater freedom of action and increased responsibility of the boards. Members should further appreciate that the directors are geographically distributed by the constitution, and the board is made as representative in character as the circumstances permit. It is inconceivable that the directors would act hastily or imprudently in any important matter, if given authority to speak officially for the Institute.

While conditions have changed in a marked degree in the conduct of the Institute's affairs, they have changed in no less important matters in the world outside. To an extent not known a few years ago, the national and state governments are establishing relations with the mining and metallurgical industries and in instances assuming control over some of their operations. The conservation movement and the establishment of the forestry bureau have greatly restricted the old-time privileges of the prospector and the miner. One can hardly avoid the conviction that in instances undue authority has been given officers of the government and has been exercised in objectionable ways.

The Institute of Mining Engineers is the most influential of our societies in respect to both industries and could well advise Congress as to what could and what could not be wisely attempted. As matters now stand, no expression of its official or authoritative opinion can be given nor can any advice, even if desired, be obtained from the Institute as a body. The present year, when it was highly desirable that the president of the Institute should have been able, as such, and with the endorsement of the directors behind him, to state to a congressional committee that a certain industrial commission should have a representative from the mining industry, the directors regretfully had to refrain from any official action. Although the elder statesmen of the Institute, they were forced to side-step a question of no small moment.

The Bureau of Mines is now an important portion of the national government and one which, as has already been brought home to the directors of the Institute, is quite often desirous of advice. Yet no opinion can be expressed by the directors as a representative body, nor can anything be conveyed to the chief of the bureau other than the opinions of individuals.

In several of our states, notably New York and Pennsylvania, strong movements are under way looking toward the examination and licensing of engineers in much the same way as physicians must secure, by examination, license to practice, and lawyers be examined for admission to the bar. The formulation of a proper law can obviously be only carried out with the best advice of our national engineering societies. Our sister societies of

civil, mechanical and electrical engineers are quite free to express their opinions and be represented by official committees, but the directors of the Institute of mining engineers, like a lot of irresponsible children, must avoid all representative participation.

The greatest and most serious opportunity has been of necessity lost in the recent discussions of the revision of the mining laws as affecting the location and property rights of claims, and for future locations the establishment of vertical planes and common-law ownership instead of the mazes, uncertainties and absurdities of the apex and extra-lateral rights. No one who has ever been personally familiar with one of these cases and the difficulties of establishing geological structure, or above all with an instance of broad lode apex rights, such as have come up in the Cœur d'Alenes, is without a feeling of amazement that the present conditions could be permitted to continue. But the American Institute of Mining Engineers, with its thousands of members, must sit tongue-tied so far as advising Congress is concerned; while the Mining and Metallurgical Society, with about 6 or 8% as many members, does yeoman service and speaks its mind freely. As a useful body in the large questions of national import the Institute has suffered greatly in comparison with the smaller society in recent years.

While the cases cited are few, they are typical and there are certain to be others of similar import arising as the years pass. Practically the decision in every member's mind should reduce to the question as to whether he has confidence in the wisdom and sound judgment in these matters of a body of men such as make up the present board of directors of the Institute and such as are certain to continue to constitute it; or whether he feels that their wisdom and sound judgment are not to be trusted in matters of policy. After some years of experience under old conditions and present-day ones, and as one who will shortly retire from the board, I have no hesitation in voting to give the board the free hand which the proposed amendments contemplate.

J. F. KEMP.

New York, Dec. 1, 1914.

### Science vs. Business

In the communication published in the JOURNAL of Nov. 14, Henry A. Marvin states several truths which have long been recognized by many members of our profession, though possibly too long endured in patient silence. While argument upon the main point of his contention may be unseemly, a few random remarks by way of amending and elucidating the philological distinctions will no doubt contribute to a better understanding of the subject.

In the name of business there is a great deal of honest (and dishonest) effort wasted, often leading to no business at all. When the dishonest efforts produce tangible pecuniary results, known as "success," we are prone to consider it as business *de facto*, or even *de jure*, provided the principals manage to keep out of jail.

But it is not pure business, nor is it considered good form to talk too much about the unpleasant little details.

We have a habit of saying that "money talks"; but this may be amended by adding, "but capital whispers." When mere money talks, there is always someone ready to grab

it, just as the fox is apt to grab the rooster who crows in the woods.

Labor talks to some extent, but experience shows us that the more labor talks the less it labors. Initiative is the fellow who must either talk or fail. When he wears diamonds or a plug hat, or both, we call him a promoter.

In general, neither capital nor labor possesses very much initiative. When capital possesses initiative, it whispers, as stated above. Labor listens for the call and sometimes hears it in time to respond. But during hard times the whisper is so faint that it is scarcely distinguishable above the hysterical clamor of the dissatisfied.

When labor possesses initiative of the right sort it is justly entitled to do some talking. But labor without capital can seldom accomplish much. Capital, being timid, is therefore haughty as a measure of self-protection. So, as a rule, labor must speak softly and with respect; for otherwise, capital refuses to listen.

The necessity for this lies in the fact that labor is merely capital of brawn, instead of money, and must cultivate some kind of protective timidity to make up for what it lacks in initiative. For every variety of rooster has some variety of fox hunting it. And the most dangerous fox is the one which tries to look like a rooster, for he generally gives a better imitation than the wolf in sheep's clothing.

In mining, business consists largely in the proper introductions and the maintenance of cordial relations between capital, initiative and labor. Technical science furnishes much of the initiative. But pure technical science is often reticent and requires the aid of business science, which latter may be considered as the twin brother of initiative.

Science is knowledge. Specifically, science is truth ascertained, classified and understood. Business devoid of science is failure. Science without business is pure or altruistic science. Applied science is business, and business is applied science. When applied technical science and applied business science work together, the result may be, and often is, "Big Business."

Whenever there is failure in business, investigation will almost invariably reveal a lack of some variety of science.

WM. B. MCKINLAY.

New York City, Nov. 24, 1914.

### Copper to Italy

The JOURNAL of Nov. 7 has just reached me, and I note the contents of the editorial headed "The Copper Seizures." By the same mail I received figures of the New York Metal Exchange for October which show 7316 tons sent to Italy in that month against 11,995 tons for the preceding nine months of this year. There would seem to be only one explanation possible for the sudden jump in the exports. I incline to believe that if the United States were in our position, its authorities would act in much the same way as ours have done. After all, economic pressure, if it can be applied, is a powerful factor in the determination of war.

NORMAN MACDONALD.

London, E. C., Nov. 16, 1914.

A New Form of Electric Furnace for making steel directly from iron ore is in use at the Moffat-Irving steel works, Toronto, Ont. The furnace was designed by James W. Moffat and is the result of a series of experiments in smelting fine ores.

## Editorials

### The A. I. M. E. Considering Changes

The members of the American Institute of Mining Engineers are presently to be requested to vote on certain constitutional changes. One of these is unimportant. The other is very important. This organization adopted a new constitution about two years ago. Unfortunately, it obtained an extraordinarily clumsy one. It goes far too much into details and incorporates in what ought to be a simple basic document of a few articles a multiplicity of prescriptions that ought to be engrossed as by-laws, capable of easy change, and many that should be classed merely as rules and regulations, capable of still easier change. The unfortunate thing about the present arrangement is that when the membership is asked to revise some trifling matter of administration routine that is voted upon by the membership without any special knowledge or consideration (the common assumption being that it has been proposed because the administration has found it necessary and therefore ought to be adopted), there is occasionally included something of basic importance which may escape a proper weighing.

In the present case the directors of the Institute fully appreciated this and appointed a committee to prepare a summary of the arguments of the proponents and opponents of the measure, which statement is to accompany the ballot. In other columns of this issue are printed the proposed amendments that are of importance, and out of the correspondence on this subject that has come to us we have selected the communications of Professor Kemp and Doctor Raymond, not that they are the leaders of the respective parties, but for the reason that their views will command universal respect.

The question is in brief whether the Institute shall depart from its historic policy of refusing to express formally its views respecting affairs of the day and shall begin to play an active part as a direct agent; in other words, doing something more than the mere presentation of information through the medium of its publications. For our own part we are not going to take sides strongly with either party, but we shall point out certain things that have been overlooked or have not been dwelled upon sufficiently, either by Professor Kemp or Doctor Raymond.

The idea of an active agency in the mining industry is by no means a new one. It was one of the fundamental conceptions of the American Mining Congress and was adopted by the Mining and Metallurgical Society of America at the time of its organization. In the A. I. M. E. ideas trending that way seem to have been crystallized by two specific matters, viz., the pending legislation for the licensing of engineers in certain states and the movement toward national legislation for revision of the mining laws. The proponents of the plan for liberalizing the Institute point also to the organizations of the civil, mechanical and electrical engineers as being ahead of it in

this respect. We are of the opinion, however, that in this the proponents err, assuming that the other engineering organizations are able to do more than in fact their constitutions permit.

Doctor Raymond points out the basic objection to the proposed measure, viz., the seeds of dissension that may be sowed by the introduction of seriously controversial matters. An organization like the A. I. M. E. is loosely knit. Its greatest bond of union is the exchange of information among its members. There are but few public questions upon which they are united, for the reason that their interests are far from being the same. There would be no trouble so long as actions by the organization were confined to questions of abstract or academic interest, but how long would a minority continue the payment of dues after a majority began to act contrary to their interests?

Let us consider certain specific things. We may imagine the Institute opposing the licensing of engineers without exciting any hard feelings among its members, who would probably take overwhelmingly the same position. With regard to the revising of the mining laws there would be less agreement; a majority would probably say that they ought to be revised, but as to how they should be revised there would be strong differences of opinion. Go a step further, to the conservation question, and there would be as bitter a fight as there would have been 20 years ago over the silver question. Whichever party were victor or vanquished there would surely be withdrawals. This is no mere surmise. The chief accomplishment of the American Mining Congress was the establishment of the U. S. Bureau of Mines. There was opposition to that, but the question was of no such vital concern as to excite resentment among the vanquished. When, however, the Congress began to act in tariff and other commercial questions, it suffered. Members asked themselves why they should support an organization working against their deep-seated convictions or even their immediate interests, and stepped out.

But, supposing an organization is going to commit itself to this policy, what is to be its procedure? The amendments pending before the Institute are so broad as to permit almost anything, which in itself is hazardous, but the idea seems to be to authorize the board of directors to act for the organization; in other words, to be a small legislature within the organization. This is far more experimental than any other engineering society has ever been. The American Mining Congress has never gone, theoretically, beyond the idea of action in convention. Its trouble has been that its conventions have always been local affairs and nonrepresentative either of broad views or of deliberate action. The societies of civil and mechanical engineers act chiefly at their general meetings, which commonly are attended by members in large number. After actions at such meetings there must be in certain circumstances confirmation by letter-ballot of the entire membership. The ability of

those societies to act in those ways is largely limited, however, to their internal affairs, and does not extend to public affairs at all.

Thus, the mechanical engineers met in New York last week, and among other things received the report of their commission which has been engaged for three years in standardizing steam-boiler design and practice to serve as the basis for uniform state legislation. This is a highly desirable thing. At present the several states have variable laws and the conscientious boiler manufacturer is obliged to make conforming modifications in order to comply with specifications for which there is neither rhyme nor reason, but which simply happened. The engineering commission conducted an elaborate, painstaking and eminently competent study of this subject and rendered its report. The American Society of Mechanical Engineers was not constitutionally able to *adopt* that report and put out its findings as the society's standard. It could do nothing more than "accept" it as filed. If the A. S. M. E. cannot adopt a standard in such a matter, how much less could it take a position either for or against a revision of a basic law of an industry?

Now, there is, of course, no limitation upon the right of any society to change its constitution in order to become able to do such things if it wants to. It will be observed, however, that the professional societies that have done this have strictly reserved the right of action to the membership and have sought to adhere to the convention idea. There is a good reason for that. There are many instances of record where a minority in the Congress of the United States has been converted into a majority by the arguments of speakers on the floor. The directors of the Institute themselves recognize the importance of this in their efforts to get the pros and cons of the pending amendments before the membership in advance of their plebiscite by mail.

As is well known, the letter ballot has been a regular procedure of the Mining and Metallurgical Society for seven years and has been found to work well. This is not only conducted by strictly defined rules, but also the essence of any action is discussion and deliberation. Moreover, the convention idea is retained in the preliminary action by local sections in their physical meetings, while besides the discussion taking place in them, there is discussion in the pages of the bulletin. The lapse of 12 months between the introduction of a resolution and the final action of the membership upon it, making it an act of the society, is a common occurrence. The procedure was, indeed, found to be so excessively deliberate and slow that for the sake of quicker action in emergencies the by-laws were amended so that the council could introduce a resolution for vote upon it by the membership, but the council cannot do anything committing the Society, and moreover, the council of the Society is subject to immediate ousting if its course in any matter be unsatisfactory to the membership. The council cannot put the Society upon record in any way and may not even express itself as a council. Thus it could not participate in conferences at Albany upon the question of licensing engineers, beyond the sending of a committee of observation.

The plan that is now before the membership of the A. I. M. E. may be a good thing in increasing interest in the organization. It may be a bad thing in committing it to a dangerous course leading to dissensions among its

membership. The ability of the membership to take any direct action that would surely be representative is highly doubtful. Out of a total of about 5000 there are seldom more than 300 present at any one meeting. The ability to conduct a satisfactory letter ballot among so large a membership is also doubtful, and would surely be expensive. More doubtful still is the ability to present an adequate discussion before the balloting. What would probably happen would be the delegation to the board of directors of the right to act. Meetings of the board are attended by only a part of its membership, but in so small an organization a satisfactory system of mail-voting might be developed. If, however, the Institute board of directors is to act as a congress, it ought to be elected in a thoroughly representative way, i.e., there should not be a nominating committee selecting the best men they know how to find, but there should be an election of average men, just as the Congress of the United States is elected.

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### The Time to Build

Now is the time for anybody who is contemplating new mining and metallurgical construction to begin it, if he has got the money or can borrow it. Steel and cement are to be had at bed-rock prices, the manufacturers of machinery are in many cases making sharp concessions in order to get business, and the conditions for the employment of efficient labor are favorable. People are coming to see that the United States is not going to remain under a cloud, even if the European war drags on for a long time. If it should show signs of terminating soon, there would be something akin to a boom in business here. Anyway, optimism is increasing so rapidly that some industrial companies are giving orders to resume construction and to inaugurate new plans in order to be in a position to meet the increased demands for their products that are foreseen in the future.

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### Ocean Freights

Ocean freights, which dropped heavily at the opening of the war, have not only recovered but have advanced to points far above those of June and July last. The advance is independent of the war insurance rates and in many cases has been over 100%. This was to have been expected, notwithstanding the cutting off of a large part of the ocean trade which was furnished by Germany and Austria. To offset this it is estimated that something like 5,000,000 tons of cargo capacity is laid up and unable to compete for freights. The ocean trade is disorganized by the war, like everything else, but to the profit of the side which remains active.

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Villa and Zapata have entered the City of Mexico, while the impossible Carranza has retired to Vera Cruz, whence the American troops have been withdrawn. With Villa and Zapata in control of things, Mexico is in rude hands, but it must be conceded that the ex-highwayman and the ex-muleteer have exhibited more common sense than the cultivated Madero, the military Huerta, and the bombastic Carranza. Anyway, they won the election by rifles, and there is a possibility that Mexico may emerge slowly into a crude state of order.



## Chronology of Mining for November, 1914

Quarterly reports of copper porphyries show no increase in costs despite curtailed operations

*Nov. 3*—Election Day—Arizona accepts prohibition and 80%-native-labor laws.—Montana defeats workmen's compensation measure.—Alaska returns Delegate Wickersham.—Socialist defeat in Butte.—England holds copper shipped to Italy on American vessels.

*Nov. 4*—Death of Frederick Augustus Heinze.

*Nov. 5*—First trial run of Jones furnace at Marquette.

*Nov. 6*—Death of Henry Gannett, geographer of U. S. Geological Survey and president of the National Geographic Society.

*Nov. 7*—Beginning of sanitary survey of Joplin district by U. S. Public Health Service and U. S. Bureau of Mines, with object of combating miners' phthisis.—Missabe docks at Duluth close.

*Nov. 9*—New York Metal Exchange reopens.—London Metal Exchange reopens.—Caving shaft at Sibley mine of Oliver Iron Mining Co. on Vermilion range, Minn., catches six men, of whom only one is later taken out alive.

*Nov. 11*—Curb market resumes open and unrestricted trading with permission to publish prices.

*Nov. 12*—Demand sterling at 4.86¾, lowest since April.—Final withdrawal of troops from Butte.

*Nov. 14*—Publication of announcement by President Bradley of Bunker Hill & Sullivan that company expects eventually to eliminate smelting of its ores.

*Nov. 16*—Federal Reserve banking system inaugurated.—Conviction of Boris Thomassen, member of I. W. W., for arson, following confession of having helped to set recent fires in Tonopah and Goldfield.—Gary steel mills increase operations.

*Nov. 18*—First distillation furnace fired at Langeloth, Penn.

*Nov. 22*—Muckie McDonald and Joe Bradley convicted of kidnapping.

*Nov. 28*—New York Stock Exchange opens for bond trading at minimum prices.—Beginning of great storm at Nome.—Formation of Safety and Sanitary League in Joplin, Mo.

*Nov. 30*—Death of Prof. Samuel B. Christy.

### The John Fritz Medal

The Board of Award some time ago decided to confer the Medal for 1914 upon Prof. John Edson Sweet, of Syracuse, N. Y., for his achievements in machine design and pioneer work in applying sound engineering principles to the construction and developing of the high-speed steam engine. The presentation took place in the Auditorium of the Engineering Societies' Building, New York, on Dec. 2. An address was delivered by Dr. James Douglas, past-president of the American Institute of Mining Engineers, on "Engineering in the Development of Mining." There followed an address on "The Relation of Standards to the Development of Engineering," by Samuel W. Stratton, director of the National Bureau of Standards. John R. Freeman, past-president of the American Society of Mechanical Engineers, president of the Board of Award in 1913, spoke on the significance of the John Fritz Medal and the achievements of

Professor Sweet and presented Professor Sweet for the award.

The John Fritz Medal is a distinction for notable, scientific or industrial achievement conferred from time to time out of the income from a fund subscribed in memory of the great engineering pioneer, John Fritz, and the award of the medal is made by a permanent Board of Award, composed of four members from each of the great national engineering societies, the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Institute of Mining Engineers.

## NEW PATENTS

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

**ALLOY OF Nickel, Copper, Chromium, Etc.** Samuel W. Parr, Urbana, Ill. (U. S. No. 1,115,239; Oct. 27, 1914.)

**ALLOY STEELS**—Process of Producing Alloy Steels. Byramji D. Saklatwalla, Crafton, Penn. (U. S. No. 1,119,643; Dec. 1, 1914.)

**AMALGAMATING MACHINE.** Edward E. Hedges, Boston, Mass. (U. S. No. 1,118,128; Nov. 24, 1914.)

**AMMONIA AND ALUMINA FROM ALUMINUM NITRIDE,** Process of Producing. Emil Milde, Goldschmieden, Germany, assignor to Aluminum Industrie Aktiengesellschaft, Neuhausen, Switzerland. (U. S. No. 1,115,003; Oct. 27, 1914.)

**BLASTING CARTRIDGE.** Peter M. Copps, Halleybury, Ont. (U. S. No. 1,117,794; Nov. 17, 1914.)

**BRIQUETTES**—Method of Making Briquettes. Fred A. Jordan, Sellwood, Ont., assignor to Moose Mountain, Ltd., Sellwood, Ont. (U. S. No. 1,117,853; Nov. 17, 1914.)

**BRIQUETTING**—Method of Briquetting Iron Ores and the Like. Georg Crusius, Gross-Ilse, Germany. (U. S. No. 1,116,024; Nov. 3, 1914.)

**CLAD METALS**—Method of Making Clad Metals. John F. Monnot, Paris, France, assignor to Duplex Metals Co., New York, N. Y. (U. S. No. 1,114,792; Oct. 27, 1914.)

**CLASSIFIER**—Cone Classifier. Sylvester Clingmon Buchanan, Guanajuato, Mexico. (U. S. No. 1,115,897; Nov. 3, 1914.)

**COATING STEEL OR IRON WITH COPPER,** Process for. James E. Sheaffer, Burnham, Penn. (U. S. No. 1,115,870; Nov. 3, 1914.)

**CONCENTRATING TABLES**—Improvements in Head Motion for Concentrating Tables. Deister Machine Co., Fort Wayne, Ind. (U. S. No. 3443 of 1914.)

**CONCENTRATOR.** Harry P. McIntire, Colorado Springs, Colo. (U. S. No. 1,115,092; Nov. 3, 1914.)

**CONCENTRATOR.**—Ore Concentrator, Tobias L. Crane, Morenci, Ariz. (U. S. No. 1,116,246; Nov. 3, 1914.)

**COPPER EXTRACTION**—Process of Extracting Copper from Carbonate and Oxide Ores. Henry R. Ellis, Salt Lake City, Utah. (U. S. Nos. 1,115,521 and 1,115,522; Nov. 3, 1914.)

**CRUSHER**—Gravity Ore Crusher. Russell Franklin Collins, Spokane, Wash. (U. S. No. 1,118,474; Nov. 24, 1914.)

**CRUSHING and Pulverizing Machine.** Joseph E. Kennedy, New York, N. Y. (U. S. No. 1,115,833; Nov. 3, 1914.)

**CRUSHING**—Chilean Mill. James R. Sears, Oroville, Calif., assignor of one-half to Walter M. Smith, Oroville, Calif. (U. S. No. 1,115,591; Nov. 3, 1914.)

**CRUSHING MILL.** Thomas Joseph Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co. (U. S. No. 1,119,126; Dec. 1, 1914.)

**CYANOGEN COMPOUNDS**—Process of Preparing Cyanogen Compounds. John E. Bucher, Coventry, R. I., assignor to Nitrogen Products Co., Providence, R. I. (U. S. No. 1,116,559; Nov. 10, 1914.)

**DRILL**—Fluid-Operated Tool. Lewis C. Bayles, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,117,307; Nov. 17, 1914.)

**DRILL**—Hammer Drill. Andrew J. Carter, Victor, Colo. (U. S. No. 1,115,898; Nov. 3, 1914.)

**DRILL**—Machine Rock Drill. Thomas Albert Sone, Preston, Victoria, Australia. (U. S. No. 1,118,692; Nov. 24, 1914.)

**DRILL**—Pneumatic Rock Drill. Clark J. Smith, Ottumwa, Ia. (U. S. No. 1,119,198, Dec. 1, 1914.)

**SCREEN**—Vibrating Screen or Separator. Willard J. Bell, Newaygo, Mich. (U. S. No. 1,114,097; Oct. 20, 1914.)

**SEPARATOR.** Henry Martinson, Elbow Lake, Minn. (U. S. No. 1,111,227; Sept. 22, 1914.)

**SLAG**—Process of Making Articles from Slag. Marco Chiapponi, Paris, France. (U. S. No. 1,114,581; Oct. 20, 1914.)

**SMELTING**—Apparatus for Smelting Ores. John A. Potter, Pueblo, Colo. (U. S. No. 1,113,481; Oct. 13, 1914.)

**TIN**—Process of Detinning. Wallace Savage, Piedmont, Ala. (U. S. No. 1,113,491; Oct. 13, 1914.)

## PERSONALS

E. M. Hamilton is in New York and will remain there for some time.

F. W. Bradley expects to remain in New York until after the holidays.

J. B. Tyrrell has returned to Toronto from a visit to the Porcupine camp in Ontario.

Yolen Williams, of Spokane, Wash., is in the Tulameen District in British Columbia.

Howland Bancroft has returned to Denver after a business trip to New York and Boston.

B. B. Thayer went to Butte last week, expecting to be back in New York about Dec. 20.

H. P. McFadden, superintendent of the Hollis mine at Sandon, B. C., was in Chicago on business recently.

John Irwin Ballard, assistant engineer, Quincy Mining Co., Hancock, Mich., was in Chicago recently on his way west.

S. H. Brockunler is conducting some tests at the property of the Pittsburgh Tungsten Mines Co., 35 miles north of Phoenix, Arizona.

E. H. Sampson, formerly at the Bluebell Mine, Kootenay Lake, B. C., is now assayer at the Jewel gold mine in the Boundary District.

George Steidle, of Rescue Car No. 5, has gone to San Francisco to take charge of mine-rescue demonstration at the Panama-Pacific Exposition.

Prof. Andrew C. Lawson has been appointed dean of the School of Mining of the University of California in place of Samuel B. Christy, recently deceased.

George W. Boyce, of the Big Five Operating Co., Leadville, and manager of the Gordon-Tiger mining enterprise, Twin Lakes, Colo., has been in Denver on business.

Anyone knowing the present address of Harry B. Per Lee, a civil engineer, last known to be employed at Elephant Butte, N. M., is requested to advise William E. Per Lee, of Stillwater, Minn.

Dr. Richard P. Flower, the ex-promoter whose arrest was recently noted, has been convicted in the New York courts of grand larceny, and sentenced to serve two years in the penitentiary.

Walter W. Johnson, president of the Union Construction Co., San Francisco, has returned from Alaska, having had a successful season in the North, both in construction and operation of gold dredges.

Prof. J. Nagazumi, of the Imperial University, Kiushiu, Japan, is making an investigation of the silver and gold mines of Northern Ontario and of the metallurgical processes for the treatment of the ores.

Charles M. Schwab, head of the Bethlehem Steel Co., paid a flying visit to Montreal on Dec. 4. His trip is supposed to be in connection with a project to build submarines in Canada for the British government. Another statement is that Mr. Schwab has decided to build no submarines.

Robert Sticht, general manager of the Mount Lyell Railway & Mining Co., who has been visiting New York, thus finishing a year's holiday, started homeward on Dec. 5. Mr. Sticht recently attended several meetings of the technical societies in New York and Boston, at which, upon invitation, he talked upon the subject of pyritic smelting, of which art he is the world's premier exponent.

Edward S. Wlard, of Denver, Colo., has been in New York on professional business. He took advantage of the opportunity to discuss with the McGraw-Hill Book Co., the publication of his book on the "Theory and Practice of Ore Dressing." The publishers already have the book in type, wherefore it ought to be ready for issue in about a month or six weeks.

## OBITUARY

William Dorian, one of the pioneers of the Butte District, died at Anaconda, Mont., Nov. 21, aged 79 years. Born in Ireland, he came to America when a young man, and after some years spent at Shullsburg, Wis., went to Montana, where he was one of the earlier settlers.

Randall Hitchcock Kemp died at Victoria, B. C., Nov. 13,

aged 62 years. Born in West Virginia, he went to the Northwest when a young man. For nearly 30 years he had been a pioneer in British Columbia, at Ainsworth, Kaslo, Slocan and other camps. His later life was all passed in that province, with the exception of three years in Alaska.

Hugh T. Stewart, Struthers, Ohio, one of the founders of the Struthers Iron Co., which built Anna furnace in 1869, died Nov. 25, aged 71 years. He was associated with Thomas Struthers, T. W. Kennedy and others, in the Struthers Iron Co., which property was afterward taken over by the Struthers Furnace Co. Anna was one of the early furnaces in the district.

Samuel Benedict Christy, dean of the College of Mining of the University of California, died at his home in Oakland, Dec. 6, aged 61 years. He was born in California and graduated from the university with which he was later connected as instructor for 40 years. He earned a high reputation as metallurgist, author and teacher. We hope to publish a suitable account of his long and useful life at an early date.

Robert B. Estey died recently at Boulder, Colo., aged 79 years. He was born in Maine, went to California when a young man and worked his way eastward through Nevada and Utah to Colorado. For 35 years he had been closely connected with the Leadville district. He was connected with many of the well known mines of the district. Mr. Estey was an authority on the geology of the Leadville district. Mining men found him to be a storehouse of knowledge concerning the geological formations and ore deposits, and the promoters of many large mining enterprises in which he was not financially interested eagerly sought his advice and counsel.

## SOCIETIES

**Old Freibergers in America**—The annual meeting of the Old Freibergers in America will be held on Saturday, Dec. 19, at 7 p.m., in the Hofbrau Haus, Broadway and 30th St., New York. The members are urged to attend and bring guests with them.

**Mining & Metallurgical Society of America**—A meeting of the New York section will be held at Browne's Chop House on Thursday, Dec. 17, at 8 p.m., preceded by the usual dinner (informal) at 6:30 p.m. Mr. Ingalls will give a talk on the metallurgical plants in Europe which are affected by the War, and a paper on mine water will be presented.

**Copper Country M. C. M. Club**—The first of the regular fall and winter meetings was held at the Douglass House, Houghton, Mich., on Dec. 7. A dinner was followed by a talk on "Safety First," by O. F. Bailey, of the Calumet & Hecla Mining Co. Mr. Bailey organized the safety and rescue crews of the Calumet & Hecla and subsidiary companies.

**University of Nevada**—Mining high schools may be established in Nevada; if plan is approved, first school will be at Tonopah. On recent visit to Tonopah, Prof. F. C. Lincoln, director of Mackay School of Mines, at Reno, found that 150 miners were taking correspondence courses in mining. Plan of high schools conforms to general purpose of university extension courses. Federal aid has been proposed, permitting use of federal funds in university extension work in mining as Smith-Lever fund is now used in agriculture.

**University of Pittsburgh**—The School of Mines has opened its University Extension classes in the mining towns of western Pennsylvania for the third year. Five classes have been organized to study the subjects of mine gases, ventilation, law and safety, in preparation for the fireboss examination. These are located at Uniontown, Mt. Pleasant, Lelsening, Yukon and Russellton. In addition, a class in more advanced subjects to prepare candidates for the mine foreman examination is being conducted at Irwin. The enrollment in the six towns is 157, exceeding that of the two previous years. Each class will be met once a week in the evening, from October to April, by a member of the School of Mines faculty. Notes covering the subjects taken up in the course have been prepared especially for this purpose, together with illustrative problems. The lectures are accompanied with demonstrations of the apparatus studied. The cost of these courses to the student has been reduced to a minimum. The School of Mines offers the instruction without charge, and expects only that the traveling expenses of the instructor be met by the class. The interest manifested in these courses, both on the part of the students and the coal operators, is very gratifying to the institution. It is hoped that in the near future, facilities will permit of complying with all requests received for organization of mining classes.

## Editorial Correspondence

### SAN FRANCISCO—Dec. 2

For the **Hydraulic** season, weather conditions in California at the beginning of December are favorable. The first storm of the fall came on the last night of November and extended practically all over the state, including the principal mining regions. For some days prior the weather had been cold in the mountains and a storm was expected at the middle of November. The snow in the higher elevations is reported sufficient to warrant a good supply of water, provided the weather does not turn warm too early and provided also there should be a reasonable amount of snow during the winter. This condition is especially attractive to the hydraulic miners who are in various parts of the state preparing for resumption of operations in many of the old mines which have been prohibited from operation recently on account of liability to violation of the anti-débris law. The hydraulic miners have become somewhat encouraged after careful study of methods for handling hydraulic tailings. A better type of dam construction has been adopted and the miners are also learning that it is possible to stack their tailings along the creek banks instead of turning them into the creeks. Methods will also be adopted during the coming season for taking care of the flume water and preventing its flow into the streams.

**Mine Insurance** is under consideration by the California Metal Producers' Association. A committee has been appointed to formulate a definite plan of inter-insurance to be submitted to the association for consideration or approval. This committee is composed of Henry Mallock, of the South Eureka Mine, Mr. Rosenfeld, of the Eagle-Shawmut, and Newton Cleaveland, of the Yuba Construction Co. Another committee will investigate employers' liability insurance as furnished by insurance companies. This committee is composed of Mr. Rosenfeld, Senator Voorheis and John Mocine, secretary of the association. There have been some informal meetings with representatives of the Industrial Accident Commission and rates of insurance upon mine employees have been considered, but no definite proposal has been presented by the commission. The association is going into the matter carefully and thoroughly and whether insurance will be taken with the insurance department of the commission or with the stock companies, or whether the inter-insurance plan will be adopted, will be decided only after the entire matter has been gone over thoroughly. The membership of the association is increasing and the indications at the present are that a majority, if not all, of the operating mines in the state will come in.

**Smelting Fume** troubles in the Shasta County copper belt are again complained of by the farmers, who have instituted two proceedings in the courts, apparently in the hope that if one plan of attack fails the other may succeed. George Baker, hay rancher, has brought suit in the superior court for \$10,000 damages against the Mammoth Copper Co., but the case was removed to the U. S. district court, as the Mammoth is a Maine corporation, a fact well known to the complainant. Erle Downing, farmer and a member of the Farmers' Protective Association, went direct to the U. S. court with a petition asking that the Mammoth be declared in contempt of the standing court decree, under which it has been conducting smelting operations for the past two or three years. The petitioner contends that the Mammoth during June and July, 1914, allowed the discharge of 600 tons of sulphur dioxide, more than 700 tons of sulphur trioxide, or more than 900 tons of sulphuric acid from its plant, to the damage of vegetation; that during those months at various times there were discharged from the baghouse, gases containing more than 0.75% SO<sub>2</sub>. Examinations for the complainant were made by the Western Laboratories of Oakland, and upon the findings of its engineers the petition was filed. The hearing had been set for Oct. 26, but was postponed to a date not later than Nov. 16. While Downing and Baker are both members of the farmers' association, which in the past has made the attacks on the Mammoth and the other plants, it does not appear that the farmers are in common accord with the present suits. In fact the majority of the farmers in the county are generally too prosperous to worry about fumes, even if there were a sufficient amount escaping to

attract the attention of the engineers making the investigation. Baker is the man who in May, 1913, stated to the "Journal" representative that if there was no smelting in the county he would not be operating a large and profitable hay ranch.

### DENVER—Dec. 3

**The Fire** that has been smoldering in the Smuggler and Molly Gibson mines at Aspen for years is still defying extinction. The country rock is a shale containing considerable carbon as well as sulphur. These elements ignited spontaneously and for a long time the properties were operated only with great difficulty. In places, the mine workings were extremely hot, so that workmen could remain in them for short periods only. All sorts of remedies were tried without success. Flooding was resorted to, but, although the workings were kept submerged for a long time, when they were unwatered and reopened the fire was found still to exist. The U. S. Bureau of Mines rescue car spent a week on the ground this fall and again flooded the mine, but the recent unwatering showed the fire unextinguished. It now seems evident that the only solution is to permit the fire to continue its own course and to burn out the combustible materials as rapidly as possible.

**Camp Boerleke** has sprung into being. It is improbable that there will be a rush comparable to those attending the birth of most mining camps, for the mining ground tributary to this settlement is held by a single interest, the Primos Chemical Co. This new point of activity is well up on the eastern slope of the continental divide, in Clear Creek County, about 8 miles west of the formerly active little mining town of Empire. For years, prospectors named Young and Lively have held and done desultory work on a large group of claims containing gold-silver veins. They have always been aware of the presence of certain yellowish and black minerals in a belt about 400 ft. wide but they never learned the names or worth of these minerals until Alfred H. Hale, a technical representative of the Primos company, happened along and informed them that the minerals contained molybdenum. On behalf of his company, he secured options to purchase the property and, under his direction, systematic prospecting was undertaken. For about two months, at least 20 men have been kept actively digging, prospecting and erecting buildings. Results thus far have been highly encouraging and the first payment on purchase has been made. Water power is to be developed to drive a compressor. A concentrating mill will be built, as soon as the proper treatment has been determined.

**The London Mine**, on London Mountain, seven miles west of Alma, was for years famous as a producer of rich silver-gold-lead-copper ore from a strong vein which was often erroneously stated to be in the London fault but which is actually some distance from it and not genetically associated with it, although having a nearly parallel strike. Some years ago the owners, a close corporation or partnership, found that the approaching exhaustion of shoots above the level of the big tunnel through the mountain, had brought about conditions precluding further profitable operation with the methods then existing. Development of new ground could be done only at great outlay. Dissension having arisen among the three estates that had meanwhile acquired the ownership, no concerted action could be taken looking to such expenditure. The portals of the mine being much above timberline in a severe climate, labor has always been difficult to retain at reasonable wages, while generation of power by coal hauled up the long, bad roads was exceedingly expensive. Last spring Charles P. Aicher secured a leasing control of the property and has introduced a subleasing system whereby blocks of the developed ground are allotted to parties of miners who come chiefly from Leadville, just over the Mosquito Range to the west. At present, 10 sets of lessees are succeeding in getting out considerable tonnages of ore from ground that could not be profitably worked by "day's pay" men.

### BUTTE—Dec. 3

**Both Miners' Unions** had members in consultation with United States Senator Walsh during his visit to Butte on Nov. 25. The subject of discussion was the proposed uniting

of the two organizations or the merging of the membership of one into the other. What progress was made toward reaching an understanding, if any, is not made public.

#### SEATTLE—Dec. 2

**The Atlin District** of British Columbia according to the latest conservative estimates, yielded more gold this summer than in any recent year. Many of the mines which depend upon English capital were closed down, but most of the creeks report a material increase in production over 1913 and 1912. This is true of McKee, Ruby, Wright, Otter, and Boulder Creeks. Pine and Spruce Creeks, however, were not so productive as in 1913, since a great many of the miners on these creeks are now on the O'Donnell River, where the outlook is encouraging, although comparatively little work has been done. The O'Donnell Placers, Ltd., spent most of the summer installing a hydraulic elevator plant and did not commence operating until late in the season.

**The Koyukuk** production for the season past was about \$280,000, a slight gain over 1913. This Alaskan camp is far north of the Arctic Circle and primitive methods of mining still prevail; the short season and the difficulty and expense of getting machinery and other supplies also tend to restrict the output. For many years the annual yield has been between \$200,000 and \$300,000. Most of the ground is extremely "spotted," but the spots are often rich. On No. 4 Above, Hammond River, J. C. Kinney and partners picked up nuggets from bedrock valued at about \$20,000; one nugget, the second largest ever found in Alaska, was worth \$2600. The rest of the dump when sluiced yielded a little less than the value of the "pickings."

**The Alaska-Gastineau** reduction plant at Thane, near Juneau, Alaska, is receiving the finishing touches and will without doubt be ready Jan. 1 as originally planned. The big steel buildings which constitute the first unit are entirely erected and the work of installing the machinery is now about 75% complete. The mine is now ready to deliver 6000 tons per day, traffic facilities being practically complete. All that remains to be done is to replace the storage-battery locomotives by the trolley system, and this work is under way. The building for the coarse-crushing plant, 100x100 ft. by 125 ft. high, is entirely finished and ready for operation. The crushing plant and the concentrating mills are in one large building. The treatment process is essentially concentration. Coarse crushing is done in two large jaw machines and four No. 8 gyratories. Succeeding operations involve a pair of 72-in. Garfield rolls, ten 54-in. Garfield rolls, impact screens, Garfield roughing tables, Wilfleys, Richards-Janney classifier and tube mills.

**Sevard Peninsula** output for 1914, as previously stated in the "Journal," will be about \$3,000,000, in spite of a dry season, which interfered with all forms of mining except dredging. This represents an increase of \$500,000 over 1913. The superiority of the dredge over other methods of handling gravel under the conditions obtaining in this area has again been demonstrated. Several new machines were built during the year, bringing the total number up to 42. Of these, 11 are in the Nome district; 10 are in the Council district; 9 are in the Solomon district; 5 are in the Teller district, 4 in the Kougarok, and 2 each in the Candle and Inmachuck districts. One dredge is also used in the York district for recovering tin. All are small, with buckets of about 3 cu.ft. capacity, and capable of handling from 1500 to 2000 cu.yd. per day. Several large hydraulic plants were also operated when there was enough water.

**Tin Mining** in the Cape York district is making steady progress. The York Dredging Co.'s dredge on Buck Creek produced cassiterite to the value of \$48,000 in 1912, and of \$104,000 in 1913. For 1914 the actual output was greater than for the preceding year, but a smaller price was obtained. In 1913 the cassiterite, averaging 62½% metallic tin, brought \$570 per ton. Although the placer deposits have received the most attention so far, promising lodes have also been found. The Lost River Tin Mining Co. has done a large amount of work on a 12-ft. vein on Lost River that is said to carry 3 to 4% tin. A small reduction plant, run by gasoline power, has been used for testing. Plans have been announced for the erection of a 60-ton mill in 1915. It is even reported that this company will build a smelting plant on Puget Sound to treat its own product and possibly ores from Bolivia. The Bartels Tin Mining Co. has 32 patented claims on Cape Mountain; 300 tons of ore tested in its 3-stamp mill averaged 3% metallic tin. The United States Tin Mining Co. has a 10-stamp mill on its claims; the main tunnel is in over 400 ft. and the vein is reported to average 4% tin. There is little doubt that an important tin-mining industry will, in time, be developed in this area, but at present it is held back by several disadvantages, of which the distance to a market

for the product is causing the most thought. Shipping and treatment charges to England total \$60 a ton—not a prohibitive charge on material worth \$570 a ton, but serving to retard development. One of the worst features where companies and individuals with limited capital are developing mines is the length of time it takes to get returns from shipments, and the general uncertainty in doing a small business at such a distance. It is to be hoped that a smelting plant will be built on Puget Sound or elsewhere in America.

**The Portage Bay** district in southwestern Alaska is doing well. Between Valdez and Portage Bay several quartz mines have been put on a paying basis this summer and many prospectors are planning the installation of mills. The operations of the Granite Mine at Port Wells have been previously reported in the "Journal." Captain George has 20 men working and is putting in bunkers at Beetles Bay, a short distance from Portage Bay. He will ship to Tacoma. Two other prospects have been opened up in this section. A stamp mill is running steadily on the Golden Treasure property at the town of Golden and several properties there have been bonded. Gus Ohm is running a small mill on Colville Creek and Colin Murray, formerly of Nome, is opening up a property on Piggott Bay, a branch of Passage Canal. Colonel Millard also has a number of options in this section and is developing several. Harvey Sullivan, former U. S. Marshal, has uncovered a vein of free-milling ore near Portage Bay and promises active development work next spring.

**The Copper Country** in the vicinity of Surprise Creek is reported to be showing activity, according to operators coming into Cordova, Alaska, for winter supplies. Harry Grennig and John E. Drake, who have been doing development work, report opening up an oreshoot showing copper 45%, gold \$8 and silver 10 oz. The property consists of a group of 10 claims on Surprise Creek, a tributary of the Kotsina River; the ore consists of chalcocite in quartz. On the Hubbard-Elliott property on Nugget Creek, a crew has been working and results are satisfactory. A crosscut tunnel has tapped the vein at a depth of about 400 ft. revealing high-grade ore, it is stated. On the California-Alaska property where a showing of ore has been obtained, assessment work has been completed by Frank Boyle. W. H. Brown, representing the Great Northern Development Co., has finished assessment work on the Regal and Kotsina and now has a crew of men employed on the Copper Mountain property of his company. Tom Lynch, who has been doing development work for the Dillman company on the Kuskalina, has about completed the work for the season and will return to the States. Tom Kinney, who has a high-grade copper prospect on the Chokosna, a tributary of the Kuskalina, has closed down for the winter after running a full crew all summer. John Canning and Ben Bonito, whose remarkable strike of gold quartz about two years ago on Cow Creek, a tributary of the Kotsina about 11 miles from Strelina, created some excitement, are preparing to work their property on a large scale. The vein was covered to a considerable depth with slide gravel, muck and tundra. They are now groundsluicing off the overburden and this winter will sink on the vein.

#### JOPLIN—Dec. 2

**A Safety and Sanitary League** was organized among Joplin operators Nov. 28. One of its objects is to prevent accidents at the mines by improvement in equipment and by such uniform rules as will tend to educate the miners. Its prime object, however, will be to alleviate the conditions which make for the increase of miners' phthisis. The organization, working in conjunction with the state mine inspectors, the U. S. Bureau of Mines and the Public Health Service, will try to carry out measures for the prevention of rock dust, for better ventilation, and for more sanitary conditions underground and in the change rooms. A set of rules and recommendations will be made out immediately by the committee with the advice of the inspectors, which will be put into effect at all the mines connected with the organization. A campaign of education will be started to help the miners themselves to understand conditions and get them to assist in the measures being taken for their benefit. The campaign will also include the work of getting all the mine operators into the organization. It is believed that eventually all the good miners will want to work only for such companies as follow the recommended rules and preserve sanitary conditions, and that mines not belonging to the organization will find it difficult to get good help or to keep a steady force.

#### CHICAGO—Dec. 5

**The Quinn** mine's plans for a washing plant have been noted in the "Journal." Additional information is now avail-

able. The Quinn is a western Mesabi mine. Its ore does not need any treatment. However, the same interests control adjoining pieces of ore-bearing land, and this ore does need treatment. Butler Bros., who are operating the Quinn mine, are therefore constructing what is known on the range as a one-unit washing plant. It will be one-fifth the size of the Coleraine plant and a little larger than the one at Nashwauk. The treatment process and equipment will be similar to that at Nashwauk, except that concentrating tables will be employed. The tables will be installed this winter, although it is understood that the orders for the tables have not yet been placed.

**The Rowe mine**, operated by the Pittsburgh Steel Ore Co., at Riverton, Minn., on the Cuyuna range, has contemplated for some time the erection of a plant to treat its ores. Reports obtained within the last few days state that work on the plant is now actually started. It is also learned that the capacity of the plant will be sufficient to permit treating other ores than those of the Rowe. In other words, it is to be something of a custom plant.

#### HOUGHTON—Dec. 5

**A Fifty per Cent.** cut in production has not been made by the copper mines of Michigan. While there may be some criticism of the mines of the Michigan district for this failure to follow the general cut as made by producers in other parts of the United States, there is ample justification for their course based on the peculiar exigencies of the situation relative to labor and mine treasuries. The Michigan mines had just been through the heartrending experience of a long fight with the Western Federation. That strike partially shut off their production over a considerable period. Furthermore, it was an expensive proceeding for the mining corporations. For this reason, while the mines in most instances, made a partial reduction when the war began, they have by no means cut their output to one-half. The one exception is the Copper Range Consolidated, which is working its Champion, Baltic and Trimountain mines on half time. Other mines are working three-quarters time and in one or two instances the low grade of the rock makes full-time operation necessary to prevent actual loss. But even with reduced working forces and fewer working days the greater efficiency of the men and improved mining methods have brought about an unusual increase in rock tonnage, a phenomenon usually in evidence when there is a superfluity of workmen and a sincere and ardent desire on the part of every man holding a job to keep it. Illustrative of the increase in rock tonnage per man employed and of the present output of the mines in this district, it can be said that the Mineral Range R.R., which serves the Osceola Consolidated, Ahmeek, Centennial, Allouez, Wolverine and Mohawk mines, handled in November, 300,000 tons of rock, within 10% of normal.

**Copper Range Consolidated** management has no intention of increasing production. The mines have operated on half time at reduced wages ever since the war began, the men working two weeks during each month. The mines lost few of their good miners, all of the men realizing that while they were compelled to suffer a hardship, it was a condition for which the war alone was to blame and that there was little to gain by seeking employment elsewhere. The announcement of the resumption of full time at the Centennial and Osceola branch of the Osceola Consolidated led to a belief that many of the other mines also would shortly resume full time. This is not so. The managements of the mines do not anticipate any sustained improvement in the copper situation until the war is ended, and they realize that it will then require a long time for business activity to reach normal conditions again, so as to call for any unusual quantity of copper.

#### ISHPEMING—Dec. 5

**The Aid Fund** of the Lake Angeline mine, a Marquette range property of Jones & Laughlin, is responsible for an interesting problem presented to the probate court. Prior to the enactment of the workmen's compensation law several years ago, it was the rather general practice of Michigan mine managements to create and maintain aid funds for the benefit of employees, both men and companies contributing stated sums monthly. Disbursements were made to the injured and the sick as needed. These disbursements fell below the receipts in some instances, and there gradually were accumulated considerable surpluses. This was the case with the Lake Angeline fund. The Lake Angeline is practically worked out, and a few months will witness the end of its career. Already it has been necessary to dispense with the services of a considerable number of the men, and most of these have long been contributors to the aid fund. The question is: To whom do the funds belong, and, if there is to be a distribution, who is to share in it and in what proportion?

#### TORONTO—Dec. 5

**Graphite Exportation** outside the British Empire is prohibited by the Canadian government, which has issued an order-in-council to that effect. The production of graphite during 1913 was 2162 tons, valued at \$90,282, most of it exported to the United States.

**On Assessment Work** a further extension of six months from Nov. 15 has been granted by the Ontario Department of Lands, Forests & Mines. A previous order-in-council gave a three-months extension from Aug. 15, owing to adverse financial conditions, and in this respect the situation shows but little change.

**The Antimony** demand created by the war has led to an attempt to revive the antimony-mining industry in Canada. The deposits at Lake George, York County, N. B., which many years ago were worked by the Lake George Mining & Smelting Co. and subsequently by the Canadian Antimony Co., Ltd., are being reopened. The operators had to contend with transportation difficulties necessitating a long haul which, combined with the low price of the metal, resulted in the suspension of operations. The increased price of antimony and the fact that railway facilities have been secured by the completion of the St. John Valley road to within three miles of the plant make conditions appear favorable to the success of the enterprise.

#### EDMONTON—Dec. 2

**Northwestern British Columbia** holds considerable promise as a gold field. In the Liard, Findlay and Parsnip River districts prospecting has been done for many years, but the enormous difficulties encountered in getting into the country and the high cost of provisions, all of which must be packed in by men or animals, have tended against thorough examination of the territory. Many outfits have, however, gone in and come out again and recently some of them returned with two and three thousand dollar pokes, gained in a few months panning. Doubtless more gold has come out than has been made known to the general public. At the present time there are several hundred men in the districts, according to reports from Hudson's Hope and Fort St. John, two points on the Peace River whence outfits go in. Hudson's Hope is 595 miles from Edmonton and Fort St. John is 635. Leaving Edmonton the first hundred miles of the distance can be traveled by train to Athabasca Landing. Thence to Peace River Crossing, 295 miles is made by river steamer. From the Crossing the Peace runs to both Fort St. John and Hudson's Hope and this part of the journey can be made in scows which will carry two and three tons with ease. Should gold be found extensively the country offers fewer difficulties than the Yukon.

#### CHIHUAHUA—Dec. 1

**The Chihuahua Smelting** plant is running at about half capacity. It appears that there is a shortage of labor at Chihuahua, which is the reason for running only four out of the eight furnaces. The mines tributary to this plant could easily furnish ore for all the furnaces, and in most of the camps there is an abundance of labor. It is reported that Donald B. Gillies has been appointed general manager of the Corrigan-McKinney properties at Terrazas and Concheño, and that these properties are soon to resume operations. There are copper mines and a smelting plant at Terrazas, and gold-silver mines and a cyanide plant at Concheño.

**The Cusi Mexicana Mining Co.**, also under the management of Mr. Gillies, will, in a few days, resume operations at Cusihiuriachic, where it has mines with large ore reserves and a 100-ton concentrating plant.

**The Cusi Mining Co.**, owner of the Promontorio mine, is shipping all the ore to Chihuahua that the smelting plant will accept, which is only half the capacity of the mine with its present equipment. A new steam hoist is being installed and should give this mine a daily output of at least 300 tons.

**The Cusi Consolidated Mining Co.** is installing a compressor plant and air drills and will resume sinking in its No. 2 shaft, which is now down 180 ft. with several hundred feet of drifting on the 150-ft. level, where good ore has been encountered in three different veins. The Minerva mine, owned by the same people, is being equipped with a gasoline hoist. This property is now shipping and is said to have encountered ore running as high as 1000 oz. silver and 3 oz. gold at only 50 ft. from the surface.

**The shaft of the San Juan mine** is now down almost to the 500-ft. level, where a crosscut will be run to a known orebody which was developed at the 300-ft. level. A second orebody has recently been encountered in a drift on the 300-ft. level. This mine has recently been equipped with machine drills.

**The Virginia C. Mining Co.**, owning high-grade copper mines in the Concheño district, is again operating and will resume shipments as soon as there is a better market for copper.

# The Mining News

## ALASKA

**FURIOUS BLIZZARD** had been raging at Nome for three days on Dec. 1, forcing ice pack up against buildings and driving water farther inland than for several years. Trails impassable. Several shore mining camps surrounded by water. No loss of life reported.

**EBNER (Juneau)**—Consolidated California-Nevada Co. to be organized by A. W. Middleton, former treasurer of Alaska-Ebner Gold Mines Co., property of which was lately bought at foreclosure in behalf of bondholders' committee for \$225,000. Shareholders of Alaska-Ebner company, whose equity in property was extinguished, have been asked to pay a 50c. assessment and receive new stock share for share. Supposedly best asset of Alaska-Ebner Gold Mines Co., namely, 100,000 shares of Ebner Gold Mines Co. stock, will not go into new company, as option on it was given to U. S. Smelting Co., until next spring. Latter understood to have spent on development work between \$350,000 and \$400,000.

## ARIZONA

### Cochise County

**CALUMET & ARIZONA (Bisbee)**—Some disposition to criticize management for paying \$1 a share on Superior & Pittsburg and 50c. a share on Calumet & Arizona. Plain facts are that bulk of profit now accruing to this consolidated interest comes from Superior & Pittsburg ore. S. & P. dividend, of course, must go into C. & A. treasury, 94% of it at least, and deficit in that treasury, close to three-quarters of a million, must be made up before disbursement is made.

**WOLVERINE & ARIZONA (Bisbee)**—To pay first dividend Dec. 10. Organized soon after success of C. & A.'s Irish Mag shaft attracted attention to Bisbee district and new exploration companies were formed every third morning in Calumet, Mich. Had merit and developed rich sulphide orebody. Working only few miners, has been steady shipper of high-grade ore to Douglas and has accumulated surplus. Operations will continue and dividend will not take all of the treasury money. At different times there have been rumors that Copper Queen or C. & A. interests would buy Wolverine, but these were not founded on fact. Present dividend 20c. per share.

### Santa Cruz County

**CONNECTICUT (Alta)**—Tom Tate has sold lease to Hudson & Gartley, who are prospecting orebodies and having good results in opening up new ore.

**GOLD COIN (Amadoville)**—Trial run made with mill on this property and clean-up retorted and sent off for assay. Upon result of run, future of work may depend. Gold claimed to be there, but point to be determined is amenability to straight amalgamation. Mill equipped with Kincaid mill and oil engine; capacity 20 tons. William Carnett in charge.

## COLORADO

### San Bernardino County

**POTASH LAND CONTEST** renewed by filing of suit in U. S. District Court at Los Angeles, involving lands under development and operation by American Trona Co. at Trona on Searles Lake. Suit filed by E. Thompson, H. A. Baker and others against Thomas W. Pack, Stella Schuler and Joseph K. Hutchinson, alleging Hutchinson and Foreign Mines Development Co., California Trona Co. and American Trona Co. are attempting to deprive complainants of interests in Searles Lake region. Alleged Hutchinson demands payment for moneys expended in improvement, and unless refunded complainants must forfeit interests.

**UNITED GREENWATER (Dale)**—Theft of \$20,000 of bullion reported at Supply mine operated by this company under lease. Clarence Loyst, a student, of Los Angeles, said to have confessed that he and W. M. Scott, watchman at mine, stole bullion, and that such thefts had been going on about two years. Bullion last stolen recovered and the two men formally charged. Mines owned by H. A. Landwehr, of Los Angeles. John McGee, superintendent for operators.

### Tuolumne County

**DUTCH (Jamestown)**—Mine reported sold to New York men represented by W. G. Devereaux, of Melones mine. Dutch has for past six years been developed and operated under management of Charles H. Segerstrom, who took charge at time when bad management had depleted ore reserves and placed mine among nonproducers. Mr. Segerstrom began campaign of practical development and installed modern machinery, including 40-stamp mill, electric hoist, compressors, and mile of narrow-gauge railroad to connect with Sierra Ry. at Jamestown in order to facilitate shipment of concentrates and receiving of supplies. Mine brought back to producing class. Details and price of sale not now available.

## COLORADO

### Boulder County

**CARIBOU (Caribou)**—This property, about two miles above Cardinal, being worked by Henry T. Lowe. Old shafts unwatered, workings cleaned out and new development under way. Mr. Lowe has conducted experiments in milling and indications are that following present equipment for cyanidation will be retained: Blake crusher, 8-ft. Hardinge mill, 6-ft. Hardinge mill, Dorr classifier, four Card tables, three Dorr agitators, Dorr thickener, three 30-ft. leaching tanks.

### Chaffee County

**MOUNT CARMEL (Buena Vista)**—J. I. De Remer has acquired control of this old property in South Cottonwood district and is putting it in shape to resume production. Ore carries gold, silver, lead and copper.

## Gilpin County

**MACKEY (Apex)**—Mill, equipped years ago for stamping and cyanidation but never operated, being remodeled and will soon treat ore hoisted from shaft.

**LONDON (Twelve Mile)**—Three shifts employed sinking new shaft wholly in ore. Two feet of vein assays \$50 per ton, shipped direct to Denver; rest goes to mill and produces concentrates averaging \$55 to \$60 per ton.

## Lake County

**ARKANSAS VALLEY** smelting plant fire damage entirely repaired and operations again in full blast.

**GORDON-TIGER (Twin Lakes)**—Manager G. W. Boyce has cleaned out tunnels 3, 4 and 5 and is putting this old property into shipping shape again.

**SIWATCH TUNNEL (Sugar Loaf)**—Suicide of former manager Albert Teats, about a month ago, interfered with work, but Jeff Miller, now assigned to management, has resumed the various operations backed by local men.

**TENDERFOOT (Leadville)**—Now shipping fine ore from ground closed a few months ago by caving. Believed winter temperature has so congealed moisture in ground that it is now quite strong enough for mining operations. While this strikes one as risky work, it is proposed to continue with steady shipments.

**NEW MONARCH (Leadville)**—Thomas Raney has contract to sink Monarch shaft another 100-ft. lift and will keep three shifts at work. Upon completion of sinking, specific exploration is planned. Lessees on Cleveland and Winnie claims shipping heavy tonnages of fair-grade ore. Nordella lease produces 50 tons daily assaying close to \$100. Bona lease ships about 40 tons per day.

**PENROSE (Leadville)**—As this shaft is center of proposed operations by Downtown Mines Pumping Co., repairs and improvements are being made. Shaft itself repaired down to water level; foundations placed for machinery; old buildings renovated and improved; electric power transmission line erected; railroad spurs improved. Delivery of machinery promised by manufacturers soon after Jan. 1.

**IBEX (Leadville)**—Connors lease in this famous Little Jonny mine continues to produce usual small quantity of extremely rich gold ore. Kinney & Gliovich lease directly above ground worked by Connors; miners expecting to catch upper portions of same rich shoots. Jacketts & Co. produces three to four cars per month of rich zinc-carbonate as well as some good gold ore. C. & G. lease ships 100 tons of low-grade ore per day. Magnee lease has opened gold oreshoot in oxidized ground and ships small, steady tonnages. Recently Clemmons & Co. delivered about one-half ton of sulphide ore to Arkansas Valley plant; during screening of rolled ore, 41 oz. of gold metallics recovered while balance of stuff assayed 190 oz. gold per ton. Ore comes from 1-in. vein at present, but lessees hope it will widen.

## San Miguel County

**BLACK BEAR (Telluride)**—Upper tramway completed; buildings wrecked by snowslides a few years ago being rebuilt.

**PRIMOS CHEMICAL CO. (Vanadium)**—Main operations closed down two months ago because of general depression, but supplies are arriving and it is planned to resume work in reduction plant on ores from company's rare-mineral claims in western part of county.

## Teller County

**CRESSON (Cripple Creek)**—Important strike of bonanza ore reported. Stuff running \$3 per lb. sacked behind closed doors with armed guards on watch.

## IDAHO

**AJAX (Mullan)**—This mine in Burke Cañon, starting development work, consisting of crosscut from the lower tunnel to cut vein.

**INTERSTATE-CALLAHAN (Wallace)**—Company shipping 60 to 75 tons a month. Ore graded up to minimum of 50% zinc content. Working full capacity, three shifts in mine and mill. Production will be greatly increased as soon as company can decide on new milling plant.

## MICHIGAN

### Copper

**ISLE ROYALE (Houghton)**—For first time in history mine not losing money on low-price copper. Asserted that during November it showed small profit. Better than 15 lb. recovery.

**SUPERIOR (Houghton)**—Less than three weeks after mine fire, hoisting normal tonnage. Remarkable reconstruction, due to good organization of Calumet & Hecla's whole plant and emergency force.

**WYANDOT (Winona)**—No operations, either exploratory or productive. Manager Van Orden has miners at work logging timber; 90,000 feet will be cut during winter, already marketed at a profit. Treasury has \$20,000 balance to pay taxes.

**CHAMPION (Painesdale)**—Ten drifts pushed south of E shaft, most southerly on Copper Range property, for three-quarters of mile with fair showing in each. Particularly interesting since property adjoins Globe tract on south, owned by interests associated with Stantons. For long time Copper Range had this property optioned. Shaft sunk and develop-

ment work done, but option permitted to lapse after considerable outlay, as results did not indicate property worth option price. Development work attended by difficulties (see E. & M. J., Jan. 24, 1914, p. 225.)

#### Iron

GEORGE S. PORTER has given 1,000 volumes and equipment for library in school of town of Alpha. Porter owner of tract of land on which Mastodon ore find was made. Alpha is town for Balkan and Judson mines opened on orebody.

#### MISSOURI-KANSAS-OKLAHOMA

JOE ALDRICH and others are installing modern pumps in old discovery shaft on Bonanza land west of Galena, Kan., to take place of smaller pumps found too light to handle water. Many years ago this old tract of land was mined to some extent but operators were forced to leave good ore in lower ground, being unable to lower water with crude pumping devices in use at that time. Modern equipment makes task comparatively easy. Mines situated near Short Creek, along bank of which levee has been constructed to prevent high water flooding mines.

DIPLOMAT (Galena, Kan.)—Mill and mines shut down for month or six weeks to make needed improvements on mill and do development in mill shaft.

#### MONTANA

##### Carbon County

LOST CABIN mine reported rediscovered. P. B. Stark and associates of Fromberg convinced they have found it near head of Lime Creek, south of Red Lodge. Assays from ore picked up near cabin ran \$20. Men found remains of cabin while hunting, with rusty tools and quantity of ore near mouth of old 50-ft. tunnel.

##### Deer Lodge County

WASHOE PLANT (Anaconda)—Construction of lead condensing chambers in new sulphuric-acid manufacturing plant recently begun. There will be six, each 40x96 ft. by 36 ft. high. There will be also 23 cooling chambers, each 11 ft. in diameter, 36 ft. high. Side walls hung in several of chambers and well started in others; no floors or ceilings yet in place; work not started on cooling tanks. Plant will be completed ready for production next spring. Work under direction of H. W. Dederick, expert engineer in construction of chemical buildings.

##### Flathead County

BEAR CREEK MINING CO. (Libby)—Company installing steam shovel to work the placer deposits, 18 miles from Libby. The property comprises old Lake Bed, formerly owned by C. Lindholm, of Spokane, Wash. There are about 15 men at work about camp. Drain 100 ft. long through rock completed and working satisfactorily. Cabins for accommodation of men about completed.

##### Lewis and Clark County

DRUMLUMMON (Marysville)—Mine sold, Nov. 28, by sheriff for \$11,486 to satisfy judgment of \$12,000. Was famous gold producer, while operated by English syndicate paid large dividends. Col. Thomas Cruse, of Helena, discoverer, sold property in 1887 to syndicate for \$1,500,000. For several years gold production was enormous; at depth of 1600 ft., low-grade ore was struck which made further operations unprofitable. For some years St. Louis Mining & Milling Co. has been in possession of property. Future of mine not determined.

##### Madison County

SILVER STAR mining district reports more than usual activity this fall. Number of gold properties being operated by leasers. On Hudson claim leasers are sinking shaft 100 ft. below water level, making good progress, are installing new boiler, pumps and hoist. Broadway mine also being operated by leasers shipping small quantity of ore regularly.

##### Silver Bow County

CLARK-MONTANA vs. FERGUSON SUIT—Trial started Dec. 1, before Judge Bourquin in the Federal court, of Butte. Case involves title to mining ground on South Montana street, Butte, opposite new Milwaukee station site. Land in controversy is 50 ft. wide and 800 ft. long. Plaintiff claims it under placer patent and the defendants claim it as quartz land, with well known and well defined vein. Hearing completed Dec. 2, and case taken under advisement by judge.

EAST BUTTE (Butte)—Reported negotiations for purchase by North Butte under way, probably on basis of exchange of shares. Said North Butte wants East Butte smelting plant. Latter thoroughly modern and on completion of alterations could treat ore of both mines, making 40,000,000 to 45,000,000 lb. copper per year. North Butte has 430,000 shares out; East Butte, 411,000. Latter still owes \$600,000 on Pittsmtont purchase but has quick assets of about same value. North Butte has about \$800,000 working capital and 190,000 shares in treasury.

#### NEVADA

##### Clark County

FREDERICKSON—Small concentrating mill to treat mixed lead-zinc carbonate ore to be erected by O'Kelly & Munzberg who recently purchased property. Tests made with Stebbins dry concentrator, but no decision made as to equipment to be installed.

MOBILE—Wadey & Frederickson, of Goodsprings, have leased property, and have installed aerial tramway. Motor trucks ordered from Los Angeles, which will be used to haul ore from mine to Jean. Expected about 300 tons of zinc carbonate ore monthly will be produced.

##### Lyon County

BLAINE (Pine Grove)—Lease on this and Sugar Loaf, Microbe and East Wing claims taken for two years, with option to purchase for \$15,000.

#### Ormsby County

GOLD STRIKE made in Brunswick Cañon, five miles from Carson City. Rich sample taken from discovery shaft. Shaft-sinking under way.

ADVERSESES to patent applications of Central Pacific R.R. to land grant along right-of-way filed by owners of mining properties. Land granted under act of July 1, 1862 and amendatory act of July 2, 1864, comprising in Nevada 11,540 acres, according to statement of Clay Tallman, commissioner of general land office. Area includes some important mining properties.

RAISES IN ASSESSMENT values on mining improvements and milling property discussed at Carson City, Nov. 25, at informal conference of tax commission with Henry M. Hoyt, W. B. Alexander, W. H. Blackburn and Frederick Bradshaw. Action of tax commission reported satisfactory. Stated Nevada Consolidated has protested to tax commission against assessed valuation. No decision rendered yet.

#### NEW MEXICO

##### Socorro County

CLEAVELAND & WEATHERHEAD (Mogollon)—Changes to be made in Deadwood and Sunburst mines and Deadwood custom mill during temporary shutdown. Company in market for 50-hp. internal-combustion hoist, new cages and drill sharpener.

TREASURY MINING & REDUCTION CO. (Mogollon)—Decrease of foreclosure granted in case of Thomas E. Waters vs. company, involving property at Mogollon with valuation of \$287,395. Property includes Confidence group, mill, mill site and water rights.

##### SOUTH DAKOTA

HOMESTAKE (Lead)—Company announces Christmas present of 7% of his total year's wages to each employee on payroll for December, payable by check at regular January paydays.

#### UTAH

##### Juab County

CHIEF CONSOLIDATED (Eureka)—Company has taken option on Scotia property in West Tintic. Shaft down 150 ft. and winze sunk in ore from this level. Development will be undertaken in neighborhood. Two small engines will be used, one for shaft, other for winze. These, as well as machine drills, will be operated by crude-oil air compressor.

##### Salt Lake County

PERUVIAN (Alta)—Five-year lease taken by the Miller Investment & Leasing Co. of Salt Lake. Work started to reach ore opened in winze from one of tunnel levels.

MAXFIELD (Salt Lake)—F. H. Fahrenkamp has taken bond and lease. Compressor, pump, etc., will be installed for unwatering below tunnel level. Operations in Big Cottonwood stimulated by Cardiff strike.

##### Summit County

SILVER KING CONSOLIDATED (Park City)—Statement sent to stockholders, by Solon Spiro, president, advises that all matters in litigation have been settled. Permanent peace established between Consolidated and Coalition.

##### Tooele County

BULLION COALITION (Stockton)—Work of sinking below Honoring drain tunnel under consideration for some time now started. Ore extends below tunnel level; it has been question whether it can be opened without handling tunnel water.

#### WASHINGTON

ALLIANCE MINING CO. (Republic)—Company has taken over mines and equipment of Anaconda Gold Mining & Reduction Co. for \$171,000; \$120,000 paid in Alliance stock and remaining \$50,000 represented by indebtedness assumed by purchasers. Alliance company already had acquired old Princess Maud property and now has group comprising 90 acres of patented land. All properties will be worked through long lower tunnel of Princess Maud. Latter was developed extensively under former ownership and will require only a few hundred feet of tunneling to connect with Anaconda group, thus eliminating hoisting and long haul to get ore to railway.

#### CANADA

##### Ontario

HAYDEN (Porcupine)—Company will recommence work, has already let contract for 200 ft. of crosscutting.

TOUGH-OAKES (Swastika)—All work stopped, believed due to trouble between English and Canadian interests.

DOVE (South Porcupine)—Diamond drilling campaign partly abandoned on account of inability to put down vertical holes.

PETERSON LAKE (Cobalt)—Calcite vein, carrying small silver content cut in the Keewatin at 300-ft. level. Is being followed into conglomerate.

TECK-HUGHES (Swastika)—Recent developments not satisfactory; oreshoot on 180-ft. level much shorter than on 80-ft. Nipissing in doubt as to advisability of continuing development but on payment being reduced to \$1500 decided to go ahead.

HOLLINGER (Timmins)—The usual four-weekly statement for period ended Nov. 4 shows gross profits of \$162,885 from treatment of 18,645 tons, average value \$14.09; working cost \$4.48 per ton milled. Not definitely determined whether ore that came into winze at 800-ft. level is No. 1 vein or not.

#### SOUTH AMERICA

##### Bolivia

HUANCHACA—Statement in "Journal," Nov. 21, that company did not intend to dispose of silver "under 20 pence," should have read "under 28 pence."

# The Market Report

## METAL MARKETS

NEW YORK—Dec. 9

All of the metals have been dull but have not exhibited any weakness except spelter, which has been decidedly stronger by virtue of important buying from Europe.

### Copper, Tin, Lead and Zinc

**Copper**—Following three or four weeks of active buying and large transactions, it was not unnatural to have the lull that was experienced during our last week of record. In the offices of the big sellers this was regarded merely as a temporary halt, and certainly there was no exhibition of anxiety among first hands to keep on selling, although there were reports of shading among dealers. The largest producers held their metal for 12½@13c., regular terms, and early in the week some sales were reported at around those figures, but later business was entertained in some quarters at 12¾@12¾c., regular terms. The differences in price demanded according to time of delivery became less sharply marked than they were during the previous week, and at the close, copper was available at 12¾c. for all positions, with a possibility that December business could be done at 12¾c. However, the market became distinctly firmer on Dec. 9, when there was a renewal of good selling to Europe.

The aggregate of transactions during the last week was very small and up to Wednesday was almost entirely for domestic account, the price for electrolytic in London having been about £58@58½ (12.66@12.88c.), which was below our parity. The opinion was held here, however, that English consumers would shortly be obliged to come into the market, and the renewed buying from England, which stiffened the market on Wednesday, lent some color to that belief.

Copper sheets, base price is now 18c. for hot rolled and 19c. for cold rolled. The usual extras are charged and higher prices for small quantities.

Copper Exports from New York during the month of October were: Pigs, ingots and bars, 55,980,643 lb.; wire rods and wire, 2,683,994; plates and sheets, 174,681; other forms, 4577; total, 58,843,895 lb. The larger exports were 21,270,187 lb. to Italy; 18,449,511 to Great Britain; 7,453,411 to Norway; 5,351,864 to France; 5,342,340 to Sweden; 358,547 lb. to Denmark.

Exports from New York, Philadelphia and Baltimore for the first week in November were 15,805,440 lb. copper.

Visible Stocks of Copper in Europe, Nov. 30, are reported as follows: Great Britain and France, 21,090; Rotterdam, 1150; total, 22,240 long tons, an increase of 184 tons over Nov. 15. In addition 100 tons were reported afloat from Chile and 3900 tons from Australia, making a total of 26,240 tons.

**Tin**—In the early part of our week the market was firm on bull speculation in London. Business in this market was active among dealers, but consumers did not evince much interest at the higher prices. With the decline in London, starting on Monday, interest in this metal in this market subsided.

Visible Stocks of Tin on Nov. 30, are reported as follows: London, 7502; Holland, none; United States, excluding Pacific ports, 3981; total, 11,483 long tons, an increase of 589 tons over Oct. 31. Of the stocks reported 4558 tons were in store and 6925 tons afloat.

**Lead**—Business was light and such as there was apparently was taken chiefly by the principal producer. The independent producers in St. Louis were a little less firm than in the previous week. Some curiosity was aroused by the prospective appearance of some large orders from Japan and Russia. Russia is said to be inquiring with respect to several thousands of tons to be shipped to Vladivostock by way of the Panama Canal.

Russia is reported to have been recently a large buyer of white lead in this market, needing it for the manufacture of rubber for automobile tires.

**Spelter**—On Dec. 3, the market leaped sharply on orders from Europe. During the following days a further demand came from that quarter, in meeting which the sales aggreg-

gated several thousands of tons. American consumers did not become excited in the least about the advance in the market and the business done with them was insignificant.

### Other Metals

**Aluminum**—Business has been slow and sales small. Quotations hold about 19c. per lb. for No. 1 ingots.

**Antimony**—Business for the past week has been small. Prices are weaker, ordinary brands—Chinese, Hungarian, etc.—being quoted at 13@13½c. per lb., while Cookson's is held at 16@16½c. There has been some inquiry for futures, but dealers are reluctant to quote ahead.

**Quicksilver**—The market has been rather quiet, but there is very little change in quotations, which are about \$52.50 per flask of 75 lb. London price is £11 5s. per flask.

### DAILY PRICES OF METALS

#### NEW YORK

| Dec. | Sterling Exchange | Silver, Cts. per Oz. | Copper                     |              | Tin                    | Lead                    |                        | Zinc                    |  |
|------|-------------------|----------------------|----------------------------|--------------|------------------------|-------------------------|------------------------|-------------------------|--|
|      |                   |                      | Electrolytic, Cts. per Lb. | Cts. per Lb. | New York, Cts. per Lb. | St. Louis, Cts. per Lb. | New York, Cts. per Lb. | St. Louis, Cts. per Lb. |  |
|      |                   |                      | 12.70                      |              |                        | 3.70                    |                        | 5.25                    |  |
| 3    | 4.8825            | 49½                  | @12.80                     | 33½          | 3.80                   | @3.72½                  | @5.50                  | @5.35                   |  |
|      |                   |                      | 12.70                      |              |                        | 3.70                    | 5.55                   | 5.40                    |  |
| 4    | 4.8825            | 49½                  | @12.75                     | 33½          | 3.80                   | @3.72½                  | @5.60                  | @5.45                   |  |
|      |                   |                      | 12.70                      |              |                        | 3.67½                   | 5.55                   | 5.40                    |  |
| 5    | 4.8750            | 49½                  | @12.75                     | 33½          | 3.80                   | @3.72½                  | @5.60                  | @5.45                   |  |
|      |                   |                      | 12.60                      |              |                        | 3.67½                   | 5.60                   | 5.45                    |  |
| 7    | 4.8763            | 50¼                  | @12.70                     | 33           | 3.80                   | @3.72½                  | @5.65                  | @5.50                   |  |
|      |                   |                      | 12.60                      |              |                        | 3.67½                   |                        |                         |  |
| 8    | 4.8700            | 50¼                  | @12.70                     | 32½          | 3.80                   | @3.72½                  | 5.65                   | 5.50                    |  |
|      |                   |                      | 12.65                      |              |                        | 3.67½                   |                        |                         |  |
| 9    | 4.8700            | 49½                  | @12.75                     | 32½          | 3.80                   | @3.72½                  | 5.65                   | 5.50                    |  |

The quotations herein are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0.15c. representing delivery charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

#### LONDON

| Dec. | Copper |           |              |       |              | Tin   |       | Lead      |              | Zinc      |              |
|------|--------|-----------|--------------|-------|--------------|-------|-------|-----------|--------------|-----------|--------------|
|      | Silver | Spot      |              | 3 Mos | Best Sel't'd | Spot  | 3 Mos | £ per Ton | Cts. per Lb. | £ per Ton | Cts. per Lb. |
|      |        | £ per Ton | Cts. per Lb. |       |              |       |       |           |              |           |              |
| 3    | 23½    | 56½       | 12.28        | 56½   | *            | 147½  | 145½  | 19        | 4.13         | 26½       | 5.70         |
| 4    | 23     | 56½       | 12.25        | 56½   | *            | 149½  | 147½  | 19        | 4.13         | 27        | 5.87         |
| 5    | 23½    | .....     | .....        | ..... | .....        | ..... | ..... | .....     | .....        | .....     | .....        |
| 7    | 23½    | 55½       | 12.06        | 55½   | *            | 147½  | 145½  | 19        | 4.13         | 27½       | 5.97         |
| 8    | 23½    | 55½       | 12.03        | 55½   | *            | 146½  | 144½  | 19        | 4.13         | 27½       | 5.97         |
| 9    | 23½    | 56½       | 12.22        | 56½   | *            | 146   | 144½  | 19        | 4.13         | 27½       | 6.06         |

\*No quotations.

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.174c.; £15 = 3.261c. = £25 = 5.44c.; £50 = 10.88c. Variations, £1 = 0.21¼c.



**Nickel**—Ordinary forms—shot, blocks or plaquettes—are 40 @45c. per lb., according to size and terms of order. Electrolytic metal is 5c. per lb. higher.

**Gold, Silver and Platinum**

**Gold** in the United States, Dec. 1, is estimated by the Treasury Department as follows: Held in Treasury against gold certificates outstanding, \$972,298,869; in Treasury current balances, \$207,269,388; in banks and circulation, \$637,553,443; total, \$1,817,121,700, which is a decrease of \$18,294,598 from the November statement.

**Platinum**—Sales have been made at \$42.50@44 per oz. for refined platinum. The market is quiet, and the demand from the jewelry trade is small. Hard metal is quoted at \$51@52 per oz. for 15% iridium.

Our Russian correspondent writes that the market shows no change. The policy of the Imperial Bank in making advances on crude platinum has much improved the position of the small and medium producers. It is reported that small quantities of metal can be bought at Ekaterinburg at low prices; but no quotations can be given either there or at Petrograd. High prices are expected after the war, owing to the present small production.

**Silver** has shown some improvement the last few days. The market has been broader, but having been satisfied yesterday at 23 1/4 d. in London, it has receded today to 23 1/8 d., at which price it is steady.

Coined silver in the United States, Dec. 1, is estimated by the Treasury Department as follows, on face value: Standard dollars, \$565,904,478—of which \$485,218,000 are held in Treasury against silver certificates outstanding; subsidiary coins, \$184,100,675; totals, \$650,005,153, a change of only \$474,478 during the month of November.

**Zinc and Lead Ore Markets**

**PLATTEVILLE, WIS.—Dec. 5**

The base price paid this week for 60% zinc ore was \$45 per ton. The base price paid for 80% lead ore was \$45@46 per ton.

**SHIPMENTS WEEK ENDED DEC. 5**

|            | Zinc Ore, Lb. | Lead Ore, Lb. | Sulphur Ore, Lb. |
|------------|---------------|---------------|------------------|
| Week ..... | 3,718,830     | 160,000       | 246,900          |
| Year ..... | 155,905,820   | 4,998,890     | 30,911,550       |

Shipped during week to separating plants—4,084,540 lb. zinc ore.

**JOPLIN, MO.—Dec. 5**

Blende, high price, \$49; assay base, 60% zinc, \$45@46.50; metal base, 60% zinc, \$43.50@44.50; calamine, base, 40% zinc, \$22@24; average, all grades of zinc, \$42.46 per ton.

Lead, high price, \$48; base, \$47 per ton, 80% metal content; average, all grades lead, \$46.46 per ton.

Zinc-ore prices are coming up a little each week, and spelter is responding, yet the margin of profit is not evident for the smelter of spelter.

**SHIPMENTS, WEEK ENDED DEC. 5**

|                           | Blende               | Calamine   | Lead       | Values       |
|---------------------------|----------------------|------------|------------|--------------|
| Totals this week          | 9,214,870            | 1,013,920  | 1,598,120  | \$254,340    |
| Totals this year          | 480,464,460          | 36,474,500 | 83,044,220 | \$11,982,400 |
| Blende value, the week,   | \$204,390; 49 weeks, |            |            | \$9,616,660. |
| Calamine value, the week, | \$12,820; 49 weeks,  |            |            | \$429,190.   |
| Lead value, the week,     | \$37,130; 49 weeks,  |            |            | \$1,936,120. |

**IRON TRADE REVIEW**

**NEW YORK—Dec. 9**

We can still note the more confident feeling in the iron trade, based on improved buying of material and on the increase in specifications on contracts.

The renewal of activity, which was first seen in the pig-iron market is beginning to extend to various forms of finished steel. It is evident that manufacturers see increased consumption ahead, or else that they have made up their minds that prices are at the lowest notch, and that any change now is quite likely to be in the nature of an upward movement. Both influences may be at work.

**Pig Iron Production in November** again showed a considerable decrease. On Dec. 1, there were 150 coke and anthracite stacks in blast, having a total daily capacity of 50,430 tons; a decrease of 2820 tons from Nov. 1. Allowing for the charcoal furnaces the estimated production of pig iron in the United States in November was 1,540,000 long tons; for the 11 months ended Nov. 30 the total was 21,646,000 tons. Of this make 15,259,000 tons, or 70.5% were turned out by the furnaces owned or operated by the steel companies.

**PITTSBURGH—Dec. 8**

There has been a measurable improvement in booking of actual shipping orders for finished steel products, some interests reporting as much as 50% increase in the past week over the previous week. The total is still small, however, and does not warrant any increase in steel-mill operations over the present rate of not more than 35% of capacity.

The buying movement in Northern pig iron continues, but is not as heavy as a week or two ago. Interest is beginning to center in Southern iron, on which some concessions will probably have to be made to induce the large buyers to close.

The most interesting concrete development in the market in the past week was the announcement on Thursday by the American Sheet & Tin Plate Co. that its price on tin plate for the coming season will be \$3.20, for 100-lb. coke plates, against a season price of \$3.40 named a year ago. What the actual settling basis on large contracts will be remains to be seen, but the mills assert that prices are not going to be shaded as much as was the case a year ago. Prospects are for very heavy consumption. The mills are now operating at about 50% of capacity, a fairly good rate at the moment, as this is the duller season of the twelvemonth.

The market for bars, plates and shapes for desirable lots for immediate specification and prompt shipment continues at 1.05c., and predictions are made that this figure will be found to be bottom. There has been somewhat more buying since this price came out. For first quarter contracts 1.10c. is generally named, but the volume of contracting thus far is not large. One mill is understood to have receded slightly from 1.10c. on contracts.

**Pig Iron**—The Standard Sanitary Manufacturing Co. has bought 8000 tons of foundry pig iron for its Allegheny plant and an equal tonnage for its New Brighton plant, for delivery over the first six months of next year. The purchases were made from four or five interests at \$13.50@13.70, delivered, and an interesting feature is that one portion of the iron is to come from a Cleveland furnace, the balance coming from the Valleys and detached western Pennsylvania stacks. The company also bought 8000 tons of Southern iron for its Louisville plant, paying \$9, Birmingham, for No. 3, and \$9.50@9.75 for different lots of No. 2. There has been fair buying of foundry iron apart from these purchases, but basic has become quiet again and bessemer remains quiet. We quote: Bessemer, \$13.75; basic, \$12.50; No. 2 foundry, \$12.75@13; gray forge, \$12.50; malleable, \$12.75, at Valley furnaces, 95c. higher delivered Pittsburgh. There are occasional lots of foundry iron available from other furnaces at \$13.50, delivered Pittsburgh.

**Ferromanganese**—The market remains nominally quotable at \$68, Baltimore, with \$2.16 freight to Pittsburgh. Fears are renewed that there will be a scarcity of ferromanganese eventually. There are large stocks at present but conditions might be entirely different if consumption began to approach normal.

**Steel**—An important tinplate interest is understood to have covered sheet bars for the major portion of 1915 at about \$20 at maker's mill. For ordinary deliveries, prompt or through March, lower prices are quoted, \$18.50 for billets and \$19 for sheet bars, maker's mill, Pittsburgh or Youngstown. These are the lowest open quotations made since 1900. Rods are \$24.50@25, Pittsburgh.

**COKE**

**Connellsville**—The movement in furnace coke contracting continues, with two or three contracts closed since last report and several fresh inquiries put out. One of the latest is from a steel interest. Hitherto the interest has been confined to the merchant furnaces. Contracts closed to date can be estimated as involving about 75,000 tons a month beginning Jan. 1. One contract is for first quarter only, at \$1.65 or \$1.70, for a very good grade of coke. Another, for a medium grade, is at what is considered extremely low prices, \$1.65 for the first half and \$1.75 for the second half. Two other contracts are for two years, on a sliding-scale basis, depending on the current market price of pig iron.

Inquiry now under active negotiation totals about 75,000 tons a month, with prospects that most of the business will be closed within the next week or two. Among furnaces that have actually been taking coke deliveries on contracts expiring this month there is 50,000 tons or more neither covered nor inquired about. These interests apparently intend to buy from month to month until the situation grows clearer.

The market is quotable as follows: Furnace coke: Prompt and December, \$1.60; first quarter, \$1.65; first half, \$1.70. Foundry coke: Prompt, \$2@2.25; contract (nominal) \$2.35@2.50, per net ton at ovens.

**Anthracite Shipments** in November were 5,928,286 long tons, an increase of 141,355 tons over November, 1913. For the 11 months ended Nov. 30, the total shipments were 63,407,010 tons in 1913, and 62,640,343 tons in 1914; a decrease of 766,667 tons, or 1.2%, this year.

**IRON ORE**

Iron-ore shipments from the Lake Superior region in November, practically closing the season, were 1,068,682 long tons, making the total for the season 32,020,487 tons, 17,049,991 tons less than in 1913. This is the smallest report since 1908. To this total is to be added one small cargo, loaded at Escanaba, which did not get away till Dec. 1. The rail shipments, also to be added, will probably bring the total for 1914 up to about 32,800,000 tons.

It is announced that the Hill ore-land trustees have completed arrangements, by lease or otherwise, to operate the large mines which will be surrendered by the Steel Corporation Jan. 1, 1915. It is also announced that a contract has been made with M. A. Hanna & Co., of Cleveland, Ohio, to sell the ore from the mines operated by or for the trustees.

**FOREIGN IRON**

**Foreign Iron Trade of Great Britain**, 10 months ended Oct. 31, as valued by the Board of Trade returns:

|                               | Exports     | Imports     | Excess           |
|-------------------------------|-------------|-------------|------------------|
| Iron and steel.....           | £36,787,046 | £9,917,456  | Exp. £26,869,590 |
| Machinery, hardware, etc..... | 42,683,635  | 11,607,419  | Exp. 31,076,216  |
| Totals.....                   | £79,470,681 | £21,524,875 | Exp. £57,945,806 |
| Totals, 1913.....             | 97,324,791  | 25,952,898  | Exp. 71,371,893  |

Actual tonnage of iron and steel exported was 4,151,081 tons in 1913, and 3,441,157 in 1914; imported, 1,816,107 tons in 1913, and 1,502,648 tons this year.

**Fuel Production of Germany** in September shows decreases of 6,360,232 tons in coal and 1,484,418 in brown coal, as compared with September, 1913. For the nine months ended Sept. 30, the totals were, in metric tons:

|                 | 1913        | 1914        | Changes       |
|-----------------|-------------|-------------|---------------|
| Coal.....       | 143,674,282 | 129,182,989 | D. 14,491,293 |
| Brown coal..... | 64,132,286  | 62,389,948  | D. 1,742,338  |
| Coke.....       | 24,096,556  | 21,773,458  | D. 2,323,098  |
| Briquettes..... | 20,400,060  | 20,554,036  | I. 153,976    |

Of the briquettes reported this year 16,434,409 tons were made from brown coal or lignite.

**Fuel Exports of Great Britain**, 10 months ended Oct. 31, in long tons:

|                   | 1913       | 1914       | Changes       |
|-------------------|------------|------------|---------------|
| Coal.....         | 61,257,261 | 52,060,846 | D. 9,196,415  |
| Coke.....         | 989,010    | 975,204    | D. 13,806     |
| Briquettes.....   | 1,711,865  | 1,487,943  | D. 223,922    |
| Steamer coal..... | 17,434,411 | 16,037,409 | D. 1,397,002  |
| Total.....        | 81,392,547 | 70,561,402 | D. 10,831,145 |

Imports are insignificant, being only 16,450 tons in 1913, and 42,962 tons this year.

**CHEMICALS**

**NEW YORK—Dec. 9**

The general market in chemicals is dull and very little business is forward.

**Arsenic**—Business continues slow and demand is small. Current quotations are \$3.75@4 per 100 lb. for both spot and futures.

**Copper Sulphate**—The market is quiet and prices unchanged. Quotations are \$4.35 per 100 lb. for carload lots and \$4.60 per 100 lb. for smaller parcels.

**Nitrate of Soda**—Business is dull and sales small. Prices are nominally the same as by last report, 1.85c. per lb. for both spot and futures.

**Imports and Exports of Fertilizing Material** in the United States, nine months ended Sept. 30, in long tons:

|                          | Imports |         | Exports   |         |
|--------------------------|---------|---------|-----------|---------|
|                          | 1913    | 1914    | 1913      | 1914    |
| Kamit.....               | 292,555 | 329,041 | 140       | .....   |
| Manure salts.....        | 145,432 | 157,710 | .....     | .....   |
| Other potash salts.....  | 176,288 | 186,034 | 3,086     | 2,746   |
| Nitrate of soda.....     | 524,831 | 430,136 | 4,276     | 7,384   |
| Sulphate of ammonia..... | 33,313  | 59,064  | .....     | 150     |
| Phosphates.....          | .....   | .....   | 1,146,104 | 915,760 |

Exports include reexports of foreign material. Some phosphates are imported, but are not given separately in the returns.

**Imports and Exports of Raw Material** for chemical manufacture, nine months ended Sept. 30, in long tons:

|                 | Imports |         | Exports |        |
|-----------------|---------|---------|---------|--------|
|                 | 1913    | 1914    | 1913    | 1914   |
| Sulphur.....    | 10,868  | 15,036  | .....   | .....  |
| Pyrites.....    | 716,085 | 776,871 | 71,705  | 96,614 |
| Chrome ore..... | 50,779  | 56,081  | .....   | .....  |
| Magnesite.....  | 123,661 | 92,925  | 1,648   | 1,196  |

Exports include reexports of foreign material. Exports of calcium carbide were 24,593,899 lb. in 1913, and 26,361,723 lb. this year.

**PETROLEUM**

The monthly statement of the "Oil City Derrick" shows new wells completed in November as follows: Pennsylvania grade, 282; Lima-Indiana, 47; Central Ohio, 92; Kentucky, 10; Illinois, 63; Kansas-Oklahoma, 396; Texas-Louisiana, 108. The summary shows 998 wells completed, a decrease of 175 from October. New production amounted to 96,641 bbl. or 8691 bbl. less than the previous report. Kentucky, Texas and Louisiana are the only fields showing an increase in the new production. New work under way at the close of the month shows a net increase of 41, which comes from Oklahoma and Texas chiefly.

**STOCK QUOTATIONS**

It is announced that the Boston Stock Exchange will open on Thursday, Dec. 10, and the New York Exchange will open Dec. 12, for trading in a number of stocks (19 of those we ordinarily quote), with minimum price restrictions to act as a safety valve on European selling.

| COLO. SPRINGS Dec. 8  |      | SALT LAKE Dec. 8        |      |
|-----------------------|------|-------------------------|------|
| Name of Comp.         | Bid. | Name of Comp.           | Bid. |
| Acacia.....           | .031 | Beck Tunnel.....        | .041 |
| Cripple Cr'k Con..... | .006 | Black Jack.....         | .041 |
| C. K. & N.....        | .05  | Colorado Mining.....    | .10  |
| Doctor Jack Pot.....  | .071 | Crown Point.....        | .01  |
| Elkton Con.....       | .42  | Daly Judge.....         | 4.65 |
| El Paso.....          | 1.20 | Gold Chain.....         | .10  |
| Findlay.....          | .011 | Grand Central.....      | .61  |
| Gold Dollar.....      | .031 | Iron Blossom.....       | 1.10 |
| Gold Sovereign.....   | .01  | Little Bell.....        | .10  |
| Isabella.....         | .111 | Lower Mammoth.....      | .011 |
| Jack Pot.....         | .06  | Mason Valley.....       | 1.50 |
| Jennie Sample.....    | .02  | May Day.....            | .101 |
| Jerry Johnson.....    | .03  | Ophongo.....            | .011 |
| Lexington.....        | .003 | Prince Con.....         | .18  |
| Old Gold.....         | .006 | Silver King Coal'n..... | 2.30 |
| Mary McKinney.....    | .41  | Silver King Con.....    | 1.65 |
| Pharmacist.....       | .003 | Sioux Con.....          | .05  |
| Portland.....         | 1.15 | Uncle Sam.....          | .02  |
| Raven B. H.....       | .03  | Utah Con.....           | .001 |
| Vindicator.....       | 1.10 | Yankee.....             | .01  |

| SAN FRANCISCO Dec. 8    |      |                         |      |
|-------------------------|------|-------------------------|------|
| Name of Comp.           | Bid. | Name of Comp.           | Bid. |
| Comstock Stocks.....    |      | Misc. Nev. & Cal.       |      |
| Alta.....               | .05  | Belmont.....            | 4.50 |
| Belcher.....            | .75  | Jim Butler.....         | .71  |
| Best & Belcher.....     | .05  | Lone Star.....          | .07  |
| Caledonia.....          | .34  | MacNamara.....          | .05  |
| Challenge Con.....      | .06  | Midway.....             | .08  |
| Confidence.....         | .21  | Mont.-Tonopah.....      | .35  |
| Con. Virginia.....      | .11  | North Star.....         | .16  |
| Crown Point (Nev.)..... | .40  | Rescue Eula.....        | .07  |
| Gould & Curry.....      | .02  | West End Con.....       | .53  |
| Hale & Norcross.....    | .01  | Atlanta.....            | .56  |
| Julla.....              | .01  | Booth.....              | .14  |
| Mexican.....            | .30  | C.O.D. Con.....         | .11  |
| Occidental.....         | .85  | Comb. Frac.....         | .12  |
| Ophr.....               | .09  | Jumbo Extension.....    | 2.35 |
| Overman.....            | .11  | Pitts.-Silver Peak..... | .20  |
| Potosi.....             | .01  | Round Mountain.....     | .39  |
| Savage.....             | .03  | Sandstrom Kendall.....  | .13  |
| Sierra Nevada.....      | .04  | Silver Plek.....        | .14  |
| Union Con.....          | .07  | Central Eureka.....     | .25  |
| Yellow Jacket.....      | .40  | So. Eureka.....         | 1.80 |

| TORONTO Dec. 4       |       |                      |       |
|----------------------|-------|----------------------|-------|
| Name of Comp.        | Bid.  | Name of Comp.        | Bid.  |
| Bailey.....          | .011  | Foley O'Brien.....   | .20   |
| City of Cobalt.....  | 1.30  | Hollinger.....       | 18.25 |
| Coniagas.....        | 5.50  | Imperial.....        | .01   |
| Peterson Lake.....   | .27   | Jupiter.....         | .161  |
| Right of Way.....    | .02   | McIntyre.....        | .221  |
| T. & Hudson Bay..... | 30.00 | Pearl Lake.....      | .031  |
| Timiskaming.....     | .11   | Poreu. Gold.....     | .05   |
| Wetliamer-Lor.....   | .06   | Preston E. D.....    | .03   |
| Big Dome.....        | 7.00  | Rea.....             | .12   |
| Dome Exten.....      | .05   | Seneca Superior..... | 2.00  |

| N. Y. CURB Dec. 8       |      | BOSTON CURB Dec. 8     |        |
|-------------------------|------|------------------------|--------|
| Name of Comp.           | Cig. | Name of Comp.          | Bid.   |
| Beaver Con.....         | .20  | Alvarado.....          | .65    |
| Big Four.....           | .05  | Bingham Mines.....     | 14.041 |
| Blue Bell.....          | .06  | Boston Ely.....        | .15    |
| Braden Copper.....      | .61  | Butte & Lon'n Dev..... | .23    |
| B. C. Copper.....       | .50  | Calaveras.....         | .93    |
| Buffalo Mines.....      | 1    | Catamet-Corbin.....    | .07    |
| Can. Cop. Corp'n.....   | 11   | Chief Con.....         | 80     |
| Can. G. & S.....        | .04  | Corbin.....            | 1.90   |
| Caribou.....            | .67  | Cortez.....            | .20    |
| Chambers Ferland.....   | .14  | Crown Reserve.....     | .75    |
| Con. Ariz. Sm.....      | 11   | Eagle & Blue Bell..... | .90    |
| Coppermines Cons.....   | 11   | First Nat. Cop.....    | 11     |
| Davis-Daly.....         | .85  | Houghton Copper.....   | 21     |
| Diam' field-Daisy.....  | .06  | Iron Cap Cop., pf..... | 5      |
| Dia. Black B.....       | .06  | Majestic.....          | .18    |
| Ely Con.....            | 1.01 | Mexican Metals.....    | .16    |
| Florence.....           | .621 | Nevada-Douglas.....    | .55    |
| Goldfield Con.....      | 111  | New Baltic.....        | 11     |
| Goldfield Merger.....   | .39  | Oneco.....             | .70    |
| Greene Cananea.....     | .26  | Raven Copper.....      | .10    |
| Kerr Lake.....          | 41   | Smoky Dev.....         | .25    |
| La Rose.....            | 111  | So. Lake.....          | 1.041  |
| McKinley-Dar-Sa.....    | .60  | Tonopah Victor.....    | .29    |
| Mines of Am.....        | 21   | Trethewey.....         | .14    |
| Mutual Min., pf.....    | 21   | United Verde Ext.....  | 111    |
| Nevada Hills.....       | .32  |                        |        |
| New Utah Bingham        | 11   |                        |        |
| Nipissing Mines.....    | 51   |                        |        |
| North Star.....         | .18  |                        |        |
| Ohio Copper.....        | .11  |                        |        |
| Oro.....                | .14  |                        |        |
| Pacific Smelt.....      | 1    |                        |        |
| Stand'd Oil of N.J..... | 405  |                        |        |
| Stewart.....            | 1    |                        |        |
| Tonopah.....            | 71   |                        |        |
| Tonopah Ex.....         | 21   |                        |        |
| Tonopah Merger.....     | .39  |                        |        |
| Tularosa.....           | .02  |                        |        |
| West End Ex.....        | .02  |                        |        |
| Yukon Gold.....         | 21   |                        |        |

| LONDON Nov. 26       |          |
|----------------------|----------|
| Name of Comp.        | Cig.     |
| Alaska Tre'dwell     | ES 28 6d |
| Camp Bird.....       | 0 6 0    |
| El Oro.....          | 0 11 0   |
| Esperanza.....       | 0 8 9    |
| Mexico Mines.....    | 4 0 0    |
| Oroville.....        | 0 7 0    |
| Santa Ger't'dis..... | 0 10 0   |
| Tombov.....          | 1 1 3    |