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THE REOPENING OF THE COMSTOCK

The Rise and Fall of Virginia City—Resumption of Mining Under Modern Conditions

BY CLAUDE T. RICE

The halcyon days of the Comstock departed long ago; Virginia City is now in so dilapidated a state that a Chinaman runs its formerly magnificent hotel. Weather-beaten signs of former assayers still hang above empty assay offices. The costly buildings of the prosperous days are fast becoming ruins, and the former city of 35,000 people looks vacant with its present insignificant population. It is distressful to view this crumbling skeleton of the old Virginia. But as one looks at the old dumps, almost mountain high, the abandoned shaft houses, and the rusty engines, he wonders if the lode which inspired all this is really dead.

On the street one still sees the Piutes as of old, but instead of the crowds of the

ENGINEERING MARVELS OF 30 YEARS AGO

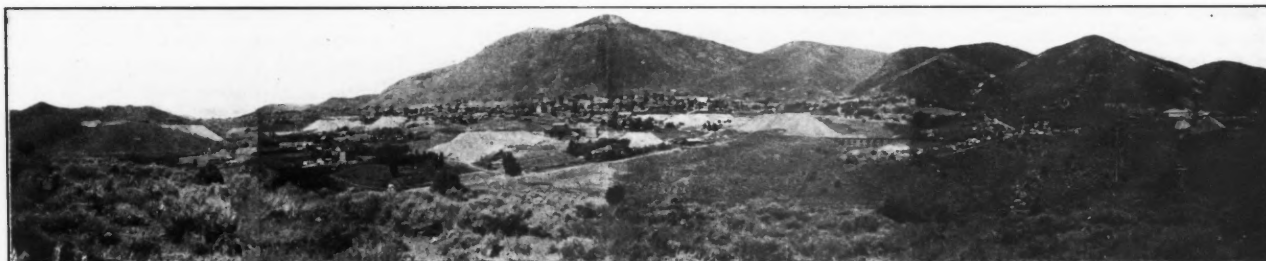
The Virginia & Truckee railroad once was the marvel of everyone who rode over it. Now its curves and tunnels and cuts are commonplace. One smiles at the Comstockers' tales of the time when the rope drive in the Chollar Potosi shaft creaked as it ran the Brush dynamos in the shaft house on top, where the electric flash across the steam-laden air of the dynamo room at the sudden shifting of the load rivaled a Coney Island display in brilliancy. At the same time the idea of the rope drive a mile and more in length, from a water wheel in one of the shafts to surface, which ran one of the pan-amalgamation mills down Six Mile cañon, ex-

bonanza, where the pressure was mainly downward.

Mining law was in its infancy in the early days of the Comstock. Claims were then located as so many feet along the vein, and with no side lines. Out of the experience gained on the Comstock grew the present laws, which unfortunately we have subsequently learned to pronounce radically bad. It was the small length of the claims owned by certain rival companies which was the reason for so much wasted work on the Comstock, for example, the shafts only 300 ft. or so apart, sunk to a depth of 2600 ft., or more.

BOLDNESS OF THE EARLY ENGINEERS

Ventilation in metal mines was brought



VIRGINIA CITY, NEVADA

bonanza days, only a few men now lazily congregate upon some corner. The gray-haired miners tell you tales of those never-to-be-forgotten times when the Comstock was the mining wonder of the age. And of the future? Well, the Comstockers never were pessimists. They went through one period of *borrasca* and then came the big bonanza. In recent years they have become pretty well accustomed to the stagnation of a great *borrasca*. They talk about the glories of the past and of those they hope for in the future. Of the present, the less said, the better.

Yet the present is not entirely blank for the camp which brought forth the square-set system of timbering and developed the process of pan amalgamation to its zenith. It still has lessons for other camps to study. Men have always had new and unique features to contend against in mining on the Comstock. The big bonanzas spurred on the men who faced these problems in the past; alluring possibilities still attract them.

cites admiration. The pipe line that brought in water to the Comstock was the wonder of the times. Its inverted siphon still ranks among the deepest of its kind. Cornish pumps were developed as far as mechanical science could carry them, but they had to be abandoned and pumps better suited to the field developed.

Larger ore chambers and wider ones were discovered than ever before. The Mexican foremen, whom the American placer miners imported to teach them of "plata" and how to mine it, were unable to handle the problem, and left it to a German-American engineer, Philip Deidesheimer, to solve. He and his carpenters did it so well that no one has since been able to improve upon their solution, the square set, under similar conditions. It is true that engineers since then, operating generally in highly inclined veins, make the caps abut against one another, instead of having the posts abut, as did Deidesheimer. But their conditions are different from those of the chamber, the big

to its highest development on the Comstock, at least in so far as the United States is concerned. The Comstock miners were driven to it by the hot water. Since then these miners have scattered in many directions, but they have failed to carry with them much appreciation of the value of fresh air to the miner, which nothing but necessity apparently can hammer into their heads. Butte, Arizona, Leadville, and other deep-shaft camps of the country still have this lesson to learn.

It has been a far step from the Mexican *peon* packing ore on his back, which characterized the early mining at the Mexican workings, to the electrically driven Koepe tail-rope system of hoisting, used at present at the Red Jacket shaft; and from the Cornish pump and the boiling tank to the electrically driven plungers and centrifugal pumps at present on the Comstock; but Comstock engineers never have been afraid to try new things. Nature forced them ahead in so many instances that progress soon became the customary

thing. Moreover, when the mines were in ore they made so much money that no one appeared to care how it was spent. At other times the directors and stockholders have been too busy following the market to pay any attention to the mines.

THE SUTRO TUNNEL AND DEEP WORKING

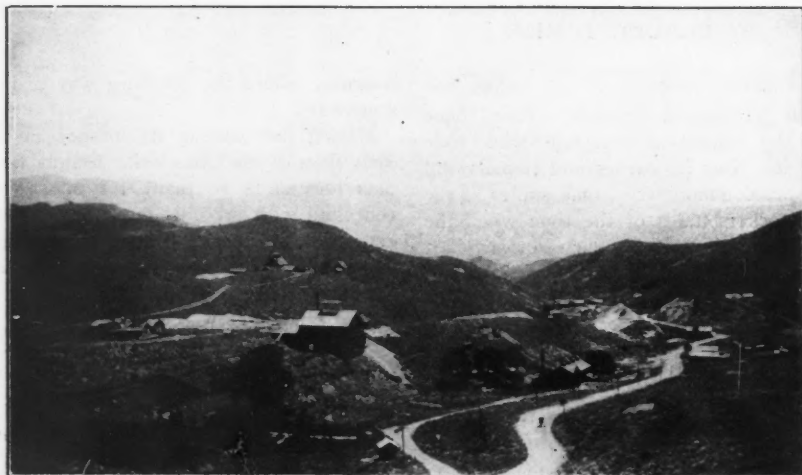
The second bonanza was exhausted. As the ore diminished, the companies sank deeper, naturally because in former times they had passed from *borrasca* to bonanza. They had sunk to the Sutro level with

Pumping cost too much, as power was very expensive. As the Comstock was proving too costly a roulette wheel for the brokers to get the public to pay for running it, and as other camps attracted more interest, pumping ceased. However, mining was not given up entirely; desultory work continued in the upper levels, where they hunted for good ore left in the old stopes in the hurry of the bonanza days, or for new orebodies in virgin ground. But this work succeeded only in

THE COMSTOCK PUMPING ASSOCIATION

In 1898 the Comstock Pumping Association was formed to reopen the lower levels. All the old reports of the mines which had worked below the tunnel level were examined in order to learn the result of the former prospecting, to see what ore had been mined, what was its value, and the extent of the orebodies at the time the lower levels were drowned out. This investigation indicated a favorable prospect for deep mining. So the pumping association adopted a plan of centralizing the pumping and also of operating several mines through one shaft, thus reducing costs to a minimum. Bids were asked from engineering companies for machinery to do the pumping. The Risdon Iron Works guaranteed to furnish an equipment which would lower the water in the C. & C. shaft 500 ft. below the Sutro tunnel level for \$30,000; \$5000 to be paid as each 100 ft. was pumped out. This consisted of an Evans hydraulic elevator similar to the one commonly used in placer mining. Considerable trouble was found in getting a nozzle which would resist the wear and also resist the pressure. Finally an aluminum bronze was decided upon. Another trouble was met with in the vibration which resulted, and which caused all the bolts to jar loose. Finally it was found that by admitting compressed air into the elevator that this jarring could be remedied as the air cushioned the knocking. These pumps proved efficient down to a depth of 300 ft. below the Sutro, when they had to be abandoned for deeper work.

It was at this point that Leon M. Hall, who had been raised on the Comstock and had been a surveyor on the lode in the bonanza days, was employed as consulting



ALPHA SHAFT, VIRGINIA CITY

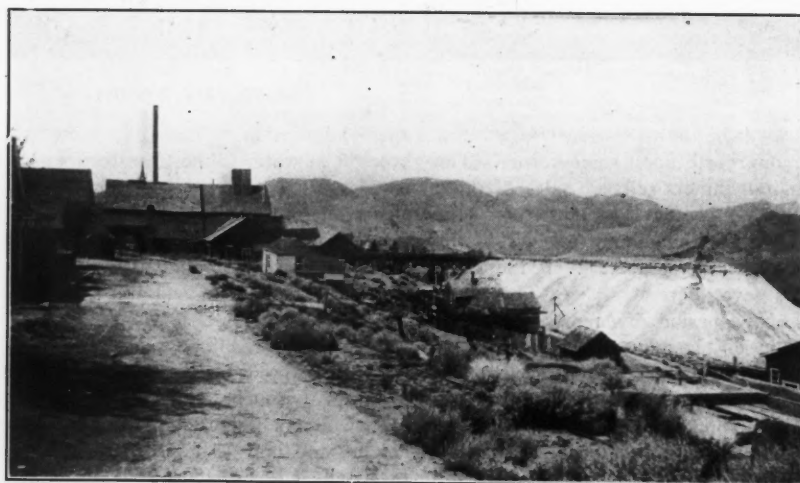
Cornish pumps before the tunnel was completed. Then they went deeper still, some of the shafts being sunk almost 1000 ft. below the Sutro level, while several winzes from the deepest levels reached the depth of 3000 ft. below the surface. The companies carried on this work independently, but the high cost of sinking and other reasons led them to combine and a third series of vertical shafts to the east was sunk.

This deep mining was only possible in those days because the Sutro tunnel gave the companies a new basis to work from. If it had not been for this tunnel there would be little mining done upon the Comstock below its level. This tunnel is about 20,000 ft. long. It cuts the Comstock lode in the Savage ground; a lateral was driven north to connect with the Union shaft, while a south lateral connects with the Alta shaft and the Crown Point.

The third series of shafts consisted of the Union shaft to work the north end mines, the Combination to work the middle mines, and the Alta and Yellow Jacket to work the Gold Hill mines. The fight against water was kept up for a while, but about 1883 the Gold Hill pumps were drowned out and the Gold Hill companies gave it up. The heat of the water and the quantity of it were too much for the Cornish pumps and the treasuries of the companies. But prior to that some ore was found and some was mined below the Sutro. About 1887 the north end and middle mines also became discouraged.

proving that the old Comstockers were fairly wise in sinking below the bonanzas instead of exploring in their vicinity.

In the meantime during this desultory prospecting of the upper levels and hunting around old stopes for ore left behind in former bonanza days, great advances were being made in electricity and in



OLD SAVAGE SHAFT AND DUMP

metallurgy. Long-distance transmission of electricity had become a success and electric pumps were giving promise of a great future. The cyanide process was successfully used in the treatment of gold ores and was being adapted also to silver ores, affording a great improvement over the old process of pan amalgamation.

engineer by the companies comprising the Comstock Pumping Association. Mr. Hall advised the use of Riedler pumps driven by gearing from Westinghouse motors, and soon the whole equipment was turned into an electric installation; but the Evans hydraulic elevator still is in use as a sinker for handling the water in the shaft.

THE PRESENT CONDITIONS EXISTING ON THE COMSTOCK

Before proceeding further it is best to explain the conditions existing on the Comstock. Hot water, slightly acid, has to be pumped. This water in the shaft is 160 deg. F., giving off a cloud of vapor, filling the stations with a cloud of mist, which greatly affects the life of any electric machinery. The hot and slightly acid water rapidly eats away the iron parts of the pump barrels and valves, but this difficulty is minimized by using bronze lining. Indeed, it is this hot water which is the bane of the Comstock and keeps cropping up in all the different problems.

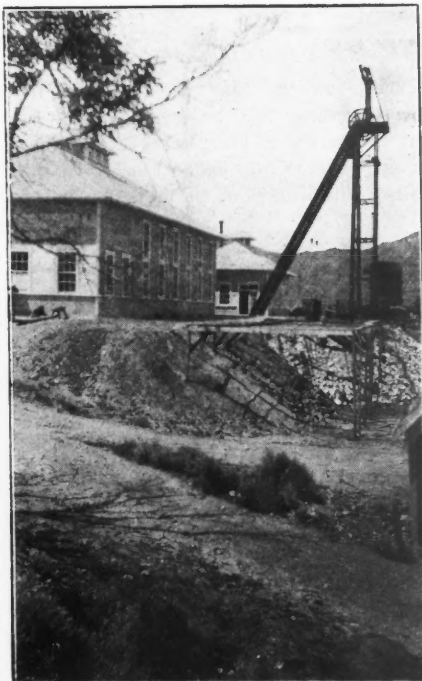
PLANS FOR NEW DEVELOPMENT

There are three plans of development for the mines. First is the development of the lode above the Sutro level. Second is the unwatering of the lower levels and the prospecting for new bodies of rich ore in this virgin part of the lode. The third proposition is to develop at depth a series of veins to the west by means of a deep tunnel, about 5800 ft. long, which is being driven by the Hale & Norcross company. Of the three the last is probably the least promising.

The other two are quite promising. About 35 per cent. of the Comstock lode above the Sutro level has been prospected by drifts and crosscuts within 200 ft. of each other, and only 7 per cent. of the ground between the Sutro and the bottom of the deepest shafts. As rather promising results attended the latter prospecting before the drowning out of the lower levels, that portion of the lode appears to be the most attractive. Especially so when it is remembered that many of the mines were in good ore in the bottom levels, and

the discovery of large bodies of low-grade ore with the hope of running somewhere into a rich bonanza.

There are to be three main pumping shafts. The water from the north end mines will be pumped at the C. & C. shaft; that from the middle mines will be



UNION SHAFT, VIRGINIA CITY

pumped at the Ward shaft; while the water from the Gold Hill mines will be pumped through the Alta shaft. Through the Union shaft, 2759 ft. deep, will be worked the Union, Mexican, and Sierra Nevada mines; through the C. & C. shaft,

Imperial and Crown Point will be operated. The new Yellow Jacket shaft has caved above the Sutro level, and, therefore, cannot be used. Through the Overman shaft, 1600 ft. deep, the Segregated Belcher, Belcher, Overman, and Caledonia will be worked.

The Walker Lake Mineral Field

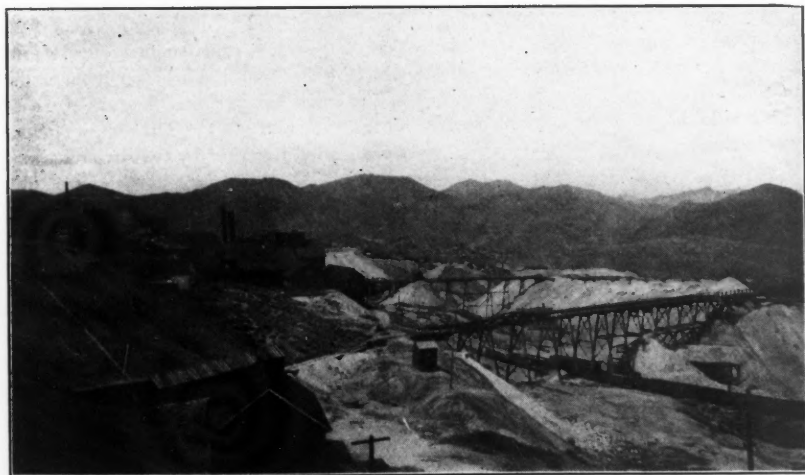
BY A. SELWYN-BROWN

The newly opened field on the old Walker Lake Indian reserve in Nevada, which is situated on the northern and western shores of Walker lake, and on the eastern flanks of the Sierra Nevada, is the scene of great activity. A very large area has been located for mining purposes and much development work is being done, notwithstanding the hotness of the season and the severity of the weather. According to the Nevada mining law the necessary location shafts must be completed before Jan. 1 next, and as the locators were unable to enter the reserve before the first snow fall it is necessary for them to do the work in the face of great hardships.

Notwithstanding the many disabilities under which they must work, the claim-holders are determined to do everything necessary to secure good titles to other claims. Many of them waited for years to have the opportunity to locate the ground and have great faith in the value of the district. The development work already done has demonstrated the fact that the pioneers had good reasons for their faith. The district carries both gold and copper veins which assay well. It is difficult to say at present whether it should be designated as a gold or a copper district. It is chiefly spoken of as a goldfield; but it appears most probable that it will later be found that many of the veins now yielding free gold will develop into copper veins when the water level is approached. Nearly all the ore obtained in the various claims yield copper assays.

Already a company has been formed to develop a mine on the Reservation. It was incorporated in Tonopah early in December to operate the Mount Grant mine situated on the eastern slope of Mount Grant, 14 miles southwest of Hawthorne. The property was located by E. R. Shields who discovered it over 12 years ago, and who within that interval managed by various artifices to evade the vigilance of the Indians and the police patrols and to do a large amount of development work. He opened up a 4-ft. quartz vein assaying from \$5 up to very high values, by means of a tunnel 600 ft. in length and a cross-cut 125 ft. in length running from a vertical shaft 100 ft. deep. The prospects of the mine are excellent, and a plant will be installed on it at once. The ground around it has been located for miles.

The Welsbach mantle is 99 per cent. thoria and 1 per cent. cerium oxide.



MINE DUMPS AT VIRGINIA CITY

many favorable remarks are seen in the old reports of the superintendents in regard to this deep prospecting. The small amount of prospecting that has been done in C. & C. and Ophir ground below the Sutro level already has been quite favorable. The plan of developing ore above the tunnel level depends for its success upon

2650 ft. deep, the Ophir, Consolidated California & Virginia, and the Best & Belcher will be worked; through the Ward shaft, 2480 ft. deep, will be worked the Alpha, Exchequer, Bullion, Chollar, Potosi, Savage, and Gould & Curry. Through the old Yellow Jacket shaft, 1200 ft. deep, with an incline to the 3000-ft. level, the

SHAFT SINKING THROUGH WATER-BEARING FORMATIONS—II

An Example of Modern Methods and Appliances Employed in German Mines

BY E. MACKAY HERIOT*

(Continued from page 1110)

SUMP BLASTING

With the exception of pumping, sump blasting is the most important item in shaft sinking. If the sump has not been properly bored, the holes will not produce the depth in proportion to their length, and one is forced to begin new holes earlier than ought to be the case, on account of which time is lost and dynamite wasted. Every time the rock is blasted the pumps have to be stopped, the steam and water pipes disconnected and the pump hoisted. Before the latter is again in working order, much water can collect. It is thus clear that at each sump shooting the greatest possible depth should be attained.

This cannot be achieved alone by drilling long holes and using excessive amounts of dynamite. The length of each fuse, the preparation of the cartridges, loading the same, the depth of the holes, their number and position, and especially the angle at which they are bored, are some of the things to be taken into consideration. We take the shortest fuse, which is for the lifter, about 2.5 m. long, and the rest, each a few centimeters longer than the preceding.

The next longest fuses are for the holes in the sump, and the longest, for the holes between the sides and the sump. The lifter is thus fired first, the sump holes come next, and those nearest the sides go off last. Special care must be taken in making up the cartridges, for they are very apt to misfire. If, for instance, the lifter should not explode, the success of the whole blasting may be much reduced; even if the miss-shot happened to one of the sump holes, it would leave apprehensions, for a loaded hole is always dangerous and much more so if the fuse is present. We often encountered small limestone layers causing hindrances when boring, sometimes making it impossible to get the dynamite to its destination.

As already has been noted, blasting between 7 and 70 m. depth was not satisfactory; generally only 1.5 m. were gained at each sump shooting, although the holes were fully 2 m. long. The blasting was thought to have turned out well when the broken rock was heaped up high, but this only signified what the upper part of the holes had done, the rest had to be determined later. During the sinking between 70 and 120 m., we took note of the depth, each time when sump boring was com-

menced. In this way we knew exactly how the shots had worked. At first it was customary to place four holes in the middle (sump) and about 1 m. from the walls. The lifter, one of the sump holes,

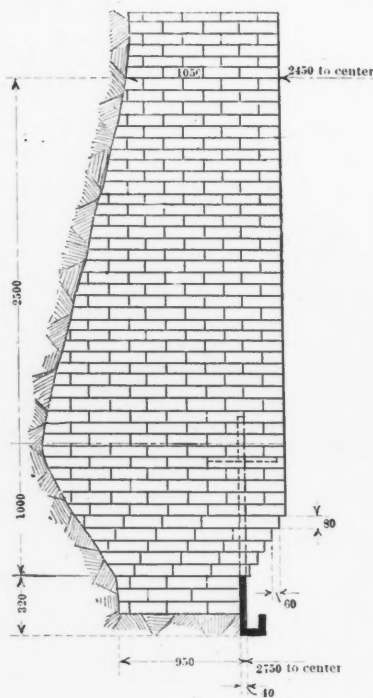


FIG. 9

was given an incline of 60 deg., and the rest were bored more vertically, the outside holes being nearly perpendicular. The sump and side holes gave seldom more than 300 buckets.

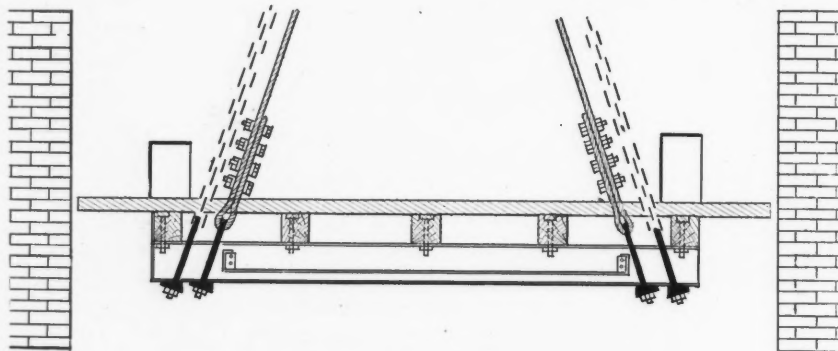


FIG. 10

Different methods were applied to gain better results in blasting, as, for instance, deeper holes, more dynamite, five sump holes instead of four, narrower sump, and bringing the outside holes nearer the middle, but all this made little difference in

the result. We then laid the most stress on the angle of boring, and this seems to have solved the problem. At the same time, the cutting edge of the drills was enlarged; the starters were broadened to 39 mm., and the long bits to 35 mm. By this we got a larger hole, and could place more dynamite at the bottom. For the lifter an incline of 30 deg. was found to be good; for the sump holes 45 deg., and for those 1 m. from the walls, 70 deg., all inclining toward the center. We could then gain 1.9 to 2.2 m. depth per sump, and turned out 350 buckets of rock per round. The holes were bored 2.4 m. deep, and loaded with 15 cartridges of No. 1 dynamite. The lifter was 1.7 m. and was allowed less dynamite. Eight or 10 side holes remained to be bored and shot with an average of about 15 to 18 m. depth. They were loaded with three to seven cartridges, according to circumstances. There is no doubt that the inclination of the holes plays a most important part in blasting in shafts, and it is better to give too much inclination than too little. It must, however, be taken into consideration that this article deals only with fairly horizontal stratification.

With ring No. 32, the provisional lining was finished for this series, and directly underneath we began the slope for the supporting wall. Side holes were not shot near the latter, but the sump was made a little larger than the normal shaft section. For dimensions of the supporting wall, see Fig. 9. From 115 m. the shaft was sunk through a rupture zone composed of red clay and pieces of limestone (*Roggenstein*).

USE OF SUSPENDED PLATFORM

The bricking up of the shaft from 70 to 120 m. was for the most part a repetition of that previously described, except that here we worked on a suspended platform, which was composed of two iron girders upon which five wooden bearers were set. (Figs. 10 and 11.) The main girders were joined together by two iron channels,

and these, in turn, by two smaller channels. Over the wooden bearers a double row of 40-mm. planks was laid. These pieces were put together at the bottom of the shaft in a few hours. This platform hung free in the shaft, and was suspended

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by four chains and four wire ropes, all being attached to one main cable. Above ground the cable was wound around a drum, actuated by a belt from a steam winch. Leaving the drum, the cable ran six times around the two drums of the steam winch, which were placed tandem. From the drum the cable passed over a pulley at the landing stage, then down the shaft. The position of the cable was 350 mm. west of the center. The suspended platform is to be preferred to the built-in forms, owing to the saving of time and ease of laying the brick walls. In this wall we used masonry in bond. Where limestone stratum was encountered, a lead pipe was bricked in, although most of them carried no water. As has been noted, the sides were generally shot away, which, as the rock was now very treacherous, loosened the walls considerably. To make sure that water could not escape from behind the masonry, the sides of the

came squirting through the joints, washing away the cement.

With utmost speed, two or three courses of bricks were laid against the joints of the plates, using plenty of cement with very little water. The result was quite astonishing; the water completely disappeared from the masonry and was carried away in the pipes. It was now easy work to brick up a sound wall. The space behind the zinc plates and the sides of the shaft was filled in with cement up to the level of the pipes, which could now be bricked in, a task which had to be carefully carried out. After the space under and around the pipe had been filled with watery cement, the bricks, hewn to fit, were pushed together from both sides, the cement swelling up at each joint. During this work a strict watch was kept to see that the pipes received no shock.

On Feb. 3, the wall was finished and

somewhat smaller, the diameter being 5.9 m., and we were progressing at the rate of 3 m. a day. As soon as a few meters had been sunk, the bucket-guide bearers were lowered 50 m. The pump was giving a lot of trouble and had to be continually packed, which difficulty was caused by the action of the salt water on the plungers.

Directly under the supporting wall, 14 liters of water per minute were encountered, and shortly after, there was double that quantity. On Feb. 22, the cast-iron pipes were closed with blank flanges, and valves, and thus the water was finally shut out and the pump was stopped. However, on the same evening more water broke into the shaft and left us no chance of getting out the rock. A second pump was soon ready and at once erected. It was a compound, duplex machine, built by Weise & Monski of Halle. Its maximum delivery was 2 cu.m. per

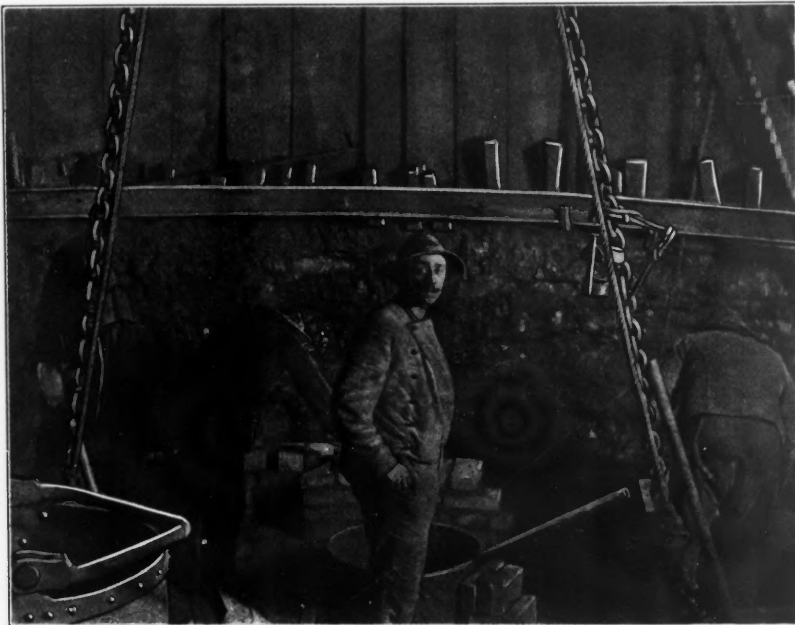


FIG. 11

shaft were smoothed with a pick, at three intervals, for 1.5 m.; the top course of bricks was always removed prior to the building up of the wall.

WORKING IN WATER-BEARING STRATA

As we were now getting nearer to the water-bearing strata, the pump was put in, repaired as well as possible, and raised up under the bucket-guide bearers. Shortly before coming to the launder we used a fast-binding cement, which sets in five hours and gets hard in 15 days; the ordinary cement taking 24 hours to bind and one month to harden. Some 10 cm. below the limestone we laid zinc plates (2x1 m.) against the side of the shaft. To take off the water, four cast-iron pipes were bricked in, which were secured to the zinc plates by a flange (Fig. 12). As soon as we began to brick in the plates, the water

we began at once to erect the ladder-way, set in the air tubes and to sink the pump. At the beginning, 6 m. were sumped in eight hours, but as the pump was lowered it worked less satisfactorily. There remained no choice but to raise the pump 23 m. and let it take the water from the cast-iron pipes at 70 m. depth. For this purpose a sump box had been placed underneath the pipes. The water in the sump then had to be taken out in the bucket, which was done at the rate of 6 m. per shift. On Feb. 7, we were able to dismantle the hanging platform and clean out the sand from the bottom.

DIFFICULTIES ENCOUNTERED IN CONTROLLING WATER

On Feb. 8, sinking had again begun. All the lead pipes in the masonry were corked. The shaft was then being carried

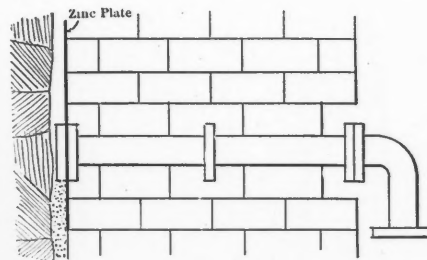


FIG. 12

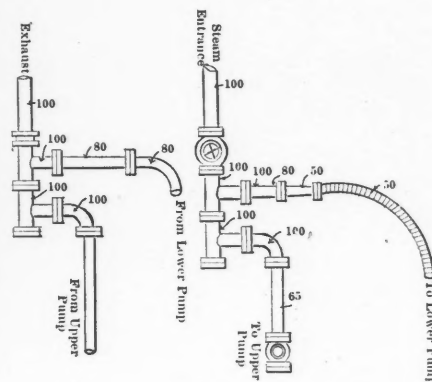


FIG. 13

minute, to a height of 100 m. The construction is very practical, because the most important parts are easy to get at. The eight sucking valves are arranged together in two rows on one side, as are the eight discharge valves on the other side. This pump was erected on wooden bearers, at 100 m. depth, in the west side of the shaft and lifted the water from a box to the surface. In the steam and return-steam conduits there are compensation pieces at two points, which were pulled out 400 mm. when erected. The piping expanded afterward 170 millimeters.

The main rest for the pipes is situated a few meters above the pump and at every 15 m. bearers also are placed, on which rest wooden clamps secured to the pipes. Where a compensation pipe was located,

the conduits could only be secured above it; below the clamps, the pipe had to be loose. By using compensation pipes the bearers had to carry only the burden allotted to them, but without them it could easily happen that one bearer pair had to carry the whole weight. For the inside bearers, the hitches in the masonry were used, but for the outside ones, new holes 80 cm. from the former had to be made.

The pipes for the steam and return steam are 100 mm. diameter to 100 m. depth and serve both the pumps. The method used in connecting the pipes of the two pumps may be seen in Fig. 13. For the condensed water from the steam, a pot was set up, while that from the exhaust pipe was conducted into the water box. As the new pump worked at 88 lb. pressure the two locomotive and one Cornwall boiler were raised from 88 to 103 lb. pressure. The second Cornwall boiler also served the hauling and electric light machines. March 7 saw the pit bottom free from water, and sinking operations were resumed. The inflow of water increased continually, coming most-

completely eaten into them. The old plungers had to be packed often during the day, since after only a few hours' work no packing could be found, it having been ground away by the rough surfaces of the plungers. The red brass withstood the salt water and we had no more trouble.

To take off the weight from the bottom of the pipe, the section above rested in brackets. By April 19 we had begun to sink the pump and extract the water. On the last ring, No. 28, a launder was set and the sides of the shaft were smoothed to the necessary radius, as may be seen in Fig. 14.

USE OF IRON LINING

As it was not possible to give the shaft a water-proof masonry lining, with water under 264 lb. pressure, we decided to use cast-iron convelage. It was arranged that the 57 m. standing in temporary lining should be taken in two series. With one series the shaft would be liable to get out of the perpendicular, also the weight of 57 m. of iron would be too heavy for one wedge-crib. For series No. 1, 18 rings

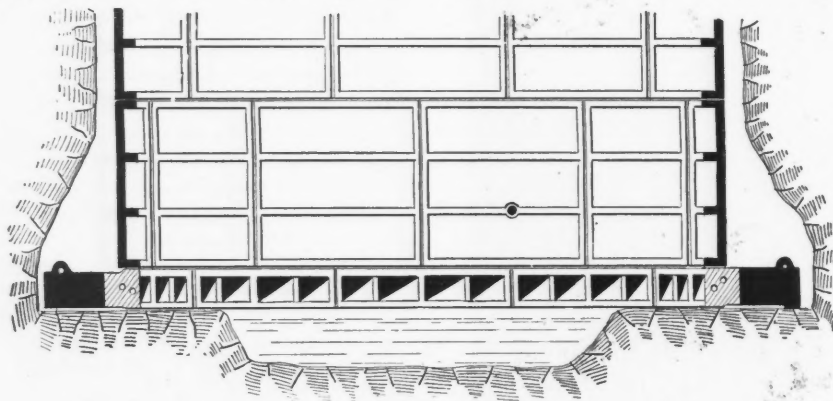


FIG. 14

ly from the limestone strata at 158 and 170 meters.

It was generally found to be the case that the larger the limestone layers, the more water they carried. The limestone occurrences at 70, 158 and 170 m. are the largest we have encountered, and they have conveyed the most water to the shaft. On account of the high water pressure, it was decided to line the shaft with cast-iron convelage. We had to wait one month before sufficient tubbings arrived; on this account the sides of the shaft were only temporarily smoothed at the bottom, otherwise the continual run of water would have loosened the rock. During this time most of the men found employment at No. 1 shaft.

The lower pump was hoisted 14 m. and we held back the water as well as possible, pumping only one shift a day. The cylinder, steam and exhaust pipes of the new pump were isolated, so that the heat, which had risen to 40 deg. C., should be more endurable. Both plungers of the old pump had to be taken out and replaced by new ones of red brass, for the salt water, with 18 per cent. of rock salt, had

were ordered, and for series No. 2, 21 rings. The thickness of the convelage is as follows: For series No. 1, wedge-crib, 55 mm., tubbings, 50 mm. For series No. 2, wedge-crib, 60 mm., tubbings, 55 mm. Each series is made 5 mm. stronger than the one above. A ring consists of 10 segments, is 1.5 m. high and weighs from 10 to 12 tons. The convelage is made of a soft cast iron, which must withstand a hard knock from a large hammer. As shown in Fig. 15, the rings have two horizontal ribs. There are nine holes on the vertical flange of a segment and eight on the horizontal. The flanges are all lathe turned and between the joints strips of lead are placed. These are the so called "German tubbings."

USE OF WEDGE-CRIBBING

In order to erect the wedge-crib a fixed center is necessary, for which purpose a pile was driven into the sump and cut off at the top, so that its end was level with the upper face of the wedge-crib. The exact center was marked by a nail driven into the pile, then the sump was covered with a platform.

The flanges of the convelage must be so set as not to collide with the permanent bearers; we therefore began the first 80 mm. southeast of a line drawn through the center, and the bearer-hitch plumb lines. The segments were attached to the winding rope by two shackles (Fig. 16) and lowered, one after another, down the shaft, where they were laid on rails and brought into position by crow-bars and a block. The latter was made fast to a ring of the temporary lining. (Fig. 16b.)

It is important that each segment should be accurately leveled at once, because the result at the end is dependent upon it. The segments are leveled by placing iron plates (from 1 to 10 mm. thick) underneath them. The work is controlled by using a water-level, and by comparing the horizontal position of the wedge-crib with that of the pile in the shaft center. The distance at which the segments are erected from the middle of the shaft is given by a rod with a spoke or arm at one end, which fits into holes in the wedge-crib. With crow-bars the segments are moved

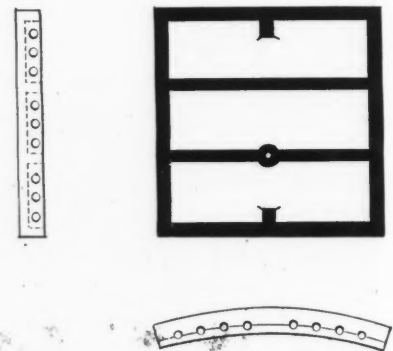


FIG. 15

to and fro as is necessary. As soon as each piece is in place, it is packed, and joined loosely to the neighboring one with one screw. The necessary space for the last segment is obtained by setting each piece 1 cm. too far back. There would then be 30 mm. room on each side. After the whole ring has been assembled, it is necessary to bring it 1 cm. nearer to the center. Wedges are set between the iron and the sides of the shaft, and after separating the segments a few centimeters, one from another, the wedges are driven in. (See Fig. 17.) Work is begun with the two adjoining ends of a segment, observing at the same time the rod, with the spoke in a flange hole, as it nears the nail at the shaft's center. This process is repeated until the whole ring is centered. The horizontal position of the segments is determined by means of the water-level, not only between the segments, but between them and the pile. The filling strips of flat iron are added or taken away as is necessary. The "prison" pins may be now hammered in, and the ring bolted together. An example of a wedge-crib is given in Fig. 18.

The spaces behind the wedge-crib, below and between, are filled with liquid beton up to about 10 cm. high. Around the inside circumference of the ring bricks are laid to stop the beton from swimming out. The mortar is formed of two parts of sand and one of cement.

The wedge-crib received its name from the wedging, so called *picotage*, between it and the side of the shaft. A wedge-crib without such wedging would hardly be thought possible by most miners, but has already been carried out in some shafts in Germany, to the satisfaction of those concerned. It is well known that wedging has several disadvantages. In the first place, the ring is easily wedged out of its horizontal position, and if the ground is at all loose a *picotage* is hardly possible, and, taken all together, the work is very tedious. Mr. Giesemann has proved in practice that a *picotage* behind the wedge-crib is not necessary to make a shaft water-tight. His method is to fill the space between the wedge-crib, together with the three first rings, and the sides of the shaft, with tamped concrete. The beton is tamped until water comes to the

nor too dry. If the sides of the shaft are so dry that they do not give off sufficient dampness, the concrete must be moistened. We found the eastern part too wet and the western part too dry; the result was that the concrete was not so hard in the east as in the west. It is important that tamping should be carried on equally all around the shaft, and that it shall contain everywhere the same amount of moisture. Behind ring No. 1 the concrete was shoveled in in layers of 30 cm. and well tamped. For the first four rings the mixture was five wheelbarrows of gravel to two wheelbarrows sand, and one barrel of cement.

(To be continued)

Dredging a Town

BY C. G. YALE

The Folsom Development Company, operating dredges adjacent to that town in Sacramento county, California, has bought up about all of West Folsom, having purchased the town lots and blocks on the bottom lands. Before trying to

It is understood that the ground through which the closed streets and alleys ran is valueless, and that Folsom can never be extended over it or use it for any purpose to which a town or county would be likely to put it. The company bought all the abutting lots and as a property owner petitioned for the closing of the public ways that it might pursue dredging operations. When the dredging is complete it is the intention of the company to promote a large industry in the form of a cobble-crushing plant for road metal and grouting work; the cobble being the best class of trap rock known. When that is entered upon, the ground to be mined over will be graded and restored to higher purposes than ever before by being surfaced and made into agricultural land.

A Mining Boom in London

While New York and other large cities of the United States have been enjoying the excitement of a mining boom, London also has been having one of its own, and in stocks quite outside the "Kafir circus." This is the story, as told by the *Economist*:

"The dramatic jump in Vaal Rivers, the boom in Siberian Proprietary, in Great Cobar, in certain of the Broken Hill group, and, most recently, the violent fluctuations in Deep Leads shares—these have all furnished splendid profits, on paper, to the bulls. Some of the advances have been caused by buying genuine enough. The Broken Hill excitement was no manufactured affair, although the colony started it. The public have joined heartily in the speculation, but without causing an inflated bull account, from which it seems demonstrable that large numbers of Broken Hill shares are being taken up and paid for by the actual buyers.

"As regards some of the other mining shares, however, the presence of the public is more doubtful. Siberian propositions do not convey an attractive sound, and in spite of the prospects being described with much attractiveness, there has so far been no great rush on the part of the outsider to gamble in the shares. All such movements, which depend for their motive power upon estimates, upon bears or upon pools, wear too close a resemblance to similar, precedents in the past for any great faith to be placed in their capacity for endurance."

The Dupont de Nemours Powder Company has commenced the construction of a dynamite manufacturing plant, about 25 miles south of Denver, on the Denver & Rio Grande Railway. The entire expenditure will be nearly a million dollars, and modern machinery will be installed. The different buildings are being erected in a rough foothill country, thereby minimizing possible damage in case of accidental explosion.

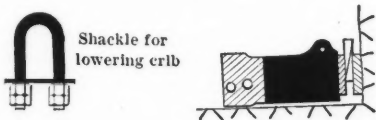


FIG. 16.

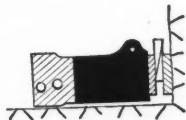


FIG. 17

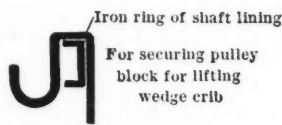


FIG. 16 R

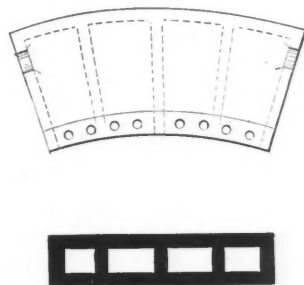


FIG. 18

surface. The nature of the rock, whether hard or soft, should have no influence on this.

During some operations, after the wedge-crib had been erected the sides of the shaft broke away, in which case a *picotage* would be out of the question. It was here that Mr. Giesemann, who had the underground management, first applied his method and 5.5 cu.m. of water per minute were successfully closed out. One thing is absolutely necessary: That the sides of the shaft should be dry up to 5 m. above the pit bottom. To attain this we had two launders in the shaft. The joint between any boards where water escaped was closed with cloth, and at suitable places troughs were erected to catch the drops, which fell free in the shaft. If the wedge-crib and ring No. 1 are well tamped with beton, good results ought to be obtained. Behind the wedge-crib the concrete (a mixture of one part of cement to three parts of sand), is laid 10 cm. deep and tamped, which is repeated until the space is filled up. The work needs great care as the beton should not be too wet

dredge this land, however, it was necessary to get the streets closed officially, and this has been done by the supervisors. Some 17,000 ft. of public streets have been closed and now the dredging company can work the ground and the streets as well. By the sanction of the supervisors streets surrounding blocks on four sides have been closed and permission granted to make those streets impassable. In some instances the Development Company has bought entire blocks outright and has had the streets on every side closed. In other cases it has purchased only portions of certain blocks, but the permission of the supervisors to close the streets in the immediate vicinity has made the remaining lots valueless, for the reason that when the dredges have completed their work these lots will be surrounded by tons of heaped-up stone and no means of entrance to them will be left. Some of the Sacramento papers are making an outcry about this donation of public streets, which were on the city map. The streets, however, were of no use to the county, and they were not graded or used.

SMELTER ADMINISTRATION

A Systematic Method of Keeping Accounts at Metallurgical Works

BY HERBERT HAAS *

The following notes are intended for metallurgists and smelter superintendents who have never had the good fortune to become familiar with the methods of metallurgical bookkeeping and compilation of daily cost sheets adopted at large metallurgical works. That an outline of such methods will be of value to men in charge of small works there can be no doubt. That some works are run without any system at all can be explained only by the narrow scope of the operations and the lack of knowledge of systematic keeping of reports and metallurgical statements by the men in charge. Smelting methods are invariably improved if a rigid system of bookkeeping is inaugurated, together with a systematic segregation of costs of the various operations.

If works treating upward of 2000 tons of material daily should not keep track of all the different products and by-products obtained in the sometimes complex metallurgical practice, failure both metallurgical and commercial would be apt to result quickly. It is well to bear in mind that metallurgy is the science of getting money, not simply the metals, out of ores.

The complete absence of a report system at many plants where I have been engaged in process-investigations is largely responsible for the present paper. This lack of information as to the daily operations is not infrequently the cause of failure, although often indirectly, owing to the fact that no reports are available for interpreting successive phases and steps of the process. The confusion that would result if a chemist were to make an analysis of some complex organic compound without noting the respective quantities of the samples taken, with all the intermediary compounds of the parts of which the whole is composed, would be shared by the metallurgist were he not to segregate the different metallurgical operations into main groups, with sub-groups, and their daily operative and repair costs.

DAILY COSTS

The daily costs should be divided into operating expenses and repairs, which compose the total expenditure of the different segregated parts of the process. The classification of the different processes into intermediary steps naturally depends on the magnitude of the operations of particular works, but emphasis must be laid on a not too general statement of costs. From the daily reports, the monthly report is compiled.

*Metallurgical engineer, San Francisco, Cal.

Taking a lead-smelting works and refinery with prevalent American practice, namely, roasting, smelting in the blast furnace, and refining of the bullion, we have under the heading of total operating expenses: (1) Total smelting; (2) total roasting; (3) total power and intermediary operations; (4) total refining; and (5) total general expenses. Separate from these items is kept (6) total construction account.

Under (1), we may make the following sub-divisions; (a) Direct smelting, blast furnaces; (b) charge floor, stock house, bins, beds; (c) feed floor; (d) elevator; (e) dump and granulating troughs; (f) handling mattes; (g) handling slag; etc.

Under (2) we have: (a) Roasting, Wethey-Holthoff furnaces; (b) roasting hand reverberatory furnaces; (c) Huntington-Heberlein converters; etc.

Under (3) we sub-divide as follows: (a) Babcock & Wilcox boilers; (b) Heine boilers; (c) Corliss engines; (d) generators; (e) motors; (f) transformers; (g) blowers; (h) pumps; (i) sampling-mill machinery; (j) briquetting machinery; (k) fluedust conveyor; (l) briquetting; (m) sampling; etc.

The class (4) may be segregated into: (a) Softening furnaces; (b) desilverizing kettles; (c) refining furnaces; (d) Faber du Faur furnaces; (e) cupelling furnaces; (f) merchant kettles; (g) molding and scale room; etc.

Group (5) includes such items as: (a) Office; (b) laboratory and assay office; (c) lights; (d) tenements; (e) watchmen; (f) stable; etc.

Total construction, class (6), is subdivided into improvements and construction.

Another column reserved for "personal accounts" will complete the report, sufficiently detailed for most practical requirements. The monthly reports are easily compiled from the daily reports bearing the same sub-divisions.

THE MONTHLY REPORT

The monthly report should be sufficiently clear and detailed for future reference, at the same time concise enough for directors and stockholders interested in the operations of the company. The cost-per-ton report plan is not a good one if used to express monthly operations. Such operations vary considerably from month to month, but if all the monthly reports as outlined in this paper are totaled for a year's operations and the different operative costs divided by the respective total tonnage treated, such costs are then of value for future comparison, as well as statistically.

Too minute a sub-division is undesirable in the monthly reports, i.e., it is not necessary to segregate costs under sampling-mill machinery into those falling to the different rock crushers, rolls, grinders, samplers, etc., but the daily report forms should show operating and repair expenses of these different machines, and tonnage treated. To be of value the daily report should give all the working details and conditions. Such data are very valuable reference material, as they show: (1) The merits of different machines; (2) the relation the materials of construction bear to the life of such machines; (3) in some cases, advantages obtainable by changing the mode of operation.

METHOD OF OBTAINING COSTS

We now come to the discussion of the system necessary for obtaining the costs, which are easily compiled if the works are divided into different departments.

At lead works we have the following departments: Roasting, blast furnace, sampling, power, machine shop and repair, carpenter shop, refinery and general expense. All these departments are provided with daily report forms, and, where space permits, these reports show on one side the time put in by the workmen, together with their wage rate, which part of the report system is verified and corrected every 24 hours by the time-keeper. The other side gives details of the work done by different departments. Wherever the scope and magnitude of the operations warrant it, such departments are in charge of different foremen, who are held responsible for the correctness of the reports they furnish to the superintendent in charge of the works.

As supplies used are chargeable either to operating or repairing expense, a store-keeper in charge of the warehouse is a necessary adjunct to the system. He enters every article bought in a warehouse book which shows: The description of article; from whom bought and number of order; date ordered; date received; net cost; cost of railway and wagon freight; total cost; date of withdrawal; number of packages and quantity; order number; to which department delivered; detailed cost; and remarks.

Such a book is advantageously made up in the loose-leaf ledger form. When a new consignment of articles is received, the store-keeper figures at once the detailed cost per unit of such articles, which places him in a position to charge any department with the value of the articles delivered. He has instructions to deliver articles only against written orders, signed by persons authorized by the superintendent. Such persons are usually the foremen of the different departments, who are furnished with order blanks.

The store-keeper delivers all orders which come in during the 24 hours' operation to the time-keeper who enters the cost of the respective articles to the operating or repair expenditures in the

daily reports, which in their complete form are then delivered to the superintendent's office, where each report is kept on a separate file.

From a perusal of these order blanks and daily reports in connection with work inspection, an experienced superintendent knows at once whether tools and supplies are wasted or whether the best results are obtained from them. Indiscriminate ordering by different foremen receives prompt reprimand by the superintendent. If such a report system had not been kept, complaints made when the store-house is emptied too quickly would not help any.

This completes what has to be said of the system with regard to the cost of operations. The system enables the superintendent in charge of the works to have in hand the operating and repair expenses of the preceding 24 hours, at the latest six hours after the close of that period.

At very large works the store-house has its purchasing agent, who is in constant communication with different houses to obtain the best material from the lowest bidder; a good man directing a store can save a company a large sum at the end of a year, if purchases are made with the necessary circumspection.

I have found the above briefly outlined system to work very satisfactorily at plants I have had charge of. However, it does not necessarily follow that to make use of the system a separate time-keeper, store-keeper, bookkeeper, etc., are necessary. Some works are not large enough to keep all these men busy. In such cases the time-keeper can also take charge of the store-house. The same holds good regarding metallurgical book-keeping. Where there is insufficient work for a metallurgical bookkeeper the superintendent will have to do most of that work.

A good scheme to get the best service out of tools is to give each shift, of the different departments, separate sets of tools and make the respective foremen responsible for them. A rivalry springs up between them and each one tries to get the best use out of his tools. It is also a good plan to have damaged or worn-out tools delivered to the store-keeper along with the order for the new article. The store-keeper is thereby enabled to judge for himself whether the order is justified.

All hand tools used in the machine shop should be charged to the different machinists using them, who should have lockers for keeping them when leaving the shop, and should be held responsible for them. If such practice is not made the rule, the machine shop's operating expense will run up to an exorbitant figure when compared with the jobs turned out.

The daily report of the machine shop and the repair department is tabulated so as to allow the master mechanic in charge to debit each department and the place where and for which the repair

work was done with the materials used and the work, at shop cost.

Well managed works have usually inventory sheets, where all the tools used in the different departments are entered. These sheets are gone over every month and the changes entered. The time so expended, which means money so invested, brings the company a large return on this investment. It goes without saying that all tools belonging to a company should bear the company's mark.

SYSTEM OF WORKING REPORTS

The manager should have reports of all the different operations going on at the works. He owes this to his employers as well as to himself. At smelters the most important is the tabulation of all receipts of ores, fluxes, fuels, etc., together with analysis of their contents and especially those of metallurgical importance.

To do such work satisfactorily the sampling of the ore, fluxes and fuels and separate samples for moisture are necessary. The average of many moisture samples is taken as representing the moisture of a whole lot. Where ores are stocked in covered bins the moisture diminishes. Moisture amounts to considerable weight in the ore treated in one day's operation. An allowance for it should be made when figuring the blast-furnace charges. At custom works a correct moisture sample is wanted, as the ore buyers do not care to pay for water in the ore on the assay basis.

I have witnessed operations by unscrupulous superintendents, where as much as 14 per cent. water in the ore was never accounted for. Instead of reporting only 1720 lb. for every ton of a wet ore charge, a full 2000 lb. were entered. Naturally, a metallurgical statement was never compiled, with the excuse that "it would not check up anyhow."

Aside from the regular working report, the following books and statements should be kept at all well managed works: A bin-book, a charge-book, metallurgical statements, fuel and flux statements, and statements of ore, by-products, fluxes and fuel on hand, and in transit.

The bin-book is divided into the same columns as the left-hand page of the charge-book, with the addition of columns for date received and date smelted. When the ores are bedded, the analysis and weights of the different ores are entered into the bin-book, and from the percentage of the elements given, the weight of silica iron and manganese, calcium, barium and magnesium oxides, zinc, sulphur, alumina, copper, etc., contained in a lot, can be figured; and when the bed is filled, the different quantities of these elements are footed up from the total, so obtained, the composition of the ore bed is ascertained. When a certain bed or bin is emptied, the respective data are entered under column "date smelted."

A plan followed in preference to the one just outlined is to take a proportionate amount of the ores that make up the bed. If a bed contains more than 1000 tons, it is well—in order not to swell the sample—to take one-third the number of grams of the numerical amount of tons of the different ores constituting the bed, from each ore bed. For instance if the bed contains 600 tons of ore "A," 100 tons of ore "B," 30 tons of ore "C," 330 tons of ore "D," etc., 200, 33,333, 10, 110 grams are taken respectively. The carefully mixed resulting bed sample is then analyzed, and this bed-analysis is used by the superintendent in figuring the blast-furnace charge. Bedding is a convenient method to secure a large neutral ore mixture, from which the major portion of the blast-furnace charge is made up. With the addition of a small amount of silicious ore, limestone, iron ore flux, etc., as the case may be, the charge can be controlled to a nicety, and uniform slags produced.

In the charge-book the same columns are printed on the left-hand page, together with space for entering the calculated slags, mattes, bullion, etc., next to which columns are reserved to enter the analysis of the slags and other products actually obtained during the day's run. The right-hand page of the charge-book is reserved for the daily reports of the blast-furnace department, showing the number of the charge which is run, and the number of charges smelted, the matte and bullion obtained, the blast pressure, time blast was on and off, and total number of furnace days (24 hours). In works operating five blast furnaces, where the total time blast was off, for all the different furnaces combined, amounted to six hours, we should count 4.75 furnace days. In fact, all the conditions which enter into the successful manipulation of the blast-furnace department should be noted. The other half-page of the charge-book has columns to enter the weight of the ores smelted each day.

For every charge a different sheet is used, and each charge receives a consecutive number. It goes without saying that when a bed is not exhausted during 24 hours' operation, and the charge works satisfactorily, the charge number is not changed until a fresh bin is started.

Aside from the bin and charge-books, a smaller book is kept, in which certain pages are reserved for each bin or bed number, and in which every day the total amount of ore removed from said bin or bed is entered together with the date. This serves as an index, and is of great help when compiling the metallurgical statements.

The charge-book, with its daily reports, is the day-book or journal of a smelter, and the metallurgical statements are the ledger. In the metallurgical statements there are entered on the debit side all the ores smelted, with weights (dry) and as-

says, and the calculated contents of valuable metals. On the credit side is put down the products obtained, as matte and bullion, and the by-products, as drosses, flue dust, barrings, slag, etc., with weights and assays, and their valuable contents figured out in ounces and pounds. The totals of the respective metals on the debit side have to balance with the totals on the credit side.

The assaying of slags every day to make sure of their cleanliness is not sufficient. A clean slag is not a testimonial to a man's competency to run a smelter. Slags have been made which contain only 0.1 per cent. copper, but 70 per cent. of the ore charge reported in the tonnage of "ores" treated was really used as flux. One man may make 10 per cent. flue dust on certain ores, while his successor, by judicious and honest manipulation, decreases that amount to 5 per cent. To do so he has to decrease his blast pressure, and apparently decrease the capacity, which also apparently increases the cost per ton of ore smelted. It is probably due to such practices that at many works the superintendents get credit only for the ore actually smelted (flue dust, barrings, fluxes, etc., being dead material), and wherever that excellent plan is followed, the management has never regretted it. All the by-products, obtained are sampled, and wherever exact weights cannot be secured, fair approximations can nevertheless be arrived at. In continuous operations, errors on one side usually balance errors made on the other side.

In the fuel and flux statements, the amount of fluxes and fuel on hand and in transit, together with their value, are entered on the left-hand side, while on the right-hand side are entered the uses to which they are put. The difference gives the total supply available at the first of the month.

In the statement of ores, by-products, fuels and fluxes, the stocks on hand falling under these different heads are entered, this serving as a ready reference.

Where such a system is inaugurated, the work will be carried on smoothly, not only in each department, but also in all alike. Furthermore, the work is well and equally distributed among those in charge, and responsibility can be properly fixed. The system enables one man at the head of the works to know of all, in detail, that is being done by hundreds of men, and to follow the sometimes intricate phases of the smelting process he is conducting.

At the recent meeting of the White Pass & Yukon Railway Company it was announced that the gain in revenue for 1905 was \$150,000 over the previous year, and the continued mining activity means a heavy future traffic. Machine mining plants are planned for many placer deposits, while quartz mining is to be done on a large scale.

The Sampling and Assaying of Ores from the Cobalt District

BY F. F. COLCORD*

The ores from the Cobalt district are extremely varied, both in the metal contents and in the character of the gangue. Below are some typical analyses of ores from different parts of the district.

Ag. Oz. per Ton.	SiO ₂ %	Fe %	CaO %	As %	Ni & Co %
300	4.0	4.0	5.0	55.0	14.1
350	53.0	12.4	2.2	5.7	4.1
400	46.1	5.8	4.0	6.2	....
3,000	10.0	6.0	5.0	41.0	....
3,000	28.3	....	21.7	2.4	....
5,600	8.3	....	10.3	27.8	....

The one point of similarity in these ores is that on grinding and sifting, metallics remain on the sieve. These metallics, as a rule, contain about 70 per cent. of silver. In some ores large pieces of native silver are present. All this makes sampling an extremely difficult task. The method of sampling used is a form of the alternate shovel, combined with the coning and quartering method.

SAMPLING

The whole lot to be sampled is crushed and rolled to 0.25 in. size and thoroughly mixed. It is then piled in a ridge about 30 ft. long, and again turned over and mixed. The ridge is then halved by alternately shovelling to either side, forming two parallel ridges, of which one is rejected and the other halved as before. This is continued until a 5000- to 6000-lb. sample is obtained. This sample is then coned and quartered to about 1000 lb., which is put through the rolls until it all passes an 8-mesh sieve. If any metallics show on the sieve they are ground in a drug mill and mixed with the fines. The sample is next worked down to about 40 lb. with a Jones sampler, and sifted through 20-mesh. The metallics, if any remain on the sieve, are ground and then thoroughly mixed with the fines. The 40-lb. sample is halved once with the sampler, one half being reserved and the other prepared for the final sampling by again sifting on a 20-mesh sieve and treating any metallics as before. The sample is then quartered down with the sampler to about 5 lb. and accurately weighed. The 5-lb. sample is sifted on an 80-mesh sieve, the oversize consisting of ore and metallics remaining on the sieve is ground for two hours in a pebble mill. After grinding, this portion is again sifted. The oversize is pounded in an iron mortar to free it from adhering fines and then sifted. The oversize (metallics) is weighed, mixed and divided into the requisite number of samples. The fines likewise are thoroughly mixed and divided.

All the rejected portions are again

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shoveled to the original ridge formation and the entire operation repeated three times. Thus four separate and distinct samplings are made of the lot from start to finish. The four samplings should agree within reasonable limits.

ASSAYING

Two methods of assaying the fines are used according to the grade and character of the ore. The first method is usually applicable to ores under 400 oz. in silver and is as follows: Four ½ A. T. portions are fused in F Denver crucibles with 200 grams to each charge of the following flux: Bicarbonate of soda, 10 parts; litharge, 20 parts; potassium carbonate, 3 parts; silica, 3 parts; borax glass, 4 parts. Enough reducing agent is added to each charge to reduce a 30- to 40-gram button. A cover of salt is used.

The lead button obtained is scorified once in a 2½-in. scorifier, cupelled and weighed as usual.

The second method for ores over 400 oz. in silver is a variation of the combination method for silver. Six to eight ½ A. T. portions are weighed into 1000-c.c. beakers. The ore is covered with 100 c.c. of nitric acid and heated to boiling. The boiling is continued for 20 minutes or until decomposition is completed. When decomposed, 300 c. c. of water is added to each, the solution stirred and allowed to settle. The solution is filtered and residue washed. The residues thus obtained, containing most of the arsenic and only a small amount of the silver, are burned, scorified and cupelled as is customary. The silver in the filtrates is precipitated with salt solution, stirred, allowed to stand over night, filtered and washed. The precipitates are burned, scorified and cupelled as usual. The special point is that the residues and the precipitated silver are run separately. The weights of the silver buttons from the residues are added to those obtained from the precipitation and their total reported.

The metallics are assayed by weighing six to ten portions of 1/10 A. T. each into 2-in. scorifiers. They are mixed with 15 grams of test lead, two grams of borax glass and silica (equal parts) and covered with 10 grams of test lead. They are then scorified and cupelled in the usual manner.

The final assay is calculated from the assays of the fines and the metallics according to their respective percentages in the ore.

The carat as a measure of weight for precious stones corresponds to about 205 mg. The International Committee of Weights and Measures has authorized the use of the name "metric carat," as a commercial designation for 200 mg., to replace the old carat. During the past year considerable progress has been made in the adoption of the new weight.

THE ESPERANZA MINE, SPAIN

A New Copper-mining Enterprise in the Huelva District

BY EDWARD WALKER

During the last few years several of the copper mines in the Huelva district of Spain have been acquired and developed by English and German firms. Until recently the Rio Tinto, the Tharsis, Mason & Barry (the last over the border in Portugal), and F. C. Hills & Co. were the only English companies of any importance operating in this district. These names have since been supplemented by the Pena, the San Miguel, Tinto y Santa

ber of separate workings, of which the Esperanza and the Angostura are the most developed. The other properties are the Mosquitos, Forzosa, Palmira, Santo Thomas and the Nueva Esperanza. The accompanying illustrations show in Fig. 1 a general map of the district; in Fig. 2 a plan of the properties of the company; in Figs. 3, 4 and 5 details of the Esperanza workings; and in Figs. 6 and 7 details of the Angostura.

iards residing in Seville, and more recently F. C. Hills & Co. did some further work on it. Since 1900 it has been in the hands of a private English syndicate, which purchased it and set itself to develop it in order properly to prove its importance and the value of its mineral masses. Considerable success has attended these efforts, for in spite of the poor surface showings large bodies of ore have been opened up at depth. An English company has recently taken the project over, and as it has the command of plenty of working capital, it is probable that the mines will become large producers in the near future.

OPERATING CONDITIONS

With regard to transport facilities it

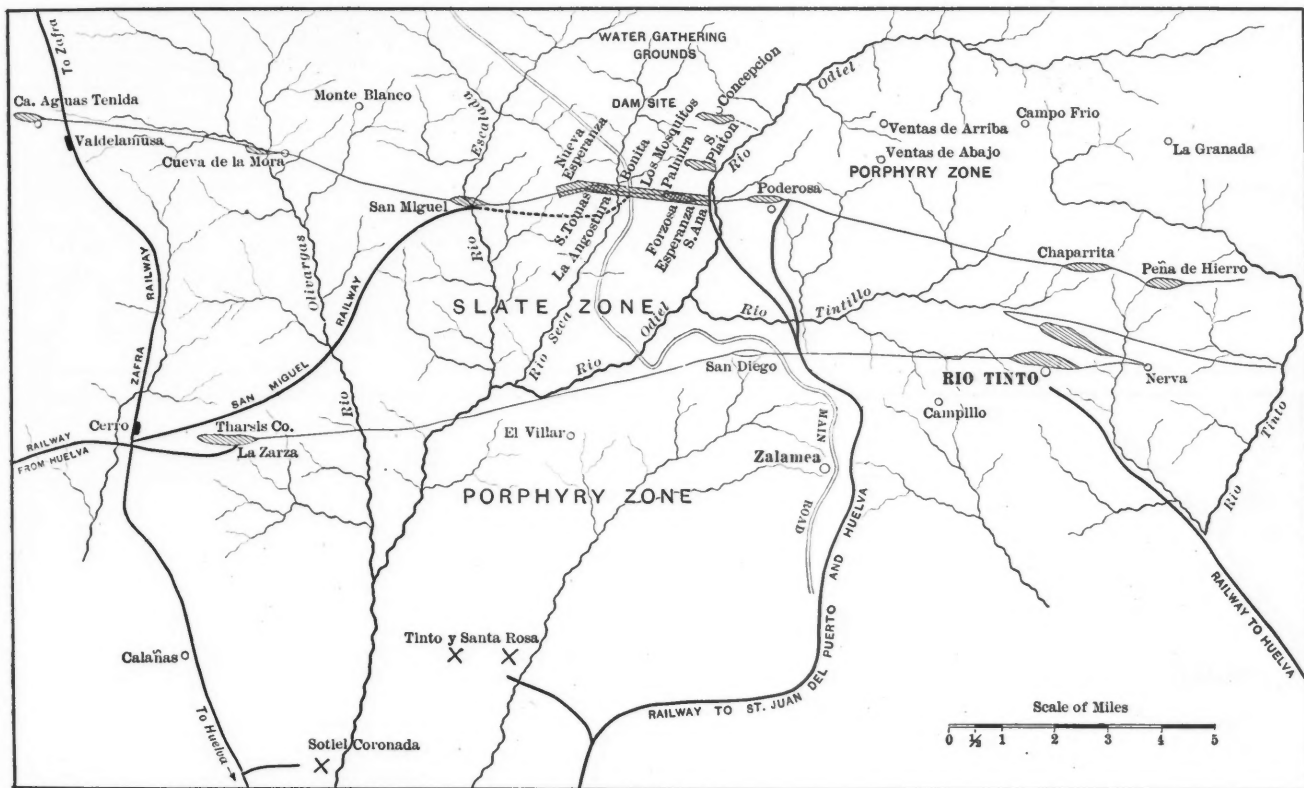


FIG. 1

Rosa, Sotiel Coronada, and the Esperanza group. The Pena is worked by an English company, the shares of which are owned chiefly by the Siemens families in Berlin and London. The San Miguel was acquired by German investors through the instrumentality of Aron Hirsch & Sons. The Tinto y Santa Rosa and the Sotiel Coronada belong to the United Alkali Company, of Liverpool. The Esperanza group was developed by a private English syndicate and about a year ago was handed over to a London company called the Esperanza Copper and Sulphur Company, Ltd., which provided a large sum of money for developments and working expenses. It will be of interest to give some information about this mine. The Esperanza group consists of a num-

HISTORY OF THE MINES

Like most of the mines in this district, the Esperanza group has been worked off and on from time immemorial; but, owing to the narrow outcrop and poor surface showings, the work done by various owners was until recently on a very small scale. It must have been worked to a certain extent in Roman days, for there are still in existence the characteristic narrow Roman shafts with footholes alternately on either side, just wide enough for the miner, or rather slave, to ascend and descend. It is probable that the Romans worked for the layer of concentrated gold ore between the iron oxides and the sulphides, and not for the copper. About 1850 the Esperanza group was worked in a small way by Span-

may be mentioned that the property is about 40 miles from Huelva. An extension of the Buitron Railway Company's line beyond Zalamea is now in course of construction and it will pass the eastern end of the property. A narrow-gage railway has been built along the property to this branch of the Buitron railway. It would be possible to extend this narrow-gage line to the San Miguel company's railway and thus reach the Zafra & Huelva Railway, so gaining two approaches to the port. Water, labor, and timber present no difficulties. The only costly item is coal, which has to be imported, and costs 28s. 6d. a ton or more.

GEOLOGICAL CONDITIONS

As is well known, the bodies of pyrites

occurring in the Huelva district are found at the contact of the slate and porphyry zones. In Fig. 1 it will be seen that the Rio Tinto, San Diego, and Zarza are found on the same line of contact, and the San Miguel, Esperanza, Pena, and others on a more northerly line of contact. The outcrops are the characteristic iron caps, and the orebodies are lenticular masses of

the Angostura, some development has been done by shaft and some by open work. It will be seen that at the Angostura there are two parallel bodies of ore with decomposed porphyry in between. In Fig. 7 the indications point to these two bodies joining lower down.

ORE DEVELOPMENT

As regards the amount of ore exposed,

adjoining mines, the amount of possible ore will be considerable. If the whole of the orebody continues in depth to an average of 65 ft. below the Forzosa level, that is for half the depth proved in the main shaft, there will be an additional 490,000 tons, which may be put down as probable ore. The mine, therefore, has, altogether, 820,000 tons of known and

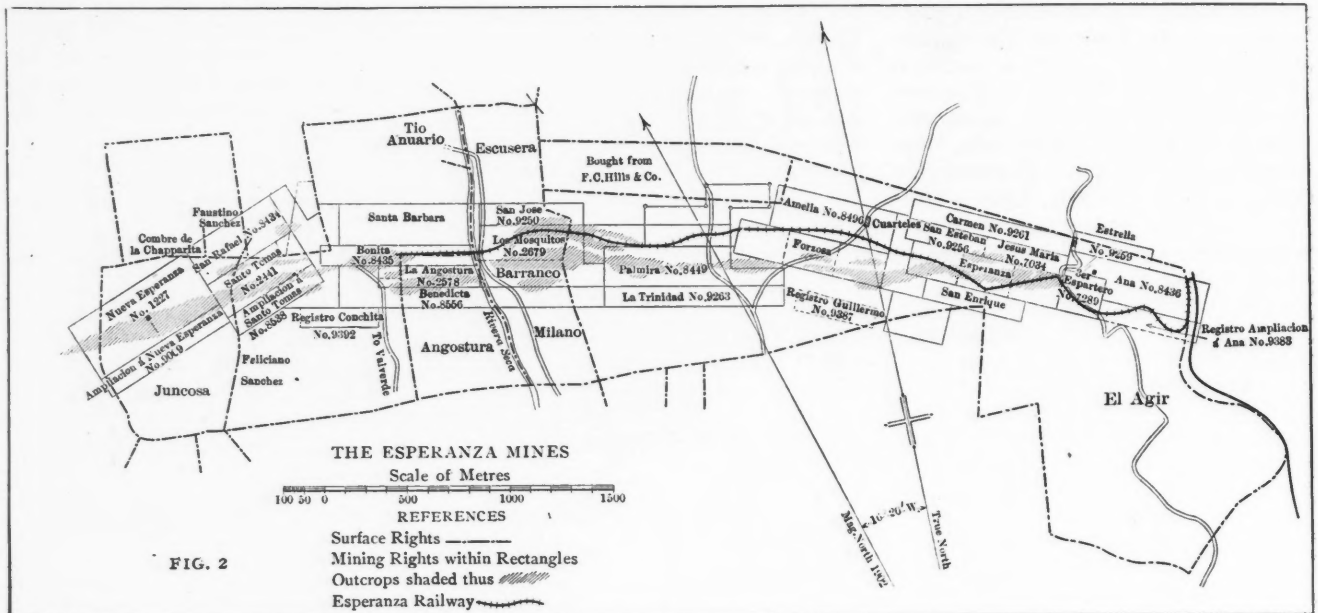
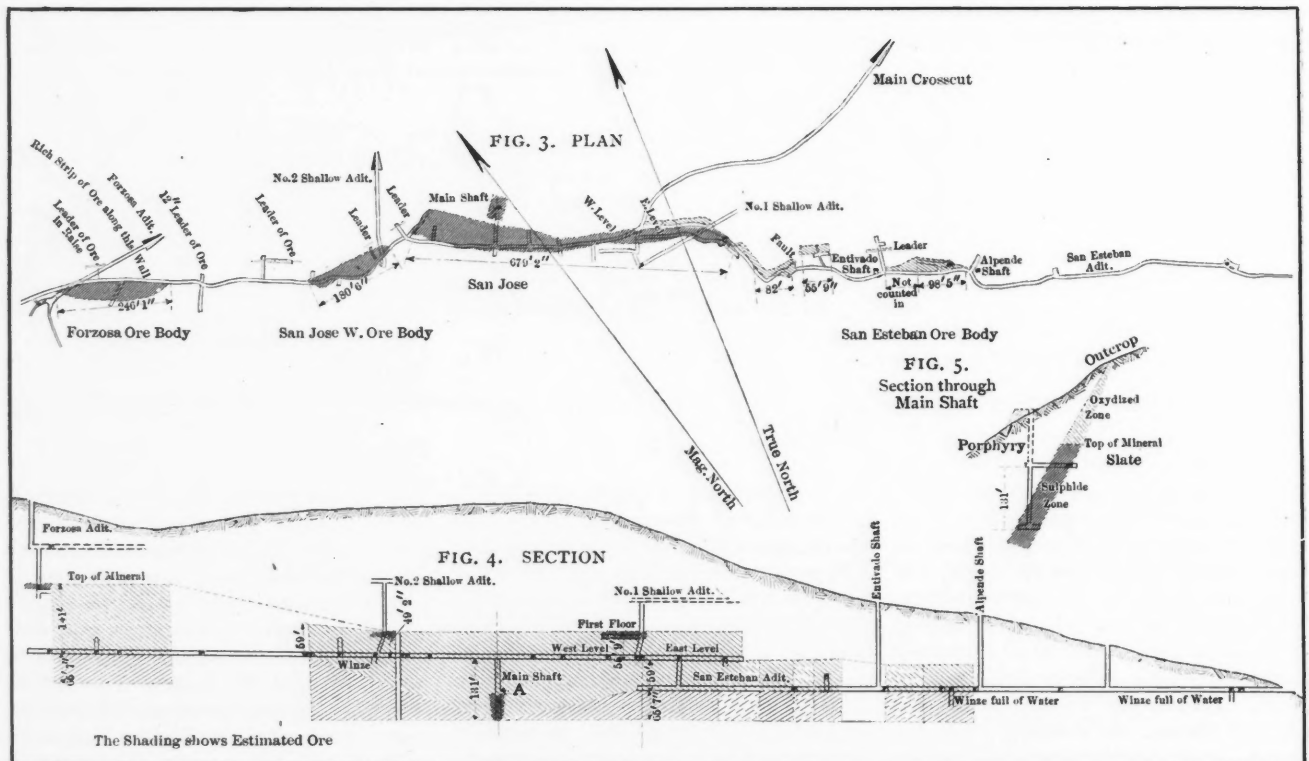


FIG. 2



varying depths. Figs. 3, 4 and 5 show the method of occurrence on the Esperanza, and Figs. 6 and 7 on the Angostura. In the former case the exploring and development work has been done by shafts and adits from two different points, viz., the Forzosa and the San Esteban levels. At

a prominent engineer estimates that above the levels of the Forzosa and San Esteban adits, the Esperanza mine contains 330,000 tons of pyrites. The main shaft has proved the existence of ore to 130 ft. below the Forzosa level, and judging from experience at the San Miguel and other

probable ore. On the same system it is figured that at the Angostura there are 400,000 tons of known and probable ore. At the other properties of the company, development has not proceeded far enough to enable any reliable estimates to be made. In fact the operations of the com-

pany will for some years be confined to the deposits previously described.

CLASSES OF ORE

As at the other mines in the Huelva district the ore can be sorted into three classes: (1) Ore containing over 2½ per cent. copper, which can be sold for export as copper ore; (2) ore containing from 0.8 to 2½ copper, which is first treated locally by leaching and ultimately sold for its sulphur content; and (3) ore containing less than 0.8 per cent. of copper, which is sold at once for its sulphur content. Of the total ore mentioned as being known and probable it is estimated that in the Esperanza the amounts will be distributed fairly equally among the three classes, while at the Angostura the bulk will belong to class 2. In a long series of assays it is observable that the ore can be

eral and 3 pesetas a ton for open-cast work. Transport to Huelva will come to 7.80 pesetas a ton, and freight to English ports 11 pesetas a ton. In addition there are local taxes which come to 3.25 pesetas a ton. The total cost of the ore at an English port will be 28.05 pesetas for mined ore and 25.05 pesetas for open-cast ore. At the present rate of exchange this will come to 17s. 6d. and 15s. 7d. respectively. It is estimated that there are 370,000 tons of this first-class ore averaging 3.65 per cent. copper and 48 per cent. sulphur. With copper at £63 a ton and sulphur at 4d. per unit, the company should receive 28s. a ton for copper contents, and 15s. a ton for sulphur contents, or a total of 43s. a ton, being a profit of 25s. 6d. a ton for mined ore and 27s. 6d. for open-cast ore. Mr. Addie estimates

Petroleum in Texas and Louisiana

SPECIAL CORRESPONDENCE

The production of the coastal oil fields on Nov. 14, as compared with that on Oct. 31, shows an increase of 900 bbl. in Texas, and a decrease of 2600 bbl. in Louisiana. The output Nov. 14 was 48,200 bbl., of which 17,400 bbl. was credited to the Jennings field. Humble, Batson and Saratoga show an increased production, while Dayton, Sour Lake and Spindletop output decreased. The Texas Company has placed the order for pipe for their new line from Humble to Indian Territory; and the Mellon interests, which control the Guffey Petroleum Company and the Gulf Refining Company, have decided to construct another 8-in. pipe line in order to obtain a steady sup-

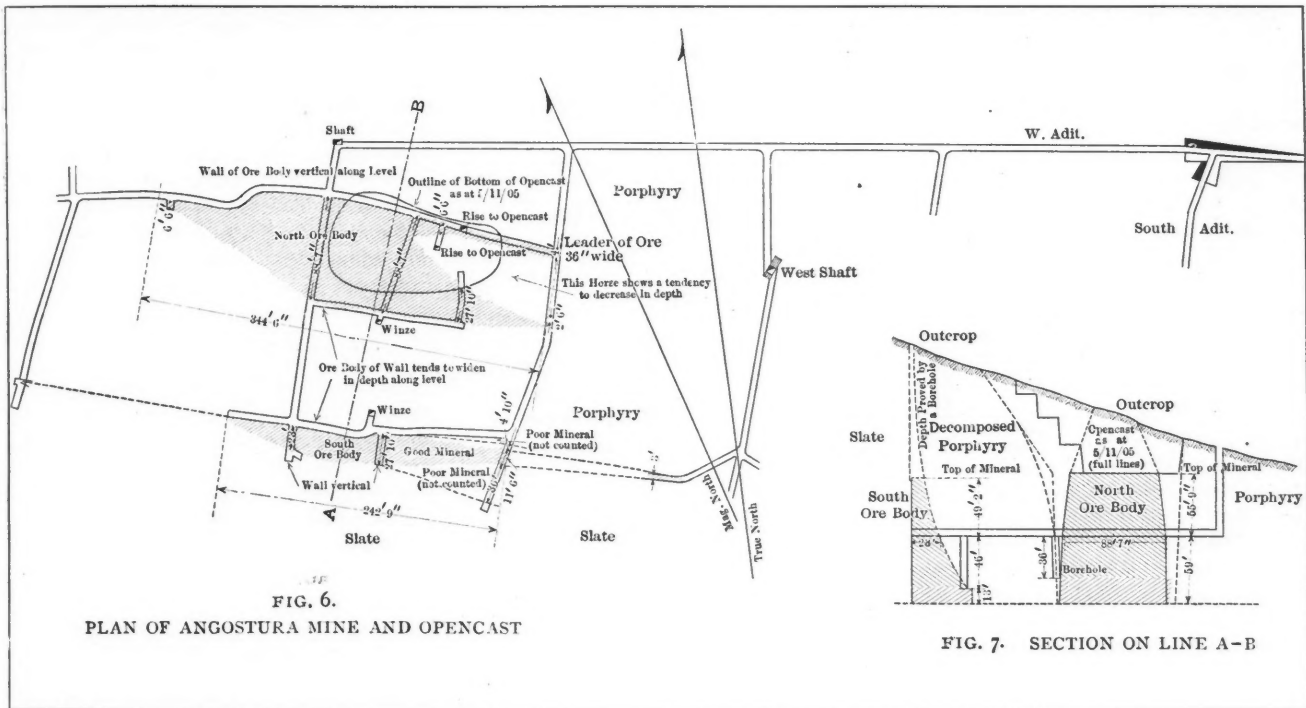


FIG. 6. PLAN OF ANGOSTURA MINE AND OPENCAST

FIG. 7. SECTION ON LINE A-B

won with very little gangue matter. In the Esperanza mine there are something like 100,000 tons of known ore running near 6 per cent. copper and 47½ per cent. sulphur. It is not intended at present at any rate to do any smelting, and the ore of class 1 will be sold for export.

The system of leaching of class 2 ores will be the same as adopted at most of the Spanish mines. The ore is spread on floors and watered from time to time. The sulphuric acid formed by oxidation of the pyrites extracts 85 per cent. of the copper in from three to six years, and the copper is precipitated by pig iron.

COST OF PRODUCTION

The cost of operations at the Esperanza will be approximately the same as at other mines in the district. It is estimated that mining, hauling, and pumping will cost 6 pesetas a ton for mined min-

eral and 3 pesetas a ton for open-cast work. Transport to Huelva will come to 7.80 pesetas a ton, and freight to English ports 11 pesetas a ton. In addition there are local taxes which come to 3.25 pesetas a ton. The total cost of the ore at an English port will be 28.05 pesetas for mined ore and 25.05 pesetas for open-cast ore. At the present rate of exchange this will come to 17s. 6d. and 15s. 7d. respectively. It is estimated that there are 370,000 tons of this first-class ore averaging 3.65 per cent. copper and 48 per cent. sulphur. With copper at £63 a ton and sulphur at 4d. per unit, the company should receive 28s. a ton for copper contents, and 15s. a ton for sulphur contents, or a total of 43s. a ton, being a profit of 25s. 6d. a ton for mined ore and 27s. 6d. for open-cast ore. Mr. Addie estimates

The great copper mines of Katanga, in which the Tanganyika Concessions, the Special Katanga Committee, and the Société Générale Belgique are interested, have been amalgamated into a company called the Union Minière du Haut Katanga. The Rhodesian railway is to be extended to the mines and is to be connected with the Benguella railway, giving an outlet on Lobito bay. The railway construction is to be rapidly pushed.

ply of light Territory crude for refinery use. H. Y. Arnold, formerly manager of the Gulf refinery at Port Arthur, is now at Tulsa, I. T., arranging for the immediate construction of gathering lines, storage tanks and loading tracks in order that 4000 or 5000 bbl. of crude can be shipped by rail daily until the pipe line shall be in operation.

Credit balance quotations remain unchanged, but contract crude is very firm. Stored oil is estimated at 12,000,000 bbl., of which two-thirds is held by refining interests.

Contract prices and output of the various fields on Nov. 14 were as follows: Humble, 7000 bbl., 70c.; Batson, 6900 bbl., 65c.; Saratoga, 8100 bbl., 67c.; Sour Lake, 6000 bbl., 70c.; Spindletop, 2800 bbl., 70c.; Jennings, 17,400 bbl., 72c. Total output, 48,200 barrels.

INDEPENDENT STIRRER FOR ELECTROLYSIS

An Inexpensive Substitute for Rotating Cathodes

BY E. L. LARRISON*

The greatest objection that can be advanced against the electrolytic method in the technical laboratory is that it is slow, and that is almost fatal. As ordinarily applied for copper, i. e., deposition from a nitric acid solution with stationary electrodes, a matte, or even an ore moderately high in copper, requires from 6 to 24 hours on the battery. This usually means that a sample received one day cannot be reported till the next. There is no half-way accuracy about the method. If we try to hurry and sponge the deposit the determination is worthless.

CONDITIONS AFFECTING SATISFACTORY DEPOSITION

The speed of satisfactory deposition depends upon several things, the most important of which are: (1) Area of cathode; (2) concentration of solution (relative to copper); (3) other cations present; (4) homogeneity of solution, i. e., circulation; (5) the presence of acids, hydrocarbons, etc., in varying amounts. Plainly it is possible to change any or all of these things. However, most of them would involve operations which in themselves require time and an elaboration not warranted.

It is not feasible to increase the cathode area to an extent which would do much good without increasing the volume of the solution and thereby decreasing its concentration. In the matter of concentration the size and shape of the electrodes and jars immediately limit the volume of solution which must be used. An ideal solution would be one which contained no other metals, but unless such metals actually contaminate the deposit it is not expedient to remove them.

The two other factors enumerated, viz., circulation and the presence of acids, hydrocarbons, etc., can be easily and quickly varied. Moreover, both have very marked effects upon the speed of deposition, and the condition of the deposited copper.

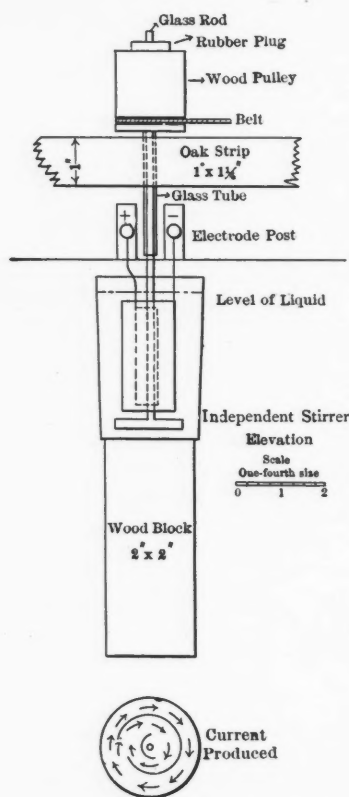
PREVIOUS EXPERIMENTS

Some very valuable results along these lines have been published. Gooch and Medway in *American Journal of Science*, xv, p. 320 *et seq.*, describe the use of a rotating cathode to produce circulation and homogeneity of the electrolyte with a marked decrease in time required for complete deposition. Classen also describes the use of a rotating platinum crucible as a cathode. Later, in the *Proceedings of the American Chemical Society*, Exner describes a rotating anode and gives some results.

In all these cases, as well as in most of

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the results which have been published, the data are derived from experiments on a solution of copper sulphate acidified with nitric acid. These results are certainly valuable theoretically, but when we come to the electrolysis of ores, mattes, etc., containing various other electro-positive elements, the conditions are somewhat changed. In the matter of speed especially is this felt. However, these accounts show clearly that circulation is the great agent for rapidity. By a rapid circulation



FIGS. 1 AND 2. INDEPENDENT STIRRER FOR ELECTROLYTIC ANALYSIS

the solution is kept at all times homogeneous and sponging is prevented even when the current density is increased to four or five amperes per 100 sq. cm. of cathode area.

DESIGN OF INDEPENDENT STIRRER

A short time ago another method of producing circulation was arranged in this laboratory. This consists of using an independent stirrer with ordinary stationary electrodes. The arrangement has the marked advantage of using the equipment already in place and consequently being inexpensive. An approximate comparison of the cost of six rotating anodes, as quoted in a trade catalog, with the same

number of independent stirrers, is as follows:

Six rotating anodes @ \$10.00.....	\$60.00
Six independent stirrers @ \$1.65.....	9.90
Saving in favor of the latter.....	50.10

The stirrers are simple glass rods, with propeller-like blades at one end. At the top of each is a light wooden pulley fitted with a cork which may be loosened to allow the pulley to run as an idler when the particular stirrer to which it is fitted is not in use. Such stirrers may be purchased at several of the leading supply houses. It is a very easy matter to make a stirrer at the laboratory which, though not beautiful, will be entirely satisfactory.

The electrodes are of the ordinary hollow cylindrical form. The cathodes are 2 in. wide by 3.5 in. long when spread flat. The anodes of the same form are 1.75 in. by 0.75 in. The plating area is 2x7 in., or 14 sq. in. The cathode is bent so that a section is as shown in Fig. 2. This produces circulation inside as well as outside, the current flowing as the arrows show. The rod of the stirrer passes between the electrode posts and down through the anode, the blades rotating just below the electrodes. The slight twist of the blades gives an upward throw to the current. Six pairs of electrodes are thus equipped, all being run by a 0.1-h.p. motor. A 1/8-in. round leather belt transmits the power.

METHOD FOR ORE AND MATTE

The method pursued in running ores, mattes, etc., is as follows: For ores running 2 to 3 per cent. Cu, 2 grams are weighed out into a No. 2 beaker. For mattes running 20 to 50 per cent. Cu, 1 gram is taken. From 8 to 15 c.c. of nitric acid saturated with bromine is added and the beaker placed on the hot plate. Evaporation is allowed to proceed until pastiness is reached and sulphur appears as a yellow globule. From 6 to 10 c.c. of sulphuric is now added, and heat applied till the nitrates are converted to sulphates and white fumes appear. When cool a little water is added and the beaker set on the hot plate till the sulphates are in solution. Ammonia is added till the solution is neutral, and nitric, sulphuric, etc., are introduced. The solution is now ready for the battery. Ores, unless entirely soluble, usually require filtering, for silica or other insolubles will scour off copper as it is deposited, when the solution is rapidly stirred. Filtering and clean washing are rapidly accomplished by using a sand filter. When interfering elements, such as arsenic, bismuth, etc., are present, some modification will be necessary.

To test the end point of the deposition a spot plate with H₂S water is used. When finished the stirrer is stopped and the cathode removed to a beaker of water. This operation takes less than 15 seconds, so that no appreciable amount of copper is re-dissolved after the current is broken. The cathode is washed a second

time in water, and twice in alcohol, and the latter ignited.

In order to determine the most rapid and satisfactory solution to use in running mattes and ores high in iron, the following determinations were made:

ANALYSIS OF A MATTE

A 5-gram sample of matte containing 44 per cent. was treated as above described and made up to 1000 c.c. Lots of 50 c.c. were drawn off with a pipette into battery beakers and each made as nearly neutral as possible without precipitating iron. To each was added a measured amount of nitric or sulphuric acid. The amount of copper deposited from each in 15 min., the current density being approximately constant, was first determined. The total copper was then deposited from duplicate solutions to determine which yielded the last traces most readily. The speed of the stirrer was about 250 r.p.m. till near the end when it was increased to 300 r.p.m. The results follow:

Solution.	Volts.	Amperes.	Copper.	Condition.	Total Time.
Neutral.	3.2	.30	.0575	Poor.	45 min.
2HNO ₃ -2H ₂ SO ₄	3.2	.80	.0758	Good.	30 min.
5HNO ₃ -5H ₂ SO ₄	3.1-3.4	.8-.85	.0757	Good.	30 min.
5HNO ₃	3.4	.80	.0755	Good.	35 min.
10HNO ₃	3.0-3.5	.90	.0774	Good.	38 min.
5H ₂ SO ₄	2.6-2.7	.50	.0752	Poor.	Not finished.
10H ₂ SO ₄	2.5-2.6	.60	.0805	Poor.	Not finished.

In the solutions where nitric acid was used alone, the deposit was brilliant and not apparently crystalline. When sulphuric was used equally with the nitric, the deposit was still bright and firm, but distinctly crystalline. When sulphuric was used alone, the deposit was dull and loose and dark, even though the current strength was reduced and the speed of the stirrer increased. It has been stated that either nitric or sulphuric acid solutions can be used successfully for this work, but experiments here with straight sulphuric solutions have been decidedly unsatisfactory.

Organic compounds, such as urea, and the hydrocarbons, seem to prevent sponging, but they tend to make the determinations run too high, probably due to the separation of solid carbon. The deposits they produce are certainly beautiful, but in accurate work they are not safe.

Considering the data recorded above as well as many observations on the daily run of work, a solution containing from 2 to 5 c.c. each of nitric and sulphuric seems most satisfactory with this class of material. When other elements are present in considerable amounts some other combination may prove better.

REMOVAL OF LAST TRACE OF COPPER

As intimated above, one of the chief difficulties is in removing the last two or three milligrams of copper. Some operators recommend the practice of electrolyzing till only a small amount remains

and estimating the residue by the ammonia colorimetric method. This in a measure makes one method dependent on another, and while it might be satisfactory for a straight copper sulphate solution it is decidedly not so for a matte or an ore containing much iron. The addition of ammonia will produce a voluminous precipitate of the hydroxide which will hold up some copper unless reprecipitation and very thorough washing are performed. In ordinary cases the copper can be entirely deposited by allowing a few minutes additional on the battery. As a precaution it is a good thing to add a few cubic centimeters of H₂S water to make sure that the deposit is complete. In the event of a milligram or two remaining in the solution the color produced will enable a very close estimate of the amount. It is necessary during the last few minutes of the electrolysis to reduce the current and increase the speed of the stirrer, as the solution has become

very dilute with respect to copper and the current which was suitable at the beginning of the run will produce sponging or discoloration. It is a rather peculiar thing that if the current is reduced too much, a part of the deposit will quickly redissolve. A little practice will show the proper reduction.

TIME REQUIRED

There is a kind of sponging that sometimes takes place if the current is too strong, or the stirring too slow, that is a very insidious cause of loss. It is a loose granulation or crystallization rather than an ordinary sponging and the color of the deposit remains good. The granules are easily dislodged and drop to the bottom of the beaker and H₂S water will fail to show color. However, if the solution is decanted off and a little nitric is added, and then H₂S, the copper can be detected. Close inspection and careful regulation of current and speed of stirrer will avoid this trouble.

The time necessary for complete deposition does not vary directly with the amount of copper in a solution. While the solution is concentrated the deposition is rapid, for the current may be kept high, but it seems necessary to allow about 10 or 12 minutes to deposit the last one or two milligrams in good condition, as the current must be reduced. The following figures show this to some extent.

Cu. Deposited.	Time.
.4827	55 min.
.2502	35 min.
.0540	22 min.

EFFECT OF IRON

The effect of iron, which is high in mattes and most ores, is shown by the following in which c.p. reagents were used.

- (1) 0.5 g. CuSO₄, 2.5 c.c. HNO₃. Time 15 min. Volts 3.1-3.5. Amp. 0.7-0.65. Deposit 0.0870 g.
- (2) 0.5 g. CuSO₄, 0.25 g. FeSO₄, 2.5 c.c. HNO₃. 15 min. Volts 3.3. Amp. 0.8. Deposit 0.0822 g.
- (3) 0.5 g. CuSO₄, 0.5 g. FeSO₄, 2.5 c.c. HNO₃. 15 min. Volts 2.9-3.0. Amp. 0.75-0.80. Deposit 0.0766 g

These results indicate that while iron increases conductivity it retards deposition, this effect increasing with the amount of iron present in a fairly constant ratio. Beyond this it seems to have no detrimental effect. It may be mentioned that by heating the solutions to about 80 deg. C. the time of deposition may be still further decreased.

EFFICIENCY OF THE METHOD

In the technical laboratory with many assays going at once, the use of the independent stirrer permits the deposition of amounts up to 0.25 gram Cu in about 1.5 hours with very little attention. For 0.5 gram about two hours are necessary. As a rule it will not be necessary to take such a weight of sample as will contain more than this. Ores, containing say 0.06 gram, in a two-gram sample, may be finished in one hour. If more care and regulation is given the apparatus this time can be considerably reduced, but for the busy laboratory the above estimates are about what may be expected. These results compare well with those obtained with rotating anodes or cathodes, and the cost of installation is far less, while the apparatus is fully as convenient and simple.

Mineral Exports of Spain

Exports of metals from Spain during the nine months ending Sept. 30 are reported by the *Revista Minera*, of Madrid, as below, in metric tons:

	1905.	1906.	Changes.
Pig Iron.....	40,298	22,384	D. 17,914
Man. Iron and steel...	4,181	22,192	I. 17,011
Copper.....	7,179	7,919	I. 740
Copper precipitate.....	13,479	17,193	I. 3,714
Lead.....	127,698	134,706	I. 7,008
Zinc.....	1,162	988	D. 174

Exports of minerals for the nine months are reported as follows, also in metric tons:

	1905.	1906.	Changes.
Iron ore.....	6,151,997	7,221,742	I. 1,069,745
Copper ore.....	765,351	828,966	I. 63,615
Zinc ore.....	101,092	108,200	I. 7,108
Lead ore.....	4,489	3,509	D. 980
Manganese ore.....	34,785	73,671	I. 38,886
Pyrites.....	539,901	780,320	I. 241,319
Sulphur.....	507	451	D. 144
Salt.....	289,860	367,972	I. 78,112

Imports of chemicals for the nine months were: Alkaline carbonates and silicates, 10,473 tons, a decrease of 1184 tons; soda sulphate, 2193 tons, an increase of 81 tons; caustic soda and potash, 10,834 tons, a decrease of 8 tons; mineral fertilizers, 139,884 tons, a decrease of 6170 tons; phosphates and basic slag, 51,453 tons.

COAL MINING AT HOLDEN, W. VA.—II

The Location, Development and Operation of a Great Enterprise

BY R. H. LYMAN*

(Concluded from page 1120)

MACHINE SHOP

One of the striking features of the enterprise is the machine shop, which is modern and up-to-date in every particular. It is a large frame building 51x151 ft., with a heavy mill-construction floor obviating the necessity of special foundations for the machinery. A standard-gage mine track runs the entire length of the building, from the carpenter shop on

shop has three forges, besides all necessary tools, and is paved with brick. The company manufactures all its own mine cars in this shop, which, together with the repair work incident to an operation of such magnitude, keeps this department more than busy.

STABLE

Midway between the two tipples is the stable. This is a frame building 135x35

streets of attractively designed frame cottages with porches, built on stone foundations and plastered throughout. With the exception of the two- and three-room cottages they are all double houses, containing four and five rooms to the side; all have running water and electric lights; open grates in all rooms except the kitchen. The general color scheme is Indian red, with black trimmings, though this is broken in the case of special buildings, producing an effect of rare attractiveness in a mining camp. There are four very pretty cottages known as foreman houses, each containing seven rooms with modern bath and plumbing, and heated with hot-air furnaces. For the use of men without families, three large frame boarding houses are provided.



FIG. 7. LOADING PIER AT HUNTINGTON

the east end through the machine shop and blacksmith shop, the latter occupying 50 ft. at the west end of the building, and into the manways of No. 1 and 2 mines near by.

A ten-ton Case traveling crane is installed in the main bay and a pit is also provided for repairs of mine locomotives, etc. The sides are practically all glass, affording ample light and ventilation. Ventilators controlled from below are also provided in the roof.

The equipment consists of one 12-in. lathe, one 24-in. lathe, one bolt cutter, one pipe machine, one power hack saw, radial drill, emery wheel, 800-lb. steam hammer, shaper, band saw and combination wood worker; two lines of 2-in. shafting, supported by Hyatt roller bearing hangers run the full length of the machine shop proper. All machinery is driven by a 15-h.p. induction motor. The blacksmith

shop has three forges, besides all necessary tools, and is paved with brick. The company manufactures all its own mine cars in this shop, which, together with the repair work incident to an operation of such magnitude, keeps this department more than busy.

HOUSES

The first sensation of the visitor to Holden is one of astonishment at the excellence of the miners' "dwellings;" instead of the usual miners' cabins, made of rough lumber, and set on stilts on the mountain side, the eye is delighted with

The clerical force, engineers, etc., are comfortably taken care of in the "Club House." This is a large, three-story structure, with about twenty sleeping rooms, baths, library, large dining room and kitchen, steam-heated throughout. The first floor is finished with quartered oak from the company's own mill; the halls are roomy and light. In the library is a large open fireplace, and with a good book from the well stocked shelves, or a current magazine, there are all the elements to make home happy. In the summer the wide veranda affords cooling shade and a fine view of the camp. In the basement are two standard bowling alleys, and at the rear on the hillside the foundation is in for an up-to-date squash court. A small building, hidden among the trees a short distance away, is fitted up for the servants' quarters.

Near the Club House, but higher on the hillside, commanding a magnificent view of the entire plant, is the residence of the general manager. This is just completed. Its outward beauty is quite equaled by its interior finish, which is in hardwoods, and its general suggestion of comfort. The spacious living room and the dining room are wainscoted in quartered oak and stained birch respectively, and each has a large open fireplace. The furniture is

ods in charge of ministers of different denominations.

WATER SUPPLY AND FIRE DEPARTMENT

Water for domestic use is furnished by driven wells, averaging about one pump to every four houses. Water is also pumped into a 200,000-gal. tank, located on the hillside above the power plant, at a sufficient height to afford ample pressure. An 8-inch main leads from the tank to the

valley below, connecting with 4-in. and 6-in. mains, which distribute the water throughout the entire town. Fire plugs are placed at numerous points, and a regularly organized and equipped fire department furnishes excellent protection. A suitable and centrally located two-room building is provided wherein to keep the hose carriage and other apparatus, one of the rooms being arranged for meetings, etc. A complete system of fire signals has been arranged whereby the power plant is immediately notified by electric signals of the approximate point of the fire and, in turn, alarms and indicates the location to the people. Fortunately the department has been called out but a few times, and in each instance has thoroughly demonstrated its efficiency.

A pleasing feature is the farm. Many acres of the bottom lands are under cultivation and the produce sold through the store. Beef cattle, hogs and poultry are being raised and fresh milk is delivered daily from house to house. To the uninitiated the unusual excellence of everything might suggest extravagance, but it has been demonstrated that good dwellings attract and retain good men who are willing to and do pay a higher rent than for inferior houses. The extent of the property is so great, and with the opening of several new mines contemplated, the period of its active operation will extend over so many years that no expense has been spared to erect buildings which will last, with a minimum amount of repair, as long as the work goes on.

SANITATION

Much attention has been paid to sanitation, each house being provided with gar-



FIG. 8. COAL TIPPLE NO. 1

massive and made from native woods to match, by the company's own men.

A modern two-story frame school building, with four rooms, thoroughly equipped with all the essentials of a graded school, is in full swing, with its competent teachers in striking contrast to the log cabin used for the purpose by the natives only four years ago.

For the entertainment of the community a roomy and thoroughly-appointed theater building, with a seating capacity of 500, has been erected, and the wandering thespian can speak his lines across the footlights, with all the accompaniments of box scene and drop curtain, and even the appreciative and familiar plaudits from the gallery. On either side of the main entrance are barber shop and doctor's office, while the second story is fitted up for the use of the various fraternal orders. A roomy structure is also under way for the colored brethren. The first floor will be equipped as a church, and the second floor given over to amusements, lodge meetings, etc.

CHURCH

An attractive church building to accommodate 200 people has just been completed and furnished by the company. It is designed to have services at stated peri-



FIG. 9. MAIN HAULAGE-WAY

bage receptacles, which are emptied daily. Encouragement is given to householders to maintain their yards in a neat and cleanly condition. Stock is not permitted within the town limits. These precautions,

distance service is furnished by the Southern Bell Telephone Company.

ISLAND CREEK FUEL COMPANY

As a result of the ready market found for the output and the inability of the

with a daily loading capacity of 3000 tons, on the Ohio river at Huntington, West Virginia, and has about completed a modern elevator at Sekitan, Ohio, about 16 miles below Cincinnati. They have already purchased 100 fifty-ton hopper-bottom cars, made to their own specifications by the South Baltimore Steel Car and Foundry Company, in which the coal will be carried direct from the mines to Huntington, West Virginia, loaded in their own barges and towed by their own steamers down the river and delivered either to other elevators or to their own at Sekitan and thence transhipped over the Big Four or Baltimore & Ohio Southwestern Railroads to interior points.

ISLAND CREEK COAL SALES COMPANY

All the coal produced is handled through the Island Creek Coal Sales Company, with offices at 605 Mercantile Library Building, Cincinnati, Ohio.

Too much praise cannot be given the president and directors of this great enterprise for the broad and liberal policy they have observed from its early beginning to the present moment. To throw hundreds of men of all nationalities into the remote backwoods, open mines, fell forests, divert streams, build miles of railroad and create a modern town of a 1000 contented souls, all without a single labor disturbance speaks volumes for the wisdom and humanity of their policy. No policy, however, could carry such an en-



FIG. 10. PIT MOUTH, MINE NO. 2

together with pure water supply, have done much to promote the healthy conditions which prevail.

ISLAND CREEK STORES COMPANY

The commissary department is operated under the name of Island Creek Stores Company, incorporated under the laws of the State of Maine. E. P. Merrill is president and W. J. Crutcher, a man of wide experience in the business, is manager. The main store building is a handsome stone structure 50x100 ft., two stories in height, with a concrete floor cellar under all, is heated by steam and is practically fire proof. All of the space is utilized by the store with the exception of the front part of the second story, which is used for offices by the mining company.

A very large and complete stock of merchandise appropriate to such a business is carried. Purchases are made in as large quantities as seem expedient, and a railroad track runs alongside the buildings to facilitate unloading with a minimum of handling. Prices are kept as low as possible, and the absolute lack of the "pluck me" spirit is attested by the liberal patronage given by the employees and the very few complaints made, a consummation devoutly to be wished in a company store.

TELEPHONE EXCHANGE

Located in the office is the telephone exchange. About 40 instruments are installed, connecting all departments. An operator is on duty day and night. Long-



FIG. 11. SAWMILL

Chesapeake & Ohio Railway Company to furnish a sufficient number of cars the Island Creek Fuel Company was incorporated. Mr. Merrill is also president of this company and J. C. Beebe, general manager. This company has just completed the erection of a large river tipple,

terprise to a successful issue unless ably executed, and to the tact, energy and ability of general manager, E. P. Merrill, and his corps of willing and able assistants is largely due the existence of Holden, one of the model industrial towns of America.

First-Aid Contest in the Anthracite Coalfield

What is claimed to be the first competitive meeting of coal-mine rescue teams

and other obstacles such as a carload of coal, a pile of rock, etc., and then place in an ambulance. The test was made to resemble conditions in a mine as nearly as possible. The silver cup was awarded to the Avoca team, which completed the

petitor was to treat a man with a wound on the temple and to open a packet and treat the wound, Benjamin George won first prize, doing the work in 3 min. 5 sec. In the contest for two men, an injured man was carried in a four-hand seat for a distance of 50 ft.; the Avoca team won this event, doing the work in 25 sec., which was one of the best features of the day.

There were representatives present from all the anthracite companies, and they were entertained at luncheon by General Manager May of the Hillside Pennsylvania Coal Company, who has for several years encouraged this work among the miners.



FIG. 12. FOREMEN'S COTTAGES, HOLDEN, W. VA.

was recently held at Scranton, Penn. The results of the contest were pleasing and satisfactory, as they are creating interest in this commendable work that could not be awakened in any other way. The meeting was held under the auspices of the Hillside Pennsylvania Coal Company, which has encouraged first-aid work among its employees, until each of its 36 operations is now equipped with a full team thoroughly trained in this work.

To demonstrate to the public, and to make it possible for all the men to be present, a day was set apart for the general contest. It would have been impossible to witness the work of all the teams in one day, and with the purpose of reducing the number of contestants, preliminary contests were held throughout the district, and the winners were selected to appear in the final competitions at Scranton. In all, there were 18 teams of five men each and five events were arranged for each team; the first event was for one man, the second for two men, and so on until the contest for a full team was reached, this last being the grand event of the day.

The contest was arranged as follows: A man was considered unconscious and with wounds which were marked by judges. The treatment was as follows: First, perform artificial respiration for one minute; second, stop hemorrhage; third, apply temporary splints to fracture; fourth, place on stretcher; fifth, carry 60 ft. over a fence



FIG. 13. THREE-ROOM MINERS' HOUSES, HOLDEN, W. VA.

work in 3 min. 47 sec. The South Pittston team did the work in 3 min. 33 sec., but its general execution was not so methodical as that performed by the winning team.

In the one-man contest, where the com-

cumulating stocks will demand heavy capital. The present position is distinctly artificial, and unless some means are found to increase consumption more serious difficulties promise to arise.

The Sicilian Sulphur Situation

Serious difficulties have arisen in interpretation of the new law. Directors of the *Consorzio* are lawyers, who have a tendency to quibble about minor points. Their refusal to listen to the grievances of the industry has caused much dissatisfaction in Catania. Strikers have compelled all the works and refineries to close, traffic has been stopped. Independent stocks being now exhausted, shippers are obliged to pay the prices of the *Consorzio*, which has again slightly increased its limits. Statistics show that stocks have greatly augmented, owing to decrease of exports to America. Money is abundant, though ac-

FATAL ACCIDENTS IN COAL MINING IN 1905

A Summary of the Losses of Life Incident to Coal-Mining Operations in North America

BY FREDERICK L. HOFFMAN

Fatal accidents in coal mining during 1905 caused a loss of more than 2200 valuable lives, valuable above the average, because the men were engaged in one of the most necessary of human undertakings. Much of the scarcity of skilled mine labor is in part accounted for by this waste of life, forcibly illustrated by a recent case which came to my notice of a coal mine in Ohio idle for want of only 200 laborers. In ten years over 15,000

a fact as the annual loss of life in coal mining should be withheld from publication until a date long after the occurrences or the close of the year. Mine inspectors can render valuable aid to the cause of accident prevention by timely publicity of all the facts which are of official record, and it is to be hoped that the tabulation of accidents in the annual reports of the United States Geological Survey on the production of coal will have some effect

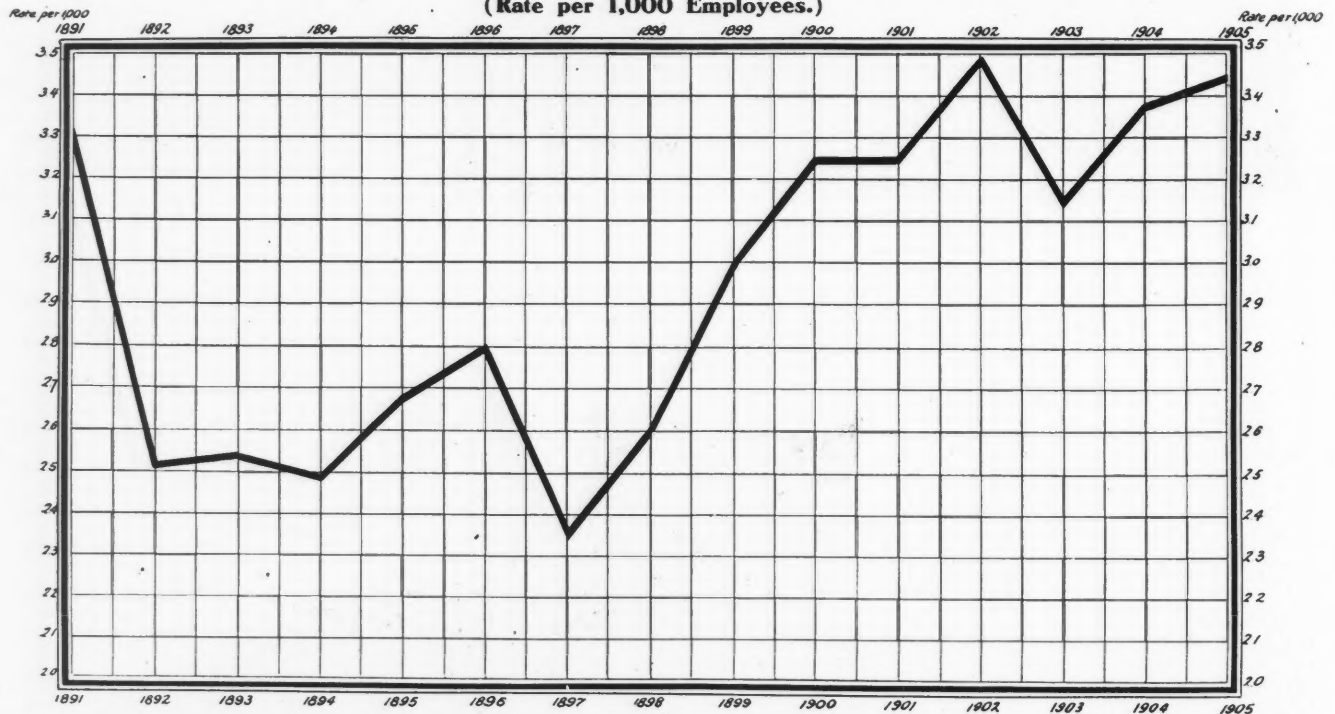
on record during recent years. This is more clearly illustrated in the diagram. A careful analysis of the first two tables shows that the relative mortality due to accidents in coal-mining operations remains unreasonably high. So much has been written upon the subject of coal-mining accidents, their causes, and the methods of prevention, that it would seem a sufficient basis of fact existed for remedial measures tending to eliminate to a considerable degree the extraordinary risk shown to exist in mining in the coalfields of North America. It must be clear to anyone who has at all considered the subject that the problem lies deeper and includes the class of labor, the duration of employment, the rate of progress of the industry or the increase in production, actual as well as relative, and many

FATAL ACCIDENTS IN COAL MINES

of North America.

1891—1905

(Rate per 1,000 Employees.)



useful lives have been lost in an industry which has been carried on for so many years that, if safety of life in the mines were the primary consideration, normal conditions and comparative freedom from risk would long since have been secured. The contrary has been the case, and the diagram, which illustrates the tendency of the accident rate for the last 15 years shows conclusively that the improvement in conditions during the period 1891-97 has been followed by a period of extreme accident liability, without a parallel in our coal-mining history.

There has been the usual delay in obtaining complete returns for certain States, and it seems to no purpose to complain. It is difficult to understand why so important

in causing certain States to make their returns available at an earlier date. I make this explanation to account for the late date of publication of this annual summary, which under different conditions could easily be made available by the middle of the year.

ACCIDENT RATE IN COAL MINES

The fatal accident rate in American coal mines during 1905 was 3.44 per 1000 employees, against an average of 3.11 for the decade ended with 1905. There was, therefore, an increase of 0.33 per 1000, equivalent to 210 lives more than if the rate during 1905 had been the average for the decade 1896-1905. With the exception of 1902 the rate during 1905 was the highest

other factors which do not enter into the present discussion. The importance of **one fact, however,** cannot be overstated, and that is the necessity of a higher regard for individual accidents, and the loss of the single life, which under present conditions is passed over as of comparatively small importance and as having no great bearing upon the larger problem of accident prevention. It would be interesting and of value to have a statement prepared by mine inspectors, showing the number of lives lost by accidents of different classes, so as to learn whether the accidents which attract general attention on account of their magnitude are really entitled to primary consideration rather than the individual accidents causing the

loss of a single life, or of a few lives, by falls of roof or slate, by machinery, electricity, etc. It is gratifying to meet with an increasing amount of intelligent discussion of the causes of accidents, and the method of their prevention, in the more recent reports of mine inspectors, to some of which I shall later have occasion to refer.

According to the method which I have followed for a number of years, I present the general facts of fatal accidents in mining in the North American coalfields in four tables, of which the first shows by States and Provinces the actual number of persons killed during each of the years 1896-1905. The returns for 1904 have been revised and brought down to date, involving slight changes, inevitable in any method of statistical analysis based in part upon preliminary returns. A distinction is made in the returns for Pennsylvania, showing respectively the number of persons killed in the anthracite and bituminous regions. According to table A there have been 2191 deaths in coal-mining operations during the year 1905. There can be no question, however, that the number of fatal accidents is somewhat larger on account of the fact that small mines are not required to report, and that accidents reported as serious or non-fatal terminate later in death, after a lingering illness, which therefore do not become a matter of record. In other words, the facts disclosed by this table are an understatement of the actual number and social importance of fatal accidents in coal-mining operations in North America. I have found it possible this year to add to the table the returns for Michigan since the latter half of 1899. For Tennessee, Utah, and Washington the returns have been taken from the report on the Production of Coal in the United States in 1905.

RATIO OF DEATHS TO NUMBER OF EMPLOYEES

In table B allowance is made for the number of persons employed and the rates have been calculated in the usual manner for every thousand persons at work. While this method of calculating the accident rate is subject to the criticism that no allowance is made for the time the miners are at work, or for variations in the hours of labor, or other conditions, it commends itself as being of the greatest practical utility, particularly in comparison with the accident frequency in other occupations. There is, no doubt, a very close relation between the annual amount of coal production and the fatal accident frequency, but since any definite theory of accident liability must rest upon a comparative basis, the ratio of the number of tons of coal produced per life lost is useless for such a purpose. Of course it is a matter of interest, and anyone who desires to make the comparison can readily obtain the total production of coal in the United States, British Columbia, and Nova Scotia, and calculate therefrom the ratio of tons produced per life lost. If, for il-

lustration, we compare the actual number of deaths occurring in 1896-1905, we shall find that the number has increased in almost exact proportion to the increase in coal production in the United States. The number of deaths has practically doubled, while the amount of coal production has increased from approximately 192,000,000 to 393,000,000 tons.

The fatal-accident rate in 1905 was 3.44 per 1000, or 0.07 higher than during the preceding year. As shown by the diagram, the rate declined during 1891-94, increasing during 1895-96, decreasing materially during 1897, reaching then its lowest point attained during recent years; since then there has been an almost continual increase to the year 1903. Compared with the average for the decade, the rate was 0.33 per 1000 in excess, or 10.6 per cent. The rate during 1905 was above the average for the decade in Alabama, Illinois, Indiana, Kansas, Kentucky, Mary-

land, Ohio, Pennsylvania (anthracite), Pennsylvania (bituminous), and West Virginia. The highest rate prevailed in Alabama, attaining to the unusual proportion of 10.74, compared with an average of 4.15 during the decade under review. Other States with high accident rates were Colorado with 4.96, Indian Territory with 5.76, Utah with 5.14, and West Virginia with 4.24 per 1000. The rate for British Columbia, for the first time in six years, shows a marked reduction, having been 2.72 against an average of 10.30 for the ten years, and 8.31 for 1904.

For a convenient comparison I add table D, showing the number of employees and the number of killed, together with the rate per 1000 employed, for the 15-year period 1891-1905. (See diagram.) It shows that while the rate during the first five years was 2.68 per 1000, it increased to 2.80 during the next quinquennium, and to 3.34

TABLE A. NUMBER OF PERSONS KILLED BY ACCIDENTS IN COAL MINES OF THE UNITED STATES AND CANADA, 1896-1905.

States.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1896-1905.
Alabama.....	28	38	45	40	37	41	50	57	84	185	605
Colorado.....	68	35	24	41	29	55	73	40	89	59a	513
Illinois.....	77	69	75	84	94	99	99	156	157	199	1,109
Indiana.....	28	16	22	16	18	24	24	55	34	47	284
Indian Territory.....	12	22	17	25	40	44	60	33	30	44	327
Iowa.....	22	21	26	20	29	26	55	21	31	24	275
Kansas.....	12	6	17	16	22	26	27	36	16b	36	214
Kentucky.....	6	12	6	7	17	21	19	25	19	31	163
Maryland.....	6	5	4	5	7	12	11	13	12	13	88
Michigan.....	..	..	..	4c	10	6	6	8	7	8	49
Missouri.....	16	8	9	14	10	15	10	17	11	11	121
New Mexico.....	7	7	7	15	15	9	17	17	15	5	114
Ohio.....	41	40	52	57	68	72	81	114	118	131	774
Pennsylvania (Anthracite).....	502	423	411	461	411	513	300	518	595	644	4,778
Pennsylvania (Bituminous).....	180	150	199	258	265	301	456	402	536	479	3,226
Tennessee.....	22	10	19	20	10	53	226	26	28	29	443
Utah.....	3	3	3	..	209	10	8	7	9	7	259
Washington.....	8	7	9	45	33	27	34	25	31	13	232
West Virginia.....	65	62	90	89	141	130	120	159	140	194	1,190
British Columbia.....	9	6	7	11	17	102	139	42	37	12	382
Nova Scotia.....	8	7	7	19	21	14	19	31	19	20	165
Total deaths.....	1,120	947	1,049	1,247	1,503	1,600	1,834	1,802	2,018	2,191	15,311

a—Underground accidents only.

b—Six months only.

c—Six months only.

d—Tennessee, Utah and Washington. (Returns from Production of Coal in the United States in 1905).

TABLE B. FATAL ACCIDENTS IN COAL MINING IN THE UNITED STATES AND CANADA. NUMBER OF PERSONS KILLED PER 1,000 EMPLOYED, 1896-1905.

States.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1896-1905.
Alabama.....	2.83	3.07	4.55	3.10	2.59	2.90	2.79	2.94	4.71	10.74	4.15
Colorado.....	10.07	4.99	3.23	5.60	3.99	6.88	8.11	3.89	8.26	4.96a	5.98
Illinois.....	2.33	2.04	2.14	2.27	2.39	2.24	2.15	3.13	2.87	3.36	2.57
Indiana.....	3.94	2.00	2.63	2.07	1.82	1.98	1.83	3.64	2.70	2.53	2.52
Indian Territory.....	3.26	6.34	4.82	6.24	7.59	8.35	9.62	5.42	3.63	5.76	6.12
Iowa.....	2.62	2.45	3.38	2.49	2.22	1.97	4.23	1.59	1.90	1.36	2.31
Kansas.....	1.36	0.71	1.95	1.57	2.06	2.28	2.70	3.61	3.09b	2.97	2.68
Kentucky.....	0.79	1.55	0.67	0.83	2.06	2.14	1.58	1.85	1.37	2.06	1.55
Maryland.....	1.58	1.17	0.89	1.08	1.32	2.23	1.99	2.29	2.11	2.09	1.72
Michigan.....	..	..	..	4.88c	6.11	3.26	4.24	2.54	2.58	2.93	3.43
Missouri.....	2.43	1.22	1.22	1.80	1.31	1.63	1.09	1.85	1.47	1.06	1.49
New Mexico.....	4.87	5.13	3.71	7.98	7.44	4.81	10.11	7.26	7.61	2.35	6.15
Ohio.....	1.44	1.39	1.77	2.03	2.14	2.15	2.16	2.75	2.57	2.96	2.22
Pennsylvania (Anthracite).....	3.35	2.83	2.89	3.28	2.86	3.47	2.03	3.41	3.69	3.83	3.18
Pennsylvania (Bituminous).....	2.14	1.72	2.27	2.82	2.43	2.56	3.37	2.65	3.45	2.90	2.73
Tennessee.....	3.37	1.58	2.43	2.60	1.15	6.10	25.80	2.69	2.81	2.38	5.11
Utah.....	4.35	4.17	4.38	..	138.96	5.81	3.24	3.21	4.06	5.14	17.66
Washington.....	2.98	2.48	2.70	13.60	7.79	5.59	7.83	5.13	6.69	2.73	5.82
West Virginia.....	2.68	2.89	3.86	3.55	5.43	4.01	3.78	4.63	3.08	4.24	3.75
British Columbia.....	3.27	2.47	2.34	2.91	4.22	25.67	34.65	9.85	8.31	2.72	10.30
Nova Scotia.....	1.33	1.35	1.56	3.39	3.17	1.83	2.36	2.79	1.63	1.86	2.14
Total.....	2.79	2.34	2.59	2.98	3.24	3.24	3.49	3.14	3.37	3.44	3.11

a—Underground accidents only.

b—Six months only.

c—Six months only.

d—Tennessee, Utah and Washington. (Returns from Production of Coal in the United States in 1905).

during the last five years. The table, therefore, discloses a distinct tendency toward a greater average accident liability, indicating the existence of conditions making distinctly for a greater hazard in coal-mining operations. As I had occasion to say in a previous report, there can be no question "but that the large introduction of foreign labor, including a considerable proportion of men unable to speak or understand the English language, has introduced a class of labor likely to suffer serious injury or death because of indifference to established rules and regulations providing for safety in mining operations." Most of the annual reports of mine inspectors call attention to the

dent prevention, Consul Williams remarks that:

"Owing to the watchfulness of both masters and men the discipline in the mines is perhaps as perfect as it is on shipboard. The miners are haled into court for any infraction of the rules, such as having matches, pipes, or liquor in their possession, smoking, drinking, or sleeping in the mines, carrying powder or cartridges in pockets or open hands, carrying unlocked lamp, entering place marked dangerous, neglecting to sprag heading, to report defect in ventilating door, presence of gas, or any other neglect resulting in possible injury to miner or horse, and even for failing to report for work when

Statistics only present problems in a manner readily comprehended by anyone interested in the subject, but the solution of the problem itself demands a most searching inquiry which should take into account modern conditions of mining, the character of new coalfields, the increasing depth of mines, the new methods of production, including the use of machines and electricity, and finally, the question of illiterate and unskilled labor.

INVESTIGATION OF CAUSES

That such an investigation might properly be made a matter of Federal interest cannot be questioned. A western mine official, John Verner, inspector for the first district of Iowa, in the twelfth biennial report on coal-mining operations in that State, makes a suggestion to this effect, which I quote in part as follows:

"About thirty-five years ago the first steps were taken in Pennsylvania to bring its anthracite mines under State supervision. Since that time all the principal coal-producing States have adopted laws regulating the operation of mines within their borders, with the view of securing an increased measure of safety for the persons employed therein, and officials have been provided by these States to see that the requirements of these laws are complied with. Under State supervision the sanitary condition of the mines has been much improved, appliances and devices affording the miner greater safety and facility in entering or leaving the underground workings are in evidence everywhere, efforts have been and are being made by the different State governments, to give reasonable protection to the miner, while at work, yet, notwithstanding all this, the yearly death rate due to accidents in the coal mines of the United States remains alarmingly high, and judging from the evidence of recent events, there seems to be little hope, under the present order of things, that the future will show any appreciable reduction in this respect.

"The good results coming from the centralizing of efforts to lessen the hazard to life incident to mining are readily recognizable in England, Germany and other coal-producing countries of Europe, and it is a matter of regret that so far no efforts have been made in the United States to profit by their example. If these explosions are to be averted in the future, as I believe they can be, and a general safer condition of the mines brought about, it must be done through the assistance of the National Government and by the creation of a national bureau of mine accidents. The scope of such bureau should include the furnishing of statistics relating to mine accidents occurring in the United States, the investigation of all accidents through which a number of lives were lost, the special investigation of every explosion, the making of tests and experiments and the providing of useful in-

TABLE C. FATAL ACCIDENTS IN COAL MINES IN THE UNITED STATES AND CANADA. COMPARISON OF 1905 WITH FIVE PREVIOUS YEARS.

States.	No. Persons Killed, Yearly Average.		Rate per 1,000 Employed.		Increase or Decrease per 1,000 Employed.
	1900-04.	1905.	1900-04.	1905.	
Alabama.....	54	185	3.22	10.74	+ 7.52
Colorado.....	57	59	6.31	4.96	- 1.35
Illinois.....	121	199	2.58	3.36	+ 0.78
Indiana.....	31	47	2.47	2.53	+ 0.06
Indian Territory.....	41	44	6.65	5.76	- 0.89
Iowa.....	32	24	2.36	1.36	- 1.00
Kansas.....	25	36	2.69	2.97	+ 0.28
Kentucky.....	20	31	1.76	2.06	+ 0.30
Maryland.....	11	13	1.99	2.69	+ 0.70
Michigan.....	7	8	3.44	2.93	- 0.51
Missouri.....	13	11	1.48	1.06	- 0.42
New Mexico.....	15	5	7.39	2.35	- 5.04
Ohio.....	91	131	2.39	2.96	+ 0.57
Pennsylvania (Anthracite).....	467	644	3.10	3.83	+ 0.73
Pennsylvania (Bituminous).....	392	479	2.93	2.90	- 0.03
Tennessee.....	69	29	7.49	2.38	- 5.11
Utah.....	49	7	2.41	5.14	+ 2.73
Washington.....	30	13	6.55	2.73	- 3.82
West Virginia.....	138	194	3.90	4.24	+ 0.34
British Columbia.....	67	12	16.25	2.72	- 13.53
Nova Scotia.....	21	20	2.31	1.86	- 0.45
Total.....	1,744	2,183	3.30	3.44	+ 0.14

changes in the character of the labor employed in coal mining, and some of the reports contain facts and suggestions which are entitled to most respectful consideration. Some of the suggestions are the result of impartial and critical observation, and if acted upon would go far to reduce the needless loss of life and limb which now attends the coal-mining industry. An American consul residing in the heart of the British coalfields has recently called attention to the relatively greater loss of life in the United States, in a report published under date of Dec. 4, 1906, from which I make the following brief extract:

"Mining as a British industry dates back over two thousand years, but in spite of all means known to the highest civilization in the way of legislation, inspection, mine discipline, and invention, death's daily toll of lives abates but slowly. According to the complete statistics for 1905, just published, the highest death rate prevails in the Cardiff district, which produces the smokeless coal. To mine 22,815,107 tons of coal 86,881 miners were employed, of whom 287 lost their lives, or an average of 3.3 out of each 1000 employed. The death rate for the entire Kingdom was 1.358 per 1000 employees."

CAUSES AND PREVENTION OF ACCIDENTS

As bearing upon the problem of acci-

dent prevention, Consul Williams remarks that:

It would carry me too far to discuss

TABLE D. FIFTEEN-YEAR RECORD OF FATAL ACCIDENTS IN COAL MINES OF UNITED STATES AND CANADA, 1891-1905.

Years.	Employees.	No. Killed.	Acc. Rate per 1,000 Employed.
1891.....	325,840	1,076	3.30
1892.....	342,744	859	2.51
1893.....	382,133	965	2.53
1894.....	383,579	957	2.48
1895.....	395,549	1,057	2.67
1896.....	401,874	1,120	2.79
1897.....	405,433	947	2.34
1898.....	405,600	1,049	2.59
1899.....	417,415	1,247	2.98
1900.....	462,308	1,503	3.24
1901.....	494,367	1,600	3.24
1902.....	525,443	1,834	3.49
1903.....	574,210	1,862	3.14
1904.....	598,678	2,018	3.37
1905.....	637,522	2,191	3.44
1891-1895.....	1,831,845	4,914	2.68
1896-1900.....	2,092,630	5,866	2.80
1901-1905.....	2,830,220	9,445	3.34

these suggestions, which, however, clearly indicate the point of view from which the problem should be approached. Mere statistical illustrations will not suffice and serve a practical purpose until the facts behind the figures are examined into more intelligently than is at present the case.

formation and advice. This bureau should be a central source of education and information, of such reliability and trustworthiness, that its teachings and advice will be readily accepted and followed by the mining interests and governments of every mining State and Territory in the Union.

"The plea that the individual mining States can deal with this question successfully is no longer tenable. The proof to the contrary is too overwhelming. Individual efforts are too uncertain and often futile, there must be coöperation to get results and get them quickly, and such coöperation can only be carried on successfully with the help of the national Government. For humane as well as economic reasons the question of the creation of a national bureau of mine accidents should receive the early and favorable consideration of Congress." (Pp. 29-31.)

COAL-CUTTING MACHINES AND ELECTRICITY

Of the underlying causes more or less responsible for the increase in the rate of fatal accidents in coal mining during recent years, probably the most important is the increasing use of coal-cutting machinery and of electricity. Of the bituminous coal mined in the United States during 1905, 34 per cent. was mined by machines against 26 per cent. in 1901. In some States, however—Ohio, for illustration—as high as 66 per cent. of the coal produced today is mined by machinery, while in Kansas the use of machinery is almost unknown. There are now some nine thousand machines in use, and the number is constantly increasing, as is also without doubt, in certain classes of mines at least, the accident risk to life and limb. I cannot do better than substitute for any comments of my own the words of the chief mine inspector of Ohio, who, in his annual report for 1904, said in part as follows: (Pp. 8.)

"Notwithstanding that 67.3 per cent. of the entire production of coal of the State is mined by electric and compressed-air machines, and electric coal-hauling motors are in general use, there is not a word in the laws governing the operation of mines that has the least application to the dangers of electric wires, mining machines, or hauling motors, in fact the word 'electricity,' or 'mining machines,' is not to be found in the mining laws, which, no doubt, is attributable to the fact that at the time the present mining laws were enacted electricity in the mines was practically an unknown experiment. Now the greater percentage of our coal is produced from its use, and the amount of machinery introduced in the mines is rapidly on the increase yearly.

"Many lives have been lost by coming in contact with live electric wires and by men being wound into chains, cogs and machinery of coal-cutting machines and many limbs are sacrificed in that way. We

even have a record of a case during the year where a man was drawn into the machinery of a chain mining machine, and could not be extricated until a physician went into the mine and amputated the limb. It is not necessary to state that the man lost his life from the effects of this terrible experience. The dangerous parts of mining machines should not be exposed, but should be shielded by some device; some of them are shielded, but in nine cases out of ten those who work with them are permitted to remove the shields and throw them away, because they are a little troublesome to handle. The law ought to require proper shielding of the dangerous parts of mining machines, and it ought also to require a safe and proper system of stringing electric wires in any part of a mine where men are liable to come in contact with them. Indisputable evidence recorded in this office shows that a very large per cent. of all accidents is due to the wanton carelessness on the part of the victims themselves and a want of proper diligence and performance of duty of those in charge of the mines which can be remedied by the enforcement of proper rules."

The subject of electric power in coal mines is also discussed at some length by James E. Roderick, chief of the department of mines of Pennsylvania, pointing out that "while the bituminous-mine law treats elaborately of many subjects, it gives very little space to the important matter of electricity in coal mines," and that, "when this law was enacted there were very few dangerous gaseous mines in the bituminous region, but during recent years large operations have been opened in which electricity has been installed for haulage and mining."

I have gone over the Pennsylvania reports for recent years, and find that during the period of 1896-1905 there occurred in the anthracite mines six fatal accidents, as the direct result of electric shock, and 65 in the bituminous region. How many of such accidents were due, directly or indirectly, to the use of electricity in mining in the entire coalfields of North America cannot be stated at the present time. It is evidently a subject which might properly receive more consideration. The matter has attracted some attention abroad, and in 1904 a special report on the use of electricity in mines was published, together with the evidence, as the result of inquiries by a departmental committee of the home office of the United Kingdom. The rules for the installation and use of electricity in mines, published in the form of an appendix to the report, are well deserving of the attention of mine managers and inspectors. As the committee points out, it has every reason to believe "that if this code, or one like it, is established, a considerable step will have been taken toward securing the safety of miners, and that it will be impossible,

under such provisions, that many casualties will occur."

TENDENCY OF THE ACCIDENT RATE

Evidently the tendency of the fatal-accident rate in coal mining in the United States is in the wrong direction. It remains for those who are responsible for mine management and supervision to improve existing conditions and minimize existing hazards to more normal proportions in conformity to the experience of European countries. Mine labor has an increasing economic value* and the annual loss of life represents a not inconsiderable diminution of national wealth. The prevention of accidents in coal mining is certain to attract more attention in the future than it has in the past.

Petroleum in Mexico

According to a recent consular report, the owners of the oil wells at Ebano, near Tampico, developed their property until they showed a sufficient production to justify the Mexican Central Railway Company in making a contract for about 1500 bbl. per day and to alter a large number of engines from coal to oil burners to consume it. This oil is now being delivered and the railway is erecting large storage tanks to receive it.

Shallow wells, giving a good quality of oil, have been discovered around Mexico City, but the flow has been limited and explorations are not now being made in that vicinity. In the State of Oaxaca and at points on the isthmus of Tehuantepec oil has been discovered and of a high grade, but the owners of these wells are concealing the quantity and other interests claim that the wells are shallow and of no permanent value.

Outside of the Tampico district a profitable oil field has not yet been developed in Mexico, but energetic companies are exploring in Coahuila, near the border, in Tamaulipas, Veracruz, Oaxaca, and Jalisco.

Cobalt Smelting in Canada

For the last six months the North American Cobalt Refining Company, Ltd., in which leading Cobalt mine-owners are interested, has been carrying on experiments in the smelting of Cobalt ores in a small smelter at Hamilton. It is announced that having succeeded in completely separating the arsenic, cobalt, and other valuable contents from the silver, the company will proceed to erect a large plant with a daily capacity of 500 tons of ore, to cost approximately \$200,000. Hamilton is mentioned as likely to be the location, though it is possible that a site elsewhere may be selected.

*For a full discussion of the length of the working or trade life see my address, "The Physical and Medical Aspect of Labor and Industry," before the annual meeting of the American Academy of Political and Social Science, Philadelphia, May, 1906, Publication No. 96.

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The Cobalt District

A representative of the JOURNAL returned last week from the Cobalt district. While there he visited nearly all the producing mines of the district, and of those visited was accorded permission to view the underground workings, with three exceptions. These exceptions were La Rose, Coniagas and University. Of these, La Rose and University are close corporations. A little of the stock of the Coniagas is on the market. The other producing companies had no objection to publicity, and this speaks well for their confidence in their mines, and in the Cobalt district in general.

There has been no material change in the showing of the mines of Cobalt during the last month. The explanation of the Nipissing affair is to be found in a change of opinion as to facts already known, rather than to the development of new facts. The reversal of the judgment originally formed on the report of the engineers was evidently due to a loss of confidence, either as to this venture alone or as to the results of the general mining speculation which was being based upon it, or both.

The fact remains that an enormous price was to be paid, a price that it is surprising that the engineers thought could be justified. Even at the present market price, Nipissing is a great gamble. There are no ore reserves. There is simply the discovery of a large number of veins of extraordinarily rich ore, some of which have already made a large production. The number and extent of these pockets of bullion (there is no more expressive term) is a matter of guesswork. It cannot be safely reckoned that because one acre has yielded \$1,000,000, therefore, 40 acres, or even 840 acres, will yield \$40,000,000.

Probably no one expects that the remarkable veins of the Cobalt district will hold their extraordinary richness to any great depth. They are doubtless examples of superficial, secondary enrichment in the most exaggerated way. However, vein 49 of the Nipissing company, the bonanza vein, has been opened to a depth of only 30 ft., and in that shallow depth serious impoverishment would hardly be expected to commence. Other veins on the Nipissing property have been opened to a depth of 80 ft., and still show good ore, while the workings of several companies have

gone below 100 ft. with continued success, and La Rose mine has been opened to the depth of 320 ft., but the showing in the bottom of that property is known only to its owners.

In the newspaper comments on the Nipissing affair, it is amusing to read that the gentlemen interested in that company, including such men as Capt. DeLamar and William B. Thompson, not to speak of some of the others, were inexperienced in mining. Not only were they adepts in mining, but also they were adepts in company promotion. Their campaign of publicity was as well conducted as any has ever been.

The Public-land Laws

The President has followed the recommendations in his annual message by sending a special message to Congress, Dec. 17, emphasizing the necessity of vigorous and immediate action to recast the public-land laws and adapt them to the actual situation existing at present. He expresses his grave concern at the unsatisfactory condition of these laws, and the prevalence of fraud under their present provisions.

Among other things, the President states that the present coal law, limiting the individual entry to 160 acres, puts a premium on fraud by making it impossible to develop certain types of coal fields and yet comply with the law. This is correct. The grabbing of coal lands has not in all cases been influenced simply by greed, but in some cases fraudulent methods of location have been considered necessary in order to obtain a sufficient acreage to warrant development.

The President goes on to say that his own belief is that there should be provision in the land laws for leasing coal, oil and gas rights under proper restrictions. We may add that there is ample precedent for such a policy. The section in each township that was given to the various States for school purposes has been found in some cases to be coal-bearing, and the States, the State of Colorado for example, have leased these lands to operating companies in consideration of a royalty per ton of coal mined.

An important feature in the President's message is his recommendation that the Secretary of the Interior be enabled to employ mining experts to examine the validity of all mineral-land claims, and to

undertake the supervision and control of the use of the mineral fuel still belonging to the United States. If such a force of mining experts and special agents be provided and well used, he says, the results will be not only to stop the land frauds, but also to prevent delays in patenting valid land claims, and to conserve the indispensable fuel resources of the nation.

In general these recommendations meet with our approval. The organization of such an executive force as the President considers necessary will require careful consideration. Undoubtedly it would lead to the establishment of a bureau of mines, which would naturally have intimate relations with the Geological Survey. If such be decided upon the whole system should be coördinated so as to secure the maximum harmony and efficiency.

We hope that while the President has in mind the reform of the public-land laws, he will direct his attention to the laws governing the location of mineral claims and use his great influence toward effecting a repeal of the law of the apex, which is a relic of barbarism and ignorance, and secure in its place an equitable law that will conform to modern geological knowledge.

Theory and Practice

It is harking back to a threadbare subject to discuss the mistaken idea that there may be a difference between theory and practice. If the results obtained in practice do not agree with what they ought to be by theory, the case is simply that the theory is wrong. Indeed, it is not a theory at all, but merely a working hypothesis. All practice is based on theory. If we have not possessed ourselves of the correct theory, we are troubled in our practice. The interesting article by Prof. Donald Clark on the flotation processes now employed at Broken Hill which was published in a recent issue of the JOURNAL, is an interesting case to the point.

At the present time no one knows what is the theory of ore "flotation," i. e., the reason why under certain conditions particles of heavy metallic minerals rise to the surface of a bath, while particles of lighter, non-metallic minerals sink, thus reversing the results of ordinary ore dressing by jigging, etc. Various "theories" or working hypotheses have been advanced to explain the matter, but none is yet accepted as satisfactory.

In the meanwhile, until a satisfactory theory is developed—in other words, until we have at least approximated the true theory—the practitioners of the art are more or less at sea. They do not know whether the ores which are being successfully separated by the new methods are yielding the best possible results, and cannot know it until it is understood what theoretical conditions must be complied with. Nor is it possible to state in advance of a practical trial whether minerals from other places can be separated by flotation, nor if in the face of negative results upon experiment whether a separation cannot still be effected by a proper modification of conditions.

The "practical" man from Broken Hill says, for example, that resin blende will not float, but the experimenter at some other place finds that it will float, at least that his particular variety of resin blende will float. Again the "practical" man says that a certain percentage of calcium carbonate, or iron carbonate, or some other carbonate is necessary in the ore before any flotation will take place; but someone else finds that it is not so. So it goes. It is when we are developing a new process, involving new physical principles, that it is most strongly appreciated that the theory is the thing of prime consequence, and without it the practical man is as much at a loss as is the mariner without a compass.

Curiosities in Nomenclature

In Wisconsin the carbonate of zinc goes by the name of "dry bone." In Missouri "dry bone" is the carbonate of lead. In the Joplin district the carbonate and silicate of zinc are both lumped together under the commercial name of "silicate," which is consequently a synonym for the term "calamine" as employed commercially and metallurgically in broader usage.

In the Joplin district iron pyrites, the bisulphide of iron, is known as "mundic;" in Wisconsin it is known as "sulphur." The two terms are not precisely parallel, because the bisulphide of iron in Wisconsin is chiefly marcasite. However, in the entire sulphuric-acid industry pyrites is known as sulphur ore. Pyrrhotite and marcasite come under the same category. Pyrites is, in fact, now a class name, rather than the name of a particular mineral species, including in commercial usage the minerals pyrite, pyrrhotite, marcasite,

chalcopyrite, and possibly also arsenopyrite.

Similarly it is a question whether the term blende has not become a class name rather than the name of a mineral species. In mineralogy, blende—or, more elegantly, sphalerite—includes several varieties, among which there are no sharp lines of distinction, the differences being chiefly in percentages of impurity, such as iron, cadmium, etc. Formerly the differences were of little more than academic interest, because all of the varieties of blende went to the smelter for treatment in substantially the same way. However, we have now a class of processes for separation, which depend for their action upon differences in the magnetic or other properties of these blendes. Broadly, we distinguish the chief mineral species as "resin blende" and "black jack." The terms may not be precise, but in a general way when they are used everyone knows what is meant, which perhaps is all that is needed.

However, a good reason for precision in mineralogical nomenclature and commercial usage is the fact that questions resting upon them sometimes come before the courts, as for example the pending case in respect to the tariff on zinc ore, recently argued before the board of general appraisers, which hangs largely upon the definition and usage of the term "calamine."

Greene-Cananea

The passing of the control of the Greene property into the hands of Cole and Ryan, who already had the Cananea Central, marks another step in the rise of that syndicate, which is closely allied with the Amalgamated. The copper production of North America is therefore further centralized by the recent transaction. While we cannot help but admire the genius which directs the great industrial successes scored by these interests, we look with regret upon the advances tending toward monopoly. The ameliorating condition is that it does not seem possible for anyone actually to monopolize copper production. Most of the mines which Cole and Ryan control, like those which the Guggenheims are developing, were unknown 10 years ago. Another 10 years may see equally wonderful discoveries in some heretofore disregarded part of Nevada, California or Arizona, and the rise of new syndicates as brilliant as the present.

COLLIERY NOTES

Details in the Operation and Development of Anthracite and Bituminous Mines

The presence of destructive insects in mine timber is often due to allowing the logs to lie unpeeled for a considerable time after being felled.

In mines where the roof is bad, it is best to use taper posts, and have all lids made wedge shape. In placing the props it is advisable to have the thickest end at the top next to the lids.

The fuel famine in Russia has reached alarming proportions, and has resulted in creating almost prohibitive prices for coal and oil. One of the causes for this scarcity of fuel is the decreased output of the Baku oilfield, where labor troubles have curtailed the production.

It is stated that the Republic of Colombia has extensive deposits of iron and coal. Openings have been made both on the Atlantic and Pacific coast, with the result that the fuel found is of an excellent quality. Some of the coal being cokable and lying in close proximity to the iron-ore deposits, promises great things for the future manufacture of steel in this republic.

To prevent the objectionable feature of having fine dust enter the jigs when coal is worked, successful arrangements have now been installed, whereby a fan driven by a motor is connected with a suction chamber, from which issues a 30-in. air pipe with 20-in. branches leading to the space above the screens. The dust formed in screening the coal is thus drawn off through the fan and expelled into a waste drain.

In the development of peat deposits, two methods particularly commend themselves; the peat is either made into briquets by heating it under pressure to about 150 deg. C., or stations are erected and electric energy is generated at the deposits, which avoids transporting the peat to the place of consumption. An installation of the latter kind is now successfully working in Sweden and producing cheap power.

Since many of the recent coal-mine explosions have been attributed to the coal dust which existed throughout the mines, much attention has been given at several collieries to providing wet sections in the mines. In some instances the advocates of this system have suggested that where the strata will not admit of watering, an arch shall be put in for a distance of 50 yd. at various intervals in the mine, and this arched section be kept thoroughly wet and clean.

Several different methods are practised in preparing wet holes for blasting. If the hole is only moderately wet, a

sufficient remedy is to insert a piece of rag or other absorptive material, and thoroughly wipe the hole out. When considerable water is present, the best results are obtained by claying. A lump of clay is inserted into the hole, and by forcing in a wooden rammer, the clay is driven into the crevices of the rock, thus forming a lining around the hole.

It is well known that the work performed by mules and horses in our mines is of a very arduous nature, and that the reward often administered is only inconsiderate treatment on the part of drivers. One English manager has inaugurated a plan which has met with much success. He gives an annual dinner to the driver boys, at which affair prizes ranging from \$2.50 to \$12 are awarded by judges to those drivers whose animals are in the best shape from having had proper care.

Few managers realize how favorable are general mine conditions to the wide distribution of coal dust throughout the workings. If we consider that the trips on the main haulways travel at a speed of 14 miles an hour, and then assume that the air current on this same haulway is traveling in at the rate of 600 ft. per min., we then have a velocity of 1232 ft. per min., meeting another velocity of 600 ft. per min., which causes secondary currents that widely distribute the coal dust.

The average British miner is born, and not made, and when he takes up his father's pick he expects to wield it until he surrenders it to his son. This and his temperament and other conditions make him careful and deliberate to a degree unknown in America. It would appear that he is becoming more deliberate year by year, for the average number of tons mined per person has fallen gradually from 314 tons in 1899, to only 279 in 1904. Whether this slowing down of 35 tons in five years is due to the greater difficulties of mining or to the attitude of the miner is an open question.

Mining as a British industry dates back over two thousand years, but in spite of all means known to the highest civilization in the way of legislation, inspection, mine discipline, and invention, death's daily toll of lives abates but slowly. According to the complete statistics for 1905, just published, the highest death rate prevails in the Cardiff district, which produces the smokeless coal. To mine the 22,815,107 tons of coal 86,881 miners were employed, of whom 287 lost their lives, or an average of 3.3 out of each 1000 employed. The death rate for the entire kingdom was 1.358 per 1000 employees.

Those engineers who are sceptical con-

cerning the effect of barometric pressure on an inflow of gas into a mine, should in this connection remember that a fall of 1 in. in the barometer is equal to a reduction of pressure amounting to more than 70 lb. per sq.ft. In a shaft mine having furnace ventilation, a rise of temperature, as indicated by the thermometer, may also be a cause of serious derangement to the ventilating current. If the increase of temperature in the downcast is equal to one-half the difference of temperature produced in the upcast by the furnace, the resultant pressure is reduced about one-half which decreases the current one-fourth.

Owing to the watchfulness of both masters and men the discipline in the coal mines of Great Britain is, perhaps, as perfect as it is on shipboard. The miners are haled into court for any infraction of the rules, such as having matches, pipes, or liquor in their possession, smoking, drinking, or sleeping in the mines, carrying powder or cartridges in pockets or open hands, carrying unlocked lamp, entering place marked dangerous, neglecting to sprag heading, to report defect in ventilating door, presence of gas, or any other neglect resulting in possible injury to miner or horse, and even for failing to report for work when not excused. The fines for these offenses range from \$5 upward, according to the circumstances. On the other hand, masters are presented for manslaughter when their neglect causes the death of a miner.

When telephones are installed in mines, the wires that run down the shaft should be rubber covered and lead incased. This protected wire may be inclosed in an iron pipe of sufficient size so that small lumps of coal that fall from the cage will not wear the covering away and expose the wire. When the line is to be extended some distance into the mine, it is best to have the wires at least 2 ft. apart so as to minimize the induction effect. Care should be taken in extending the line along an entry to see that the wires do not come in contact with the roof. All low places should be plugged for an insulator. Experience has shown that by using No. 12 rubber-covered wire properly stretched and attached to insulators at 20-ft. intervals, there will be little trouble from induction or other causes. The expense necessitated by the purchase of new batteries, repairing breaks, etc., at a mine where six instruments are in use, amounted to about \$40 per year. Whether the wires should be strung on the roof or side of the entry, depends entirely on local conditions.

THE COBALT DISTRICT, ONTARIO

The Existing Conditions in this Famous Silver Camp

EDITORIAL CORRESPONDENCE

If the visitor to Cobalt expects to find a mining camp, the streets of which are lined with gambling places, dance halls, and saloons, with rough characters carrying belts filled with cartridges, revolvers and all the accessories of the early Western mining camps, he will be greatly disappointed. It is true that when the discoveries were first made in Cobalt, a few individuals appeared equipped to uphold their rights by the "law of the six-shooter," but in less than a week armament of all kinds disappeared, and the camp took on the orderly, quiet and law-respecting attitude it has ever since maintained. If gambling and drinking exist at all to-day they do so behind closed doors, and the visitor sees nothing to cause him to change his opinion with regard to the orderliness of the district.

The hotels furnish meeting places for all and deals for property, passed claims, etc., are put through in the quietest manner.

When one remembers that previous to February, 1906, there were no buildings except a few log cabins, the rest of the people living in tents, he is naturally surprised to step from a Pullman car and register at a hotel, heated by steam and lighted by acetylene gas. In the hotels the beaver coat of the capitalist rubs against the "mackinaw" of the prospector and the mocassins and coonskin coat seen so frequently may belong to the man who has sold a claim for a fabulous price.

In all mining camps there exists a varied assemblage of men always searching for the precious metals, and Cobalt is no exception. Mining men from Rossland, Alaska, South Africa, New Zealand, Colorado, Utah, Nevada, California, and every section of the world are there either on their own behalf or in the interests of capitalists. When the rush first started store-keepers, farmers, business men and professional prospectors hurried to the scene and claims were soon staked and applied for. Then began squabbles and litigation over claims, some of which have not been settled to this day. The case concerning the Lawson controversy is very interesting, and will be described in a future issue of the JOURNAL.

FIRST MINERAL DISCOVERY

The discovery of mineral wealth was primarily due to the advance of the railroad through the country. There seems to be a discrepancy with regard to the first discovery. The McKinley-Darragh people claim that the men laying ties discovered silver in the swamp adjoining the railroad, and on their present property, while others maintain that La Rose, a

blacksmith employed by the railway, discovered the precious metal and filed the first claim. La Rose is one of the owners of the famous La Rose mine, for which, it is rumored, \$10,000,000 has been offered and refused.

In other camps the miners are offered every opportunity to spend their hard-earned wages. In Cobalt the men live at the camps, and there is comparatively little opportunity to spend their money. It is the rule for companies to furnish board and lodging in comfortable quarters, and the wages paid include living expenses. The food at the camps is exceedingly good and in abundance. Wages range from \$1.75 to \$3.50 per day, depending upon the kind of work. Under these conditions the men fare very well. There is always a good demand for men owing to increasing development work in all the mines.

POSSIBILITIES OF CLAIMS

The district as a whole is probably the most peculiar ever brought to the notice of mining engineers, investors and the public. All claims have their element of interest because, while there may be only enough showing of valuable mineral to warrant passing by the inspector, still no man can state, because of the peculiar conditions existing in this country, that there will be none at depth. This gives the "wild-cat" promoter a chance of which he has promptly availed himself, and the man who may have paid \$1500 for his 20 or 40 acres, will calmly ask from \$50,000 to \$100,000 for it, and in many cases such prices were paid. The loss or profit to the buyer can only be decided by time and development.

The occurrence of the veins in Coleman township has been likened to the cracks on a dry mud flat. While the general trend seems to be northeast and southwest, still there are strikes having a north-south and also an east-west direction. Veins are liable to swell and pinch, twist and turn, and it is doubtful if there are many in the camp which have shown any marked continuity.

A vein existing strongly in one property may or may not continue in the adjoining claim, as is seen on the Lawson Lot. Here the vein shows up right to the surface at a width of from 6 to 12 in., but when it reaches the Silver Leaf boundary the vein branches out into stringers. To the south it pinches out, and fails to enter the Silver Nugget property so far as is known. And so it is too uncertain for anyone to try to predict or to lay down any rules for the district. Geologists have advanced theories only to have them upset in a short time.

The salvation of the camp is that rich mineral deposits are found in every direction. When we stop to consider that two men with practically no equipment, can work a vein no wider than 0.5 in., and realize more for their labor than they could at any trade, we can obtain some idea of the wealth contained in a vein from 4 to 12 in. in width. It is not uncommon to see rock running as high as 15,000 oz. of silver per ton, but, of course, this is by no means the run of the camp.

PRODUCTION OF THE CAMP

A glance at the figures obtained by the Bureau of Mines of Ontario will give a more accurate idea of the actual wealth. In 1904 only 158 tons were shipped from the district. This shipment realized \$136,217 or \$862 per ton. The following year returns show 2144 tons, valued at \$1,473,196, or \$691 per ton. During the present year there have been shipped, from Jan. 1 to Sept. 30, 2305 tons, the value of which was \$1,750,000. For October and November no values are available, but the tonnage is a matter of record. During these two months 1864 tons were shipped to the smelters, and estimating their value according to existing data we would find that the total shipments from the beginning of the camp to Nov. 30, 1906, amounted to 6453 tons, valued at \$4,700,000, or \$729 per ton. This average price includes all ore shipped and does not show the high values of the first-grade ore.

THE NIPISSING MINES

During the present time rumor is busy and one hears surprising reports from all quarters. The Nipissing mine has been made the subject of more rumor than probably any other mine in the district. Since the announcement was made that the Guggenheims had decided to throw over their option, reports were circulated that the mine had decreased in value owing to the pinching out of vein No. 49, that this vein had changed into antimony, that in sinking, slate had been encountered, that only 30 men were working on the property, that the title was to be revoked, and that a new attack was to be made on certain claims held by the Nipissing company. These rumors were circulated by people who either knew nothing of the actual conditions existing at the mine or else were maliciously endeavoring to depress the stock. That this result was accomplished is evident to all. There is no doubt, whatever, that the mine, so far as has been shown, is in a healthy condition, and that values are apparent even to the lay mind. An inspection of the property, during the week ending Dec. 15, showed active mining operations and veins of great richness.

Vein 49, the vein that has been chiefly talked about, has been stripped for a distance of 110 ft., and broken down by underhand stoping to a depth of approximately 25 ft. The work has been done in 3 steps, and that valuable ore exists is

apparent even without assay results. The vein is almost solid argentite, containing native silver, smaltite and calcite, and the wall rocks contain a workable amount of leaf silver. The width of the vein appears to vary from about 20 in. to 48 in. At the bottom there was exposed a little decomposed calcite, but that the vein has changed materially in character, width or value may emphatically be denied.

There are from 175 to 180 men employed on the property, 75 of whom are on underground operations. A more detailed description of the property will be given in a subsequent issue.

Scenery and Industry

BY R. W. RAYMOND

The extent to which the State can properly be called upon to preserve "scenery," at public expense and to the hindrance of industry, is not easy to determine. Conceding, for instance, that it is both proper and worth while to limit the utilization of the water-power at Niagara, and to stop the operation of quarries on the river-front of the Palisades of the Hudson, it does not follow that everybody who has built a "camp" in the Adirondacks has a right to demand that the State shall preserve the surrounding region as a decaying and unprofitable wilderness for his enjoyment, and without cost to him, or that everybody who has set up a country-house in a picturesque, wild region, should demand government protection against the intrusion of operations, the sight of which, he thinks, would mar his esthetic solitude.

This question has been very recently revived in a new form. The great city of New York needs immense quantities of building and paving material. Any unnecessary cost of such material means greater expense in all constructions, and higher rents to all inhabitants. Nature has provided a great water way, along which abundant supplies of such material are accessible. The city naturally availed itself first of the trap of the Palisades, for the purposes to which that rock is adapted. This source of supply is now cut off. Does it therefore follow that the whole Hudson must be eliminated from the natural resources of New York City, lest a quarry might be considered as impairing the landscape viewed by the passengers on the Peoples' Line or the Albany day-boat?

The question is affected further by the great recent development of the use of concrete, which, as all engineers admit, is to be the safe and durable building material of the future. It has proved its superiority against fire, and (especially when "reinforced" with interior steel) against earthquake; and it will be largely used wherever its materials can be obtained at reasonable cost, not only for buildings, but also (and, at present, perhaps, still more extensively) in other con-

structions, such as the lining of the Hudson river tunnels and other sub-marine or harbor works.

The pressure of this industrial need has led to the revival of quarrying at various places near New York City. One of these places is Storm King mountain, on the Hudson, where granite of special excellence can be obtained. In former years, much of this granite was quarried there, to be used in the construction of High Bridge, the City Hall, and the pavement of Broadway and Seventh avenue. It has been discovered lately that this granite possesses another quality, namely, that the crushed "spalls" or refuse of the quarry can be advantageously used for the manufacture of concrete, by reason of the nature and form of the particles. That discovery has led to the purchase of the property containing the old quarries, with the view of supplying the great demand of New York City for building stone and concrete. This renewal of a former industry was conceived in good faith, and seemed to be entirely unobjectionable. I frankly confess that, before any sentimental protests had come to my notice, I acquired a small interest in the enterprise, which I thought likely to be profitable to the owners, as well as beneficial to the public. Whoever thinks that this small interest would bias my opinion, may make the most of it. To me, it is only significant, because it incidentally involves special knowledge on my part of the undertaking concerned, and a consequent confidence in it as an honest investment.

But I have been surprised by a sudden and evidently concerted outburst of journalistic indignation over the alleged scheme of the "Trap Rock Vandals" to deface the shore of the Hudson. This indignation has found vent through our most respectable and fearless daily papers, like the *Evening Post* and the *Sun*. It is always such papers that are sought as mouth-pieces by sensational sentimentalists; and it is too often such papers that lend themselves with impulsive credulity to the appeals of private interests, disguised as protests instigated by passionate and disinterested devotion to "beauty," or "art," or some other high-sounding public interest. It is not very creditable to the *Evening Post* that it should be ignorant of the fact that the outcrop of the trap dike constituting the Palisades ceases many miles below Storm King. Of course the author of the article published in the *Evening Post* of Oct. 29, called the rock "trap," in order to make it appear that it ought to be preserved from "defacement" by industry, as the Palisades had been preserved, at public cost. It looks well, to stigmatize as "Trap Rock Vandals" people who wish to supply the demand of their fellowmen for granite!

But such blunders, intentional or unintentional, are not worth discussion. Neither need special attention be given here to the circumstance (incidentally re-

vealed in one of the newspaper articles I have read, and possibly constituting a large part of the "milk in the cocoanut") that certain persons who have built country houses do not wish their rural solitude to be disturbed by the sight of human industry. The main and only question of importance is, Does the proposed re-opening of the old quarries on Storm King threaten such public injury as would justify the interference of the State, by the condemnation of private property at the cost of the taxpayers?

As to this question, it has not been shown that the proposed re-opening of the old Storm King granite-quarries would be visible at all from the river. It is my impression that it would not be thus visible, except by reason of the landing required for shipments. But, even if the face of the quarry were visible to travelers, how would it "deface" the scenery of the Highlands of the Hudson? These masses of granite rock, long since denuded of forest growth and covered with worthless "chapparal," are less capable of esthetic injury by quarrying than any scenery I know in the world.

A few weeks ago I made, after an interval of forty-odd years, a trip on the Rhine. During that period, the Germans had made of their historic river a great interior highway of industry and commerce; and I found it quite as beautiful, and twice as interesting, as when it showed little or no traces of modern progress. Quarries and docks and factories and new cities have been taken into the landscape by all-harmonizing Nature; and man has wisely not interfered!

There is, of course, no disputing about tastes; and, consequently, I do not attempt to enforce upon my neighbor my sense of the picturesqueness of a quarry and its great superiority as a thing of beauty to the average suburban residence, any more than I implore the State to condemn and remove his very unesthetic villa and outhouses. On the other hand, I do not think it right that he should enforce upon me his preference for an unbroken solitude, without a quarry—and make me pay for that preference besides!

The miners' unions of the Ruhr, Saar, and other districts of Germany, held a conference at Essen, Nov. 21, to discuss concerted action in the wages question. After a lengthy debate, the meeting adopted a resolution in which it was decided to await the statistics of wages during the last half-year compiled by the various unions before coming to a decision with regard to a strike. The demands for increased wages will meanwhile be insisted on in their entirety, and, in view of the increase of the price of coal by 25 per cent., decided upon by the Coal Syndicate, the conference felt that those demands are too low rather than excessive.

The Greene-Cananea Consolidation

The consolidation of the Greene Consolidated and the Cananea Central copper companies, by means of the sale of both to a new holding company, has been finally arranged. The transaction is fully explained in the following circular, issued to the stockholders of the Greene Consolidated on Dec. 17:

"Together with a number of the directors and members of the executive committee of the Greene Consolidated Copper Company, I have just returned from an extended trip to the company's properties in Mexico, during which we made very thorough examination of the recent developments of the Greene Consolidated Copper Company's property, and also of the adjoining properties belonging to the Cananea Central Copper Company. In view of the very large orebodies that have been developed during the past few months, the necessity of increased reduction capacity, spoken of in my last annual report, became more apparent. Tentative plans and specifications have been prepared by our engineers, looking to the erection of a new smelting plant to be established on the San Pedro, east of the city of Cananea, together with a further increase of 4000 tons daily in our concentrating capacity which will make, in connection with improvements now under way, a total reduction capacity of about 10,000 tons of ore per day. The estimated cost of these improvements, together with the necessary transportation facilities, will be about \$5,000,000. Several plans were discussed by the directors of your company of the best means of raising this additional capital, among which was a proposed increase of 250,000 shares of capital stock to be offered the stockholders of the Greene Consolidated Copper Company *pro rata* at a price of \$25 per share. In view of the present financial conditions, this was considered inadvisable.

"A proposition was then considered by the stockholders of the two companies looking to a merger of the Cananea Central Copper Company and the Greene Consolidated Copper Company. A plan has been formulated by which a holding company, to be known as the Greene Cananea Copper Company, a corporation under the laws of Minnesota with main offices at Duluth, would take over the stock of the two companies. The plan as formulated provides for the issuance of 2,500,000 shares of the Greene Cananea Copper Company stock, which has a par value of \$20 per share.

"Of this stock 1,500,000 shares is set aside for the purpose of exchanging with such stockholders of the Greene Consolidated Copper Company as desire to exchange, on the basis of 1½ shares of the new company for each share of his stock

of the Greene Consolidated Company. One million shares have been set aside for the purpose of exchange with such of the stockholders of the Cananea Central as desire to exchange on the basis of 1,000,000 shares for the capital stock of the Cananea Central. The new Greene Cananea Copper Company will have a directorate of nine members in all, representing various strong mining interests of the country. Sufficient stock in both companies has been pledged for exchange to insure the new company the control of both companies.

"Stockholders of the Cananea Central Copper Company will take over and pay for in cash to the treasurer of the Greene Consolidated Copper Company the 200,000 shares of the Cananea Central stock held by the Greene Consolidated Copper Company. The price of \$4,000,000 cash has been paid in escrow to the Wells Fargo & Co. bank, in this city, to be delivered to the treasurer of the Greene Consolidated Copper Company upon the completion of the organization of the Greene Cananea Copper Company, and legal details necessary.

"The entire issued stock in the Greene Cananea Copper Company will be used only for exchange for the stock of the Greene Consolidated Copper Company and Cananea Central Copper Company and can be obtained in no other manner, as none will be offered for sale to the public.

"Messrs. Cole and Ryan and Col. Greene will leave New York this month for a trip of inspection of the Cananea Central and Greene Consolidated mines, and decide upon a comprehensive plan of working both properties.

"After full consideration, the directors of your company, by a resolution passed at a meeting held at the offices of the company on Dec. 17, 1906, decided that the proposed merger was for the best interests of the stockholders of the Greene Consolidated Copper Company and recommended to all of the stockholders of the Greene Consolidated Copper Company to exchange their stock in said company for that of the Cananea Copper Company on the basis above mentioned, to wit: 1½ shares of the stock of the new company for one share of the stock of the Greene Consolidated.

"The organization of both the Cananea Central and the Greene Consolidated Copper Company will be maintained until all of the capital stock of each company has been exchanged for stock of the holding company, so that the proposed exchange is entirely voluntary on the part of every stockholder."

Consul J. C. McNally, of Liège, reports that the Belgian Government has just contracted for 15,000 tons of 88-lb. rails at \$30.68 per ton, which was the bid of the Belgian companies, those of France being about \$33.77 per ton.

New Publications

"Reinforced Concrete." Part I—Methods of Calculation, by Albert W. Buel. Part II—Representative Structures and Part III—Methods of Construction, by Charles S. Hill. Second edition, revised and enlarged. Pp. 499; illustrated. 6x9½ in.; cloth, \$5 net. New York, 1906: Engineering News Publishing Company.

"Lead Smelting and Refining with Some Notes on Lead Mining." Edited by W. R. Ingalls, Pp. 327; illustrated. 6½x9½ in.; cloth, \$3. New York and London, 1906: ENGINEERING AND MINING JOURNAL.

Contents: Notes on lead mining. Roast-reaction smelting. Sintering and briquetting. Smelting in the blast furnace. Lime-roasting of galena. Other methods of smelting. Dust and fume recovery. Blowers and blowing engines. Lead refining. Smelting works and refineries.

This book is a reprint of various articles pertaining especially to the smelting and refining of lead, together with a few articles relating to the mining of lead ore, which have appeared in the JOURNAL, chiefly during the last three years; in a few cases articles from earlier issues have been inserted, in view of their special importance in rounding out certain of the subjects treated. For the same reason, several articles from the *Transactions* of the American Institute of Mining Engineers have been incorporated. Certain of the other articles comprised in this book are abstracts of papers originally presented before engineering societies, or published in other technical periodicals, subsequently republished in the JOURNAL.

The articles comprised in this book relate to a variety of subjects, which are of importance in the practical metallurgy of lead, and especially in connection with the desulphurization of galena, which is now accomplished by a new class of processes known as "Lime Roasting" processes. The successful introduction of these processes into the metallurgy of lead has been one of the most important features in the history of the latter during the last 25 years. Their development is so recent that they are not elsewhere treated in technical literature, outside of the pages of the periodicals and the transactions of engineering societies. The theory and practice of these processes are not yet by any means well understood, and a year or two hence we shall doubtless possess much more knowledge concerning them than we have now. Prompt information respecting such new developments is, however, more desirable than delay with a view to saying the last word on the subject, which never can be said by any of us, even if we should wait to the end of the lifetime. For this reason it has appeared useful to collect and republish in convenient form the articles of this character which have appeared during the last few years.

Personal

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

Walter E. Koch has returned to El Paso from Guerrero, Mexico.

John E. Rothwell has returned to Denver from a professional trip to Mexico.

J. R. Hastings, of Chicago, is in Gilpin county, Colo., looking after mining interests.

F. S. Earnest, of Spokane, Wash., is looking after his mining interests in Mexico.

E. W. Sebben returned to Denver last week from a professional trip to New Mexico.

D. W. Brunton has left Denver for Australia and New Zealand on important business.

Foster Hewett is attending to professional engagements in southern Nevada and California.

Barclay Benthorne, of Vancouver, B. C., is in Oaxaca, Mexico, examining mines in which he is interested.

Edwin E. Chase returned from Arizona and Nevada, and left for California after a couple of days in Denver.

C. Colcock Jones is at Phoenix, Ariz. He is conducting some mine examinations in the Superstition mountains.

J. B. Tyrrell, of Toronto, Ont., has just returned from an extended visit to Windy Arm district, Yukon Territory.

John Larson, of Idaho Springs, Colo., manager of the X-Ray Mining Company, is making a business visit to Chicago.

J. J. Cusick, mining engineer of Butte, Mont., has been examining the Revenge mine near Eldora, Boulder county, Colorado.

Chester F. Lee, of Seattle, Wash., has gone to Juneau, Alaska, for London clients in connection with Alaska-Perseverance matters.

Philip Argall, mining engineer, of Denver, Colo., has just returned from an extended trip in Arizona, Nevada and California.

R. C. Canby, of El Paso, is at Charcas, San Luis Potosi, Mexico, installing an electric zinc separator plant for the Tiro General mine.

W. E. Renshaw, manager of the Consolidated Gem Mines Company, of Idaho Springs, Colo., is making a visit to the East on business.

J. G. Creveling, Jr., president and general manager of the Tiro General mine at Charcas, Mexico, is in the United States on personal business.

Dr. John H. Banks, of Ricketts & Banks, New York, has returned from a professional trip to the Manitou district, western Ontario.

James W. Neill, consulting engineer for the East Butte Copper Company, arrived in Butte from Pasadena, Cal., Dec. 10, to inspect the property.

Henry E. Wood, of Denver, Colo., was in New York last week on business in connection with his gold-mining interests in California.

E. G. Spilsbury, mining engineer, of New York, has gone to Arizona on professional business, and is not expected to return until the first week in January.

E. C. Monday, general agent for the Peñoles Mining Company, Mapimi, Mexico, was married to Miss Ethel Bine, of San Antonio, Texas, on Nov. 27.

Joseph H. Tumbach, manager of the San Pedro Gold Mining Company, of Colorado, passed through Denver a few days ago, on his way to St. Louis and New York.

Joseph A. Coram, of the Davis-Daly Estates Company, and E. L. White, president of the Bingham Consolidated Company, of Utah, spent several days in Butte recently.

Rees C. Vidler, general manager of the Transcontinental Transportation and Mining Company, of Georgetown, Colo., left recently on a visit of several months to London, England.

Frank C. Loring has resigned his position as superintendent of the Trethewey mine at Cobalt, Ont., to take effect Jan. 1. He will remain with the company as consulting engineer.

Lawrence Addicks, formerly with the Raritan Copper Works, is now superintendent of the refinery of the United States Metal Refining Company, at Chrome, New Jersey.

A. M. Cunningham, of Waco, Texas, president of the American Consolidated Mining and Milling Company, is inspecting the company's property in the Taviche district, Oaxaca, Mexico.

G. M. Minzesheimer, of Minzesheimer & Co., of New York, who is connected with the Butte-New York Copper Company, visited Butte early in the month in connection with the property.

H. H. Taft, a mining engineer of Denver, inspected the property of the Butte & Summit Valley Company, in Butte, a few days ago, in the interest of Boston men, who are backing the company.

R. E. L. Townsend, who has been in charge of mining properties in old Mexico, has been appointed manager of the Taawaasa Gold Mining, Cyanide and Reduction Company, operating in Gilpin county, Colorado.

Charles O. Ellingwood has resigned the position of general manager and treasurer of the Western Exploration Company, and the Honerine Mining Company, of Utah. Charles M. Dupont has succeeded him as secretary of the Honerine company.

Societies and Technical Schools

Canadian Clay Products Manufacturers' Association—The annual convention of this association was held in Toronto, Dec. 12 and 13, about 200 members being in attendance. Samuel J. Fox, of Lindsay, president. The association includes manufacturers of brick, tile, pottery and sewer-pipe. Prof. A. P. Coleman delivered a lecture on the historical formation of the clay deposits and their adaptability to various industrial uses. Dr. Pyne, Ontario Minister of Education, indicated that a department of technical instruction in the clay industries would probably be established in connection with the Toronto School of Practical Science.

Industrial

The H. W. Johns-Manville Company has opened a branch in New Orleans, in charge of W. E. Carpenter.

The Shenango Furnace Company is arranging to build a number of by-product coke ovens adjoining its furnaces at Sharpsville, Penn. It is also building an additional blast furnace.

The Bartlett Steel Company, Joplin, Mo., has been awarded the contract for the fabrication and erection of all the steel buildings required in the new cement plant of the Dewey Portland Cement Company, Dewey, I. T., which plant is now being constructed by Tyler & Co., of Junction City, Kansas. This work of erection will commence in less than 90 days and it is expected that it will be completed in the early part of May. This involves about 500 tons of structural steel.

Powell & Colne, 11 Broadway, New York, agents for the Tropenas converter steel process for small and medium steel castings, have closed a contract with the Reading Steel Casting Company, Reading, Penn., for a new two-ton converter, to be placed where they first installed the process under the name of the Brylgon Steel Casting Company. They have also contracted for a second two-ton converter for the Duquesne Steel Foundry Company, Coraopolis, Pennsylvania.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Niles-Bement-Pond Company, 111 Broadway, New York City. "Progress Reporter," Dec., 1906. Pp. 48, illustrated; paper, 10x12 inches.

Allis-Chalmers Company, Milwaukee, Wis. Electric Hoists; Pp. 16, illustrated; paper, 8x10 in.; Sept., 1906. Also Allis-Chalmers Direct Connected Reynolds Corliss Engines, Bulletin No. 1610; Pp. 12, illustrated; paper, 8x10 in.; Sept., 1906.

Sturtevant Mill Company, Boston, Mass. Crushing Rolls. Pp. 6, illustrated; paper, 7x11 in.; 1906.

Knippenberg Manufacturing Company, Oshkosh, Wis. Miners' Lamps. Pp. 32, illustrated; paper, 6x8½ in.; 1907.

Ingersoll-Rand Company, New York. Catalog X36, Imperial Air Compressors. Pp. 40, illustrated; paper, 6x9 in.; 1906.

Crandall Packing Company, Palmyra, N. Y. Crandall Packings. Pp. 80, illustrated; indexed, paper, 5½x8 in.; 1906.

Truxal-Painter Manufacturing Company, Chattanooga, Tenn. The Painter Hoist. Pp. 6, illustrated; paper, 6x9 in.; 1906.

American Sheet and Wire Company, Chicago, Ill. American Wire Rope News. Pp. 12, illustrated; paper, 9x12 in.; Oct., 1906.

Western Electric Company, Chicago, Ill. Hawthorne Works for the Manufacture of Power Apparatus. Pp. 24, illustrated; paper, 10x7 in., 1906.

Westinghouse Traction Brake Company, Pittsburg, Penn. Straight Air Brake Equipments. Pp. 11, illustrated; paper, 8x11 in.; Oct., 1906.

The C. L. Hathaway Rock Crusher, Company, Denver, Colo. Catalog No. 1, Hathaway Gyrotory Crusher; Pp. 62, illustrated; paper, 8x10 in., 1906.

Parker Hoist and Machine Company, 973 North Francisco Ave., Chicago, Ill. Catalog No. 18, Contractors' Machinery; Pp. 42, illustrated; paper, 3x6 in., 1906.

Colorado Iron Works Company, Denver, Colo. Bulletin No. 21, Screening and Sizing; Pp. 20, illustrated; paper, 7x9 in., 1906. Also Bulletin No. 22, Crushing Rolls; Pp. 12, illustrated; paper, 7x9 in., 1906.

Deutsche Gold-und Silber Scheide Anstalt, vormals Roessler, Frankfurt am Main, Germany. No. 8, Preis-Verzeichniss für Laboratoriums-und Industrie-Ofen Laboratoriums-Apparate und Probier Utensilien. Pp. 120, illustrated; paper, 5½x8 in.; 1906.

Construction News

Arroroy, Masbate, Philippine Islands—The Mount Cogran Mining Company is planning to double the capacity of its mill early next year. George Lander is secretary; address as above.

Manitou Lake, Ontario—The Manitou Mines Company, which operates the Victory gold mine, is arranging for the instalment of a hoist, boiler and compressor plant. A contract will also be let for 100 ft. of sinking supplemented by cross-cutting and drifting. H. D. Alston, managing director, has been instructed to select the plant.

Special Correspondence

San Francisco Dec. 12

The unprecedentedly heavy storm of Saturday night and Sunday was felt all over the State, and has brought a heavy fall of snow in the mountain regions. The rainfall has been large on the watersheds of the Yuba, Bear, Feather and Sacramento rivers, as well as on the Klamath and its numerous tributaries. Rainfall over the Tuolumne, Stanislaus, Calaveras and Mokelumne watersheds has been very heavy indeed. All this is exceedingly beneficial to the mining industry in all sections. The hydraulic and surface placers may now start up in those sections where ice does not interfere with operations.

Six miners were entombed by a cave in a big tunnel in the Kern river cañon a few days ago and the rescue parties energetically working to clear away the débris heard sounds as if the men were still alive. A steel pipe was driven through the caved material and yesterday one of the men, L. B. Hicks, was found to be alive, while the others were dead. Hicks asked the men to hurry and get him out. He was not injured as his position is beneath a car in the débris, the car saving him from being crushed to death. He had been imprisoned 100 hours when communicated with. Milk is being poured through the pipe to serve as food. At this writing it is expected that it will take four more days before the man can be extricated.

The Nevada Association of San Francisco, with a limited regular membership of 200, and 25 associates, is being organized in this city by the business men who recently went on a trip of "discovery" to the new Nevada mining camps. The purpose of the organization is stated to be the promotion of friendly relations between the mining men of Nevada and the business men of San Francisco, with the idea of making San Francisco the headquarters of the present generation of Nevada miners, as it was of the Comstock men. For this purpose a correspondent will be maintained in each of the important mining camps of the State. An information bureau will also be instituted with headquarters in the St. Francis hotel where quarters have already been donated. The temporary officers are Henry T. Scott, president; Andrew Carrigan, vice-president; M. J. Brandenstein, treasurer; E. P. Brinegan, secretary. In response to the action of the local committee the Tonopah Board of Trade has appointed the following committee to coöperate: Key Pittman, W. J. Douglas, R. P. Dunlap, L. L. Mushett and H. T. Sheldon. George Wingfield of Goldfield has wired his co-operation, and states that a committee will be appointed to help in the work within the next few days.

The Midway oil field, 40 miles west of

Bakersfield, has no transportation facilities at present, and the Standard Oil Company proposes to construct a 50-mile pipeline from the district to its tanks and get control of the output of the field, which furnishes some 6,000,000 bbl. a year. The corporation desires the Midway oil, which is very light, to mix with the heavy product of the Kern river field. It is reported that 25c. per barrel has already been offered by the Standard to the Midway producers, and that the trust is prepared to go higher if necessary. The Santa Fe is a large holder in the Midway field, having a month ago bought property there at an estimated cost of \$1,000,000, and made a survey into the field.

At the Mammoth smelter, Kennet, Shasta county, furnace No. 3 has been closed down for repairs and general overhauling. The present capacity of the tram, namely several hundred tons daily, while up to the full capacity of the original plans, is nevertheless hardly capable of fulfilling the requirements of all three furnaces in operation at their present high rate of consumption. Recently 1183 tons of charges were put through in a single day of 24 hours.

Holt & Gregg, of Anderson, Shasta county, are about establishing an extensive cement-making plant at that point, where the raw materials necessary are abundant.

News is received from Greenwater that the cold spell has reached even into the confines of Death Valley. Greenwater and vicinity have been covered with several inches of snow. Despite this the work of development has gone steadily on and the mines are being opened up with all possible speed, while the growth of the towns is remarkable.

The Grass Valley Miners' Union voted down the proposition to strike in the event that the demand for \$3 a day for carmen and \$2.50 for shovelers and tool-nippers was not granted. The vote stood 246 for striking and 101 against it. It required a three-fourths vote to carry. The miners are working on a new proposition in regard to wages and hours to be made to the employers.

If the plan of leading mining and business men carries, the prominent mines of Nevada county will be listed on the stock board. They have come to the conclusion that what Nevada county—with the richest gold mines in the State—needs, is something like this to induce capital to assist in the development of the scores of properties now lying idle.

Salt Lake City Dec. 15

An amendment to the articles of incorporation of the Lower Mammoth Mining Company, has been filed, changing the capital stock from 150,000 to 190,000 shares.

The new Tintic Smelting Company, organized recently to build a plant for the treatment of lead-silver ores in the Tin-

tic district, will open offices in Salt Lake City, jointly with the Utah Smelting Company, operating a copper plant near Ogden. Bela Kadish is manager of both concerns.

The directors of the Daly Judge Mining Company will meet during the present week to post the initial dividend. The company will close the year with about \$300,000 in the treasury. The net proceeds have been about \$50,000 per month for some time. The amount of the dividend has not been determined, but will probably be 45c. a share.

The property of the Ohio Copper Company at Bingham is now being conducted under the management of F. Augustus Heinze, who recently secured control of the stock. Mr. Heinze has been elected vice-president, Frank P. Swindler, secretary and treasurer, and W. A. Kidney a director. The latter will look into the matter of mill facilities, which will be upon an elaborate scale. The plant will probably be built to handle 2000 tons of ore daily.

Articles of incorporation of the Nevada Ore Sampling Company have been formed to build and operate a sampling mill at Hazen, Nevada. Fred B. Smith, of Hazen, is president and manager. Salt Lake parties are interested with him.

Samuel Newhouse has become interested in the Pioche, Nev., district by the acquisition of a large interest in the stock of the Ohio-Kentucky Mining Company, Mr. Newhouse has been made president of the company, succeeding J. H. Hackett, of Louisville, Ky., resigned. This is believed to be the forerunner of a consolidation of the Ohio-Kentucky and the Nevada-Utah Mines and Smelters corporation.

Denver Dec. 14

Attorney General Miller is preparing an order on the executors of the Stratton estate to show cause why interest on the amount of inheritance tax, assessed against them, should not be paid, they having refused to do so. They have stated their willingness to pay the principal, amounting to about \$280,000, and the interest has accumulated to the extent of \$70,000. Possibly suit will be commenced in the district court of El Paso county.

The capacity of the United States Zinc Company's plant at Pueblo, one of the properties of the American Smelting and Refining Company, will shortly be more than doubled, and extensive improvements are in progress. Thirty brick and cement houses will be built and there is a probability that the Pueblo Traction Company will extend its electric line to the town of Blende, which has gradually grown up in the vicinity of the smelter.

The Arizona Smelting Company, of Humboldt, Arizona, has recently been re-organized, and is now the Consolidated Arizona Smelting Company, with a capi-

tal stock of \$15,000,000. The executive officers of the company are J. L. Elliott, president, and L. Vogelstein, vice-president.

Active work is beginning on the great power plant at Lafayette, and 250 men are in the employ of the Northern Colorado Power Company. The management will be in the hands of J. J. Henry and the estimated cost will be about \$2,500,000. About 20 towns in northern Colorado will probably be furnished with light and power, and it is said, although Mr. Henry will not confirm the report, that the Colorado & Southern Railway Company has contracted for power for a line between Denver and Boulder.

Duluth Dec. 15

Shipments of iron ore from the Mesabi and Vermillion ranges are given by the railroads as follows, in long tons:

	1905.	1906.	Changes.
Dul., Missabe & N.	8,807,559	11,220,218	I. 2,412,659
Dul. & Iron Range	7,779,850	8,180,128	I. 400,278
Great Northern...	5,124,000	6,084,200	I. 960,200
Total.....	21,711,409	25,484,546	I. 3,773,137

The roads are now preparing to handle ore on the same basis in 1907, as follows: Duluth, Missabe & Northern, 13,000,000 tons; Duluth & Iron Range, 9,000,000; Great Northern, 7,000,000; or a possible total of 29,000,000 tons out of the Minnesota ranges.

Rumors have been current the past week to the effect that the Oliver Iron Mining Company was to sell its Michigan mine, Menominee range, to Pickands, Mather & Co., and was to turn over perhaps all its properties in Iron county, Mich., to the same buyer. It is decidedly contrary to the Oliver policy to sell mines, and the rumor is without foundation. The Oliver company is more liable to buy mines than sell them.

The firm of Pickands, Mather & Co. is adding to its holdings all the time, and it has now six mines on the Gogebic range, most of them at the Sunday Lake end of the district. These include the Sunday Lake and Brotherton, the Mikado, Cary and Windsor, and the firm has now taken the Pike, an extension of the Brotherton ore lenses. This has been a small shipper, but is liable to develop into a mine of some importance under strong management.

The New York State Steel Company, which has been busily engaged in picking up mines on the Mesabi for some months, has taken a third property, one of the Congdon-Hartley group, containing a medium tonnage of ore of good structure. This gives the company an abundance of ore for some time to come, and it will now carry on explorations at various points in order to secure itself for the future.

Scranton Dec. 17

According to the official figures of the United Mine Workers, the membership is

far from a good proportion to the number employed. In the first district, where there are 72,000 eligibles, there are only 14,000 members, and in the Seventh district there are but 4000 members. In the Ninth district, where there are 60,000 eligibles, there are 12,000 members in good standing.

President William Dettery, of the Hazleton district of the United Mine Workers, has announced that he will not present any charges against the president, John Mitchell, at the Lansford convention. A few weeks ago, when Dettery withdrew as an officer of the union, it was alleged that he made statements that, at the convention, he would make his position known, and that there would be some sensational charges, intimating that they would be leveled at Mitchell. Since that time President Mitchell announced that he would be at the convention to answer the charges. Dettery, who is a member of the Conciliation Board, has thus restored peace in the region.

The Pennsylvania Child Labor Committee, of Philadelphia, has sent out copies of the child-labor bill, which will be introduced at the coming legislature, next month, which provides that no child under 14 years of age shall be permitted to work for compensation or wages. Boys under 16 years of age are to be prohibited from working in the anthracite or bituminous mines. Neither will boys under this age be allowed to work in places where they may be required to do oiling, repair belts, or operate circular saws. Employment certificates are also to be produced from the school superintendents of the district, regarding school attendance.

The Scranton Coal Company is sinking a shaft at the Pancoast colliery, Scranton, which was rebuilt about twelve months ago. The shaft will be 180 ft. deep and 10x14 ft. in dimensions. It will be used for additional ventilation. A new fan-house is also being erected.

Toronto, Ont. Dec. 16

The record for provincial mining charters of incorporation was broken this week. No fewer than 24 companies with an aggregate capitalization of \$30,840,000, are on the list. They are mostly Cobalt companies, but two of them are Larder Lake propositions.

Dec. 14 a telegram was received by Prof. Willett G. Miller, provincial geologist, from Mining Inspector E. T. Corkill, now directing Government work on the Gillies timber limit, near Cobalt, stating that in drifting on the 70-ft. level a large body of high-grade silver ore was uncovered. This is considered by the officials to indicate that the deposits are very extensive. Professor Miller left for the mine at once to make fuller investigations. It has been decided to let a contract for the further sinking of the shaft on the second vein on the limit now 25 ft. down.

General Mining News

Petroleum Exports—Exports of mineral oils from the United States for the 11 months ending Nov. 30 were in gallons:

	1905	1906
Crude	93,621,790	107,097,073
Naphthas	26,531,329	23,623,989
Illuminating	786,596,746	761,696,954
Lubricating	98,302,212	135,483,944
Residium	59,496,233	55,122,446

Total.....1,064,548,310 1,083,024,356

Lubricating oils include paraffin. There was an increase in the total of 18,476,046 gal., or 1.7 per cent.

ALABAMA

CLAY COUNTY

Standard Copper Pyrites Company—This company has nearly completed a new and modern plant, designed to mine about 250 tons of ore per day. It will probably be in operation about Jan. 1. The company has a large body of ore, which carries at present 6 per cent. copper and 42 to 46 per cent. sulphur. Should the copper values continue good as mining progresses, the company will put in a concentrating plant, and later a 100-ton smelter. The mines are at Zell, the post office address being at Pyriton, Ala. Robert R. Zell is president of the company.

ALASKA

VALDEZ

Valdez Hydraulic Gold Mining Company—The company has leased its property to H. H. Bradlee and associates, on a royalty basis, with option of purchase. The property consists of 1600 acres in the Craig Creek basin.

ARIZONA

GRAHAM COUNTY

Arizona Copper Company, Ltd.—This company reports the production of its works at Clifton in November at 1135 short tons of copper.

PIMA COUNTY

Omega—This company informs us that after cleaning out the old workings, which were abandoned 23 years ago, some 7000 tons of high-grade sulphide copper ore were exposed. C. T. Roberts is superintendent in charge.

Tip Top—It is reported that this property has been sold to the Guggenheim interests. It is in Helvetia district, about 22 miles south of the Omega mines.

CALIFORNIA

AMADOR COUNTY

Sutter Creek—At this gold mine, eight miles east of Sutter creek, development work has commenced under superintendency of B. K. Worly. It is expected that a five-stamp mill will be erected shortly.

Zeila Mining Company—Ore extraction has stopped at this mine at Jackson in order to repair the shaft, a piece of

work which will take several months' time.

CALAVERAS COUNTY

Chapman—Considerable surface work is going on at this mine, San Andreas, and the incline shaft to reach the gravel will shortly be started.

Copper—The Constant Bond ranch, near Angels, has been bonded by Tonopah men who will prospect it for copper ore.

EL DORADO COUNTY

Robinson Claim—The 160-acre tract of this name near Fairplay has been sold to Eastern men, with John W. Perry in charge. The deep gravel channels are to be developed.

FRESNO COUNTY

Copper King Mining Company—This mine near Clovis, which has been operated for some time by a receiver, has been closed down and the original company is expected to begin work on its own account, the liens having been paid off and part of the other debts as well.

INYO COUNTY

Greenwater—Owing to unprecedentedly cold weather the mines in this new copper camp are in a partial state of suspension except in the deeper ones. The recent growth of the towns in the district is quite remarkable.

South Furnace Creek Copper Company—This company, owning nine claims in Greenwater district, is making financial arrangements to start a 250-ft. shaft to develop its property.

NEVADA COUNTY

Southern—The property of James Southern in Grass Valley district, consisting of several mining claims, a mill, and some miles of ditches, has been purchased by Frank Gluyas, of Grass Valley, who will develop the claims.

Coulin Mining Company—This company at Nevada City has let a contract for a 10-stamp mill, which is to be built by the Taylor Engineering and Foundry Company of that place.

PLACER COUNTY

Loomis Gold Mining Company—This company has recently been operating the old Barton gravel mine near Loomis, with R. C. Browning as superintendent. The mine had been idle for 15 years.

PLUMAS COUNTY

Plumas-Eureka Mining Company—This famous old property at Johnsville, worked profitably for many years by the Sierra Buttes Mining Company, an English corporation, and finally given up by them, is now being operated again by Nevada men who are putting up new machinery and hope to make the mine productive again.

SAN DIEGO COUNTY

Golden Cross Mining Company—This property, in Cargo Muchacho district, near Ogilby, which has a mill of 140 stamps, is

now clear of debt, and it is understood will shortly be reopened. There is a 400-ton cyanide plant at the mine.

SAN LUIS OBISPO COUNTY

Copper—F. W. Bray, of Santa Cruz, has bonded for two years a tract of land near Cayucos and is reopening some of the old tunnels which were run 50 years ago. One of these tunnels is 700 ft. and another 300 ft. long.

TRINITY COUNTY

Le Grange Mining Company—This company, near Weaverville, is intending this winter to prospect extensive beds of gravel in the Trinity river, a few miles below North Fork. The Hicks water right has been purchased. Men working for this company have also established a camp within four miles of Weaverville to prospect a bed of auriferous gravel at that point.

Bullychoop—This mine will be operated all winter, its new 30-stamp mill having been completed. With the water-power plant it is expected to mine and mill the ore for about \$1 per ton. The 30-ft. ledge is of an average value of \$4 per ton.

Lookout—This mine, in Indian Creek, has been bonded to W. R. Beall, and W. R. Bigelow. Both quartz and placer mines are included in the bond.

Humboldt Placer Mining Company—This company has signed an agreement to sell 4574 acres of auriferous gravel in Buckeye mountain district, eight miles northeast of Weaverville, to Lincoln Brodt.

TUOLUMNE COUNTY

Bagdad-Chase Mining Company—At the Soulsby mine, Soulsbyville, owned by this company, the shaft is now 725 ft. deep and when sunk to the 800 level, drifts will be run both ways.

COLORADO

LAKE COUNTY—LEADVILLE

Resurrection—Several weeks ago the Yak company secured a lease on the Resurrection and Fortune, Big Evans gulch, and work will be started on No. 3 shaft of the former before the end of the year. Some surface improvements are being made now. It is the intention of the company to install heavier machinery, unwater the shaft, 1100 ft., and when this is accomplished the sulphide orebodies in the lower contact will be thoroughly explored. When the Resurrection shaft is unwatered, the Fortune shaft will be practically dry and work will be resumed on this property at the lower levels. In the meantime the tunnel is being driven ahead and is now nearing the Ollie Reed territory. The Yak people have also started sinking on the Hopemore shaft, north of Little Jonny No. 4, and it will be sent down 700 ft.; the shaft will be 4½x9 in the clear.

Sugar Loaf—The starting of the long

drainage and development tunnel on the Dinero property has given impetus to mining in this section, and a number of prospectors who generally quit work on their claims during the winter months will continue at work. Mason, who is leasing on the Bartlett tunnel, is shipping monthly a carload or two of high-grade ore; in addition to taking out ore he is driving a crosscut drift to open the orebody at another part of the mine. Peach & Smith are still driving ahead on their tunnel, which will cut the Swisher fault, and have several hundred feet to go. Emmet Koehler from the Sundawn claim is shipping fair ore from a vein that was opened at 50 ft. From the Tiger, Caton & Murphy are shipping about 75 tons a month of a good grade of ore. When the Dinero tunnel drains the hill, Sugar Loaf district will add considerably to the monthly tonnage.

White Cap—Part of this property on Iron hill is under lease to Lou Chamberlain and during the week in one of the lower levels he opened a body of quartz that carries 1 oz. gold per ton; the little work that has been done on the orebody shows it widening. This is another property that is controlled by the Yak tunnel people. The ore was found in the Imes claim portion of the White Cap.

Crescent—Recently this shaft was leased to Calvert and associates by the Morning and Evening Stars Consolidated Mining Company, and when the necessary repair work is done, drifting will be started from the bottom level and driven into virgin ground in Carbonate hill. The men who have the lease are all practical miners, and thoroughly understand the conditions and formation of Carbonate hill.

Union Jacks—On Homestake mountain, two claims owned by George Wilson and located 1500 ft. south of the old Homestake mine, will probably by the spring be shipping ore. Work on the claims is done through a tunnel and last week several small veins came into the breast, carrying good values in gold, silver lead and zinc. Wilson is of the opinion that the veins will come together when the Homestake vein is reached, and, to accomplish this, work will be continued during the winter months. The property is located above timberline.

Bohn Shaft—This shaft, East Second street, in the downtown section, has opened up a splendid body of iron in the upper workings and will be able from now on to ship 1500 tons per month. The high-grade ore in the lower levels still holds out. The ore is chloride running high in value.

Yak Tunnel—The heading of the tunnel is now several hundred feet east of the Vinnie shaft, Breece hill, and going straight for the territory of the Ollie Reed, South Evans gulch. When the lessees on the Vinnie get matters straightened out, the shaft will be sunk to the

tunnel level and connections made. In the meantime the Yak people are working the Ollie Reed from the main shaft and shipping some fair ore from the lower levels. Recently a clash took place between the manager of the tunnel and the Denver & Rio Grande railway officials as to the rights of trackage at the mouth of the tunnel, with the result that the tracks were taken up out of the yard. This has caused considerable inconvenience to outside shippers, principally those from Rock hill, who hauled from the mines to the Yak yards and loaded on the cars. Now they have to haul to the Moyer switch farther up the gulch.

Hopkins—In this mine, Mt. Sheridan district, at the head of California gulch, the lessees, Wall & Shanahan, have driven a tunnel on the vein a distance of 200 ft., and at that point the vein has widened out several feet and ore running from \$50 to \$65 per ton is being shipped. The ore is heavy in lead and carries values in gold and silver. As the tunnel is driven ahead the ore shows no signs of diminishing.

Helena—A good body of lead sulphides has been opened at the 300-ft. level, and this mine, in Iowa gulch, is shipping about 30 tons daily. During the summer the inflow of water was so heavy at the 600-ft. level, the bottom of the shaft, that work had to be abandoned. The water flow has greatly subsided and preparations are being made to unwater the shaft and prospect for the body of ore in the lower contact.

New Mills—The Boston & Arizona mill at the foot of Harrison avenue is being equipped with machinery as fast as it can be secured from the foundry, and will be in running order by Jan. 1. When in running order the mill will be in a position to handle any kind of zinc ore that is found in the camp. The Damascus mill, at the old Norton sampler, will also be in running order by the first of the year.

Murphy Shaft—Recent development work on this property, Rock hill, has opened up larger orebodies and the mine is now in a position to ship 50 tons daily of hard carbonate and gray sand. The principal work is being carried on to the northeast.

TELLER COUNTY—CRIPPLE CREEK

The talk of starting the drainage tunnel is being indulged in freely, and from the best obtainable data it seems as though the big bore would probably be started shortly after the beginning of the year. The building of mills for the treatment of low-grade ores on the ground is still in progress. Several of these mills have recently been finished or soon will be and are in the market for ore, either custom or from the mines owning the mills.

Little Clara Lease—This lease still continues to be the sensation of the day. The

fortunate owners are also venturing in to several other propositions, among these being the Hoosier on Tenderfoot hill.

Elkton—This mine, while only working one shift at present, is taking out a fair amount of good grade ore. No attempt is being made to work the mine below water level.

Isabella—Good reports are coming from the Isabella property on Bull hill. The mill for the treatment of the low-grade ore on this property will soon be ready for business.

C. K. & N.—This property has been leased by Thompson and associates who, it is understood, are to work the property through El Paso workings.

GEORGIA

DADE COUNTY

High Carbon Coal Company—This new company has been organized to hold and work a tract of coal land. James K. Hines, of Atlanta, Ga., is president; E. M. Jones, of Chattanooga, Tenn., general manager. The property is close to the Tennessee line, near the Nashville, Chattanooga & St. Louis road.

IOWA

DUBUQUE COUNTY

Avenue Top—Specifications are being asked for by this company, at Dubuque, Iowa, to cover a 50-ton mill and power plant. It is proposed to place the mill down near the Mississippi, owing to the location of the mine in the heart of a fine residence portion of Dubuque, thus assuring plenty of water and ample room for refuse and tailings. The ore is of such a nature that it can readily be culled and only the rich mill dirt need be hauled to the mill. The company is almost entirely composed of representative business men of Dubuque. When built, this will be the first modern concentrating plant at Dubuque.

MONTANA

BUTTE DISTRICT

Amalgamated—This company has been notified by the Great Northern Railroad that 200 steel cars for transporting ore from the mines to smelters are on the way from the lake region. The addition of these cars to the regular equipment will relieve the congested condition. Several of the subsidiary companies have been compelled to close their mines a day or two at a time recently on account of inability of the railroad to keep the orebins from becoming overcrowded. Anaconda expects to finish sinking on the High Ore by the first of the year. The shaft will then be 2,600 ft., the deepest in the district. Drifting on the vein at the 2400 of the Anaconda mine is progressing, and reports are to the effect that the orebody is as strong at that depth as it is on the 2200. Anaconda is the first to open a vein at the 2400 level.

Coalition—The company is still engaged in extensive development and expects to have its mines in fair shape by the first of the year. Its ore production is averaging about 1000 tons a day, the larger part of which is coming from the Rarus.

North Butte—The output at present is a little less than 1200 tons a day. Sinking is in progress in the main shaft. Development is going on in Speculator ground south of the shaft, where connections with the Diamond are to be made, and also in the veins of the Jessie and Edith May. The company may not start work in the Berlin shaft until toward spring.

Butte-New York—The company is equipping the Col. Sellers claim, one of its group, preparatory to sinking a deep shaft close to an immense copper cropping. It is developing the Pollock, a silver-ore producer, farther west.

La France Copper—This company, the only asset of United Copper, in Butte, is on the eve of greater ore production from its upper levels. It has been mining from 125 to 150 tons a day, but expects to increase the quantity to 225. It is figuring on substituting an electric hoisting engine for the steam one in use.

Davis-Daly Estates—The face of the crosscut, which the company is driving south of the 1800-ft. station of the Original mine, is in about 1000 ft., and is supposed to be near the vein of the Thomas claim. The company is not mining ore in any of its claims, as it is confining its efforts to development, but lessees have struck a vein of high-grade silver-gold ore in the Plymouth, one of the group.

NEVADA

NYE COUNTY—TONOPAH

Ore Shipments—Shipments over the Tonopah railroad from Tonopah for the week ending Dec. 6 were: Tonopah Company, 665 tons; Belmont, 250; Tonopah Extension, 315; total, 1230 tons. In addition 1630 tons were shipped from Goldfield, making a total of 2860 tons. Shipments were light, owing to coal shortage at the mines, and lack of cars on the railroad.

Midway—The Midway Mining Company has declared its regular quarterly dividend of 5c. per share, payable on Jan. 1 next. The mine is shut down at present on account of the fuel famine.

Boston-Tonopah—Operations have been resumed on this property after a lapse of several years. The shaft is 500 ft. deep and there is a southeast crosscut running 220 ft. from the lowest level. This crosscut will be extended 600 ft. farther, and sinking will be resumed when fuel is obtainable. The mine is well situated northeast of the North Star and Montana mines and their veins will be cut when development operations are extended at greater depth.

Great Western—The shaft is down 365 ft., and no further change in the country has been experienced. The prevailing rock is still rhyolite. The management intends sinking until the lode porphyry, or later andesite, is cut before crosscutting for the extension vein, which is believed to run through the ground.

Big Limit—A Tonopah company consisting of prominent mining operators, has commenced development operations on the Big Limit claims on the southeastern slope of Lone mountain, about 15 miles southwest of Tonopah. A large quartz vein outcrops on the surface, and assays well in copper and silver. It is proposed to sink a shaft to a depth of 500 ft. and develop the vein at depth.

NYE COUNTY—MANHATTAN

Original—A large ledge was cut in a crosscut from the 65-ft. level in the Monday claim several weeks ago, and the prospects were so good that the management decided to continue sinking to the 100-ft. level. A crosscut was run to the ledge from that level, and successfully cut a fine body of auriferous quartz. This has led to a rapid increase in share values.

Yellow Horse—A 4-ft. orebody of a promising nature was cut in the 90-ft. level a few days ago, and it is proposed to sink to a greater depth before opening up the vein.

NYE COUNTY—BULLFROG

Steinway—The northeast crosscut has been run a distance of 250 ft., and promising quartz stringers have been encountered. It is expected that the vein will be picked up within a short distance.

Tramp—The management continues to sack all the rich ore mined. The Tramp shaft is now about 60 ft. below the Eclipse tunnel level. All the workings are in ore and in places very high assay values are obtained.

Golden Sceptre—A new drilling plant has been installed to operate in the crosscuts from the 300-ft. level. These crosscuts are now in 150 ft. and 55 ft., respectively, and will be sent ahead as rapidly as possible. The main tunnel is now in 600 ft., and at a distance of 585 ft. a strong quartz vein was entered, and has not yet been cut through. The average assay value of the first 5 ft. is \$7 per ton.

Denver Annex—The winze from the Louisville tunnel has been sunk to a depth of 65 ft. It is in ore all the way. It is proposed to continue sinking to the 100-ft. point, where a drift will be started to prove the extent of the ore-shoot. Drifting is also being done from the tunnel level. The prospects being so promising the company proposes to largely increase the working force.

WASHOE COUNTY

Olinghouse—The Olinghouse camp in the White Horse district is showing much activity. The new railroad to the camp,

connecting with the main line of the Southern Pacific, at Wadsworth, is nearly completed and freight is already being hauled in over it. The 50-stamp mill now being built at the lower terminus of the railroad on the Truckee river, is expected to be completed by February. The excavation has been finished and concrete foundations are being laid. The machinery and stamps, furnished by the Joshua Hendy Company, of San Francisco, are all on the ground. Power is to be obtained temporarily from the electric plant at Wadsworth, but later the Truckee river will be utilized. The various mines and prospects of the district are doing active development work. On the Buckeye Buster a new tunnel is to be run which will cut the known leads at a depth of 750 ft. The Keystone Nevada is preparing to sink its shaft to the 300-ft. level, and then crosscut to get the ledge of free-milling gold ore encountered on the 100-ft. level. The company has recently ordered machinery adequate for deep mining, which will be immediately installed.—The Nevada Consolidated Mining Company (formerly the Green Hills) is blocking out ore preparatory to making large shipments when the new mill is completed.—The Olinghouse Nevada Company, owning the Renegade claim, has cut a ledge of free-milling ore at a depth of 200 ft., averaging \$10, with the footwall not yet in sight. The width of the vein so far exposed is 40 ft. The company has leased the Slip mill, and will begin shipping immediately.

OREGON

BAKER COUNTY

Sovereign Consolidated—This company has been organized with \$2,000,000 capital stock. The officers are: James A. Howard, president; John Arthur, vice-president; Kenneth C. McEwen, secretary; W. J. Patterson, treasurer. The property is 35 miles northeast of Baker City, and 5 miles from Sparta, on Coin creek. It consists of 12 claims, on which prospecting has shown a copper-bearing vein, cropping out for a considerable distance. At a depth of 40 ft. the vein promises well.

South Pole—This mine, on the Elkhorn range, has been sold by A. Hanson, of Denver, Colo., P. Basche, of Baker City, and E. Melzer, of Bourne, the owners, to Manager Harris of the Maxwell mine, an adjoining property. The price named is \$100,000, and the new owners will develop the property.

Virtue—In this mine, 6 miles east of Baker City, a strike has been made which is believed to show a new orebody, carrying free gold. The Virtue is the oldest mine in the district.

PENNSYLVANIA

ANTHRACITE COAL

Delaware & Hudson—No. 1 colliery of this company, at Carbondale, which has

been idle for six weeks for repairs, resumed operations last week.

Wilkes-Barre Coal Company—This company, which recently began boring operations in the Shickshinny valley, at the southern end of the Wyoming basin, has struck a small vein at 800 ft. depth.

Darkwater Colliery—A tunnel is being driven at this colliery, near Pottsville, for the purpose of tapping the water from the old Repliner workings, which were abandoned about 30 years ago, when a squeeze occurred.

Ellsworth Colliery—A new breaker is being built at this colliery, near New Castle. John Davis, of St. Clair, has the contract.

Scranton Coal Company—This company has completed the sinking of a shaft at the Richmond colliery, in Scranton, under great difficulty, and has overcome a problem not often met with in mining. Two years ago it was decided to sink a new shaft, the old one being too small to deal with the increasing output, but owing to the fact that the shaft had to be sunk through a bed of quicksand 75 ft. in depth, special arrangements had to be made. Engineer Frank G. Wolfe devised a system of lagging which was placed for a depth of 80 ft., as the men sank the shaft through the sand. This was an unusually strong structure, and was suspended from a framework. After the bottom of the sand had been reached, a foundation was made in the rock and the building of an immense concrete wall begun. The shaft is 12x30 ft., and the concrete is reinforced by mine rails placed both horizontally and vertically, and clamped to heavy ironwork in the timber. A system of drainage has also been laid out, permitting the free passage of the large body of water from the sand through the concrete wall. The shaft is 520 ft. deep, and has two hoist ways, 7 ft. 6 in. each, and one air-way 12 ft. 2 in. The shaft reaches the lower vein, and will work the four veins of coal in this section.

BITUMINOUS COAL

Rochester & Pittsburg Coal and Iron Company—This company has heretofore controlled the coal lands bought by the Buffalo, Rochester & Pittsburg Railroad company. Practically all of the stock has been owned by the railroad company. It is now announced that the property will be transferred to a new corporation known as the Mahoning Investment Company. The stock of this—\$4,200,000 in amount—will be distributed *pro rata* among the stockholders of the Buffalo, Rochester & Pittsburg Railroad Company, each receiving stock to the amount of 25 per cent. of his holdings in the railroad company. The ownership of the Mahoning Investment Company will, therefore, be vested in the individual stockholders, and not in the railroad company. This action is taken in consequence of the provisions of the

Federal railroad law, forbidding the ownership of coal by the railroad over which it is transported.

SOUTH DAKOTA

State Mine Inspectors' Report—The report of the State mine inspector for the year ending Nov. 1, 1906, estimates the gold output for that period at \$6,986,900, about \$200,000 less than for the previous year. However, the production of the Gilt-Edge Maid, amounting to over \$110,000, is not entered in the report, and the placer gold output is also omitted. The report shows that 4000 miners are employed in the Black hills, and the average wage is \$2.50 a day for surface men and \$3.50 for miners. It recommends that the present laws in regard to safety devices in mines be made more specific, and that laws be passed requiring wire screens on cages when carrying men; also requiring certain precautions in the handling and thawing of dynamite. The Homestake has the largest production of any mine, \$5,250,000. It is followed by the Golden Reward, \$415,000. Next in order are the Mogul, Imperial, Lundburg-Dorr and Dakota with respective productions of \$285,485; \$274,000; \$220,000 and \$128,000.

CUSTER COUNTY

Lillian Belle—A deal is under way for this group of claims near Custer. The company has been incorporated and considerable work has been done, with good results.

Granite Reef—This group of claims has been sold for a consideration of \$20,000, of which \$1000 was cash. The remainder will be paid in March, 1907. The group includes 10 full claims and 2 fractions, together with water right and mill site. The purchase was made by R. G. Gillespie, of Pittsburg, through his agent, Dan McGonigal.

Newark Group—A New York corporation has purchased this group, and will proceed at once to active development work. The group includes 21 claims, located on French creek, northwest of Custer. A steam hoist will be erected over the 100-ft. shaft, and other machinery will be purchased.

LAWRENCE COUNTY

Victoria—In the lower contact in the Victoria at Ragged Top, ore running from \$4.50 to \$26 a ton was encountered. Indications are that the deposit is permanent and extensive.

Water Power Plant—George P. Baldwin, secretary and treasurer of the Eleventh Hour Mining Company, has purchased the water-rights of the Cascade Water Power and Electrical Transmission Company, which extend 5½ miles below the falls on the Spearfish river.

The fall of the river is estimated at the rate of 100 ft. per mile, and nearly 3000 h.p. will be produced for sale to mines

and manufacturing companies. The preliminary surveys are now being made, and actual work will begin as soon as plans are drawn.

Gold Queen—The shaft is now down 215 ft. in ore of a good milling grade.

Homestake—The strike which was threatened at this company's mines has been settled. The disagreement was over the demand of the miners for an eight-hour day. This is now granted for all employees, with the provision that half the time required in going to and returning from work in the mine shall be included in the day worked.

PENNINGTON COUNTY

Oriole—This property adjoins the Golden Slipper, and the vein is seemingly a continuation of that found on the latter ground. It has widened from a few inches in width at the surface to 2 ft. at the depth of 140 ft. The shaft is sunk on the vein and work is going on rapidly.

Hymahulu—This company is conducting extensive operations on its ground on Slate creek. The shaft is 60 ft. deep and shows 8 ft. of ore with only one vein encountered. The upper tunnel, which is in a distance of 200 ft., will cut this vein 240 ft. below the surface, while the lower tunnel will intersect it at 500 ft. depth.

Auburn—This company is preparing to install machinery for the treatment of its ore. A tunnel which has been driven 150 ft. has cut several veins. A Michaelson concentrator will be put in.

UTAH

JUAB COUNTY

May Day—Conditions are reported as being better in this property than they have been for some time. Development is progressing on the 300-, 400- and 500-ft. levels.

Tintic Ore Shipments—Shipments last week amounted to 154 carloads, the contributing mines and amounts being: Ajax, 3; Beck Tunnel, 10; Black Jack, 2; Bullion Beck, 11; Carisa, 8; Centennial Eureka, 37; Eagle & Blue Bell, 8; Eureka Hill, 7; Gemini, 5; Godiva, 2; Grand Central, 10; Mammoth, 18; May Day, 2; Scranton, 6; Tintic Iron, 14; Uncle Sam, 2; Yankee Consolidated, 5 cars.

SALT LAKE COUNTY

Emma Copper—This Alta company is running a drift from the Flagstaff adit along a fissure which is known to lead to the orebodies of the old Emma mine. Through an arrangement with the Consolidated Flagstaff, the Emma property will be worked through the adit.

Columbus Consolidated—A body of high-grade ore has been encountered in a drift west from the 300-ft. level. The ore assays about \$100 in gold, silver, copper and lead.

Boston Consolidated—General Manager Louis A. Cates has reported an important

strike in the sulphide mine in a drift run northward from the Armstrong level, and about 150 ft. below the Peabody level, where a rich stope was opened several months ago.

VIRGINIA

NELSON COUNTY

Piedmont Soapstone Company—This company has been incorporated with \$1,000,000 capital stock to manufacture all kinds of products from soapstone. It will erect necessary buildings, dwellings, mills, etc., at a total cost of \$100,000. H. S. Kimball is general manager.

WASHINGTON

KITTITAS COUNTY

Washington Quicksilver Mining Company—A shareholder states that stock is being sold on the Eastern market. The property is situated on Camp creek, near the town of Ellensburg. It is said that a large force of men will be employed all winter, and a complete plant will be running some time during next January.

Mammoth Silver-Lead Mining and Smelting Company—A body of ore has been struck on the John R. Stone claim, the most important strike ever made in the Metalline district. The ore is rich in silver and lead. A known ore zone is 700 ft. long and 400 ft. wide. The ore is chiefly galena.

OKANOGAN COUNTY

Lake View—A body of good ore has been struck. This property is near Oroville. Another property of the same name is near Loomis.

WEST VIRGINIA

NICHOLAS COUNTY

Tidewater Coal Company—This company has bought 6000 acres of land in the Pocahontas district, and proposes beginning development at once. The officers are H. K. Wick, president and treasurer; Robert Bentley, vice-president; T. H. Woodman, secretary; all of Youngstown, Ohio.

RALEIGH COUNTY

Wyoming-Pocahontas—This company has been incorporated to take over and develop a large tract of coal land recently purchased by W. M. Osborn, of Cleveland, O., and associates.

WISCONSIN

ZINC DISTRICT

Blackhawk—Frank C. Stover, of Chicago, reports the finding of a rich body of ore, that will put the Blackhawk among the best producers. If this strike proves up satisfactorily, it will mean a great deal for the district as it opens up an entirely new zinc camp. The Blackhawk is the first mill and roaster in the Big Patch camp; heretofore a quantity of lead has

been mined in the vicinity. The equipment consists of a three-jig mill of seven cells each and the usual arrangement of elevators, trommels, rolls, etc., excepting the first rolls, which are 30-in. and of the inclosed type. The power is supplied by three boilers, two 80-h.p. and one 60, a 14x36-in. Bates Corliss engine and a 40-kw. dynamo, which supplies the Galena type roaster with power. A 12 & 14 $\frac{1}{4}$ x14-in. Ingersoll-Rand straight-line class A steam-driven air compressor supplies air for the drills. Owing to an increase in the volume of water it has recently been found necessary to put in two 12-in. cross-head lift pumps instead of the two 8-in. that formerly did the work.

Economy—At a meeting of some of the stockholders of this company at the mine recently, with President Wittendorf, it was decided to install an air compressor, hoist, and sufficient power for the proper development of the mine. The contract for same will be let soon. It was also decided to run crosscuts, as it is thought the ranges from the Glanville and Dark Horse Mining Companies cross this property. Ed. Voss has full charge of the workings and has developed a 6-in. face of solid jack lying in 2 ft. of glass rock.

Lake Superior Mining Company—Mr. Treuttner, of Ironwood, Mich., is equipping this mine, in Shullsburg camp, preparatory to extensive development. The mine is located in an excellent locality and should make good.

Midway—This mine, lying half way between the Baxter and Reliable, is owned by 10 men, all of Stoughton and Platteville. It was stated early in the summer, shortly after the drilling was completed, that the drill holes had been salted and that the rich cuttings were a fake, but in spite of this report the owners have persistently gone ahead and put down a shaft at considerable expense. Recently ore was encountered in the shaft in quantities and of a grade which is said to exceed that of the Baxter. The ore resembles the Joplin rosin-jack more than anything yet found in the Wisconsin field.

Platte—At this mine the conditions at first were rather discouraging, but the management has finally opened up a body of ore from which there was produced last month about 11 cars of ore, assaying from 35 to 40 per cent. zinc and from 12 to 17 per cent. iron.

PHILIPPINES

MASBATE ISLAND

Mount Cogran—Secretary George Lander, of this company, writes from the mine at Arroroy, under date of Nov. 3, as follows: "The mill built by the Union Iron Works, San Francisco, and erected by us has been running constantly since June 10. We have not had the slightest difficulty with the machinery. It will crush 50 tons of our ore per day with ease. We are treating surface ore only and at the same

time working a large force on development work. At this date we have 41,200 tons of \$10 ore blocked out, also about 80,000 tons of low-grade \$3 ore. We have planned to increase our plant to 100-ton capacity in the early part of 1907."

Foreign Mining News

CANADA

NOVA SCOTIA

Construction work has been begun on the bessemer converter which is being installed at the works of the Dominion Iron and Steel Company, Sydney. The work is being done by the Pennsylvania Engineering Company.

A new underground engine house is being erected at Dominion No. 3 colliery of the Dominion Coal Company, Glacé Bay, and is nearly completed. It will be run by electricity from the new power-house at Dominion colliery No. 2.

ONTARIO—COBALT DISTRICT

Cleveland-Cobalt—The company, which owns 114 acres on Clear lake, is preparing to develop the property on an extensive scale. It has ordered machinery and plant to the amount of \$40,000, including a gas-producer plant of three units and air compressors for the sinking of three shafts. A strike has been made on the old Smythe property now being developed at the depth of 45 ft. Traces of silver were found at 25 ft., and at the lower level native silver and argentite were found, the vein at this depth being 5 ft. 4 in. wide.

Edison—At this mine, situated on the Montreal river, some three miles north of Latchford, 20 men are at work. A plant, comprising 60-h.p. boiler, an air compressor and three drills, has been installed. The main shaft sunk in the vein is down 60 ft., and a tunnel is being driven from the hillside to strike the shaft at that level. The vein is calcite, with riders of smaltite 6 in. wide, and improves on being followed down. Horace M. Wilson is in charge as superintendent.

Foster—The net returns from the first carload of ore shipped were \$26,070. The company expect that its steam plant at Cobalt will be in operation early in January.

Little Nipissing—B. B. Harland has purchased J. B. No. 2, a property of about 38 acres, adjacent to the McKinley-Daragh, Savage and Silver Queen, for about \$250,000. It will be called the Little Nipissing and capitalized at \$650,000. It is proposed to install new machinery at once.

Right of Way—On Dec. 1 seven men, with shovels and drills and a wheelbarrow, took out four tons of ore running from 2000 to 6000 oz. to the ton, valued at over \$8000. The ore was taken from a continuation of the Timmins vein.

Rothschild—An American syndicate represented by Benjamin Gero, of Manistique, and George P. McCallum, Sault Ste. Marie, has acquired a controlling interest, Mr. Gero taking the place of A. J. Young as president of the company.

University—For some weeks a force of men have been engaged in the installation of compressor and electric light plants at Cobalt, but the work has been retarded on account of the difficulty of obtaining skilled mechanics.

Trethewey Silver Cobalt Mine, Ltd.—The directorate has been reorganized owing to the control of the company having changed hands. Col. A. M. Hay has been chosen president, and S. A. Wickett, vice-president. Col. Hay, who was one of the pioneers of the Cobalt field, has had an extensive mining experience.

Green-Meehan Mine—On Dec. 8 a 400-lb. nugget was found on vein No. 1 at Cobalt, and a few days afterward another of 200 lb. weight was secured.

Temiskaming & Hudson Bay—A strike of gold in the Kinler shaft, Cobalt, was recently reported in a vein of 6 ft. wide. Assays were stated to show \$151 gold to the ton. No confirmation of the report has so far been received.

MEXICO

SONORA

Greene-Cananea—It is announced that a consolidation of the interests of the Greene Consolidated Copper and the Cananea Central Copper companies has been arranged. The Greene directors have already approved the plan and submitted it to the stockholders. The position of the Greene property is well known; the Cananea Central holds a large adjoining tract, and the consolidated company will practically control the Cananea district and its great copper resources.

The union will be effected by means of a holding company, which will own the stocks of both companies. This will be called the Greene-Cananea Copper Company, and it is organized by Thomas F. Cole, of Duluth, Minn., John D. Ryan, of Butte, and associates. The new company will have a capital stock of \$50,000,000, in shares of \$20 each, and the stock will be issued in exchange for the existing stocks. The Greene Company owns 200,000 shares of Cananea Central, and these will be at once transferred to the new company for \$4,000,000 in cash. It is understood that sufficient stock in both companies is already pledged to give the new company full control, and most of the shareholders will come in.

Thomas F. Cole will be president of the Greene-Cananea Company, and Col. W. C. Greene vice-president. The control will practically be vested in the group which controls the Calumet & Arizona and the newer companies at Bisbee, and includes

John D. Ryan, of the Amalgamated Copper Company.

ASIA

INDIA—MYSORE

Kolar Goldfield—The output reported for November is 46,487 oz. bullion. For the 11 months ending Nov. 30 the total was 573,499 oz. bullion in 1905, and 526,306 oz. in 1906; a decrease of 47,193 oz. The bullion reported this year was equal to 473,675 oz. fine gold, or \$9,790,862 in value.

NEW ZEALAND

The Mines Department reports the exports of gold and silver for August as follows, in ounces:

	1905.	1906.	Changes.
Gold	42,550	42,441	D. 109
Silver	81,628	111,563	I. 29,935

For the eight months ending Aug. 31 exports of gold were 370,369 oz. bullion, equal to 352,480 oz. fine gold, or \$7,277,483 in value.

Coal Trade Review

NEW YORK, Dec. 19

The coal trade in the East has been enlivened by the coming of cold weather, which has started up the demand for domestic fuel. The anthracite trade is fairly supplied with cars. In the bituminous trade there is more trouble, and shipments are delayed more than at any time since last winter. Steam coal is generally in good demand.

In the West the railroad situation does not improve, and mine-operators are seriously embarrassed by irregular service and car supply. In Indiana they are trying to get some relief through the Railroad Commission.

In the Northwest, where they are entirely dependent on the railroads, conditions are serious. The weather has been cold and many smaller towns in Minnesota and the Dakotas are suffering from lack of fuel. Motive power is short, as well as cars, and the railroads seem unable to improve matters.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Dec. 8 were as follows, in short tons:

	1905.	1906.	Changes.
Anthracite.....	4,306,483	4,277,745	D. 28,688
Bituminous.....	28,392,262	30,318,015	I. 1,925,753
Coke.....	10,590,772	11,936,127	I. 1,345,355
Total.....	43,298,467	46,531,887	I. 3,233,420

The total gain this year has been 7.5 per cent.

Coal tonnage originating on the lines of the Southern Railway for the nine months ending Sept. 30 was, in short tons: Tennessee district, 1,176,699; Alabama district, 1,360,245; total, 2,536,944 tons.

Coal and coke tonnage over the Chesapeake & Ohio Railway for the four

months of its fiscal year from July 1 to Oct. 31 was as follows, in short tons:

	Coal.	Coke.	Total.
New River.....	1,778,822	58,575	1,837,397
Kanawha.....	1,149,460	26,384	1,175,844
Kentucky.....	47,794	.....	47,794
Connecting lines...	158,134	31,048	189,182
Total.....	3,134,210	116,007	3,250,217
Total, 1905.....	2,776,214	140,295	2,916,509

The total increase this year was 333,708 tons, or 11.4 per cent. Deliveries of tonnage originating on the line this year were: Points west of mines, 1,473,624 tons coal and 63,626 tons coke; points east, 457,718 tons coal and 21,333 tons coke; tidewater, 1,026,734 tons coal.

The coal and coke tonnage of the Baltimore & Ohio Railroad for the 10 months ending Oct. 31 was as follows, in short tons:

	1905.	1906.	Changes.
Anthracite.....	844,883	752,939	D. 91,944
Bituminous.....	18,374,117	20,878,711	I. 2,504,594
Coke.....	3,922,834	4,826,038	I. 903,204
Total.....	23,141,834	26,457,688	I. 3,315,854

The total increase this year was 14.5 per cent.

Coal and coke tonnage over the Norfolk & Western Railway for the 10 months ending Oct. 31 was, in short tons:

	Coal.	Coke.	Total.
Line points.....	6,909,833	1,723,938	8,632,771
Tidewater.....	2,600,529	136,447	2,736,976
Total.....	9,509,362	1,860,385	11,369,747
Total, 1905.....	8,538,848	2,003,681	10,542,529

The total increase was 827,218 tons, or 7.8 per cent. Tidewater shipments were 24.1 per cent. of the total this year.

The coal shipments over the lines in the Ohio Coal Traffic Association for the 10 months ending Oct. 31 was as follows, in short tons:

	1905.	1906.
Hocking Valley.....	2,976,201	3,212,402
Toledo & Ohio Central.....	1,281,646	1,475,093
Baltimore & Ohio.....	1,660,502	1,570,522
Wheeling & Lake Erie.....	2,163,374	1,817,314
Cleveland, Lorain & Wheeling.....	1,702,672	1,713,578
Zanesville & Western.....	817,605	953,862
Toledo Division, Penna. Co.....	1,494,503	1,861,285
Lake Erie, Alliance & Wh'ling.....	630,953	621,623
Marietta, Col. & Cleve.....	.....	10,726
Total, net tons.....	12,727,455	13,236,405

There was a total increase of 508,950 tons, or 4 per cent., this year, notwithstanding the stoppage in April and May.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the week ending Dec. 15 were 23,441 tons; for the year to Dec. 15 they were 788,830 tons.

New York Dec. 19

ANTHRACITE

Shortage of cars is the only thing that prevents the anthracite market from displaying tremendous activity. The demand is exceptionally strong, under the influence of present winter weather, and certain sizes, particularly the steam coals, are sold far in advance of delivery. No attempt is made to secure fresh orders, since there is no hope of filling them for a long time. Egg coal can be had in any amount, but all other kinds are exceedingly scarce.

Prices hold firmly to circular rates and even the steam sizes show no advance from the ordinary quotations.

Prices remain at \$4.75 for broken and \$5 for egg, stove and chestnut; for steam sizes; \$2.80@3 for pea; \$2.25@2.50 for buckwheat; \$1.45@1.50 for rice; \$1.30@1.35 for barley; all f.o.b. New York harbor shipping points.

Lewis A. Riley, president of the Lehigh Coal and Navigation Company, announces that he will retire from that position at the next election. He has been head of this corporation for ten years. It is expected that W. A. Lathrop, who is now a member of the board of managers, will be elected to succeed him.

BITUMINOUS

The Atlantic seaboard soft-coal trade is tremendously strong, but owing to the difficulty in making deliveries there are no surplus stocks to be found anywhere, and all coal is promptly absorbed as soon as it reaches tidewater. Certain classes, particularly gas coal, are in strong demand in the West and are practically unknown at tidewater markets just now. Car supply is worse rather than better, and boats for coastwise business are also scarce.

The far East is calling strongly for more coal, and on other than contract business advanced prices are secured. The Sound also shows a heavy demand, but transportation to this territory is bad. Demurrage on boats kept standing at the receiving docks of the New Haven road is a heavy item, but the shippers have not yet succeeded in calling the railroad company to account for this loss.

New York harbor is absorbing all the coal that comes to it and prices are strong, ranging \$2.75@2.85 for good steam coal up to \$3 or more for specialties, f.o.b. New York harbor shipping points. Not much of the cheaper grade of coal is seen in this market. Demand for all-rail coal is very strong; contractors are taking all that they can get, at prices which range \$1.50@1.60 at the mines.

Transportation is rather slow and irregular and car supply is intolerable. Many mines in West Virginia stand idle three or four days in the week without a single car. The market for vessels in the coastwise business is strong but prices show no advance. Current rates are \$1 and discharge to Boston, Salem and Portland, and 85c. to the Sound, both with loading and discharging clause.

Birmingham Dec. 17

The coal production in Alabama shows no improvement. The railroad car shortage is worse, if anything. Between shortage of cars and almost daily wrecks on the mineral lines in the coal district, the coal operators have a hard proposition.

Bills are being drawn up looking to amendments to the mining laws in Ala-

bama to be presented to the next legislature. The miners seek an amendment to the present laws which will provide better ventilation in the mines.

Chicago Dec. 17

Unusually mild weather, following a brief cold wave at the beginning of the last week, has brought dullness on the coal trade again. Nearly every kind of coal is sluggish in movement, old orders being well caught up with and new orders awaiting the next cold wave. The car shortage continues to prevent prompt shipments from Illinois and Indiana mines, though supplies of Eastern coals are better. Anthracite nut is very scarce and with navigation closed promises to be scarce all winter. In the city there is a good supply of all kinds of bituminous coals, except Youghiogeny and Pittsburg.

The result of the mild weather is seen most in the falling off for prepared sizes of Illinois and Indiana coal, and the increase of demand for run-of-mine and screenings. Country dealers are not stocked with either bituminous or anthracite, so that they can stand any continued cold weather. Lump and egg from mines of the two States mentioned bring \$2@3.25, run-of-mine \$1.75@2.25, and screenings—in better demand and 10@20c. higher than last week—sell for \$1.25@1.70. Coal is moving more freely outside the city than inside, though there is little demurrage coal now to be found on the tracks within the city.

Smokeless is in good supply, Pocahontas and New River holding up more closely to the circular prices of \$4.30 for prepared sizes and \$3.40 for run-of-mine, though run-of-mine in some cases brings 10@20c. less than circular. Youghiogeny is firm at \$3.65 for ¾-in. and Pittsburg is in short supply, selling at \$3.40 for 1¼-in. Cannel is still much in demand with not enough coming in and sells for \$5.15 per ton.

Cleveland Dec. 18

The coal market on the lakes has ended for the season. The last boat to load in Cleveland for the year left Saturday night. One or two boats started for Lake Michigan Monday. It is now impossible to force a passage at the Sault, the channel being frozen over. The boats are able to get to Milwaukee and from there the material will be moved by rail to destination at the head of the lakes. Those who shipped from the Pennsylvania fields completed their contracts. Shippers from southeastern Ohio did not. The total movement of bituminous coal by lake is not told as yet, but it is estimated at about 12,000,000 tons, through Ohio ports. The anthracite movement is placed at about 4,500,000 tons.

In this territory the car shortage is still the governing factor in the matter of coal prices. A recent statement is to the effect

that Cleveland is only a week to 10 days ahead of the mines in supplying coal for all sorts of purposes. This seems to be about true. The increase in demand brought about by cold weather, taken with the desire on the part of consumers to get a little surplus ahead, has been a strong factor in determining prices. The result has been an advance all along the line. Mine-run steam is selling at \$1.50@1.60 at mines with three-quarter and lump on a commensurately higher basis. Slack is worth \$1@1.25 at the mines. The domestic situation is even stronger, and the producers have difficulty in keeping up with the demand. Selected lump is selling on the basis of \$2.35 at the mines for Massillon.

The coke market is still strong, there being a good demand, both for spot shipment and on contract. The prices are unchanged at \$4.25 at the oven for 72-hour foundry, and \$3.50@3.60 at the oven for furnace coke.

Indianapolis Dec. 17

The decision of State Mine Inspector Epperson to the effect that the explosion in the Rosebud mine, near Seeleyville, resulting in the death of two miners and seriously burning 30 others, was a smoke explosion due to illegal shots, is being resisted by the miners. The miners insist that it was a dust explosion, and that the company should be held responsible for not keeping the mine sprinkled. For this reason, and because the company has issued an order requiring the employment of shot-firers, to be paid by the miners, the latter have refused to return to work. The contention promises to be a stubborn one as the miners say they will not consent to pay the shot-firers. The mine inspector, the committee of miners and President John Mitchell, agree that the miners responsible for the explosion should be punished, and they will be prosecuted for criminal carelessness.

The Cincinnati Coal and Coke Transportation Company proposes to make Evansville a coal-distributing center for all river points. The company will build coal docks in Evansville, and thus open up a new market for Indiana coal.

The Indiana Manufacturers' and Shippers' Association, composed in part of coal operators and dealers, held a meeting in this city during the past week to take action toward the improvement of railroad conditions, and expediting the movement of freight, especially coal. Those attending the meeting showed how the local markets had been skimmed, industries compelled to shut down, and coal mines forced to remain idle, because of the refusal of the railroads to haul and deliver consignments speedily. The purpose of the meeting was for thorough organization all over the State, the creating of public sentiment and the outlining of a plan of appeal to the legislature to enact a law giving more power to the State Railroad

Commission to deal with railroad delinquency and discrimination; also a law providing for reciprocal demurrage and compelling railroads to move coal cars at least 50 miles per day. The coal operators present said it was a conservative estimate that the output of the Indiana mines would be curtailed 2,000,000 tons during the present year because of the lack of cars. The association perfected its organization and elected the following officers: President, J. E. Fredericks, Kokomo; vice-presidents, Edward Watson, Vincennes; C. C. Hull, Connersville; Harry Gable, Marion; E. R. Call, Elwood, secretary.

Pittsburg Dec. 18

Coal—The suspension of shipments of coal to lake ports has not materially increased the supply of railroad cars and production for the week shows but little improvement over the previous week. Movement of cars is being retarded today by the severe weather, and if it continues some mills may be crippled. Prices are firm on a basis of \$1.60 a ton for mine-run coal at mine and the minimum price of 1¼-in. coal is \$2 a ton. The rivers are still navigable and all the coal loaded in the pools and harbor has been sent to lower ports. The largest tow of the season reached New Orleans last week. It was composed of coal boats and the total shipment amounted to 50,000 tons. The markets at Cincinnati and Louisville are well supplied, but prices are high. The tow-boats are being hurried back with empty coal boats and barges and there will be a good supply that will keep the river mines in steady operation for several months.

Connellsville Coke—There has been but little change in conditions. The demand continues heavy and the production for the week was a trifle larger than the previous week, being in the neighborhood of 290,000 tons. Shipments this week are not likely to be as heavy owing to the snow storm throughout the region, which is interfering with the handling of railroad cars. Prices are firm and \$3.50 is still quoted as the minimum price for furnace coke for prompt or first-quarter delivery. For all of next year quotations are higher, \$3@3.25 being named according to tonnage. Foundry coke prices also are higher and \$4@4.50 for first half and \$3.85@4.25 for all year is quoted.

Foreign Coal Trade

Dec. 19

Exports of coal from Germany for the 10 months ending Oct. 31 were, in metric tons:

	1905.	1906.	Changes.
Coal.....	14,738,444	16,315,901	I. 1,577,457
Brown coal.....	16,531	14,525	D. 2,006
Total.....	14,754,975	16,330,426	I. 1,575,451

Exports of coke for the eight months

March-September this year were 2,334,246 tons; of briquets, 679,928 tons. Included in these, there were 14,504 tons of coke to the United States.

Coal imports into Germany for the 10 months ended Oct. 31 were, in metric tons:

	1905.	1906.	Changes.
Coal.....	7,846,945	7,490,342	D. 356,603
Brown coal.....	6,534,211	6,953,381	I. 419,170
Total.....	14,381,156	14,443,723	I. 62,567

Imports of coke for the eight months March-October this year were 371,017 tons; of briquets, 104,520 tons:

Bunker coal—that is, coal loaded on steamships for their consumption—at United States ports was 435,914 tons in October and 4,270,333 tons for the 10 months ending Oct. 31. Adding this to the exports, heretofore reported, makes a total of 12,500,282 tons of coal sold for consumption beyond the limits of the United States.

Iron Trade Review

NEW YORK, Dec. 19

The only change to be noted in the iron and steel markets is an increase in buying for the second half of 1907. Notwithstanding the season, many consumers seem to have decided that there is nothing to be gained by waiting; that prices are not going lower, and that it is safer to secure themselves by contract. This has served to remove the quieter tone which seemed to be settling down upon the market last week. There is, however, a cessation in the demand for earlier deliveries, which was so much in evidence a short time ago.

The largest single order for wrought pipe ever placed in this country for shipment abroad has been closed. It calls for 30,000 tons of 10-in. steel pipe to be sent to Burma, India, for the Burma Oil Company, operating the wells of Upper Burma. The pipe line to be built extends to Rangoon, the principal refining and shipping point. The main line is 285 miles in length and the total length, including the branches, is 328 miles. The order was placed with the United States Steel Products Export Company, and will be filled by the National Tube Company, Pittsburg. The first delivery will be in the middle of February, and thereafter shipments will be between 4000 and 5000 tons a month.

Pig Iron Production—The returns from the furnaces on Dec. 1 show 315 coke and anthracite stacks in blast, having a total weekly capacity of 516,200 tons, or 15,600 tons more than on Nov. 1. This is the highest capacity ever reported. Taking the complete statement of the Iron and Steel Association for the first half of the year, the *Iron Age* estimate for July-November and an allowance for the charcoal furnaces, the output of pig iron for the 11 months ending No. 30 was, approximately, 23,073,000 long tons.

New Producing Capacity—The improvement program of the United States Steel Corporation for 1907, as just announced, includes six new blast furnaces, two at Duquesne, and two at Youngstown, for the Carnegie works; one at Lorain, O., and one at the McKeesport works of the National Tube Company. They will be of 450 tons daily capacity each. There will be 36 new open-hearth furnaces, 18 at Duquesne, 12 at Youngstown, and 6 at Lorain. Several new rolling mills are on the program. This does not include the work on the great steel plant at Gary, Ind., which is now in progress.

Lake Superior Iron Ore Shipments—Iron ore shipments in November were 3,734,167 tons, an increase of 392,938 tons over Nov., 1905. For the season up to Dec. 1 the shipments by ports were as follows, in long tons:

	1905.	1906.	Changes
Escanaba.....	5,176,385	5,716,272	I. 539,887
Marquette.....	2,925,250	2,743,219	D. 182,031
Ashland.....	3,460,120	3,333,561	D. 126,559
Superior.....	6,043,234	6,979,378	I. 936,144
Duluth.....	8,767,706	11,098,175	I. 2,330,469
Two Harbors.....	7,099,149	8,102,397	I. 403,248
Total.....	33,071,844	36,973,002	I. 3,901,158

The ice at the Sault has now closed in, ending navigation for the season. Only a few cargoes came through in December.

Baltimore Dec. 18

Exports from the port of Baltimore for the week included 4005 tons steel rails, 897 tons splice-bars and 89 tons spikes, all to the Isthmus of Panama.

Imports for the week included 761 tons spiegeleisen and 869 tons ferro-manganese. Arrivals of manganese ore were 11,800 tons from India and 4000 tons from Brazil, 15,800 tons in all. The iron-ore imports were 3000 tons, from Cuba. There was also one cargo, 4230 tons, iron pyrites from Huelva, Spain.

Birmingham Dec. 17

With two companies at least out of the market and orders being accepted for iron to be delivered during the third quarter of the coming year, the Southern iron market can be considered strong. The quotations for third-quarter iron are \$18 and \$19 per ton, No. 2 foundry and soft. A large quantity of iron has accumulated in furnace yards by reason of the railroad car shortage which has been on for several weeks. There is no relief in sight. The advance of 25c. per ton on iron rates announced a few weeks since will not become effective until Feb. 1, 1907, but considerable correspondence is now on as to whether the railroads will put the new rate on delayed iron, the manufacturers claiming that they are not responsible for the iron being on hand yet.

The probable make for the first half of the coming year has about been covered and for that reason some of the companies are withdrawing from the market

altogether on iron to be delivered before July.

Chicago Dec. 17

The iron market continues quiet and firm. There is no disposition on the side of either buyers or sellers to do much business until after the holidays. The only eagerness displayed is by melters who need a carload or two of iron as soon as they can get it, and who are willing to pay the premium demanded for such lots—when they can be found. Considerable foreign iron is coming into Chicago territory, but there has been no weakening of the domestic trade on that account. Many melters are inquiring actively about future requirements, but contract-making is not common.

Quick-delivery lots continue to bring \$21@23 Birmingham for Southern No. 2 (\$24.90@26.90 Chicago) for January delivery and 25c. more for delivery after Feb. 1; \$25.50@26.50 for Northern No. 2. For contracts requiring deliveries in the last half of the year, \$17@17.50 Birmingham (\$21.15@21.65 Chicago) is asked, with Northern at \$21.25@21.75.

The strength of the iron market is shown in the generally strong demand for finished products, and in the advances of prices on light rails, plates and wire products. Plates hold firmly to 1.70c. against 1.60c. formerly, though sales are not heavy owing to the large orders placed before the advance occurred. Structural shapes are in very good demand, and all indications are for continued large demand for all finished products.

Coke is still scarce and Connellsville 72-hour holds firmly to \$6.90 with West Virginia cokes at \$5.65@6.15 per ton.

Cleveland Dec. 18

Iron Ore—The figures compiled show the lake-ore movement for the month of December to have been 540,588 tons, compared with 405,060 tons for the corresponding period a year ago. This shows a gain of 135,528 tons. The total movement by lake for the season was 37,513,589 tons, compared with 33,476,904 tons, a year ago, showing an increase of 4,036,685 tons. The movement for December was a complete surprise, since most shippers expected it to be nominal only. Most of the smaller shippers have placed the major portion of their ore for 1907 delivery with the vessel-owners. The Steel Corporation has taken no action so far. No further sales of ore are reported.

Pig Iron—There is a good deal of inquiry for iron for immediate shipment and for delivery during the first half of next year. Furnaces are able to squeeze out a few lots of foundry for immediate shipment, but there is no prospect of any large sales. The same condition applies largely on deliveries during the first half of next year. For that delivery there is a large uncovered tonnage and some con-

sumers are worried. Prices are largely nominal. Spot Northern No. 2 is selling at \$26@27 at the furnace. The price for first-half delivery is firmly established on the basis of \$25 at furnace. Second-half delivery is selling at \$22@23 at furnace. About the same prices apply on bessemer and basic.

Finished Material—The percentage of the steel trade done on a premium basis is steadily increasing. The higher prices on plates and structural shapes, charged by Eastern mills, is not shutting off any of the business. Billets are still exceptionally strong, with the near deliveries bringing higher prices than are paid for delivery 60 to 90 days hence. Forging billets are bringing \$40 at mill for immediate shipment, while re-rolling billets are selling at \$36@37 delivered in Cleveland. The sheet market is strong, but prices have not changed. High prices of scrap have a good deal to do with the price on bar iron. Steel bars, however, are equally high, based on the strong demand.

New York Dec. 19

Pig Iron—The special feature of the market has been buying for the second half of 1907. Users of iron seem to have made up their minds that it is no use waiting, and that they would do better to provide for the future. The range of prices is still wide and rather irregular.

Current quotations for pig iron are for New York or parallel delivery.

Northern:	
No. 1 X foundry.....	\$25.50@27
No. 2 X foundry.....	24.50@26
No. 2 plain.....	24@25.50
Forge pig.....	20.50@22
Southern:	
No. 1 foundry.....	23.50@27
No. 2 foundry.....	23@26.50
No. 3 foundry.....	22@25.50
No. 4 foundry.....	21@24.50
No. 1 soft.....	24@27
No. 2 soft.....	24@26.50
Gray forge.....	20@21.50
Basic pig:	
Northern.....	22@23.50
Virginia.....	22@23.25
Alabama.....	22@23.50
Foreign:	
Scotch foundry, ex-ship.....	24@24.50
Middlesboro, No. 1, ex-ship.....	23@23.50
Middlesboro, No. 2, ex-ship.....	22@22.50

City or local deliveries are not included in prices, which are for large lots, on docks or cars. Foreign irons are quoted ex-ship, duty paid.

Cast Iron Pipe—For spring delivery \$34.50 per ton is quoted for 6-in. pipes, carload lots, at tidewater, with some foundries asking \$1 more.

Bars—Bars are strong at 1.845c. tide-water, for common iron, while refined is 1.895c. Steel bars are quoted at 1.745@1.845c., according to size and conditions of orders. Store trade is good at 2.75c. delivered.

Plates—For tidewater delivery, carload lots, prices are: Tank, 1.845@1.945c.; flange, 1.945@2.045c.; marine, 2.245@2.345c., according to width. Some makers are asking \$2 or \$3 per ton premium to secure deliveries.

Structural Material—Prices are nominally unchanged, but premiums continue to be paid to secure deliveries.

Rail—Business here is still mainly in trolley rails; light rails are in some demand, also.

Old Material—Foundry scrap has had the call this week, and is higher, No. 1 machinery selling at \$18.50@19.50. There has been also a call for old rails fit for relaying, which bring \$28@29 per ton.

Philadelphia Dec. 19

Pig Iron—The pig-iron market, after having taken a nap for a short time, has been aroused by an unexpected demand from consumers who have quite recently secured a large volume of business, which demanded material. Some of this business is promised for early delivery, and iron for immediate delivery is wanted. There was quite a scurrying around to get the material and considerable telegraphing, as well as some rushing to New York for foreign iron, which was supposed to be there. Our buyers are not yet out of danger, and are scrambling for iron wherever they can get it. Some of the Eastern consumers of basic iron managed to secure the acceptance of contracts, and they are now comparatively safe. Forge iron has been in very active request for a few days, and No. 2 foundry is close behind it. There is a feverish condition in this market, and some of the large consumers are looking to Scotch and English irons for relief. Quotations may be given approximately at \$26.50 for No. 1 X foundry, \$25 for No. 2, \$24.50 for No. 2 plain, \$22 for standard gray forge, \$23 for basic, \$23 for No. 1 Middlesboro on dock, and \$24.50 for Scotch, same delivery. These quotations will answer for the present, but some of our consumers have paid more money for special accommodation.

Steel Billets—The steel mills are apparently catching up a little, or, at least, are able to meet their engagements with a little more promptness. Prices are maintained pretty nearly at \$34 for rolling billets. There is a good inquiry this week for forging billets, but only small quantities have been ordered at prices ranging from \$36@38.

Bars—Steel bars are commanding premium quotations, and nearly everything that has been ordered this week has been taken above the nominal quotations. The mills have booked quite a good lot of business for refined iron, which is quoted at 1.88½ as the lowest. All of our bar mills are crowded to the limit, and store demand is heavy by way of stocking up for the winter.

Sheets—The reports to-day are to the effect that the demand is straining capacity, and that premium quotations still rule.

Pipes and Tubes—The tube market is very active, and orders have been submitted to the mills, within a week, which

will probably be accepted, and which call for very large deliveries.

Plates—The plate market is in an excited condition over the advances recently made, and the hurry of orders that are being submitted.

Structural Material—The actual business placed this week was rather small, but the mill people are figuring upon inquiries and orders previously submitted, and are finding it more difficult to squeeze in accommodation orders.

Steel Rails—The chief demand at present is for rails for electric roads and light sections for mining purposes, and the inquiries from these two sources are rather appalling when the oversold capacity of the mills is taken into account.

Scrap—The scrap market is in an excited condition, over the advances that are being made, and it is impossible to quote prices with any degree of accuracy.

Pittsburg Dec. 18

The week has been the duller of the year in the iron and steel trade as to new business but one of the most active in the matter of production. All the finishing mills that are not hampered by a scarcity of steel are being operated to capacity. Despite the heavy production deliveries are unsatisfactory, due to the car shortage. Some relief was expected when the lake shipping season closed, but so far there has not been a noticeable improvement in the car supply. The cold wave which struck this district last night is expected to remain and will further delay freight movements. Contemplated advances in some lines of finished products evidently have been abandoned, as mills are so heavily booked that new rates would not be effective for several months. In tin-plate where an increase of 10c. a box was scheduled for last week the mills are sold up to July 1. Idle mills are to be started as soon as steel can be obtained, and where it is possible to fill a new order a premium is paid. The McClure Company, which had been trying for nearly two months to operate its plant at Washington, Penn., on a non-union basis, gave up the fight and is now running with a full force of skilled union workmen. Other tin-plate mills are to be started early in the year when the production of steel will be increased. The Follansbee Brothers Company started the first of its new steel furnaces last week and the West Leechburg Steel Company are building new furnaces and the Pittsburg Steel Company, the largest independent wire producer in the country, is preparing to erect a number of open-hearth steel furnaces and will also build two blast furnaces. This concern planned these additions nearly two years ago but abandoned the plans when the United States Steel Corporation entered into a contract to furnish the company with its steel supply. It is asserted that shipments have not been

satisfactory and the company has determined not to be dependent upon an outside interest for its requirements.

There was a lull in rail buying last week, the leading interest booking but 8000 tons of standard sections and 3000 tons of light rails. This week contracts for standard rails aggregating 30,000 tons were received. Orders continue to come from Western roads, which indicates that the Illinois Steel Company and the Colorado Fuel and Iron Company are either sold up for the year or are reserving some capacity for some roads that are likely to add to orders already placed.

Pig Iron—A sale of 1000 tons of bessemer pig iron was made yesterday for delivery this month at \$23, Valley furnace. The sale was made by an interest that had sold the estimated production of its furnaces but was able to increase the output. It is reported that the production of other furnaces is being increased beyond expectations, and that it would not be surprising if the production for the year in the country exceeds the estimate of 25,000,000 tons. Some Southern iron for first-half delivery was sold in this market, but the tonnage was not made public. Freight rates on pig iron from the Birmingham district have been advanced 25c. a ton, effective on Feb. 1. The new rate to Pittsburg will be \$4.85 a ton. As all iron sold here has been at a delivered price, the advanced freight rate will come out of the sellers' profit unless an arrangement can be made with the buyer to assume all or part of it. There have been no sales of Northern No. 2 foundry or gray forge and prices for foundry for December delivery remain nominally at about \$25, Pittsburg, and gray forge at about \$23.10, Pittsburg. Active buying for the third quarter has not begun although there are a number of inquiries. The leading producer is quoting \$21, Valley furnaces, for bessemer iron, and \$20.75 for basic.

Steel—The steel market is practically a nominal one, as there are no billets to be had and producers are behind in deliveries on old contracts. Bessemer billets are quoted at \$29.50@30 and open-hearth at \$31.50@32.50. Steel bars are firm at 1.60c. and plates at 1.70c.

Sheets—Premiums are still being paid for prompt delivery and the demand continues to be greater than in any month this year. Black sheets are quoted at 2.60c. and galvanized sheets at 3.65c. for No. 28 gage.

Ferro-Manganese—Demand is somewhat stronger and prices are about \$1 a ton higher than a week ago, quotations ranging from \$83 to \$84 per ton.

Cartagena, Spain Dec. 1

Iron and Manganiferous Ores—Messrs. Barrington & Holt report that shipments for the week were two cargoes, 7400 tons dry ore, to Great Britain; one cargo, 5300

tons dry ore, to Philadelphia. The market is stronger and prices have again advanced. Freight rates are high; late fixtures are 7s. 6d. to Maryport, and 8s. to Philadelphia.

Quotations for iron ores, f.o.b. shipping port, are: Ordinary 50 per cent. ore, 9s. 9d.@10s.; special low phosphorus, 10s. 3d.@10s. 6d.; specular ore, 58 per cent. iron, 13s.; S. P. Campanil, 11s. 9d. Manganiferous ore, No 3 grade, 35 per cent. iron and 12 manganese, is 14s. 6d.; no higher grades on the market.

Pyrites—Iron pyrites, 40 per cent. iron and 43 sulphur, are 11s. 6d. per ton, f.o.b. shipping port.

Dusseldorf, Germany Dec. 5

The output of the German blast furnaces in October, as reported by the German Iron and Steel Union, was 1,073,874 metric tons of pig iron. This was 37,121 tons more than in September; the daily average being 34,558 tons in September, and 34,641 tons in October. For the 10 months ended Oct. 31 the output was as follows, in metric tons:

	1905.		1906.	
	Tons.	Per Ct.	Tons.	Per Ct.
Foundry iron.....	1,559,335	17.4	1,757,409	17.0
Forge iron.....	666,183	7.4	718,653	6.9
Steel pig.....	568,127	6.3	777,845	7.7
Bessemer pig.....	351,665	3.9	399,332	3.7
Thomas pig.....	5,825,229	65.0	6,693,618	64.7
Total.....	8,970,539	100.0	10,346,857	100.0

The increase in foundry iron was 198,074 tons; forge iron, 52,470; steel pig—which includes spiegeleisen, ferro-manganese, ferrosilicon, and all similar alloys—209,718; bessemer pig, 47,667; Thomas, or basic pig, 868,389; the total gain being 1,376,318 tons, or 15.3 per cent.

The coal production of the German Empire for the 10 months ended Oct. 31 is reported as follows, in metric tons:

	1905.		1906.		Changes.
	Tons.	Per Ct.	Tons.	Per Ct.	
Coal.....	99,951,160	114.273,413	I. 14,322,253		
Brown coal.....	42,438,507	46,098,425	I. 3,659,918		
Total mined.....	142,389,667	160,371,838	I. 17,982,151		
Coke made.....	12,366,680	16,720,631	I. 4,353,951		
Briquets made, 10,589,931	12,066,857	I. 1,476,906			

The briquets are made largely out of the brown coal, or lignite. The total increase in coal mined this year was 12.6 per cent.

Metal Market

NEW YORK, Dec. 19.

Gold and Silver Exports and Imports.

At all United States Ports in November and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Nov. 1906...	\$1,963,757	\$ 8,934,958	Imp. \$6,971,201
" 1905 ..	1,137,318	5,202,790	" 4,065,472
Year 1906..	44,831,203	147,961,827	" 103,130,624
" 1905 ..	44,125,935	46,264,524	" 2,138,589
Silver:			
Nov. 1906..	4,411,830	2,914,157	Exp. 1,497,673
" 1905 ..	5,361,819	4,306,838	" 1,054,981
Year 1906..	53,400,246	39,790,748	" 13,609,498
" 1905 ..	49,316,953	31,246,389	" 18,070,564

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

Gold and Silver Movement, New York.

For week ending Dec. 15 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	\$552,500	\$ 77,928	\$ 439,880	\$ 45,491
1906.....	6,608,465	93,307,078	48,775,939	2,543,156
1905.....	34,633,733	10,774,078	33,729,906	4,114,960
1904.....	102,699,301	7,208,510	34,566,340	1,140,653

The gold exports for the week were to Panama, Buenos Aires and London; the silver to London. Imports, both gold and silver, were from the West Indies and Mexico.

The foreign merchandise trade of the United States for the 11 months ending Nov. 30 is valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1905.	1906.
Exports.....	\$1,427,252,275	\$1,607,693,555
Imports.....	1,078,001,751	1,186,036,125
Excess, exports....	\$349,250,524	\$421,657,430
Add excess of exports, silver.....		13,609,498
Total.....		\$435,266,928
Deduct excess of imports, gold.....		103,130,624
Apparent export balance.....		\$332,136,304

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

The statement of the New York banks—including all the banks represented in the Clearing House—for the week ending Dec. 15 gives the following totals, comparisons being made with the corresponding week of 1905:

	1905.	1906.
Loans and discounts..	\$1,004,564,000	\$1,027,666,300
Deposits.....	983,888,500	967,061,400
Circulation.....	53,060,700	53,551,100
Specie.....	174,219,100	171,940,100
Legal tenders.....	75,714,100	68,126,200
Total reserve.....	\$249,933,200	\$240,066,300
Reserve required.....	245,972,125	241,765,350
Surplus.....	\$ 3,961,075	
Deficit.....		\$ 1,699,050

Changes for the week this year were increases of \$1,238,900 in legal tenders; decreases of \$17,002,500 in loans, \$14,000 in specie, \$15,116,100 in deposits and \$189,800 in circulation. The deficit below legal reserve was diminished by \$5,003,125.

The following table shows the specie holding, in dollars, of the leading banks of the world:

	Gold.	Silver.	Total.
New York.....			\$171,940,100
England.....	\$163,995,175		163,995,175
France.....	547,443,625	\$200,605,065	748,048,690
Germany.....	139,960,000	46,660,000	186,620,000
Spain.....	76,805,000	120,835,000	197,640,000
Netherlands.....	27,662,500	28,366,500	56,029,000
Belgium.....	16,443,335	8,476,665	24,920,000
Italy.....	169,200,000	22,653,000	191,853,000
Russia.....	583,505,000	22,345,000	605,850,000
Austria.....	134,685,000	59,210,000	193,895,000
Sweden.....	19,795,000		19,795,000

The returns of the associated banks of New York are of date Dec. 15, and the others Dec. 14. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to Dec. 6:

	1905.	1906.	Changes.
India.....	£6,286,421	£14,412,796	I. £ 8,126,375
China.....	879,113	430,700	D. 448,413
Straits.....	38,299	1,750	D. 36,549
Total.....	£ 7,203,833	£ 14,845,246	I. £ 7,641,413

Receipts for the week were £75,000 from New York. Exports were £55,600 in bars and £64,400 in Mexican dollars; a total of £120,000, all to India.

Indian exchange is again stronger, a heavy demand for money in that country being evident. The Council bills offered in London were all taken at an average of 16.09d. per rupee.

The United States Mint has resumed its purchases of silver for subsidiary coinage. The quantity bought last week was 200,000 oz., deliveries to be 100,000 oz. at Denver and 100,000 oz. at New Orleans. The price paid was 68.964c. per fine ounce.

Prices of Foreign Coins

	Bid.	Asked
Mexican dollars.....	\$0.63	\$0.55
Peruvian soles and Chilean.....	0.47%	0.49
Victoria sovereigns.....	4.85%	4.87%
Twenty francs.....	3.87	3.91
Spanish 25 pesetas.....	4.78	4.80

SILVER AND STERLING EXCHANGE.

December.	Sterling Exchange.	Silver.		December.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
13	4.83½	68½	31½	17	4.83¼	69½	32½
14	4.83½	68½	31½	18	4.83½	69½	32½
15	4.83½	69	32	19	4.83	68½	31½

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

Other Metals

Daily Prices of Metals in New York.

December.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.			New York, Cts. per lb.	St. Louis, Cts. per lb.
13	23 @23½	22½ @22½	105½	43	6.00	6.55 @6.60	6.40 @6.45
14	23 @23½	22½ @22½	106½	43	6.00	6.55 @6.60	6.40 @6.45
15	23½ @23½	22½ @22½		43	6.00	6.60 @6.65	6.45 @6.50
17	23½ @23½	22½ @22½	107½	43	6.00	6.60 @6.65	6.45 @6.50
18	23½ @23½	22½ @22½	106½	42½	6.00	6.60 @6.65	6.45 @6.50
19	23½ @23½	22½ @22½	106½	42½	6.00	6.60 @6.65	6.45 @6.50

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b.s. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotation on spelter are for ordinary western brands; special brands command a premium.

Copper—The scarcity of supplies is becoming so acute that sellers are compelled to cut down the orders which are being proposed by their customers. There has been a steady demand for both domestic and European consumption, and prices again have advanced, the quotations at the close being 23¾@23½ for Lake; 23@23¼ for electrolytic in ingots, cakes and wirebars. The average price at which business in casting copper was done during the week is 22½@22¾.

The London standard market has fluctuated rather wildly but within narrow limits, the tendency on the whole being upward. Quotations at the close are cabled at £106 12s. 6d. for spot, £107 17s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £110; best selected, £111@112; strong sheets, £115@116.

The United Metals Selling Company, of New York, has declared a dividend of 20 per cent. on its stock for the year. This is the same rate that was paid last year.

Exports of copper from New York for the week were 1888 long tons. Our special correspondent reports the exports from Baltimore for the week at 1350 long tons of fine copper.

Imports and exports of copper in Germany for the 10 months ending Oct. 31 were, in metric tons:

	1905	1906	Changes
Imports.....	92,187	110,551	I. 18,364
Exports.....	9,972	8,836	D. 1,136

Balance, imports, 82,215 101,715 19,500

This shows an increase of 23.7 per cent. in the approximate consumption of foreign copper.

Copper Sheets—The base price of copper sheets, as fixed by the manufacturers is 27c. per lb.; subject to change without notice.

Tin—The erratic fluctuations in London have not allowed a definite tendency to develop, and buyers are using extreme caution respecting their commitments. After advancing to near £200, the market in London at the close shows a heavy decline, quotations being cabled as £194 12s. 6d. for spot, £195 5s. for three months, while business here is being done at 42½@42¾ cents.

Lead—The American Smelting and Refining Company has raised its price to 6c. New York, 5.92½ St. Louis. All reports indicate a very heavy consumption in every line of manufacture.

The London market also is considerably firmer and under heavy business, prices advanced from day to day, closing firm at £19 17s. 6d. for Spanish lead, £20 for English lead.

The electrolytic lead refinery of the United States Metals Refining Company, near Chicago, Ill., has gone into operation. This is the first lead refinery in the United States to employ the Betts process.

The movement of foreign lead in the United States for the 10 months ending Oct. 31 is reported by the Bureau of Statistics as below, in short tons:

In bond Jan. 1.....	8,148
Imports, 10 months.....	73,155
Total supplies.....	81,303
Re-exports, 10 months.....	40,088
In bond, Oct. 31.....	6,206
Total deductions.....	46,294
Balance	35,009

The balance has presumably, entered into consumption in the United States.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Dec. 1 that the price of pig lead was 89.75 reales per quintal, silver being paid for at 14.25 reales per ounce. Exchange, 27.67 pesetas to £1. The price of lead, on current exchange, was equal to £18 4s. 7d. per long ton, f.o.b. Cartagena. Exports were 100 tons desilverized to Antwerp; 384 tons argentiferous and 66 tons desilverized to Marseilles; 400 tons desilverized and 1024 tons argentiferous lead to London; a total of 1974 tons.

Spelter—A fair business is doing from day to day, and such quantities as have been offered in the market are being readily absorbed. The close is steady at 6.60 @6.65 New York, and 6.45@6.50 St. Louis.

The London market is slightly higher, the close being cabled as £28 for good ordinaries, £28 5s. for specials.

The firm of L. Vogelstein & Co., of New York, and the American Zinc, Lead and Smelting Company, of Boston, Mass., have jointly purchased the zinc smelters heretofore owned by William Lanyon. These comprise plants in operation at Caney and Pittsburg, Kansas, and a new plant now under construction at Dearing, Kansas, which will go into operation in the spring of 1907.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Dec. 1, that shipments for the week were 1100 tons of blende to Antwerp. No change in the market.

Zinc Sheets—On Dec. 15 the price of zinc sheets was again advanced 15c.; it is now \$8.25 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—While reports from Europe still show the market to be strong there, the metal here is neglected and rather weak. Cookson's is still quoted at 26@26½c., and Hallett's at 25@25½c., but ordinary brands are at 24@25c., which is off a little from last week.

Nickel—Quotations for large lots, New

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

Platinum—Demand continues strong. Unmanufactured platinum is quoted at \$38 per oz., while \$31.50@32 is paid for good scrap. A further advance is probable.

Quicksilver—This metal remains steady, with no material changes. The New York quotation is \$40.50@42 per flask of 75 lb., according to size and conditions of order. San Francisco quotations are \$30@40 per flask for home orders, and \$37@38 for export. The London price is £7 per flask, with £6 18s. 9d. named by jobbers.

Aluminum—The chief producer gives list prices for ton lots and over as follows: No. 1, over 99 per cent. pure, 36c. per lb.; No. 2, over 90 per cent., 34c. Small lots are from 1 to 3c. higher. Granulated metal is 2c. per lb. over price of ingots; rods, 1c. per lb. up, according to size.

Wisconsin Ore Market

PLATTEVILLE, Dec. 15

The zinc-ore market opened up early in the week quite strong; some of the buyers started purchasing Monday, which is unusual, and \$47 was the regular price during the week. In one or two instances a little better price was offered, but this was only where conditions were favorable and a larger quantity of ore available. One of the largest buyers who has not been over-anxious for ore for some time appeared to be the most active buyer. The market during the latter part of the week was more active than it has been for some time, although there was not much variation in prices. The principal item of interest was the increased offers for unroasted ore.

Lead remains steady and a good demand is shown. The same is true of dry bone and sulphur.

The different camps of the district report ore loaded for the week ending Dec. 15, as follows:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur Lb.
Platteville.....	751,330	34,310	.....
Linden.....	281,850	62,795	.....
Benton.....	170,700	.....	.....
Highland.....	147,500	.....	.....
Buncombe & Hazel Green	118,600	30,000	.....
Cuba City.....	115,000	.....	.....
Mineral Point.....	98,300	38,900	.....
Livingston.....	95,000	.....	.....
Galena.....	88,000	.....	.....
Harker.....	64,800	.....	.....
Total for week.....	1,931,080	166,005	.....
Year to Dec. 15.....	75,259,920	3,511,135	4,053,910

Shortage of cars still continues to limit the shipments.

Missouri Ore Market

JOPLIN, Dec. 15

The highest price for zinc ore approximated \$49.50, the assay basis price ranging from \$44 to \$47 per ton of 60 per cent.

zinc. The average price was \$44.12, all grades.

The highest price reported paid for lead was \$86 per ton, with medium grades selling all the way from \$80 to \$84 per ton. The average, all grades, was \$81.82 per ton.

It is doubtful if the zinc-ore purchases of the week exceeded 3000 tons, with an output of over 5000 tons, the balance of the ore shipped coming from purchases of previous weeks. The lightness of the demand arises from lack of cars to move the ore purchased. Being unable to ship, the smelters have no incentive to buy. As a result the stock is accumulating rapidly with about half of it purchased, while three weeks ago very little ore was unsold. The smelters are trying to ship what is already purchased, leaving the accumulation for a later division when there is some prospect of shipping it.

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

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville.....	1,992,100	956,430	\$79,935
Joplin.....	2,855,380	336,380	79,454
Galena-Empire.....	1,631,910	176,230	43,129
Duenweg.....	255,830	105,450	12,536
Neck City.....	441,410	.....	10,373
Alba.....	393,130	.....	9,254
Oronogo.....	365,700	12,440	9,130
Granby.....	450,000	60,000	8,660
Badger.....	349,000	.....	8,376
Aurora.....	341,130	15,360	6,393
Prosperity.....	77,710	98,680	5,793
Spurgeon.....	153,760	49,680	4,867
Baxter Springs.....	104,570	.....	3,456
Carthage.....	100,200	.....	2,568
Zincite.....	91,000	4,370	2,181
Sherwood.....	31,340	14,700	1,291
Totals.....	9,704,980	1,789,720	\$287,394

50 weeks.....	533,940,930	74,901,570	\$14,454,443
Zinc value, the week.....	\$214,159;	50 weeks, \$11,548,846	
Lead value, the week.....	73,235;	50 weeks, 2,905,597	

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

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1905.	1906.	Month.	1905.	1906.
January.....	52.00	47.38	January.....	61.50	75.20
February.....	52.77	47.37	February.....	67.82	72.83
March.....	47.40	42.88	March.....	67.20	73.73
April.....	42.88	44.63	April.....	68.00	75.13
May.....	43.31	40.51	May.....	68.27	73.40
June.....	40.75	43.83	June.....	67.80	80.96
July.....	43.00	43.25	July.....	68.00	74.31
August.....	48.83	43.66	August.....	68.00	75.36
September.....	46.75	42.58	September.....	63.50	73.84
October.....	47.60	41.55	October.....	63.86	73.84
November.....	49.55	44.13	November.....	68.67	81.98
December.....	49.00	.....	December.....	76.25	.....

Sharp competition is denoted in the market for lead ore, with an apparent tendency to an advance; yet, when the average price is summed up, the change from week to week is small. Buyers pay little attention to the relative price on a grade, paying what is necessary to get the ore. When once in hand and the other buyer out of competition, prices will be lowered, while advances will be made on some other bin of ore under the control of the opposition. This situation makes price

unsteady, but in the aggregate the change is small. It is an unsettled market and few producers understand the constant fluctuations.

Chemicals

NEW YORK, Dec. 19

Copper Sulphate—The market is very quiet, but holding firm. Buying is comparatively light at \$7 for carload lots and \$7.25 for smaller amounts.

Nitrate of Soda—Market is firm, but very quiet. About \$2.55@2.50 is being received for spot delivery; while for 1907 delivery \$2.45@2.40 is being asked.

Mining Stocks

NEW YORK, Dec. 19

The stock markets have been generally irregular and rather weak, under the depressing influence of high rates for money. There is a general feeling that the speculators who have had most to do with the market will be forced to liquidate if money continues scarce, and this apprehension is keeping many out of the market. There seems to be no immediate prospect of easier money, and speculators are depressed accordingly.

The market for mining stocks has been quiet, in sympathy with the general market. The sensation of the week was the announcement of the consolidation of the Greene Consolidated with the Cananea Central, under the control of the Cole-Ryan syndicate. The immediate effect on Greene stock was not favorable.

The market closes with sharp declines in many stocks, occasional partial recoveries, and much excitement.

Boston

Dec. 18

Mining shares have been characterized by sensational price movements the past week in certain spots and extra large trading. Greene Consolidated and Tecumseh have been the principal features. The former made its highest price at \$35, and advance of \$7.50 over a week back, but has since yielded to \$30.37½. On Friday last over 95,600 shares of this stock were recorded on the tape. The cause for the advance was the merging of Greene and the Cananea Central through the medium of a new holding company with 2,500,000 shares having a par value of \$20. Of this, 1,500,000 shares will be exchanged for Greene and 1,000,000 for Cananea. The cause for the drop was the disappointment felt that no action was taken on the dividend at the directors' meeting Monday. By the putting of Messrs. Cole and Ryan in charge of Greene, this company will get something that it has not heretofore really had, a business management. Cananea Central, in the meantime, went up from \$34.87½ to \$40.75 and back to \$30.50 on the curb. The new holding company, Greene-Cana-

nea, started at \$26, and fell to \$22. This stock is quoted as "when issued."

Tecumseh is to be merged with the Caldwell and La Salle properties, upon terms not yet determined, which caused the stock to advance \$6 to \$27. Tecumseh has something over 45,000 of the 100,000 shares in its treasury. It is now known that the heavy recent buying of Allouez, Centennial and Osceola has been for the account of prominent Wall Street people with the intention of merging them and possibly other Lake properties under the direction of Cole and Ryan. Osceola touched \$140, for this reason, and on the expectation that the next dividend will be increased to \$8. Tamarack is up to \$111, on the same expectation. Utah Consolidated responded to the extra 50-cent dividend, by advancing \$3.50 to \$68, but is back to \$65, tonight.

A 50-cent assessment is expected to be levied by the Adventure early in the year. Baltic, practically owned by the Copper Range Consolidated, has declared an \$8 dividend, making \$14 for the year, and the Copper Range Company, a subsidiary, has declared two dividends of \$1.50 each, making five at this rate this year.

On the curb Nipissing after advancing to \$15.50 is back to \$12.87½ tonight. Superior & Pittsburg went off over \$1 to \$24.87½ on the curb.

Colorado Springs Dec. 15

The market in Cripple Creek shares during the past two weeks has been active, and especially so in the prospect list, there being a large demand for these stocks. The tunnel proposition stands about as it has, with the sentiment in favor of the deep tunnel and a big proportion of the amount necessary practically subscribed.

Mexico

Dec. 14

The demand for mining shares on the Mexican market showed a decided falling off during the past week, and a notable bear movement all along the lines. Of the shares traded in El Fero, Durango, went at \$5; Roma and Angustias, State of Guanajuato, at \$26 and \$110, respectively; La Paz, of San Luis Potosi, \$235; and Barreno, \$268. Of the Pachuca stocks, Sorpresa brought \$525; Amistad y Concordia, \$113@101; San Rafael, \$1025; Santa Gertrudis y Guadalupe, \$126; Soledad, \$1650. In El Oro district, Dos Estrellas sold at \$8075; Luz de Borda, \$16; Germania, \$9; Aldebaran, \$150; Borda Antigua, \$87.

Of new stocks there were listed those of La Defina, Guerrero, third series, for increase of \$250,000 in the capital (50,000 of \$5 par); Juanita, a new company in Michoacan, with a capital of \$260,000 (\$10 par); the new issue of Maria Luisa y Anexas, Michoacan, \$150,000 (7,500 of \$20); La Equidad y Anexas, of Michoacan, with \$250,000 in stock of various issues. All the above figures are in Mexican money.

Monthly Average Prices of Metals

SILVER.

Month.	New York.		London.	
	1905.	1906.	1905.	1906.
January.....	60.690	65.288	27.930	30.113
February.....	61.023	66.108	28.047	30.464
March.....	58.046	64.597	26.794	29.864
April.....	56.600	64.765	26.108	29.984
May.....	57.832	66.976	26.664	30.968
June.....	58.428	65.394	26.910	30.185
July.....	58.915	65.106	27.168	30.113
August.....	60.259	65.949	27.822	30.529
September.....	61.696	67.927	28.528	31.483
October.....	62.034	69.523	28.637	32.148
November.....	63.849	70.813	29.493	32.671
December.....	64.860	.....	29.977	.....
Year.....	60.352	.....	27.839	.....

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, 0.925 fine.

COPPER.

Month.	NEW YORK.				LONDON.	
	Electrolytic.		Lake.		1905.	1906.
	1905.	1906.	1905.	1906.		
Jan.....	15.008	18.310	15.123	18.419	68.262	78.869
Feb.....	15.011	17.869	15.136	18.116	67.963	78.147
March.....	15.126	18.361	15.250	18.641	68.174	81.111
April.....	14.920	18.375	15.045	18.688	67.017	84.793
May.....	14.627	18.457	14.820	18.724	64.875	84.887
June.....	14.673	18.442	14.813	18.719	65.881	83.994
July.....	14.888	18.190	15.005	18.585	66.887	81.167
Aug.....	15.664	18.380	15.725	18.706	69.830	88.864
Sept.....	15.965	19.033	15.978	19.328	69.667	87.831
Oct.....	16.279	21.203	16.332	21.722	71.406	97.269
Nov.....	16.599	21.833	16.758	22.398	74.727	100.270
Dec.....	18.328	.....	18.898	.....	78.993	.....
Year..	15.590	.....	15.699	.....	69.466	.....

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2240 lb., standard copper.

TIN IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan.....	29.325	36.390	July.....	31.760	37.275
Feb.....	29.262	36.403	August....	32.866	40.606
March.....	29.523	36.662	Sept.....	32.096	40.516
April.....	30.525	38.900	Oct.....	32.481	42.852
May.....	30.049	43.313	Nov.....	33.443	42.906
June.....	30.329	39.260	Dec.....	35.835	.....
			Av. year.	31.358	.....

Prices are in cents per pound.

LEAD IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan.....	4.552	5.600	July.....	4.524	5.750
Feb.....	4.450	5.464	Aug.....	4.665	5.750
March.....	4.470	5.350	Sept.....	4.850	5.750
April.....	4.500	5.404	Oct.....	4.850	5.750
May.....	4.500	5.685	Nov.....	5.200	5.750
June.....	4.500	5.750	Dec.....	5.422	.....
			Av. year.	4.707	.....

Prices are in cents per pound. The London average for January, 1906, was £16.850 per long ton; February, £16.031; March, £15.922; April, £15.959; May, £16.725; June, £16.813; July, £16.525; August, £17.109; September, £18.266; October, £19.350; November, £19.281.

SPELTER.

Month.	New York.		St. Louis.		London.	
	1905.	1906.	1905.	1906.	1905.	1906.
Jan....	6.190	6.487	6.032	6.337	25.062	28.225
Feb....	6.139	6.075	5.969	5.924	24.594	25.844
Mar....	6.067	6.209	5.917	6.056	23.825	24.563
April..	5.817	6.078	5.667	5.931	23.813	25.781
May....	5.434	5.997	5.294	5.846	23.594	27.000
June..	5.190	6.056	5.040	5.948	23.376	27.728
July...	5.396	6.006	5.247	5.856	23.938	26.800
Aug...	5.706	6.027	5.556	5.878	24.675	26.938
Sept..	5.887	6.216	5.737	6.066	26.375	27.563
Oct...	6.087	6.222	5.934	6.070	28.295	28.075
Nov...	6.145	6.375	5.984	6.225	28.500	27.781
Dec...	6.522	.....	6.374	.....	28.719	.....
Year.	5.822	.....	5.730	.....	25.433	.....

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2240 lb.) good ordinary brands.

STOCK QUOTATIONS

NEW YORK. Week Dec. 15. Table with columns: Name of Company, High, Low, Clg., Sales. Lists various mining and industrial stocks.

NEW YORK INDUSTRIALS. Table with columns: Name of Company, High, Low, Clg., Sales. Lists industrial companies like Am. Agri. Chem, Am. Smelting & Ref., etc.

PHILADELPHIA Dec. 15. Table with columns: Name of Company, High, Low, Clg., Sales. Lists local industrial stocks.

PITTSBURG Dec. 15. Table with columns: Name of Company, High, Low, Clg., Sales. Lists local industrial stocks.

St. Louis Dec. 15. Text listing prices for various commodities like Adams, American Nettle, Central Coal and Coke, etc.

COLORADO SPRINGS Dec. 15. Table with columns: Name of Company, High, Low, Clg., Sales. Lists local industrial stocks.

BOSTON Dec. 15. Table with columns: Name of Company, High, Low, Clg., Sales. Lists various mining and industrial stocks.

BOSTON CURB. Table with columns: Name of Company, High, Low, Clg., Sales. Lists various commodities.

NEVADA MINING STOCKS. Dec. 19. (Revised by Weir Bros. & Co., New York). Table with columns: Name of Company, High, Low, Last. Lists mining stocks like Tonopah Mine, Belmont, etc.

MANHATTAN STOCKS. Table with columns: Name of Company, High, Low, Last. Lists stocks like Belcher, Best & Belcher, etc.

LONDON. (By Cable.) Dec. 9. Text listing prices for various commodities like Dolores, Stratton's Independence, etc.

SAN FRANCISCO Dec. 12. Table with columns: Name of Company, High, Low, Clg., Sales. Lists various mining and industrial stocks.

MANHATTAN STOCKS. Table with columns: Name of Company, High, Low, Last. Lists stocks like Indian Camp, Jumping Jack, etc.

New Dividends. Table with columns: Company, Payable, Rate, Amt. Lists companies and their dividend details.

Assessments. Table with columns: Company, Delinq., Sale, Amt. Lists companies and their assessment details.