

# The Engineering and Mining Journal

VOL. LXXXV.

NEW YORK, FEBRUARY 22, 1908.

NO. 8.

## Sinking a Five-compartment Shaft on the Rand

The Difficulties Caused by Breakage of Drill Steel in Hard Rock Was Solved by Slightly Decreasing the Air Pressure

BY EUSTACE M. WESTON\*

In the following notes I have endeavored to give some details of the methods employed in sinking a large shaft on the property of the Rand Collieries, Ltd. (Gold Section).

Bore-holes had shown that the ground to be sunk through on this property (see Fig. 1) was largely composed of interbedded diabase sheets. The largest one, occurring in the middle of Kimberly slates, was of exceptional hardness and toughness, consisting in its core of a fine-grained aggregate of pyroxene and labradorite crystals. The other diabase sheets were of varying hardness, being some-

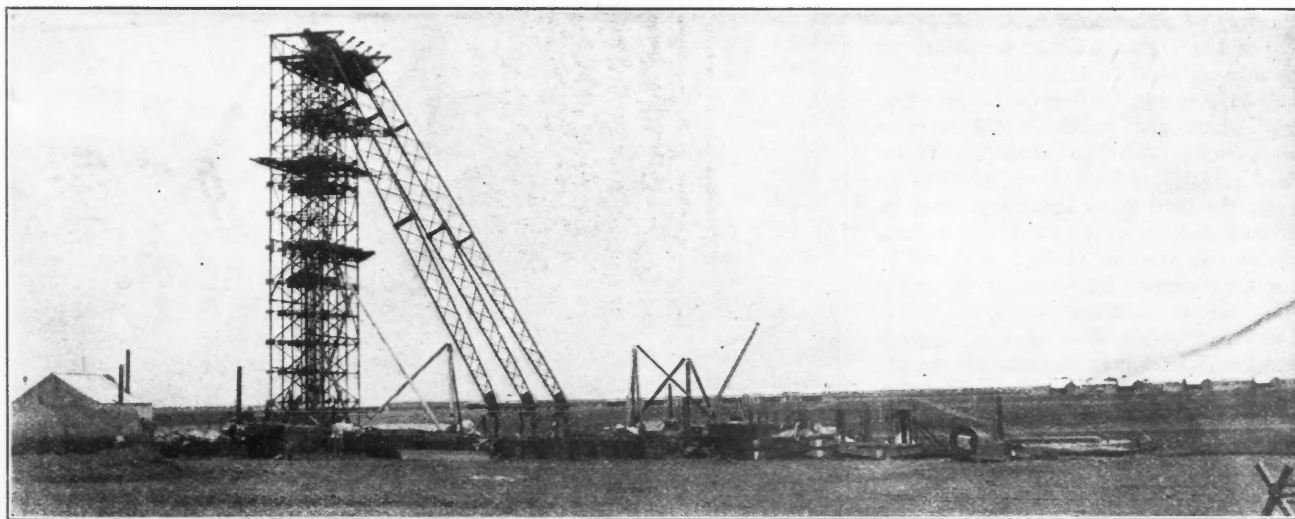
examination showed that these Kimberly slates on the East Rand were composed mainly of quartz grains with some chlorite, sericite and pyrite. Mr. Denny considered that the occurrence of this diabase, showing in the bore-hole cores an apparent transition both above and below into the slates, proved that these so-called slates were really of eruptive origin.

### ORIGIN OF THE KIMBERLY SLATES

In sinking through this strata I was on the watch for any stratigraphical evidence that might make the matter clearer. The slates, as they approached the diabase,

the contacts. Here there are, it will be observed, nearly 1100 ft. of slates and diabase, while other bore-holes, within half a mile on one side, show only 400 to 600 ft. of slates with no sign of the diabase core. This appears to be the normal thickness in this locality. On the contact between the slate and the quartzites, quartzite occurs interbedded with the slate and *vice versa*.

For a depth of 50 ft., while in the soft clay and surface soils, these shafts, there being two on the mine, were excavated three feet larger than the normal size. When solid rock was reached a bearer set



PERMANENT HEADFRAME ERECTED BY VAN RYN PROPRIETARY MINES, LTD., FOR SINKING FIVE-COMPARTMENT SHAFT WITH SKIPS

what decomposed, but these sheets had all re-silicified the quartzites in their immediate neighborhood, rendering them much harder than the average. G. A. Denny, the consulting engineer to this company, owing to the character of the ground disclosed, decided to use machines for sinking. He was also responsible for the design of the timbering used.

The appearance of the Kimberly slates with the associated diabase in the center, as shown, is interesting owing to a controversy that had arisen. Mr. Denny contended that these so-called Kimberly slates were really of eruptive origin. Dr. Hatch, however, stated that microscopic

\*Manager Rand Collieries, Ltd. (Gold Section), Brakpan, South Africa.

certainly assumed a blocky and massive structure, and had all the appearance of a decomposed eruptive rock. At one of the contacts, out of the four observed, it seemed possible to note a definite contact; but in the other three it was impossible to say exactly where the slates ended and the diabase proper began. I collected a set of typical specimens showing an apparent graduation of one rock to the other, but, until these have been submitted to microscopic examination, no definite opinion can be given. I am, however, from other evidence available, much inclined to think that a diabase sheet or dike has forced its way through the center of these slates and that the appearance of graduation is due to metamorphism on

was placed in position; then the shaft was timbered to surface and closely lagged. The space between these sets and the temporary timbering was completely filled with concrete making the shafts absolutely secure. The large steel collar set was then carefully placed in position and bolted down.

### HOISTING EQUIPMENT

A small steel head-frame and temporary hoisting engine was then placed in position, the intention being to proceed at once with the erection of a permanent headframe and engines. For various reasons this program could not be carried out, and only one engine has been available for sinking. The engine in use is a

geared two-cylinder 16x32-in. engine, made by Robey and Company, England, having two 8-ft. drums, provided with clutches. Two similar engines are installed at one of the large four-compartment shafts being sunk to 4000 ft. by the Brakpan Mines, Ltd.

Similar engines, of the same size but provided with a drop-valve gear, are employed at the large shaft of the Hercules company, which is being sunk to a similar depth. These engines have a normal hoisting speed of 500 ft. per minute. But, as in sinking against time they must often hoist at even a greater speed than 1500 ft. per minute, they are scarcely suitable for the work.

Opinion is divided as to whether it is preferable to install temporary winding engines of moderate power for shaft sinking or immediately to install the permanent hoisting engines, which must, of course, be of very large size to hoist skips, carrying 5 to 6 tons of rock, at high speed from great depths.

I think it will be found that for sinking deep vertical shafts, engineers, experienced in shaft sinking, prefer temporary direct-acting engines, worked by slide or tappet valves and made as simply as possible without any great refinements in the way of steam economy.

The headframe, whether temporary or permanent, must be of substantial design and have enough head room for lowering wall plates and guides in the hoisting compartments. Where skips are to be used for sinking with shoes, 30 to 40 ft. long, the permanent headframe must be erected as soon as possible, or the temporary one made 90 ft. high as shown in the accompanying half-tone of the headframe at the shaft of the Apex Mines, Ltd. No matter what kind of engines and headframes may be installed, the installation of two engines is a necessity in order to make rapid progress, when sinking shafts having more than three compartments. The extra capital cost is more than justified in the lowering of sinking costs and the shortening of the time, during which the capital is unproductive.

The shafts at the Rand Collieries, Ltd., have five compartments and are about 34x9 ft. between rock. These shafts were sunk with air drills, and a center V-cut was used. The shafts are timbered throughout their whole depth.

In sinking these shafts buckets were used, hung from Berry cross-heads by means of a special method of attachment, described in another article to be published in this JOURNAL.

#### MUCKING OUT THE SHAFT

When buckets and detachable hooks are used, three buckets can be employed for hauling rock; then one bucket is always on the bottom being loaded. When working with three buckets in this shaft,

the bucket, coming down empty in one compartment, is swung over underneath the other compartment by means of a short iron hook, having a handle, about 4 ft. long; this is hooked into the ring on the bottom of the bucket. The bucket is unhooked when properly landed; the rope and shackle are then rung up the shaft to have the spare bucket attached, while the one on the bottom is being filled. The other empty bucket comes down just over the full one and this is swung under the other compartment, leaving a space of about 5 ft. between the buckets. Two workers can easily unhook the buckets

that amount of time can be employed to advantage in picking over and loosening the material on the shaft bottom. If the material is thoroughly loosened, 16 shovellers can load the 20 cu. ft. bucket in one minute. Time is lost in cleaning out, when workers have to dig or scrape up the broken rock; hence it is a mistake not to spare some time for properly loosening the rock so as to enable all to work at high pressure. About six laborers only, use picks; these rest or pick the far ends of shaft, while the buckets are being filled by the 16 to 18 laborers, detailed to shoveling. The buckets are tipped over



TEMPORARY, WOODEN HEADFRAME FOR SINKING SEVEN-COMPARTMENT SHAFT, APEX MINES, LTD.

and hook the other on again without climbing on top of the buckets, which hold about a ton.

The laborers on the far side of the bucket begin to fill it immediately on its arrival at the bottom and while the loaded bucket is being attached; during this time, the workers on the other end of the shaft are picking over the bottom. The loaded bucket, standing as it does immediately under the rope in the compartment through which it will be hoisted, rises without any swinging.

The use of three buckets does not save much time when the trip in the shaft does not take more than 1½ minutes because

doors on the surface by hand or with the aid of a block and tackle.

Ventilation in all modern shafts is provided for by carrying down a timber brattice in the center of a seven-compartment shaft or between the pump and hoisting compartments in a five-compartment shaft. Planks, 1¼-in. or ¾-in. thick, are used. These are scribed against the irregular sides of the shaft, making a fairly air-tight partition. Natural ventilation clears the smoke out quickly, consequently, men are sent down to clean the timbers, almost immediately after the blasts have exploded. Signals are given by ¾-in. galvanized steel bell lines. These

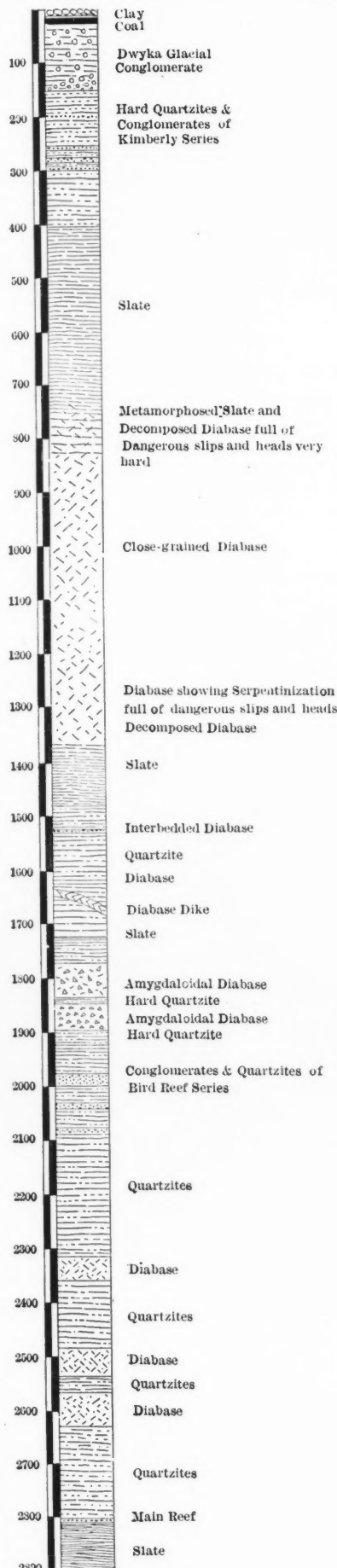


FIG. 1. GEOLOGICAL SECTION OF DIAMOND-DRILL HOLE AT SITE OF SHAFT, SUNK BY RAND COLLIERIES, LTD.

are hauled up some distance before blasting. The arrangement of bell lines is shown in Fig. 2.

**ROUTINE OF SHAFT SINKING WITH MACHINES**

The routine of shaft sinking with machines, at the Rand Collieries, Ltd., is as follows: Three white men work 8-hr. shifts and supervise the cleaning out of the shaft and help during the drilling shift. These are paid £1 per shift. Three whites and a foreman and about 25 natives or Chinese comprise the drilling crew. There are three shifts of shovelers. These go down in rotation after a blast; their task is to send up 60 buckets of rock, or, when the bottom has to be scraped, only 50 buckets. There are about 25 natives or Chinese on each of these mucking shifts. The white men on the drilling crew get 25s., or \$6, per day. They have to do the drilling and they also have to go down, when required, to assist in blowing out holes for second blasting and to help clean down the timbers and to lower hose ready for the drilling shift. Natives and Chinese get 2s. per shift with a 6d. or 1s. bonus for work performed within a specified time. A bonus, depending on the equipment of the shaft and the class of ground passed through, is also given for feet sunk greater than a certain footage per month. In future these bonuses will, no doubt, be greatly reduced.

As soon as the ends of the shaft are cleaned up, blocks, wedges and bars are sent down and the end bars rigged up. Hose are lowered and any defective ones replaced; any stumps of holes are blown out and plugged. Then, when the center of the shaft is cleaned out, the drilling crew come down and work is started.

Where the ground is shattered by jointings or where drilling has to go on under water so that there is a danger that rock fragments will wash into the holes, collar pipes are driven into the mouth of the hole. These are pieces of old pipe or boiler tube about 12 in. long, having a 3-in. to 3½-in. diameter inside. These help the drilling greatly for the hole "muds" better than when drilling under water, for it can splash when these are used. After the hole is loaded, when it is possible, these pipes are drawn so as to be used again. When the ground is of such a character that the mud tends to settle in the bottom of the hole, the hole is pumped out, whenever a drill is changed. For this purpose, pipes, 3 to 12 ft. long and from ¾ to 2-in. diameter, are used. They are moved rapidly up and down in the hole while the hand is used as a valve at the top of the pipe. The pipe is kept closed on the up stroke and the hand is taken away on the more rapid down stroke. This throws the mud and water out. In other places I have seen elaborate pumps, made with a plunger and a marble, or other valve, at the bottom,

employed. Ordinary blow-pipes are also used here, but only when coarse grit or rocks in the holes render their use necessary.

A single snatch-block is hung from the lowest set of timbers and a rope and hook are used to hoist the machines in and out of the buckets and to swing them into position in any part of the shaft. The machines are rigged on clamps directly off the bars, which are 8 ft. long and 4½ in. diam. There is no difficulty in making a secure set-up. Occasionally the bars have to support four machines at work, but generally two are placed on each bar except the one on the pump end which carries three.

**MACHINE DRILLING IN HARD ROCK**

The drilling of long holes in the shaft bottom, when the ground is full of joints

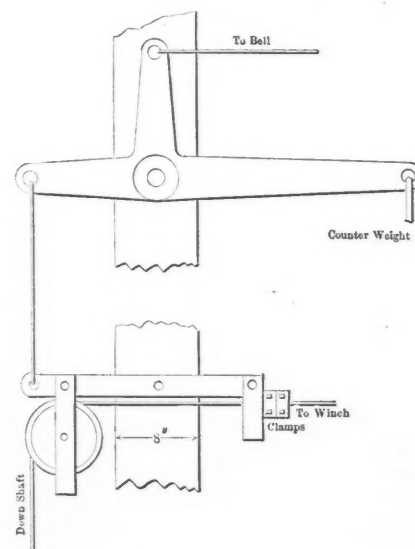


FIG. 2. ARRANGEMENT OF BELL-CRANK LEVERS, USED IN SIGNALING, RAND COLLIERIES, LTD.

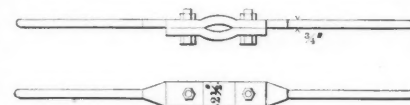


FIG. 3. CLAMPS USED TO EXTRACT DRILLS FROM FITCHERED HOLES

and slips, requires considerable skill. In hard ground a close watch has to be kept, so that drills are not kept at work after they are too dull, otherwise the drills will either bend or break, or else it will be found impossible to get the next drill to follow. Re-aligning a drill in a hole, that has "run away," is not so easy as it is when an arm is used on the bar, for no change in vertical elevation can be made. If a hole gives trouble the jig bolt is first slackened a little, then the clamp is moved along the bar, in whatever direction may appear best, and the bolts tightened again. If trouble is still apparent the

clamp bolts are loosened a little, while the machine is running; then very often the machine will align itself. The following trick used when a bit is slightly too large for the hole, is certainly bad practice; but nevertheless, it is often useful. The chuck bolts are loosened and the machine is cranked back so that the chuck is used as a hammer to strike the shank of the drill; meanwhile the drill is turned by hand. The hole can thus often be reamed out and the drill made to follow.

The law here requires that a plank staging be left over all except the hoisting compartments while men are at work below. These have to be stacked on large Z-hooks and then lashed on the timbers, or taken up before blasting. The law also requires that chain ladders be left hanging from the lowest timbers. The neglect of this precaution added greatly to the loss of life at the South Rose Deep mine, where a large volume of water from a cloud-burst poured down a shaft over 2000 ft. deep. At blasting time, the chain ladder is hung from one of the buckets. The drum on that side is unclutched, when the timbers are reached and this bucket is not hoisted until after the bucket, containing the miners, is at surface.

The miners going down after blasting examine the timbers for loose rock, re-lay the staging and pick down the walls of the shaft. The shaft timbers are examined beginning about 200 ft. above the bottom; but there is always a chance that loose rock will afterwards fall down the shaft. The timbermen are assisted by natives or Chinese, so that there is also always the danger of tools and wedges falling to the bottom. Hence work on the shaft bottom is always dangerous, although fortunately each blast tends to bring down any loose rock from the sides or on the timbers.

Curious accidents often occur. Recently a miner was helping a Chinaman to dislodge a loosened slab on the shaft bottom when the Chinaman's pick went through a stick of large blasting gelatine in an unexploded hole. Luckily the gelatine, instead of exploding, merely took fire from the spark struck by the pick on the rock and burned harmlessly.

#### SHAFT LOG BOOK

In shaft sinking the keeping of a log book is essential for checking the work done. It shows the time consumed in drilling, cleaning out, lowering timbers, cleaning down shaft, etc. Any falling off in efficiency is at once shown and its reason can be sought. The following is a specimen of log book kept at this mine for machine sinking. This log also indicates fairly well the time consumed in the different operations of sinking this shaft.

In this shaft the best cleaning-out done was 60 buckets hoisted from 2100 ft. in 3 hr. 40 min., including 10 min. spent in coming down to work. With four buckets

at the Village Deep shaft 80 buckets of rock have been hoisted in 3½ hours from a depth of about 1500 ft. At the Brakpan shaft 107 buckets have been hoisted and the shaft drilled over by hand in eight hours.

As we have no drill-sharpening machine at this mine, bits of star section could not be jumped up and formed from the steel. Consequently we had to follow what is the usual custom in this field of using, for all cross-bits, star-section steel welded upon octagon steel. There are in fact only a few mines on the Rand equipped with machines for sharpening and making machine drill-bits. In this respect I believe American practice is far in advance of ours, when really hard ground has to be drilled. Welds, however well made, are always a source of weakness and trouble.

The diabase in this shaft was of exceptionally hard and tough character. Therefore during the drilling shift, it was necessary to have a blacksmith always available

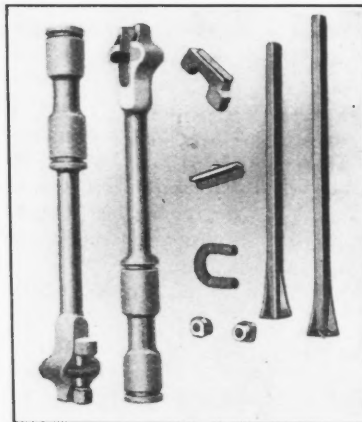


FIG. 4. SIMPLEX DRILL CHUCK

to sharpen drills to any gage required owing to bits wearing abnormally or shattering. Star bits had to be employed up to a length of 7½ ft. as chisel bits lost their gage too rapidly. At the Village Deep shaft, where the rock was favorable for drilling, only chisel bits were used, after the starter had "pitched" the hole.

#### RECOVERING BROKEN-OFF BITS

Owing to the use of welded steel, breakage of drills was frequent and holes were repeatedly lost owing to this cause. Nothing is more annoying and disheartening to the operator than to have a 6-in. end break off in a 5-ft. hole that had required, as was frequently the case, three hours' drilling to reach that depth. I found it impossible to devise any really satisfactory tongs or other extractor for regaining these ends. When drills stuck in holes, owing to bending or other causes, I found a clamp extractor, Fig. 3, very useful.

The air pressure that we used in hard rock was 80 lb. per sq. in.; when in the hardest rock, we found it better to re-

duce this to 70 lb., for though the speed of drilling was much reduced, fewer drills were broken and fewer holes were lost on that account. But, when the shaft bottom was in quartzites of moderate hardness, 90 lb. pressure was employed and it resulted in much more rapid drilling. In such rock three 8-ft. vertical holes are easily drilled in two hours; at the producing mines in rock of the same hardness, with the pressure there employed, 22 ft. of hole is the average amount drilled during an 8-hr. shift. Comment is needless.

#### SIZE OF STEEL USED

Only the best brands of chisel steel, costing 11 to 12c. per lb., would stand in this diabase without bending; but, for the longest drills, having chisel bits and 11 ft. long, 1-in. steel was found to stand satisfactorily with the ¾-in. machines. Next to the welds, the worst breakage of steel occurred at the shanks. The ends of the shanks were most carefully hardened to prevent burring up, but they broke badly just outside the chuck, where the diameter was reduced by swaging to form the shank.

The patent Simplex chuck, manufactured by Stephens of Camborne, England, Fig. 4, is much better than the ordinary English and American chucks. Steel of ordinary octagonal section can be used without shanking. As shown in the accompany cut, the side of the chuck is cut away and the long pad or key clamps the steel against a half-chuck bushing on the other side. Wear on this bushing can be cheaply taken up by liners. The key is easily tightened or loosened by a tap of a hammer. A great saving in bushings and in the cost of shanking results when this chuck is used.

The machines in use here are ¾-in. Ingersoll-Sergeant drills, equipped with an auxiliary valve, and the ¾-in. Holman air-valve drills. Generally the American machines were preferred for, as they were made of better material, they required fewer repairs; no great difference in the speed of drilling was noted. Eleven machines are used in the shaft bottom. At the Village Deep shaft 12 machines, rigged on four bars, were used. Here we find 11 machines sufficient. The hoisting buckets work in the two compartments, 5 ft. long, next the pump compartment. The pump compartment is 8 ft. long. When the sump or cut is taken out under the two hoisting compartments there is a space of about 13 ft. at one end of shaft and of 10 ft. under the pump compartment end. Five bars are rigged, two under the pump end and three under the two unused hoisting compartments. Five machines drill 15 holes on one side of the cut and six machines drill 18 holes on the other side of the cut. If any extra holes should be required, there is always a machine that has finished its holes, before the machines, drilling the

center cut holes, are through, and it is available for the work. The distances apart of the bars and the arrangement of holes are shown in Fig. 5.

**METHOD OF HANDLING THE AIR HOSE**

The air is carried down the shaft in a 6-in. pipe, placed in the pump compartment. A double platform is put in over the pump compartment and the two un-

much from flying rock. Hose, 150 ft. long, were therefore used and the platforms kept further from the bottom. Six natives and a white man are sent up, just before the drilling of the round is completed, to haul up the hose. Two of the natives remain on the timber platform about 40 ft. from the shaft bottom; thus the hose, though heavy, are easily and quickly hauled up.

hose must be lowered, when only one is required at each end of the shaft for blowing out holes, etc.; the remainder are then in the way of timbering and shoveling. The platform method, though it is expensive and troublesome, is perhaps the most convenient.

The costs of sinking these shafts during certain months are shown in accompanying tables:

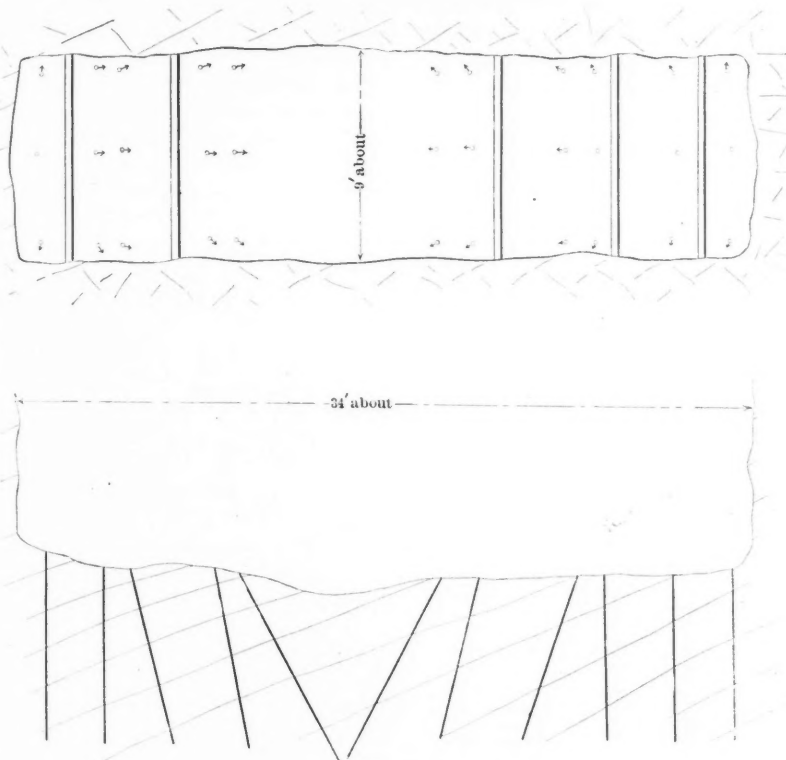


FIG. 5. SECTION AND PLAN, NO. I SHAFT, RAND COLLIERIES, LTD., SHOWING POSITION OF DRILLING BARS AND ARRANGEMENT OF DRILL HOLES

**\* LOG FOR SHAFT SINKING WITH MACHINES, RAND COLLIERIES, LTD.**

DECEMBER, 1906		BUCKETS HOISTED		TIME OF SHIFT	LENGTH SHIFT	TIME LOST						
DATE	SHIFT	Rock	Water			TIMBER CLEANING		LOWERING WALL PLATES		BLASTING		
					Hrs.	Min.	Hrs.	Min.	Hrs.	Min.		
5th	Drilling		6	1 40 a.m. 4 10 a.m.	14	30	1	25				
	Muck'g 1st	60		5 35 a.m. 10 10 a.m.	4	35			1	35		
6th	2nd	50		11 45 a.m. 3 20 p.m.	3	35						
	3rd	50		3 20 p.m. 11 45 a.m.	5	55				1 30		
7th	4th	20		12 15 a.m. 3 45 a.m.	3	30						
Total buckets hoisted		180		Total time mucking	17	35	1	25	1	35	1	30

Total time for round = 36 hr. 35 min.  
Footage sunk for week = 28 ft. For month = 103 ft.  
Ground sunk through, hard diabase.  
Number of machines drilling on shaft bottom, 11.

used hoisting compartments. A cross piece of 4-in. pipe, provided with cocks, is run across the shaft; five hose are coiled on hooks, hanging from the shaft timbers on one end and the other six on the other end. At first these hose were 100 ft. long and the stage kept from 60 to 100 ft. from the bottom, the 6-in. pipe being lengthened, whenever a distance of 40 ft. was sunk. In really hard ground, however, the hose and platforms suffered too

In some cases all the hose are attached to one detachable pipe and are counter-balanced by a weight on a rope passing over a pulley high up in the shaft. This pipe is taken off just before blasting and hoisted high enough so that the hose hang high enough in the shaft to be out of the way of flying rocks. This method has the disadvantage that excess length lowered must be taken up again and the hose secured with rope; besides, all the

**COST OF SINKING NO. I SHAFT.**

August, 1907; 131 ft. sunk through hard quartzites.

	£	s.	d.
Winding ropes and bell lines			11.183
Tramming	7	17	7.611
Sinking*	7	14	1.923
Cleaning up broken rock	4	0	0.672
Pumping	1	2	2.885
Hauling	1	13	11.527
Lighting		6	6.336
Total sinking costs per foot	15	15	6.137
Timbering	4	17	5.315
Ladders		2	5.413
Lagging		6	9.020
Air brattice		7	0.375
Total cost	21	0	10.0
General expenses on two shaft basis	1	5	9.8
Total cost per foot	22	6	7.8

\*This includes the cost of breaking the ground and shoveling, of explosives and of maintenance of rock drills.

**COST OF SINKING NO. II SHAFT.**

December, 1906, 103 ft. sunk through hard diabase.

	£	s.	d.
Winding ropes and bell lines		7	4.1
Surface tramming	1	2	4.5
Sinking*	14	9	8.0
Pumping	1	7	2.2
Hauling	2	0	7.2
Lighting		3	3.8
Total sinking costs	19	12	6.31
Timbering	4	19	7.31
Ladders		2	10.67
Air brattice wall		6	11.23
Lagging		19	7.29
Administration and general charges	2	1	2.40
Total cost per foot	28	2	9.21

\*This includes the cost of breaking the ground and shoveling, of explosives and of maintenance of rock drills.

Breathing appliances for rescue work in mines are of four types. The most common type is the helmet, supplied with air from a pump or compressed air pipe through a connecting hose. In the second type the wearer breathes into and out of a receptacle filled with chemicals, which absorb the carbon dioxide in the expired air, while the oxygen is replaced by highly compressed oxygen from a steel cylinder. In the third type the expired air passes through a receptacle containing superoxide of sodium and potassium. This absorbs the carbon dioxide and also liberates sufficient oxygen to rebuild the depleted supply in the air to be respired. In the fourth type the air to be breathed is supplied by the evaporation of liquid air.

# The Economic Geology of Northern New York

Valuable Deposits of Pyrites, Graphite and Iron Ores Abound,  
but Mining is Neglected Because of Various Unfavorable Conditions

B Y F R A N K S. M I L L S \*

There is a large area in the north-central portion of New York State, lying within St. Lawrence and Jefferson counties, which has some historic interest on account of the early mining enterprises prosecuted there. General prospecting has had a revival of interest in the past few years after a long period of dormancy. The established industries of quarrying St. Lawrence marble and Potsdam sand-

rocks is ascribed to the metamorphism of pre-Cambrian sediments. A typical exposure is shown in one of the illustrations Older, dark-colored schists are cut by the younger lighter colored, intrusive granite, forming inclusions within the rock masses. These intrusions have been productive of local metamorphism and have given rise to many of the secondary minerals for which the region is noted.

large lenticular deposits. While the latter have been worked to a greater or less degree, the industry has never been firmly established. The only deposit, now worked actively, is that of the Stella mines in Hermon township. A well equipped plant, shown in an accompanying illustration, was recently completed a few miles northeast of Gouverneur, and operated for a short time by the Adirondack Pyrites



GRANITE WITH INCLUSIONS OF DARK-COLORED OLDER SCHIST

stone for building purposes, and the production of talc, are well known.

The geology of the region is highly complex in its structural and stratigraphic relations. It is a region which has been subjected to severe dynamic disturbances and metamorphism since the early geologic eras, and consists of ancient schists, gneisses, intrusive granitoid eruptives and interlinear belts of crystalline limestone. To the north of this area lies the Potsdam sandstone.

The origin of these older crystalline

\*Andover, Mass.

The present prospecting and exploiting operations are located mainly along the zones of folded gneisses and schists or their contact lines. A number of poorly developed but promising properties are beginning to attract attention; these may become the basis of important industries in the future.

## PYRITES

Iron pyrites has a large distribution throughout the region, being especially abundant in the pre-Cambrian schists. It occurs in fine cubic crystals, rarely pyritohedral, in granular masses, and in

Company. The ore is a pyrite-bearing schist contiguous to the Grenville limestone. It is mined from an open pit, and compressed air is used in the drilling. This open pit is shown in one of the illustrations. Treatment at the plant involved a minimum of handling. After loading the skip at the pit, it was hauled up the inclined plane to the top of the mill, automatically dumped, and all transfers from crusher to rolls, to fine grinder, to jigs, to dryer and to the storage bins, was accomplished either by gravity, by conveyers, or continuous belts. Final loading on the cars was done by means of chutes.

Conditions were not entirely favorable at this property, but the true cause of the suspension of operations is said to have been disagreement in regard to the management.

A few miles to the northeast, at Pyrites, is a large body of pyrite, situated near water power and within easy reach of railroad facilities. This deposit has been worked to some extent. It is an irregular mass, roughly lenticular in shape, and occurs near the contact zone of schist and limestone, with a superficial gossan of oxidized and disintegrated material. The surface opening of the main shaft lies near the bank of the De Grasse river. The elevation above the river bed is a little more than 75 ft., the De Grasse river having cut a post-glacial gorge in the

According to late reports the property has been purchased by a large steel company, and will be worked on an extensive scale.

The great increase in the number of pulp mills in New York, and the increased production of sulphite paper, creates a demand for immense quantities of sulphurous acid. The region abounds in rich deposits of pyrites, and if these deposits were properly worked, it seems reasonable to suppose that a successful mining industry might be developed.

#### GRAPHITE

The geologic stresses to which this region has been subjected, and the attendant metamorphism, have produced a large number of secondary minerals, or altera-

Black lake. The surface is in general hummocky with low, highly compressed folds, into one of which a large cut has been made. The cut shows a finely laminated, graphic quartz-schist, complexly foliated and corrugated. It may represent the highly metamorphosed deposits of organic material near the shores of the Cambrian sea. The contact line of the indurated Cambrian sandstone is irregularly disposed as the northern boundary of this locality. The laminated deposit is crumpled, friable, quartzose, and contains a small proportion of iron. The property has been worked to a limited extent by a small company under the name of the Macomb Graphite Company, of Canton, N. Y. A section about 75 ft. long and nearly 15 ft. deep was cut into the face of one of the folds. The structure is uniform and rich in crystalline graphite. The company mined about 100 tons of the rock for experimental purposes. The deposit seems to grow richer and the percentage of iron to decrease with depth. Although the milling was done with rather crude equipment, the yield was from 15 to 20 per cent. of graphite. Several tons of excellent concentrates were produced, averaging more than 90 per cent. carbon. This product was distributed to various manufacturers, to determine its practical value for lubrication, foundry work, metallic paint, and other uses. The reports were highly satisfactory. For lack of capital the company has temporarily ceased operations after having worked out the major problems of extraction.

#### IRON ORE

Large segregated masses of magnetic iron ore are found at various places in northern New York. There are also minor occurrences of hematite of less value. An adequate and satisfactory explanation of the origin of these magnetic ores has not as yet been found. They probably originated in a diversity of ways during the long pre-Cambrian era. They are found associated with the regional crystallines, which have been interpreted as highly metamorphosed pre-Cambrian sediments. The great abundance of iron pyrites in these rocks suggests that the magnetite may be a derivative product. The bisulphide by weathering and oxidation may have been decomposed and precipitated and concentrated into beds of limonite, and the latter, by subsequent metamorphism, converted into magnetite. The hematite deposits may also be a derivative product of the original pyrites, or from the magnetite. Conditions in this region do not oppose, but rather confirm, the theory advanced by C. H. Smyth, Jr., that oxidation of the pyrites produced iron sulphates and free sulphuric acid, which attacked the magnetite, producing additional sulphates. Contact with calcium carbonates then resulted in deposits of



OPEN PIT, ADIRONDACK PYRITES COMPANY

country rock. The shaft descends at a high angle, below and under the river bed, to a depth of about 200 ft. There are six drifts, about 25 ft. in extent. Compressed air, electric current, steam and water power have all been used at different times in operating the mine.

The lump mineral was hauled up the shaft and carried by bucket tram to the mill. At one time a portion of the mined product was rich enough to ship directly without treatment. For the most part it was crushed, rolled, screened, jigged, concentrated and stored for shipment. Laboratory tests of the concentrates, taken at different times, gave 46.55, 46.69 and 46.78 per cent. sulphur, or an average of 46.67 per cent. Operations at this deposit have been varied and irregular, due to financial difficulties and managerial troubles.

tions of those originally formed. This widespread metamorphism is shown in the abundance of disseminated graphite. This mineral occurs in the old crystalline rocks and limestones, and more rarely as veins or laminated deposits near contact zones. When bedded it occurs in fine flakes or scales. Search for concentrated bodies of graphite has been more or less continuous. Vein deposits have been spasmodically worked here and there, only to be abandoned eventually. The veins are for the most part small, and they tend to pinch out, or have been faulted and interrupted by erosion. None has been worked to the point of commercial success, and they are mostly high in impurities.

One laminated deposit has recently been prospected in Macomb township, south of

iron carbonate; or, the iron-bearing solutions by loss of carbon dioxide and by oxidation deposited hematite.

In earlier years these ores were actively worked, and a large amount of iron was produced. The iron industry of Clifton passed through various vicissitudes and was active under the names of the Clifton Iron Company, the Magnetic Mining Company, and the Clifton Mining Company. A temporary road was built from the mines to DeKalb, and intermittent operations were carried on until 1890. Cooper's Falls was once the site of a blast furnace, with an ore road running to the hematite mines in Hermon; now nothing remains but the ruins of the plant. The Phoenix Iron Company once made pig iron at Norfolk from bog ores

it would not be hazardous to predict that the ores of northern New York will eventually furnish material for an extensive iron industry.

### German Mining Interests in the Orient

BY ROBERT GRIMSHAW\*

Mining is carried on extensively by German interests on the island of Thasos, in the Aegean sea directly opposite the port of Cavalla. This island, long celebrated for its copper and lead mines, has been, for many years, politically connected with the Turkish *vilayet* of Salon-

the sole right to work all other mines on the island of Thasos.

#### DEVELOPMENT OF THE DISTRICT

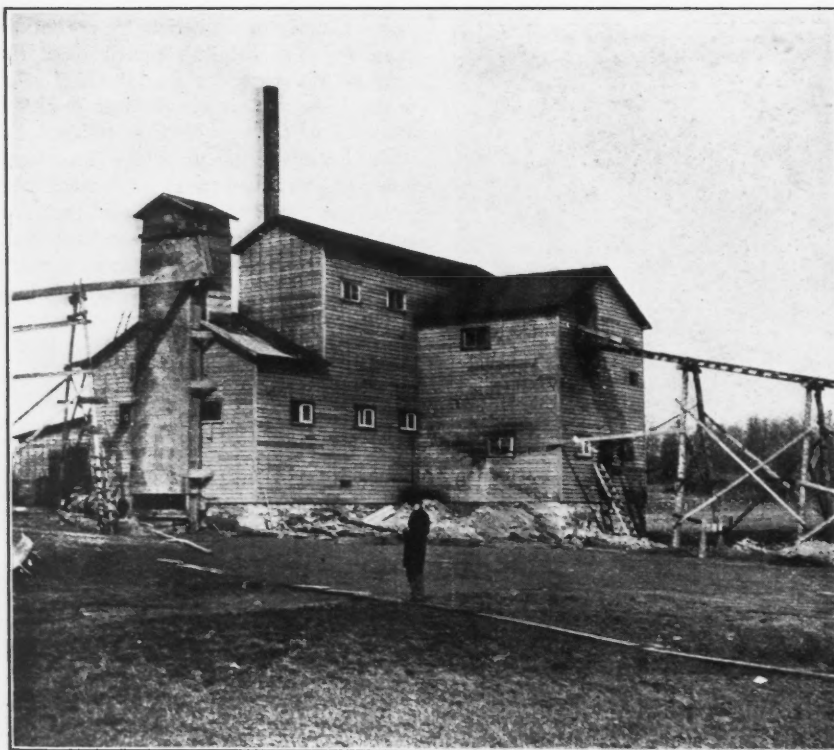
Mining commenced in 1903 with four workmen employed, but development has been so rapid that now there are more than 800 miners at work in Castro. Greeks, Turks, Albanians, Armenians, Lascians, Bulgarians and others compose the laboring class; sorting the ore is done by women and children. The mining company has in all 1500 miners, laborers and other employees, among which are 30 Germans.

The ore is rich, sometimes containing as much as 54 per cent. zinc. The first shipment took place in the second half of 1904 and amounted to 2400 tons. In 1905, 21,000 tons of high-grade ore was shipped mostly to Antwerp or Hamburg, whence it was sent to the zinc-smelting works in Belgium, the Rhine district and Silesia. The ore is sold by the mining company to the Metallgesellschaft at Frankfort-on-the-Main, delivery being made in Antwerp or Hamburg.

In Sotiros, dressing works containing immense crushers are under construction. Ore, valued at 180,000 marks has been shipped and plans for more thorough extraction are being formulated. Besides Sotiros, ores are also obtained from the following places on the island: Coumaria, Agios, Elefthire, Marlon, Metamorphosis, Selada, Cassarit, Boulgaro, and Limeras. In addition to zinc ores, copper, lead and iron ores are also found. In ancient times, copper and lead were extensively mined, and it is not impossible that, in the depths to which the miners of old could not reach with their primitive tools and appliances, large quantities of these ores may now be found.

Materials and supplies are bought, for the most part, in Germany. Up to the end of 1905 material valued at about 500,000 marks was purchased in Germany. The German Levant line received 190,000 marks for carrying ore in 1905, and about 60,000 marks for transporting coal and other materials for the mines.

R. H. Lodge has found as a result of a series of tests made upon the arsenical nickel and cobalt ores from Ontario, that with varying quantities of litharge in the charge one obtained, by the crucible assay, varying amounts of silver when assaying the same ore; with a large excess of litharge the silver result was too low. He therefore recommends the scorification method of assay for such ores since no such trouble is experienced when using that method. Owing to difficulty in slagging off the nickel, a charge containing 1-20 A. T. of ore is recommended. Mr. Lodge recommends the following charge: 1-2 to 1-10 A. T. ore, 3 to 8 grams borax glass, 65 grams, or more, lead, with some silica.



DRESSING PLANT, ADIRONDACK PYRITES COMPANY

taken from the extensive swamps. The Rossie Iron Works date back to the early settlement of the region. Many other localities have had a similar experience. The enormous quantity and high quality of the ores discovered in the West, the ease of mining, and cheap delivery to the blast furnaces located in the heart of the coal region, crippled workings less favorably situated.

The present outlook is encouraging for greater activity, and capital is investigating the possibilities. About \$100,000 is said to have been expended during the past year in renovating and equipping the magnetite workings at Benson Mines, and it is said that they will be actively operated in the near future. Representatives of capital are securing mineral rights, or buying property already investigated. Conditions are constantly improving and

ika. Formerly the island was governed by a resident Mutessarif living in Limenas on the eastern coast. After long negotiations, a German firm, in 1903, closed a contract with the Imperial Ottoman civil list, by which it secured the sole right, for a period of 40 years, to work the zinc ores found near the village of Castro. The Government receives 5 per cent. of the gross receipts of all ore shipped, sharing no part of the cost of extraction, but paying 5 per cent. of the transportation charges to the port of shipment. The concession has an area of 14 sq. km. The Turkish taxes amount to 10 Turkish pounds (\$44.00) per sq. km. per year.

By a second contract with the Government, the mining company has secured, for a period of 40 years beginning 1904,

\*Engineer, Dresden, Germany.



# Methods of Mining Iron Ore at Sunrise, Wyo.

The Ore Was Mined with Steam Shovels for Some Years but Is Now Extracted by the Milling System

B Y B. W. V A L L A T \*

The Sunrise iron mine is situated about 125 miles north of Cheyenne, in Laramie County, Wyoming. It is connected by the Colorado & Wyoming Railway with the Colorado & Southern at Hartville Junction, 14 miles west, and at Guern-

known as the "Hartville Iron Range." The property is owned and operated by the Colorado Fuel & Iron Company.

The iron ores consist of two distinct varieties of high grade hematite, viz.: the soft red variety of greasy texture, and

secondary alteration of the hard due to the action of surface waters. This theory seems to be well demonstrated by the fact that at the surface of the orebody the soft ore is in excess; at the 200-ft. level the hard ore is more in evidence;



PIT NO. 2 OPERATED WITH STEAM SHOVELS. STRIPPING OPERATIONS ARE BEING CARRIED FORWARD ON BOTH SIDES OF PIT



NORTH WALL OF PIT NO. 1, STEAM SHOVELS IN PIT NO. 2, AND STEEL HEAD FRAME AT MAIN SHAFT

sey with the Burlington six miles west of the mine. The district is generally

Note—Abstract of a paper read before the Colorado Scientific Society, Oct. 5, 1907.  
\*Chief engineer, iron mines department, Colorado Fuel and Iron Company, Denver, Colo.

the hard blue hematite, which intermixed afford an ideal ore for working in the blast furnace.

The occurrence of the two varieties of ore in the same body is easily explained by the fact that the soft hematite is a

at 300 ft. the hard ore is in excess, in fact with very little showing of the soft ore, which, in the diamond drill holes below this point, cuts out and gives way entirely to the hard blue ore. The two varieties of hematite differ in phosphorus

and silica content, the hard ore containing the lower phosphorus and the higher silica. This variation, however, applies only to the ore near the surface, where the alteration is most marked. As depth is attained the ore becomes very uniform with a low phosphorus and silica content.

The orebody which we now have opened up occurs in irregular masses or lenses with no well-defined walls as yet proved. The lenses of ore are surrounded by schist, which undoubtedly must be considered a part of the iron formation. Next to the schist lies a hard dolomitic limestone of an impervious character, which will probably prove to be the wall rock of the iron formation. However, up to the present time we have not done enough in the lime formations to show what relation they actually bear to the iron. In exploring ahead of our producing orebodies, we have as yet found nothing to guide us in looking for new ones, especially on surface, which, in the immediate vicinity of the mine, is capped by limestone. The ore is where we find it, and the diamond drill is the only reliable expert we have yet employed. The schist areas are badly folded and twisted, dipping at all angles from surface down to a depth of 300 ft., and having no well-defined strike, so that it is impossible to follow them out with any degree of certainty.

As to the derivation of the ore, it is reasonable to assume that it is a product of the schists, having originally occurred in the schist in the form of pyrite and perhaps some magnetite. The hematite then is no doubt a replacement of the schist. On the east side of the main orebody, and deeper than we have yet explored in the mine, we find a dark gray biotite schist impregnated with pyrite. This I believe to be the original form of the iron-bearing schist, the schist itself probably resulting from some igneous rock. As we approach the orebody, we find a more altered phase of the same rock with a heavy iron stain, and the pyrite missing, and finally next to the ore the very much altered light gray to greenish schist, looking very much as if it had gone through a leaching process.

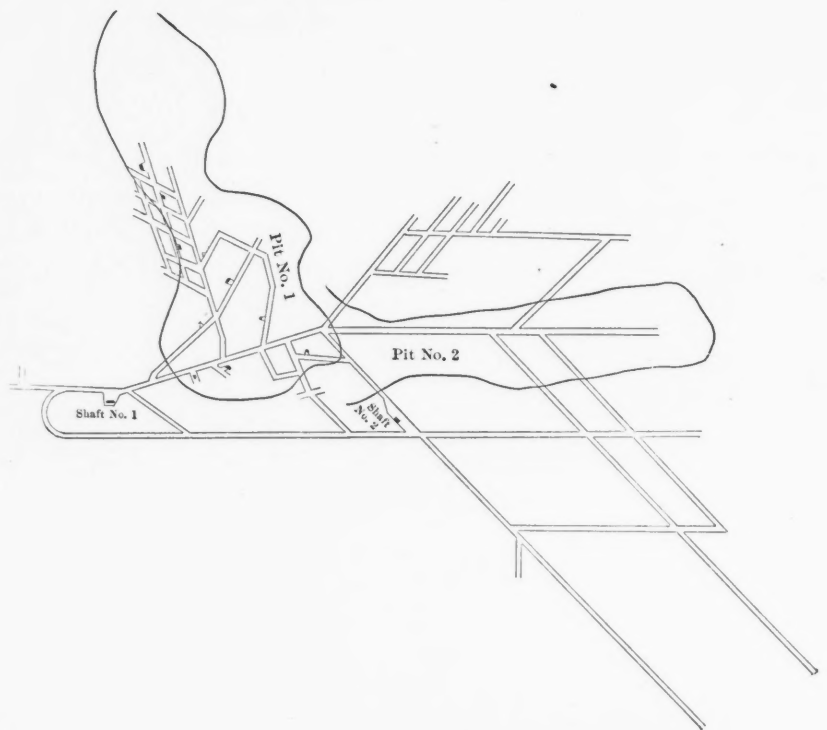
#### SYSTEM OF WORKING

The first mining, at what is now the Sunrise mine, was done in the early '90s for copper. The copper deposit proved to be a pocket, which was finally worked out and the shaft with some small drifts bottomed in iron. This, together with a small showing of iron on a side hill below the copper, called attention to the possibility of the value of the immediate territory for iron.

In 1900 the Colorado Fuel and Iron Company first entered the field, leased a group of 72 claims, covering an extensive part of the district, and later purchased the same. In the same year operations

were begun on a small scale with a steam shovel in the ore which was exposed on the side hill. Up to the spring of 1901 about 81,000 tons of ore had been shipped and nothing was as yet known about the existence of any more other than that actually in sight, which at this time was a very small quantity ahead of the steam shovel. At this stage J. D. Gilchrist, now manager of the iron mines department, was summoned from the Mesaba iron district of Minnesota to take hold of the property. He started immediately by introducing Lake Superior methods in the endeavor to locate and open up some available ore in the quickest possible manner, and at the same time with a view to the most economical future mining operations. Guided only by the fact that the

maximum grades on which the railroad locomotives could haul the loaded cars out of the ore pit. (The standard gage tracks were laid direct to the steam shovel in the pit and the ore loaded into the cars for immediate shipment.) To prepare for another system of mining a vertical shaft was started in December, 1902, and sunk in rock to a depth of 200 ft., where a level was started off into the orebody. Later, sinking was continued to a depth of 340 ft. Another level was started off at 300 ft., the remaining 40 ft. being for a skip sump and loading chutes. (The shaft is 6x18 ft. in the clear, with three compartments consisting of two skip ways each 5x6 ft., and a ladder way and pipe compartment 6x6 ft. 8 in.) Drifts were rapidly pushed out



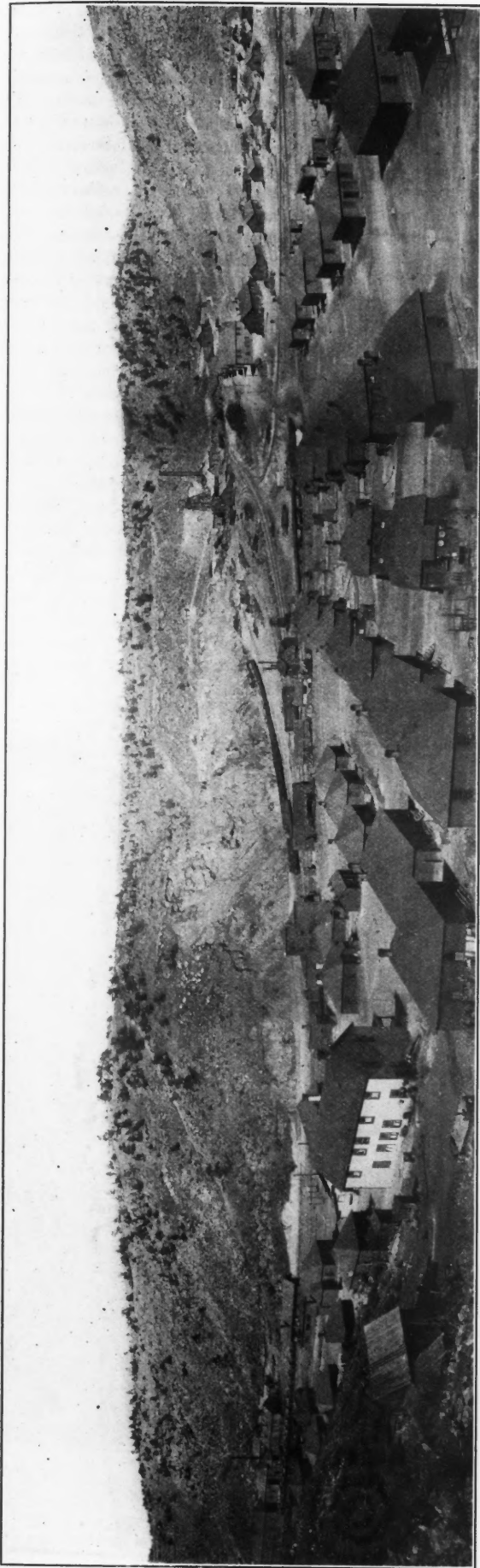
PLAN OF SECOND LEVEL SHOWING RELATION TO OPEN PITS

old copper shaft was bottomed in iron, as above mentioned, and the trend of the ore already being worked, stripping operations on the overlying surface were started with a second steam shovel. The work was well rewarded by the uncovering of a good body of ore which was available for mining with the steam shovel, which is without doubt the cheapest method of mining where conditions are suitable. While this was under way, diamond drills were put to work and constantly kept busy proving up the ore. It was soon found that an orebody of large proportions was awaiting development.

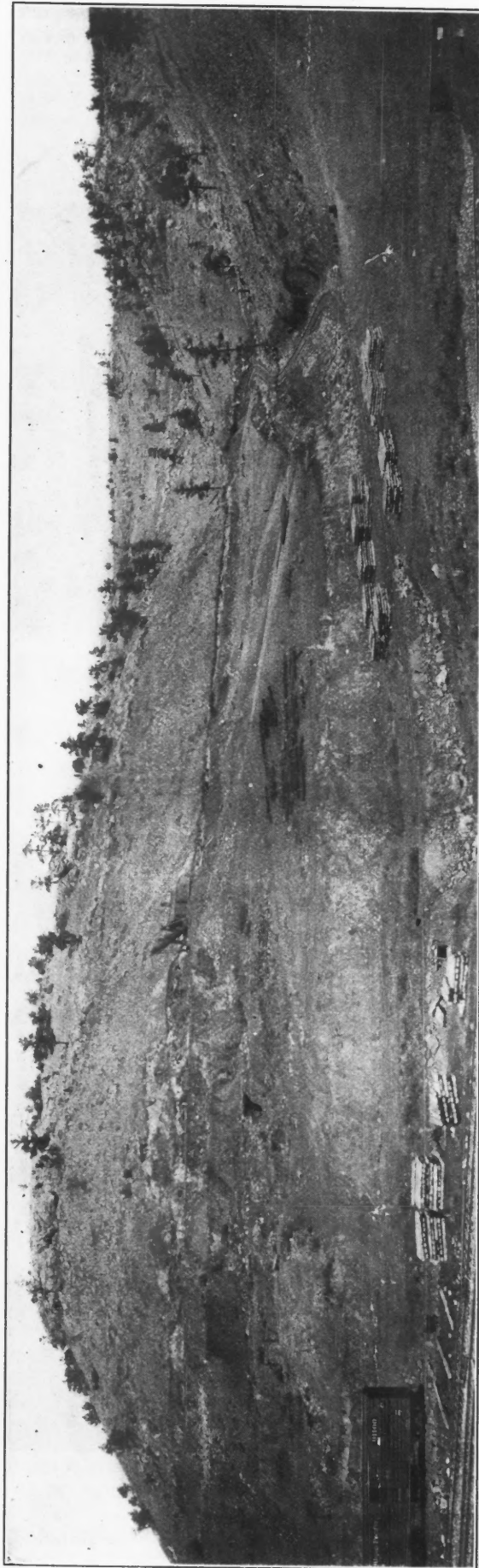
As the ore had been located to several hundred feet in depth by the drills, the end of economical mining with the steam shovel was anticipated several years ahead, it being necessarily limited to the

into the ore and under the first steam shovel pit (a second steam shovel pit having been opened up just north of the original one). This was in preparation for the milling system, which ranks next to the steam shovel work in cheap mining operations. Raises were put up from the underlying second level drifts to the open pit above. These formed the mills through which the ore is picked down to loading chutes on the second level, where it is loaded into cars, hauled out to the shaft and hoisted to surface, dumped into shaft pockets by self-dumping skips, and thence into railroad cars.

The prompt development of the orebody underground not only brought the milling system into operation at the proper time, but also served to drain the ore with which more or less water is al-



EAST END OF LOCATION, SHOWING MAIN SHAFT AND NORTH WALLS OF PIT NO. 1



FIRST OPERATIONS AT SUNRISE. STRIPPING OR UNCOVERING THE FIRST ORE WITH STEAM-SHOVELS

ways associated, so that when the milling was started the ore was quite dry.

Drifting on the underground levels has

and arc lights are used around the open pit on the surface so that the milling work can be carried on at night.

speed compound Westinghouse driving engines; two cross-compound two-stage Rand air compressors of 20 drills capacity each, and one 20x42 in. first motion hoist of the Corliss type, operating two five-ton skips in the shaft. The boiler plant consists of a battery of six 150 h.p. return tubular boilers. The electric and also the air power are installed in two units each, rather than installing the same capacity in one large unit for each, the feature of this being the one unit in reserve in case of a breakdown in the other. At this time we are using but one generator and one compressor, having one unit of each always in reserve, but even though they were all working at once to get the desired capacity, half the power is better than none in case of an accident to one of the units.

One of the features in the equipment, which should not be passed over, is the new dry or change house recently built for the comfort of the men. It consists of a one-story brick building 40x115 ft., divided into a changing room 38x54 ft., a wash room 38x46 ft., the mining captain and shift bosses' room, and an emergency hospital in the remaining space. The two large change and wash rooms are laid with cement floors on concrete



PIT NO. 1 UNDER STEAM SHOVEL OPERATION IN 1905

gone on steadily until the mine has reached the stage of development shown by the map. All drifts are in ore except where we have met with small talcose horses or seams of schist, which have been few for such a large area. The diamond drill is here in constant use. No drifting is done in waste rock until it is known that there is ore beyond. This is determined by not only putting a drill hole in on the course of the drift, but also fanning out with at least two angle holes on either side of the first one, especially where there is no knowledge of the ground in the immediate vicinity. We find this much more economical than drifting ahead blindly with the possibility of getting into undesirable ground. To give an idea of the extent of our diamond drill operations it might be interesting to state that the total number of feet of drilling done by the company in this district amounts to 50,648 ft., or 9.6 miles, of which 12,222 ft. were done underground in the mine.

Since the summer of 1903, the development in drifting amounts to 18,815 ft., or about 3.5 miles. From 1901, with 97,000 tons, the production has increased rapidly, the last fiscal year showing 571,000 long tons of ore.

The underground levels are equipped with electric haulage, the trolley system being used, operating three 5-ton Jeffrey electric locomotives. This makes it possible to handle the ore very rapidly in connection with the milling system. The main haulage drifts are electric lighted



INTERIOR OF PIT NO. 1 SHOWING MILL-HOLES

The surface plant consists of two 125 kw. direct current Westinghouse generators, belt driven by two enclosed high- base and sloping to a central drainage system. The whole floor space can thus be flushed out with a hose and kept re-

markably clean and sanitary with very little work. The change room is fitted with several hundred expanded metal individual lockers equipped with Yale locks, so that every man has a private and safe place to keep his clean clothes and valuables. On either side, and running lengthwise of the change room between the rows of lockers, are long hanging racks for the working clothes, fitted with steam coils underneath and large ventilating hoods overhead, which converge into stacks projecting out through the roof. This makes an ideal arrangement, as the steam coils below the racks (which, by the way, are for this particular purpose, the heating system for the building being installed in steam coils around the walls), dry out and air the clothes by creating a steady draft up through the ventilating hoods and thus disposing of the resulting foul air at once without having it distributed through the building. The wash room is connected with the change room by doorways, and is fitted with 12 shower-baths on one side, while on the other there are two long steel wash troughs, equipped with 13 pairs of faucets each and individual wash basins for as many men as are employed. The troughs each have a capacity for 52 basins. Both the showers and wash troughs are equipped with hot and cold water. I believe this is the most modern and best equipped change house at any mining location in this western country and goes a long way toward keeping good miners.

### Leading Producers of Kalgoorlie, West Australia

BY GERARD W. WILLIAMS\*

The leading producing mines of Kalgoorlie may be conveniently classified into three groups, the western, central and eastern. The mines in the western group are three in number: the Oroya-Brownhill, the Associated, and the Associated Northern. These mines are situated on and derive most of their ore from the rich Iron Duke lode. This lode differs from most lodes in this district. The gold-bearing channel dips at an angle of about 30 deg., and has a cross-section averaging 100 by 60 ft. The chute runs from the Brownhill mine through the Associated Northern and finally into the Associated.

**Oroya-Brownhill**—This property comprises three distinct mines, one of which, the Oroya, is among the richest mines in the world. The wealth of telluride in the stopes of this mine is without parallel. On some faces of the chamber-like stopes the telluride occurs in veins and splashes

in every direction. The ore milled from the three mines has recently been reduced from 25 dwt. to 15 dwt. on a monthly output of 11,000 tons. Mining costs \$1.43, and treatment \$3.30 per ton. A total of 380 men are employed on the whole mine, 150 being employed underground. To date the mine has produced \$18,750,000 gold and paid \$2,500,000 in dividends.

**Associated and Associated Northern**—These two mines are situated on the extension of the Oroya or Iron Duke lode. The Associated Northern is a compact little property situated in the center of the lode which enters its ground at a depth of 300 ft. and leaves it at 600 ft. The plant is comparatively new and is singularly compact. The mine crushes 3500 tons per month of 20-dwt. ore. Working costs are \$5.03, of which \$1.68 is for mining, \$2.85 for reduction and \$0.50 for general expense. The mine employs about 120 men, of whom half are engaged in development.

The Associated is now under the same management as the Associated Northern. The orebodies are somewhat widely distributed and irregular in occurrence. Early mismanagement has much hampered the work of the present management. The mine has recently been submitted to a thorough examination by W. R. Feldtmann, but the results are not public as yet. The greatest depth is 1800 ft. The mine averages 1000 tons of 10-dwt. ore per month. The employees number slightly more than 400. Working costs are about \$5, distributed in mining, \$1.68, reduction, \$2.76, and general expenses 40 cents.

#### MINES OF THE CENTRAL GROUP—PRODUCTION AND YIELD.

	Tons Per Month.	Dwt. Per Ton.
Lake View.....	11,000	6.5
Kalgurlie.....	11,000	15.0
South Kalgurlie.....	9,000	8.0
Perseverance.....	15,500	9.5
Hainault.....	5,000	7.5

**Lake View Consols**—This mine makes about \$0.50 profit on a recovery of about \$6. So far as ore values go this mine is but the shadow of its former self, but it nevertheless shows signs of recovery. It was from this mine that \$1,500,000 in 1899 was won from 6500 tons of ore. This lasted about six months and since the abnormally rich pocket of telluride was worked out the management has had to battle hard against the rapidly decreasing grade. Mining costs are \$1.65; treatment, \$2.56; general expenses, 15 cents. The stopes are worked on the shrinkage system. The mill has 70 stamps.

**Great Boulder Perseverance**—This mine, like the Lake View, is now milling ore of reduced grade. The mine is developed down to about 1650 ft., and employs about 600 men, of whom about 55 per cent. are engaged underground. Mining costs \$1.34; extraction, \$2.66; general expenses, 30 cents.

**South Kalgurlie**—This is a compact

little mine, and with capable management a monthly output of 8000 to 9000 tons is maintained with 200 men. Mining costs average \$1.45; of this ore-breaking costs \$1; trucking and raising, 40c., and stope filling, 5c. Treatment costs, \$2.65. The following are the average costs per foot in development: Driving, \$13.20; crosscutting, \$13.60; raising, \$13.70.

**Kalgurlie**—This mine is celebrated for the great width attained in the stopes. The lenses, especially on the 300- and 700-ft. levels run up to 120 ft. in diameter. The distribution of the ore is somewhat irregular, but the mine has a large amount of development work ahead of the mill. The greatest depth is 1350 ft. The number of employees is 400. Ore-breaking and raising costs \$1.20; stope filling, 16c.; treatment, \$2.56; and general expenses amount to 30 cents.

**Hainault**—This property adjoins the Kalgurlie and is under the same management. The mine is in no way typical of Kalgoorlie in that the ore is free-milling and readily cyanided by percolation. The reduction plant is being remodeled and 40 stamps have recently been erected. The mine sorts 18 per cent. of the tonnage raised. Working costs at present are about \$4.10, of which mining absorbs \$1.50. The ore gives a recovery of \$6.50.

#### TONNAGE AND YIELD OF THE EASTERN GROUP.

	Tons Per Month.	Dwt. Per Ton.
Great Boulder.....	14,000	17.0
Golden Horseshoe.....	24,000	10.5
Ivanhoe.....	17,000	12.0

**Great Boulder Proprietary**—This is the greatest dividend payer in the State and the second greatest producer; \$12,000,000 has been paid in dividends since 1895. The mine has been for many years under the same management, and is the pioneer mine on the field for deep development. At a depth of 2050 ft. large bodies of 10-dwt. and 12-dwt. ore have been opened up, and the latest returns show high values. This mine has been better managed in the past than any other on the field; not only was development pushed ahead in days when the future was largely left to look after itself, but the rich stopes were not stripped out for the sake of a transitory record output. While other mines are striving to overcome errors committed by former managers, at this mine the policy is practically unchanged, and the satisfactory development of the lower levels gives every promise that the mine will be worked to still greater depth. The ore in the lower levels is impregnated with quartz stringers and consequently is harder than the ore in the upper levels. The mine employs about 630 men, 380 of whom are miners. Working costs total \$4.32, of which mining is \$1.68, reduction \$2.48, and general expenses 32c.

**Golden Horseshoe**—This mine is the greatest producer and second greatest

\*Metallurgist, Ida H. Gold Mining Company, Laverton, West Australia.

dividend payer in the State. The present output is about \$250,000 per month; the dividends paid amount to \$11,330,000. The mine is developed down to 1400 ft.

*Ivanhoe*—This mine adjoins the Horse-shoe and works the same lode. Like the former, it employs wet-crushing. The lode is proved to 1600 ft. depth. The ore-body, as in the other mines of this group, averages from 10 to 12 ft. in width. Working costs average \$4.20.

#### LABOR

Mining wages in West Australia are considerably higher than in any other part of Australasia, and in consequence the mines have the pick of the labor in the commonwealth. The wage varies somewhat in different portions of the State, but all West Australian wages are computed upon the basis of the Kalgoorlie rate, differences being introduced to suit local variations in the cost of living. The rate is fixed either by the Arbitration Court or by industrial agreements between the mines and the representatives of the labor unions.

The Arbitration Court is a somewhat one-sided affair, excellent in theory, but rather indifferent in its application, for if the award, which is legally binding on both parties, does not suit the workers there is nothing to prevent them from going on strike, and strikes have been of frequent occurrence as a result of awards by the court. The court is composed of a judge of the Supreme Court and a representative chosen by the employers, together with a representative of the unions. One grave drawback of the act lies in the fact that arbitration is compulsory; either party may compel the other party to appear; and such compulsory arbitration involves a paradox in terminology, for arbitration to be successful must proceed from the spontaneous desire of both parties. The industrial agreements entered into between the representatives of the employers and employees are more logical and certainly more successful in practice.

Under the present agreement for the Kalgoorlie district the wages are as follows, on the basis of an eight-hour shift: Machine men in shafts, \$3.42; machine men in raises, \$3.32; machine men in stopes, \$3.20; hammer and drill men, \$2.80; truckers and shovelers, \$2.64; timbermen, \$3.20; filterpress hands and men in cyanide vats, \$2.80; amalgamators, \$3.32; fitters, smiths, carpenters, \$3.12 to \$3.60; firemen, \$2.80; shift bosses (surface and underground), \$4.

The underground workers' week consists of 47 hours; that of surface hands 48 hours. A single man gets board and lodging at from \$7 to \$8 per week. The standard of the men is very high; both as regards industry and ability Kalgoorlie mine employees compare favorably with workmen in any other field. The labor

totals given for the different mines are in themselves sufficient comment as to the quality of the West Australian miners.

## Phosphate Mining in Tennessee

By H. D. RUHM\*

Little change has taken place in the general phosphate situation since Dec. 1, except that still more of the manufacturers have suspended shipments; the Independent Phosphate Company shut down its plants the latter part of December, but these were started up again late in January. The present indications are that the expected active demand for rock will take place in the months of February, March and April. Shipments from the entire Tennessee field were about 15,000 tons in January, of which 10,000 tons were from Mt. Pleasant, and the rest from the Century, Satterfield, Carters Creek, Wales, and Centerville districts. The production during January almost equalled the shipments, so stocks on hand remain about stationary in the neighborhood of 60,000 tons, all told, practically all of which is sold.

Indications are that the next six weeks will see such bad weather that practically no mining will be done; and if the demand is as expected, stocks on hand will very rapidly diminish, so that by the middle of March, prices are apt to be high again. On the other hand, if the demand does not revive, the inactivity of some of the miners may cause them to offer inducements in the shape of lower prices. What advantage this can bring is not evident, however, as the existing unfilled contracts, if shipped out, would exhaust the supply on hand, and it does not seem reasonable to offer lower prices, before the old contracts are filled. All of the drying and loading plants are being put in first-class condition, during the temporary lull in business, and all will be ready to put out rock as soon as it is wanted, provided the weather will permit mining the product.

#### PHOSPHATE PROPERTY AS AN INVESTMENT

Considerable interest is being manifested by capitalists in the investigation of phosphate properties with a view to purchasing, either for speculative investment, or for development, and several good deals have recently been consummated while a number of others are pending. The recent money troubles have put a number of people in proper humor to trade at reasonable prices, and the present time seems to offer about the best opportunity for profitable investment that

has existed for some time, or that will exist again for some time in the future. It is wise, however, for intending purchasers to have the advice and opinions of competent judges of phosphate property, before they separate themselves from their cash, as "not all that glistens is gold," by any means.

Considerable criticism has been indulged in by manufacturers in the past two years of rapidly rising prices, because some miners, taking advantage of car shortage which prevented completion of contracts, resold their rock at the market advance, and held the buyer up on deliveries until a more convenient season. "The shoe is now on the other foot" and the buyers are demonstrating the fact that "some folks has as much human natur' as others, and some a blamed sight more," by attempting to get out of existing contracts in anticipation of a falling market.

The organization of the Tennessee Phosphate Miners' Association, which took place about Jan. 1, bids fair to correct many of these abuses. The association is going right to the bottom of the matter, with the probable result that the business will be on a much more satisfactory and reliable basis in the future. A uniform standard contract has been adopted by the association, making some very vital changes in the old form, whereby buyers will be granted substantially larger penalties for rock shipments falling below the guaranteed analysis; but at the same time the seller will be allowed equally substantial premiums for any excess over the guarantee. This will absolutely insure shipment of rock above guarantee in the future, whereas according to the past custom, nothing was paid for over-run, and only a cost and freight deduction on unit basis was made for under-run, which put a premium on shipping rock below the guarantee. For this condition buyers have been largely responsible, both by reason of the above features and from the fact that they constantly did everything in their power to foster the irresponsible miner, in order to have on hand his prices with which to attempt to force down the prices of those in a stronger position. The owners have sown considerably and reaped accordingly, and are now filled with righteous indignation.

The new association is now offering the buyers an opportunity to act in conjunction with it, and thereby make all points satisfactory to both sides, which is of course the only true basis of satisfactory business relations. The monthly meetings of the association are held on the first Tuesday of each month, and at the coming meeting a report from the joint committee, appointed to settle the contract, sampling, and analysis matter will be read.

\*Civil and mining engineer, Mt. Pleasant, Tenn.

## Recent Developments in Electrolytic Cells

BY HENRY STANLEY RENAUD\*

Of the various types of electrolytic cells for the decomposition of alkali chlorides, that known as the diaphragm cell has recently shown the most active development. In leading up to the purpose of this article, a description of the Billitzer cell just patented in Europe, it will be of interest to note briefly the present status of the other well-known types.

### GRAVITY CELLS

These depend on gravity alone to keep the anode and cathode liquors apart. The Bell is the best known type, claiming an energy efficiency of 30 per cent., with a working voltage of five at 10 amp. per sq.ft. It does not appear to have passed beyond the experimental stage. The Gintl

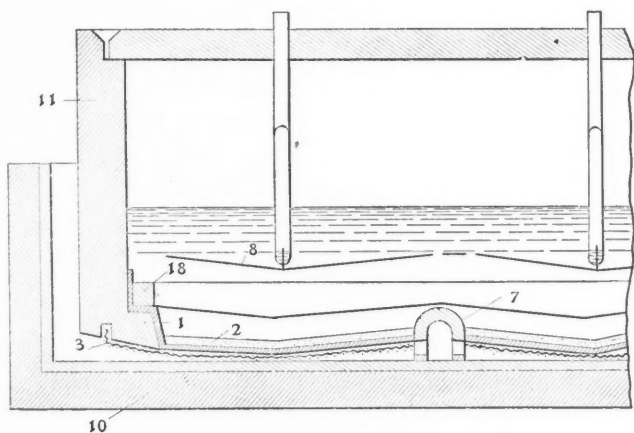


FIG. 1

cell, lately patented in this country, is said to be in successful operation in Germany. It is distinguished by a novel, hollow electrode. The units are small, necessitating a large number of gas connections which must result in leakage and in the production of weak chlorine.

### FUSED ELECTROLYTE CELLS

The corrosive action of fused salt continues to be the obstacle in the way of the successful production of caustic by this method. Vautin, and later Hulin, constructed ingenious apparatus for the electrolysis of fused sodium chloride, but both abandoned the idea. Borchers once proposed an apparatus which he never tried, and finally the Acker cell, the most promising of all, has not proved a commercial success. The plant of the Acker Process Company was destroyed by fire last year, and at the receiver's sale the patents showed a trifling value.

\*Consulting chemist and counsellor-at-law, 159 Front street, New York.

### MERCURY CELLS

The disadvantageous feature of this type is the large quantity of mercury in process. The cost of installation is high and the interest is therefore a heavy charge against the product. The interest, in addition to unavoidable losses of mercury in operation, may average 75c. per ton of product. The best known types of this cell are the Castner, Rhodin and Solvay, all of which are similar in principle, viz., mercury cathode and carbon anode. The anode and cathode liquors are completely separated, thus avoiding loss of energy by reverse reactions, common to other cells, and producing a strong, chlorine-free caustic solution. The production per cell is, comparatively, very high on account of the high current density possible; 150 amp. per sq.ft. of anode surface may be employed. Diaphragm cells average 10 to 20 amp. Mercury cells are in successful operation, and recent minor improvements in the cells mentioned indicate that

vents backward diffusion and consequent reverse reaction. The caustic liquor thus contains an excessive amount of undecomposed salt. An energy efficiency of 68 per cent. is claimed for this cell, while the McDonald and Roberts are said to average 50 per cent.

As compared to the mercury cell the diaphragm type has the advantage of cheap construction, showing a low interest item in manufacturing costs. This, however, is heavily balanced by the repair item. The latter is chiefly due to the perishable nature of asbestos diaphragms, and it does not yet seem to be disproved that this factor still stands in the way of successful commercial competition with the mercury cell.

### THE BILLITZER CELL

This cell, the latest claiming recognition in Europe, revives the old idea of combining the principles of the gravity and diaphragm types, but with certain interesting modifications.

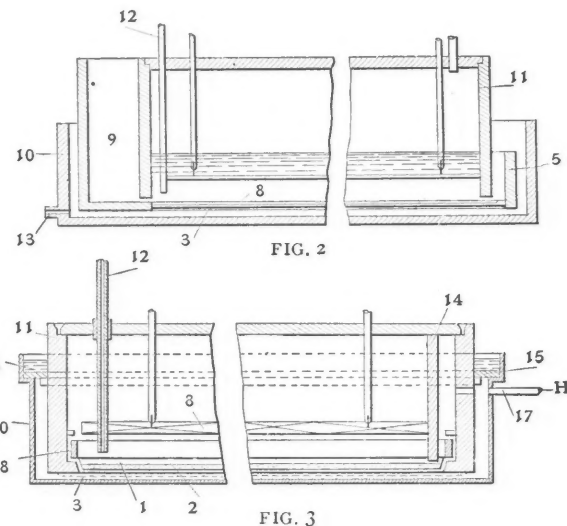


FIG. 3

considerable interest is attached to their development.

### DIAPHRAGM CELLS

The commercial failure of the Hargreaves-Bird, the simplest and most extensively exploited of diaphragm cells, argues badly for this type. The recent activity in the development of the McDonald, Townsend and Roberts cells, however, shows the attraction offered by the low cost of installing these cells. The Roberts and McDonald cells have, as their only departure from the general principle of this class, a special construction of their diaphragms, chiefly composed of asbestos. The Townsend cell employs kerosene oil as anode liquor. This rapidly removes the caustic from the sphere of action and prevents corrosion of the iron cathode. It also represents a serious fire risk. The hydrostatic pressure of the electrolyte in the anode compartment is maintained at such a height that the rapid flow of liquor through the diaphragm pre-

The apparatus (Fig. 1) consists of a bell (11) closed by a diaphragm (1, 2). The latter rests on an iron or nickel screen (3) which serves as negative electrode. The anode of platinum or carbon is inside the bell, a short distance above the cathode, and parallel to it. The salt solution is charged into the bell and the caustic liquor allowed to accumulate in vessel (10) until it just wets the cathode and then overflows through the outlet (7). The cathode is bent at a slight angle to permit the separation of hydrogen which also escapes through the outlet (7), thus avoiding its diffusion through the electrolyte and disturbance of the diaphragm.

The diaphragm consists of a piece of asbestos upon which is precipitated a layer of a mixture of barium sulphate and divided asbestos. The presence of sodium chloride in the solution is said to favor the formation of a compact layer. This diaphragm is said to last for months and to be easily renewed. By varying

the proportion of barium sulphate and asbestos as well as the thickness of the layer, it is possible to regulate the permeability of the diaphragm at will.

During electrolysis, the salt solution being admitted through a supply pipe (12), the upper stratum of the electrolyte becomes dilute while the specific gravity of the lower stratum increases, especially just above the diaphragm. The solution does not communicate with the cathode through the diaphragm alone, but is made to flow over the dam (5, Fig. 2), thereby coming in contact with the cathode from beneath. By this means, irregularities in the permeability of the diaphragm are compensated while, as in the Townsend cell, the flow of the electrolyte can be regulated so as to prevent the backward diffusion of the cathode products.

Several continuous six-weeks tests of this apparatus have been made. The working voltage is 4 to 5 and the caustic liquor produced contained 12 per cent. NaOH with yields of 85 to 95 per cent. The chlorine gas is said to run 99 per cent. The current density was 600 amp. per sq.m. (55.6 amp. per sq.ft.) and the temperature 60 deg. C.

Fig. 3 represents an apparatus for the separate collection of hydrogen. Vessel (10) is luted as shown at (15, 16) and the hydrogen removed through (17) at a pressure within the limits allowed by the variation of the level of the caustic liquor in the cathode compartment. It is stated that the hydrogen thus collected may be burned with the chlorine for the production of muriatic acid. This is claimed in the Roberts patents and successfully practiced at the plant of the Roberts Chemical Company, at Niagara Falls.

### Mining in South Carolina During 1906

BY EARLE SLOAN\*

**Monazite.**—While a few regularly organized companies systematically mine monazite, the greater portion of this mineral is supplied to the magnetic concentrators by numerous individuals, who operate irregularly. Some of these individuals own producing mines; others operate on the leasing system; the usual royalty being one-sixth of the output. Monazite is mined extensively in both Greenville and Cherokee counties, and subordinately in Spartansburg and Anderson counties, but the magnetic concentrators and purchasing agencies are centered at Gaffney, S. C.

**Mica and Feldspar.**—These minerals are mined in Greenville county by Miller and Teague, of Piedmont, S. C. The mine was opened during the latter part of 1906 and produced mica of the ap-

proximate value of \$1,000,000 in the course of exploration, incident to which good bodies of high-grade mica and feldspar were exposed.

The sinking, in December, 1906, of an exploratory shaft on the G. W. Chapman property afforded some mica and revealed a good prospect.

**Gold.**—The Haile Gold Mining Company, of Kershaw S. C., continued the largest producer of gold east of the Mississippi river. For some years past its output, varying from \$70,000 to \$150,000, has exceeded the aggregate output of any of the Eastern States apart from South Carolina.

The Blackmon mine, of the Piedmont Development Company, Kershaw, S. C., was a regular producer during the year. The Magnolia, Brown and Schlegel Milch mines, of Hickory Grove, S. C., the Darwin and Love mines of the King's Creek Station section, the Brassington mine, near Kershaw, S. C., and the Ophir mine, near Glenn Springs, S. C., were irregular producers during the year. The Gregory placer deposit, near Jefferson, S. C., was worked intermittently.

The aggregate output for 1906 comprised 3,819.63 oz. (reported to U. S. Geol. Surv.) valued at \$78,959.

**Tin.**—The Ross tin mine, owned by Capt. S. S. Ross, Gaffney, S. C., is the only property in South Carolina which afforded tin ore during the year. In the course of limited exploration below the 61-ft. level about 30 tons of cassiterite were accumulated. This ore affords about 70 per cent. of metallic tin singularly free from objectionable associated metals. It commands an eager market at Haile, Cornwall, England. The value of the tin ore produced during the year was \$16,800.

**Fullers Earth.**—The National Earth Company completed during the year a plant near Salters, S. C., for supplying fullers earth.

**Phosphate Rock.**—The following companies mined land rock in 1906: Charleston Mining and Manufacturing Company, Charleston, S. C.; Bolton Mines Company, Charleston, S. C.; Bradley (P. B. & R. S.), Charleston, S. C.; Runnymede Phosphate Company, Charleston, S. C. The following mined river rock: Central Phosphate Company, Beaufort, S. C.; Stone Mines, Charleston, S. C. The total production of phosphate rock during 1906 was 223,675 long tons, valued at \$1,118,375 (\$5 per ton f. o. b.).

The following is a list of owners of fertilizer plants with sulphuric acid chambers: Anderson Oil and Fertilizer Company, Anderson, S. C.; Ashpoo Fertilizer Company, Charleston, S. C.; Etiwan Fertilizer Company, Charleston, S. C.; Read Phosphate Company, Charleston, S. C.; Royster (F. S.) Guano Company, Columbia, S. C.; Virginia-Carolina Fertilizer Company, Charleston, S. C. (7 plants); Blacksburg, S. C. (1 plant); Columbia,

S. C. (2 plants); Greenville, S. C. (1 plant); Pon Pon, S. C. (1 plant); Port Royal, S. C. (1 plant). The South Carolina fertilizer plants (with acid chambers) represent an aggregate capacity slightly exceeding 500,000 tons. During 1906 the marketed product represented an approximate value of \$7,945,955.

### Mining in the Juneau District, Alaska

In the Juneau district, where gold is the predominating metal, there was a steady advance in mine development in 1907, says C. W. Wright of the United States Geological Survey. At the Treadwell group, on Douglas island, the use of oil instead of coal has been introduced for the steam plants, and the capacity of the water-power plants has been increased, thus materially reducing the cost for power. The gold production for 1907 from these mines will be somewhat less than it was for 1906. This decrease is attributed to the inefficiency of labor, a condition which has affected the entire region. At the Perseverance mine a 100-stamp mill has been completed and 50 stamps have been in operation most of the summer. Work at the Alaska-Juneau mine was continued from June until November and results similar to those in former years were attained.

The Ebner mine suspended operations early in June and the mine has been idle since that time. Some exploratory work was done at Sheep creek, but no actual mining. At the Eagle River mine developments have been vigorously advanced in search of the main vein, which is displaced by a fault. The developments now show both the character and the amount of this comparatively wide zone of faulting, and the vein is being developed at points farther in the mountain, beyond the fault. Considerable mining interest has been shown in the prospects north of Eagle river, at Yankee Basin and at the head of Cowee creek, where auriferous quartz veins are being explored. The Jualin mine, which was being operated under a lease during the summer, was the only mine in the Berners Bay region where mining was in progress. Except a limited amount of prospecting and small-scale operations at the Crystal mine, near Snettisham, no work was done in the mines south of Juneau.

An article in the *Electrician* states that it is possible to vary the color of sapphires by exposing the stones to the radiations from radium bromide, which caused the colors to pass from the initial blue through green to yellow and in the case of red gems to cause them to pass through violet, blue, green and yellow.

\*State geologist, Columbia, S. C.



## Rescuing the Men Entombed at Alpha Shaft, Near Ely, Nevada

By E. W. WALTER\*

The Alpha shaft of the Giroux Consolidated Mines, is located on the south slope of Old Glory hill, at Kimberly, nine miles from Ely, Nevada. The shaft is 1100 ft. deep and is the deepest in the district. It is sunk near the south wall or footwall of a huge fissure; for the first 500 ft. the shaft is in a sheared and shattered "lime-quartz," firmly cemented and discolored with iron oxide. From that point with greater depth the amount of cementation becomes less until at a depth of 580 ft., owing to crushing caused by faulting, the rock has been ground to a powder, much resembling ashes in appearance. From the 600-ft. level to the 1000-ft. station, the lode matrix is a leached "lime-quartz," heavily impregnated with iron oxide, requiring little, if any, timber in the mining operations. Consequently the only treacherous ground is that between the 500-ft. and 600-ft. levels, especially the 20-ft. belt of crushed ground between the 580-ft. point and the 600-ft. level.

The shaft from the surface to the 760-ft. level consists of one compartment and a manway; from the 760-ft. to the 1000-ft. station two compartments and manway; and from the 1000-ft. to the 1100-ft. level three compartments and manway. The shaft was started as a prospect shaft, and upon the striking of ore was increased in size with depth, the plan being eventually to enlarge the shaft throughout the entire distance.

Permanent water level was reached 10 ft. below the 1000-ft. station. Consequently the company installed an electric pump at the 1000-ft. station so as to prospect the orebodies at still lower depths. The station pump was a quintuplex Aldrich pump, while an Aldrich electric sinking pump was used in the shaft. The column pipe to surface was a heavy, high-pressure, 6-in. pipe fitted with 2½-in. flanges.

On the morning of Dec. 4, four men were working in the bottom of the shaft about 1100-ft. below surface while the pumpman was on the 1000-ft. station tending the pumps. Suddenly without the slightest warning, although the cage had come down only a few moments before, the air was filled with dust and a terrific rush of sand came down the shaft, due to a cave in the upper part of it. Two of the men, working in the third compartment, and therefore somewhat protected from the direct fall, which came down the cage compartment, successfully made their way up the ladderway to the station. At the station they were met by

the pumpman, and all three hurried into a long crosscut extending to the south. The other two men, working on the bottom of the shaft evidently made for the cage and were unquestionably killed instantly.

After the cave had filled the shaft and station (as was discovered later) to a point 33 ft. above the station and things seemed to have settled, the three men began to investigate conditions. They unbolted the flanged elbow connecting the 6-in. water column to the pump, and began to signal by tapping the pipe, hoping against hope that this column had withstood the cave and that their signals would be heard. At surface this tapping was soon recognized as signaling and hastily the column was disconnected at the mouth of the shaft. A hand windlass with 1000-ft. of ½-in. rope was at once placed over the pipe and a letter with weight attached was anxiously but carefully lowered; then when the 1000-ft. mark was passed and it was realized that the column was intact and that there was a possibility of saving the entombed men, a shout arose.

As the pump was located about 8 ft. from the station wall plates, the column had an elbow near the top of the station, from which it led horizontally to the pump. The entombed men were, however, equal to the emergency for, by taking an old bolt and a piece of wire bent into a hook, they were able to extract the message. Communication being established, the condition of the men was learned and the knowledge that the column had withstood the terrific shock of the cave gave encouragement to those on the surface and relief to the entombed. After a little experimenting 2-in. nipples, 6 in. long, with caps, through which an eyebolt was riveted were connected together with flexible links to form a "train." Four nipples constituted a "train," which was lowered by means of the ½-in. rope and the windlass through the pipe. After some preliminary testing, food and water were placed in the nipples, which were then lowered to the men below. Later a message was sent to the men directing them to connect the station telephone to the unbroken transmission cable, so they were soon able to talk to their friends and make their wants known. Reading matter and blankets were ingeniously fastened to the rope and lowered to the men; in short all ordinary conveniences were supplied in spite of the unenviable position of the men. With their minds free from anxiety and their freedom simply a matter of time, the long confinement of 46 days had no effect on the men other than to make each of them a bit more fleshy than formerly.

### THE METHOD OF RE-OPENING THE SHAFT

The work of rescue was immediately started. An examination of the shaft showed a large opening, reaching from

the top of the débris at the 480-ft. point, extending east, west and south; the north side of the shaft had stood. This opening was approximately 30x20x40 ft. high. The shaft timbers were gone below the 440-ft. point.

The first work was to protect the shaft above the cave. A stringer of 10x10-in. timber was placed under the wall plates at each end of the shaft. These stringers were attached to 1-in. wire cables reaching to the surface. These cables were drawn taut by means of chain blocks so that these timbers served as bearer sets to sustain the weight of the uninjured part of the shaft above them. A crib of 8x8-in. timbers was then built from the top of the débris to the stringers. Around this crib, in the open cave, 100 cords of wood were piled so as to fill it and support the roof from which slabs fell even while the men worked. Regular shaft sets with ¾-in. hanger bolts were then placed inside the crib and extending to the top of the cave.

From this point progress was slow, due to the necessity of driving spiling around the sets, in order to keep back the loose débris, which would flow almost like water. The spiling was driven as closely as possible, rags and old sacks being used to stop any openings. Broken timbers and criss-crossed lagging delayed the work, for these had to be sawed gently so as not to disturb the ground more than was actually necessary. The various pipes had been shoved from the manway compartment clear over into the hoisting compartments, particularly the column, one of the heavy flanges of which was broken so that the pipe was almost disconnected.

After progressing for nearly 50 ft. through this floury débris, the caved and wood-filled portions began to settle badly causing the wall plates on the southwest corner to sag and also making openings between the spiles through which sand ran. Other cables were lowered in an endeavor to support the work already done, but on account of stretching, were of no avail.

Some other plan had to be adopted to get through such shifting, settling ground. It was impossible to learn what the material in the shaft rested upon; if the shaft was hung up, there was a possibility of another run below, which would sweep everything down. Thirty additional cords of wood from time to time had been placed in the opening to take up settling and the ¾-in. hangers were pulling apart; something had to be done or else this method of going through the cave and recovering the shaft must be abandoned and a winze sunk at a point north of the cave in good ground and then a crosscut driven to the shaft at some supposedly good point. One could not hold the mountain which seemingly was pressing down the timbers for the cables could not hold much more weight.

\*Manager, Giroux Consolidated Mines, Ely, Nevada.

At this point it was suggested, that, if the new portion of the shaft, which was subjected to so much strain, were disconnected from the upper or uninjured portion by taking out the hangers, the new portion could settle without particular injury.

While this upon trial was found to be the right course, still the settling was unequal against the sets, one corner having a tendency to sag more than another. To overcome this, angle braces were placed, which equalized the settling and permitted continuous sinking. Finally by fighting for every inch, on Jan. 18, the 600-ft. station was reached, 46 days after the accident. At that point the bottom of the cave was reached for there the timbers and lagging had criss-crossed and wedged each other so tightly as to close the shaft and stop further flow.

A small opening, large enough to allow a man to pass was made through the matted mass of timber; then it was found that the remainder of the shaft was entirely undamaged and was open to within 33 ft. of the 1000-ft. station. The entombed men were apprised of this fact and instructed to take out one of the lagging plank on the manway side, with the result that by a little work, the manway was cleared from debris and their imprisonment was ended. The rescued men were untired from their exertions in cleaning the manway and climbed the perpendicular ladderway 400 ft. to the point from which they could be hoisted to the surface, and thereby terminated their long entombment of 46 days.

At the shaft, a bulkhead has been placed just below the wedged timbers, giving a firm solid bearing, and the timbers carefully removed. With very little further work the shaft will be fully recovered and made thoroughly safe for future work.

### What Goldfield Thinks of the Presidential Commission

The following remarks by the *Goldfield News* of Feb. 1 indicate the local opinion as to the commission appointed by President Roosevelt to investigate the labor trouble at Goldfield:

"The members of the legislature are to be commended for indorsing the action of Governor Sparks in calling for United States troops to prevent riot and bloodshed and the destruction of property which would have certainly taken place but for their presence. The indorsement of the Governor's action was passed without a dissenting vote, and should be proof that the people of Nevada are the best judges of the conditions that exist here, despite the report of President Roosevelt's tenderfoot commission that troops were not needed, and were being used in the interests of the mineowners to disrupt the miners' union. The lack of judgment used by the President in sending a com-

mission composed of Easterners whose only previous acquaintance with the West consisted of observations from the window of a palace car, if any of them have even been in the West before, is beyond comprehension. President Roosevelt is undoubtedly better posted on Western conditions than any other man who has occupied that exalted office, and he, more than anyone else in the East, should know that it is necessary for one to live in a mining camp for a considerable time to understand and appreciate the feelings of terror and insecurity of life and property that can be inspired by a lot of anarchists banded together to further their own ends at any cost. That a commission of three men coming directly from the effete East could be expected to appreciate such conditions during a stay of five days, is absurd, and if the President had appointed three men of equal prominence and ability from any of the Western States, there is absolutely no doubt but that he would have received a very different report. The action of the legislature, composed of men who are thoroughly conversant with these conditions, is ample evidence that the Governor was right and the commission wrong. No matter how impartial the commissioners were in their report, they were absolutely unqualified and incompetent to get at the root of the matter through their lack of knowledge of existing conditions."

### A California Debris Decision

SPECIAL CORRESPONDENCE

The California Supreme Court has reached a decision in the famous Polar Star hydraulic mine case—legally entitled the County of Sutter against William Nichols—which in effect states that a license to mine by the hydraulic process issued by the California Debris Commission, is no protection to the hydraulic miner, if anyone can prove to the satisfaction of a local court that damage is being done by the debris from the mine. This is a decided victory for the Anti-Debris Association over the California Miners' Association. Sutter county brought suit against Nichols to restrain him from sending down the river debris from his hydraulic mine, alleging that it would damage bridges across the Feather and Yuba rivers, which belong to Sutter county. The defendant's defense was that he was operating his mine under a permit issued by the California Debris Commission, and that he had complied to the letter with the provisions of the law. The court held that this was the case, but that the dam was insufficient to protect the property of the county, and the restraining writ was issued. A new trial was denied the defendant and he took an appeal to the Supreme Court,

which sustains the Sutter county court in its decision.

After describing the Caminetti law and the rules about hydraulic mining adopted by the California Debris Commission, the court says: "It is the contention of the appellant that the act empowers the commission to act as a judicial tribunal by which, in the prescribed proceedings, all persons liable to injury may have their rights ascertained and their property protected from the effects of debris by the adoption and enforcement of a plan appropriate and sufficient for the purpose; and that the decision and orders of this tribunal are binding and conclusive upon all parties affected by the mining operations authorized by the permit granted, even if it should turn out that the plan adopted was wholly inadequate and ineffective to prevent injury. . . ."

"The preservation and improvement of the navigability of navigable rivers is no doubt a proper subject of Congressional legislation. The act in question is intended to promote those objects by providing for the regulation, restriction and supervision of hydraulic mining upon the headwaters of those rivers. Its provisions are calculated so to control and restrict the operations of the mines as to prevent the further clogging of the navigable streams by mining debris, which otherwise would occur, and to devise plans and means whereby hydraulic mining, controlled and restricted, may be carried on without injury to other persons. They were never intended to give such miners full license, in case the plans proved ineffectual to prevent it, either to fill up the river channels or to commit injuries to private property by discharging debris into the stream.

"While it was the purpose of the act to prevent such injuries if possible, it was not intended to exonerate the miner from liability therefor, or in any respect to limit or restrict the powers of the State courts to protect private property from threatened injury and to redress injury inflicted thereto from the operation of hydraulic mines, though carried on under a permit and in strict compliance with the plans and directions of the commission, and the act does not have that effect. The provisions of the act, directing notice to be given and authorizing a hearing at which all parties interested may appear, were not intended to conclude and estop the owners of lands with respect to subsequent injuries that might be inflicted, but were designed to enable the commission to obtain all aid which it could derive from the suggestions of all interested persons, including those who might believe their property to be in danger."

It is easier to keep air pipes tight than steam pipes, as heating and cooling, with the accompanying expansion and contraction stresses, do not occur.

## Equipment for the Prevention of Mine Explosions

By WILBUR S. MAYERS\*

Up to the present time a large majority of mine operators have placed their reliance in the matter of safety upon adequate ventilation produced by well designed fans and properly constructed airways, together with sprinkling the pavement in dusty haulways.

Numerous explosions, however, and especially the disasters occurring in December, 1907, in Pennsylvania, West Virginia, and Alabama have shown beyond doubt that, although the ventilation may be adequate and the explosions from gas alone reduced to a small factor, we still have to solve the dust problem, which is in itself, a formidable one.

We can get rid of the gas by constructing proper airways and by increasing the size and power of ventilating fans, but in so doing, we are increasing the velocity of the air in the main headings and airways with consequent agitation of whatever dust there is, thus increasing instead of diminishing the danger from dust explosions.

### VELOCITY OF AIR CURRENTS MUST BE LIMITED

It has been suggested that fan power could be increased to such an extent that the fine dust particles could be blown out of the mine as fast as they are produced. This reasoning is fallacious, the principal defect being that in the working places where the greater part of the dust is produced, the air velocity is low and not sufficient to carry all the dust into the headings. It is, moreover, just about as easy to blow the dust out of a mine as it would be for a strong wind to blow the snow off the ground, for where it is removed in one place it accumulates in another.

Even in case the fine dust could be driven from the rooms into the airways and thus conveyed to the outside, considering the fact that its production is constant during the working hours, we would have a condition favoring explosions.

There is still another important consideration in dealing with large fan power, and that is in the moisture absorbing properties of air when rapidly renewed while covering a large surface, especially during the winter and early spring months. Through this agency the particles of dust, by virtue of their fineness, must give up a large percentage of their moisture, their inflammability and buoyancy being thus increased.

These conditions being recognized, it is quite in order to propound the query, "How are we going to make our mines actually safe?" The question may be met

in a general way by the statement that we must reach a solution of the dust problem. In view of recent experiences the truth of this statement is self evident, but in itself it is but a diagnosis without a remedy. Of the numerous remedies proposed, two of the principal ones are: first, the removal of the dust; second, that the dust be kept in a damp and consequently non-explosive condition. It is scarcely to be denied that either of these two remedies would be effective against dust explosions but our troubles really begin when we attempt to put them into practice.

### AMOUNT OF VAPOR ABSORBED BY MINE AIR

In regard to the moisture absorbing properties of air under certain conditions which obtain in practice, let us take the example of a comparatively dry mine having a fan producing 300,000 cu.ft. of air, the temperature at the intake being zero, Fahrenheit, and the relative humidity say 60 per cent. This air, after entering the mine, becomes heated to a temperature of say 62 deg. F. If there were no moisture in the mine, the relative humidity of the air would be considerably lowered on account of the expansion due to higher temperature and its moisture absorbing properties proportionally increased. But in passing through the mine after it has been thoroughly wetted down, the water is rapidly evaporated and is taken up by the air until its relative humidity increases to say 80 per cent.

The weight of the water vapor in one cubic foot of saturated air at 0 deg. F. is, according to Kent, 0.000079 lb., and at 60 per cent. saturation would be equivalent to 0.0000474 lb., this representing the weight of the vapor per cubic foot carried into the mine at the intake.

The weight of the water vapor in one cubic foot of saturated air at 62 deg. F. is, according to the same authority, 0.000881 lb., and at 80 per cent. saturation would be equivalent to 0.0007048 lb., this representing the weight of the vapor per cubic foot in the air passing out of the mine.

The amount of vapor absorbed in the mine per cubic foot of air in this case will be the difference between the vapor weights at the intake and outlet which is 0.0006574 lb., and at the rate of 300,000 cu.ft. of air per min. the total weight of water removed is 197 lb. Assuming that 30 per cent. of the evaporation in the mine comes from ditches, sumps and wet portions where sprinkling is not necessary, we have remaining 136 lb. per min., or 195,840 lb. per day of 24 hours, equivalent to 23,510 gallons.

Under the ordinary method of wetting down a mine, using tank cars holding 500 gal., it will be seen that in the case cited above there will be required about 50 tank carloads per day of 24 hours. Under average conditions in a medium-sized mine, probably one-half of this amount of water or even less would suffice, but in the

wetting down process we should consider, among other things, the hygrometric condition of the air taken into the mine.

### EXHAUST STEAM REDUCES ABSORPTIVE POWER OF AIR

In some cases the exhaust steam from the fan engine and from other sources has been turned into the intake at little expense and with a decided betterment of conditions. During the winter months and in fact at all other times, the air is heated to some extent and supplied with moisture in a finely divided form by the exhaust steam just when its absorptive powers are greatest, and there are cases on record where the moisture from the steam has been quite perceptible without the use of a hygrometer at a distance of over 4000 ft. from the fan. Evidently the nearer the saturation point is approached due to the absorption of moisture from the exhaust steam, the smaller will be the amount of absorption of the water used in sprinkling.

### FINE DUST DIFFICULT TO REMOVE

In undercutting an ordinary room, the machine makes about two short tons of fine cuttings, and of this, it is safe to say that 0.5 per cent. is pulverized finely enough to remain in suspension in the air for a matter of some seconds after being stirred up, while the finer particles will be suspended a much longer time, in fact they cannot settle while the circulation of the air is perceptible, or where rapidly moving trips are of frequent occurrence.

The remaining 99.5 per cent. of the machine cuttings too coarse to be suspended in the air, and therefore non-explosive, is loaded and hauled out of the mine; but what becomes of the 0.5 per cent. of fine dust? Is it not reasonable to believe that in the act of shoveling only a small part of it permanently lodges in the car? If this reasoning is correct then it is evidently difficult, if not impossible, to remove much of the explosive part of the machine cuttings by shoveling. If the fine dust can be collected at the undercutting and drilling machine before it becomes diffused in the air in the room a decided advance will have been made toward a solution of the problem.

As a step in this direction, I propose the adoption of a modification of the apparatus now used in manufacturing establishments where dust in considerable quantities is made. This apparatus consists principally of an exhaust fan which discharges through a sheet-metal pipe into a "cyclone" dust collector, and takes in air through similar pipes from one or more hoods located at the points where the dust is produced. Such an apparatus adapted for use in connection with mining machines and drills can be made easily portable with the exhaust pipes flexible and from 2 to 3 in. in diameter and connected with hoods properly designed to extend over the machine chain and around the drill bit, a close fit not being necessary.

\*Engineer with Fairmont Coal Company, Fairmont, W. Va.

The motor, getting its power from the same source as that from which the machine is driven can be small, since but little power is required.

An atmosphere free from heavy clouds of dust is also to be desired from the standpoint of the health of the machine runner, and the amount of grime on his face at the end of the day's run should furnish evidence as to whether the dust collecting apparatus has been used in an efficient manner.

An apparatus similar in design but on a larger scale and mounted upon a truck can be used to clean up the fine dust from the pavement, ribs and roof where all other means except a liberal washing down would fail.

#### THE WASHING DOWN SYSTEM

The washing down process, when well done, involves the use of a considerable amount of water and the subsequent removal or dampening of the sludge resulting therefrom. The roof and both ribs should be sprayed using a large number of small jets, and if a quantity of water large enough to wash the dust away is used and the pavement kept damp, only an occasional treatment of this kind is necessary.

Upon the basis of 2 gal. of water per lineal foot of heading washed, one 500 gal. tank carload will be required for each 250 ft., or about 20 tanks per mile. In order to facilitate the work by reducing the number of trips to the source of the water supply, several tank cars should be provided, the number depending upon the distance to the supply. In many cases it would be expedient and economical to lay pipe lines alongside the track in the main haulways, the pipes to be supplied from an outside source or by connection to the discharge line of a pump used for unwatering the mine. Such a pipe line should have outlets with valves at points 200 to 300 ft. apart and if there were pressure enough it would be exceedingly valuable in cases of mine fires.

The washing down system is naturally best adapted for use in headings and other narrow workings where both ribs can be reached by the water jets. For the return airways, which are not usually provided with tracks, both methods present difficulties of considerable consequence, especially where the ventilation is effected by the exhaust system, drawing the dust into the return airways.

#### A UNIQUE SPRINKLING ARRANGEMENT

Where several tank cars are made into a train, they may be interconnected by short pieces of hose and the sprinklers mounted upon a separate truck. Upon the same truck may be placed a small motor-driven centrifugal pump for furnishing the pressure necessary to give the water jets the proper velocity. If the tanks are made of light steel plate and enclosed air tight there may be placed on a truck at the front end of the trip a small motor-driven air compressor discharging into the top

of the first tank. The pressure is transmitted through the hose connections to the sprinklers on the last tank car, and if the water connections are made in the bottoms of the tanks, all the water is expelled by the air pressure. Where electrical haulage is employed, an electric locomotive is obviously the proper means for hauling the train, and where air locomotives are used the above mentioned small compressor may of course be dispensed with.

It can scarcely be denied that an adequate system for the removal or watering of explosive dust can be installed only at a considerable cost, but in the light of developments, and especially those of recent date, it seems safe to say that the mine dust question is fully as important as that of ventilation.

Of the two evils, gas and dust, the latter is the harder to combat, for it exists ordinarily in all parts of the mine, while on the other hand, the gas in mines is usually confined to certain localities and may often be fired or exploded without seriously affecting the workings in general, provided that the dust is not also fired.

Observations and experiments seem to indicate that the conditions favoring dust explosions are that there must be a rather heavy cloud of dust in combination with a large sheet of flame of high temperature, such as that produced by blown out shots from black powder or the ignition of a gas pocket. It is also probable that the blown out shot or the local gas explosion may each produce a cloud of dust and by igniting it, cause the explosion to extend throughout the mine where dust exists.

### Foreign Metal Trade of the United States in 1907

The foreign trade of the United States in metals for the year 1907, as compared with 1906, is reported by the Bureau of Statistics of the Department of Commerce and Labor as in the following tables:

#### COPPER

Exports of copper from the United States for the year were as follows, in long tons:

	1906.	1907.	Changes.
Great Britain .....	24,597	36,344	I. 11,747
Belgium .....	2,891	1,707	D. 1,184
France .....	36,028	41,551	I. 5,523
Italy .....	9,829	0,461	I. 632
Germany and Holland .....	110,839	117,973	I. 7,134
Russia .....	4,252	1,938	D. 2,314
Other Europe .....	11,277	11,706	I. 429
Canada .....	1,864	1,673	D. 191
China .....	2,202	4,466	I. 2,264
Other Countries .....	235	382	I. 147
<b>Total Metal .....</b>	<b>203,014</b>	<b>227,201</b>	<b>I. 24,187</b>
<b>In Ores and Matte .....</b>	<b>5,319</b>	<b>6,973</b>	<b>I. 1,654</b>
<b>Total .....</b>	<b>208,333</b>	<b>234,174</b>	<b>I. 25,841</b>

The actual quantities of ore and matte in 1907 were: To Canada, 82,016; Mexico, 16,737; other countries, 388; total, 99,141 tons.

The imports of copper and copper material for the year were as follows, the figures giving the metal contents of all material:

	Metal.	In Ores, etc.	Total.
Mexico .....	34,260	14,945	49,205
Canada .....	13,796	5,715	19,511
Great Britain .....	11,476	.....	11,476
Japan .....	4,379	.....	4,379
South America .....	.....	3,878	3,878
Other Countries .....	22,206	2,526	24,732
<b>Total Imports .....</b>	<b>86,117</b>	<b>27,064</b>	<b>113,181</b>
<b>Re-exports .....</b>	<b>445</b>	<b>.....</b>	<b>445</b>
<b>Net Imports .....</b>	<b>85,672</b>	<b>27,064</b>	<b>112,736</b>
<b>Net Imports, 1906 .....</b>	<b>78,122</b>	<b>21,919</b>	<b>100,041</b>

Actual quantities of ore and matte reported in 1907 were: Mexico, 96,179; Canada, 128,730; South America, 28,313; other countries, 39,195; total, 292,417 tons.

#### TIN

The imports of tin into the United States for the year were, in long tons:

	1906.	1907.	Changes.
Straits .....	15,452	12,013	D. 3,439
Australia .....	937	537	D. 400
Great Britain .....	26,424	21,806	D. 4,618
Holland .....	553	839	I. 286
Other Europe .....	1,486	1,131	D. 356
Other Countries .....	250	527	I. 277
<b>Total .....</b>	<b>45,102</b>	<b>36,852</b>	<b>D. 8,250</b>

Exports of tin, chiefly foreign, were 807 tons in 1906, and 562 tons in 1907.

#### LEAD

Imports and re-exports of lead in the United States for the year were as follows, in short tons:

	1906.	1907.	Changes.
Lead, Metallic .....	11,763	9,277	D. 2,486
Lead in Ores and Base Bullion .....	72,371	70,538	D. 1,833
<b>Total Imports .....</b>	<b>84,134</b>	<b>79,815</b>	<b>D. 4,319</b>
<b>Re-exports .....</b>	<b>47,247</b>	<b>51,447</b>	<b>I. 4,200</b>
<b>Net Imports .....</b>	<b>36,887</b>	<b>28,368</b>	<b>D. 8,519</b>

Of the imports in 1907 there were 64,506 tons from Mexico, and 5539 tons from Canada. Exports of domestic lead were 74 tons in 1906, and 55 tons in 1907; a decrease of 19 tons.

#### SPELTER

Exports of spelter, zinc dross and zinc ores from the United States for the year were as follows, spelter and dross in short tons, ore in long tons:

	1906.	1907.	Changes.
Spelter .....	4,670	563	D. 4,107
Zinc Dross .....	15,887	9,593	D. 6,294
Zinc Ores .....	24,750	18,171	D. 6,579

Imports of spelter were 2204 short tons in 1906, and 1778 tons in 1907; a decrease of 426 tons. Imports of zinc ore for the six months July 1-Dec. 31, 1907, were 32,624 tons calamine and 6472 other ores; 39,096 tons in all. Previous to July 1 last zinc ores were not reported.

#### THE MINOR METALS

Imports and exports of the minor metals in the United States for the year were as follows, in pounds; the third column showing increases or decreases as compared with 1906:

	Imports.	Exports.	Changes.
Antimony Metal .....	8,662,683	.....	I. 762,489
Antimony Ore .....	2,700,186	.....	I. 513,055
Nickel and Oxide .....	.....	8,772,378	D. 1,847,832
Platinum .....	6,184	.....	D. 5,279
Quicksilver .....	.....	384,913	D. 90,238
Aluminum, Value .....	\$304,938	.....	D. \$59,313

Imports of nickel ore and matte were 15,156 tons in 1906; in 1907 they were 16,889 tons, containing 18,418,305 lb. metal.

# Coal Mining by the Bord-and-Pillar System

Methods of Robbing Pillars Vary with Pitch, and Miners Are Paid According to Thickness and Purity of Seam

BY GEORGE RAYLTON DIXON

The scheme adopted or evolved in mining coal by the bord-and-pillar system in Northumberland depends on the direction of the cleat, the direction and amount of dip of the seam, and the amount of water the seam is making. Fig. 1 shows one method. The winning places are driven "bord ways course" (at right angles to the main cleavage planes), and in the direction of the full rise. The rate of dip is not heavy; the left side of the figure shows a scheme for a light grade, 1 in 27, while on the right side is shown a method for a heavier grade, 1 in 10.

Three winning places are driven, the center one for a main rolleyway, and a return airway on each side. All three places are driven narrow, 7 ft. wide; and the center place is afterward made 12 ft. wide, by taking off side coal. This center place is made at least 6 ft. high under the timber. It is driven narrow in the beginning, because faults, swells, or other interruptions may be met which render it desirable to place the main rolleyway above or below the position of the seam for parts of its length.

The "whole" working is plainly shown in the figure. Headways are driven at right angles to the winning bords and the main rolleyway, and they are turned away so that they are a few yards off and on, and the openings on the main rolleyway do not face one another. Bords are holed from one of these headways to another, thus cutting up the coal into rectangular blocks. The bords are the places from which the greater part of the output from the "whole" will be obtained. The tendency, therefore, is to drive them as wide, and have as many of them as possible. Headways are driven narrow, for they have to be kept open a long time, and must be kept in good order; hence there will be as few of them as possible. Our object is, of course, to get out all the coal; therefore, we must consider how the working of the "whole" will effect the working of the "broken."

## PREVENTING CRUSH AND CREEP

If the pillars formed be too small, thrust and creep will occur. It is usually assumed that each foot in depth in coal measure strata means a pressure of 1 lb. per sq.in. If we take out 50 per cent. of a coal seam in the first working, there will be double the original pressure on each square inch of the coal left. Thus at a depth of 300 ft. the original pressure would be 300 lb. per sq.in., but on extracting half the coal, the pressure on the remainder would be 600 lb. per square inch.

Thrust is the cutting up of the roof by the remaining pillar of coal. Creep is the rising up of the bottom. Thrust and creep nearly always take place to some extent, but these conditions are prevented as much as possible. It is obviously desirable to prevent crush of the coal, especially if it is a steam coal. In any case crush will cause a good deal of coal dust, which is most undesirable, even dangerous, in any mine. The nature of the roof and floor, the character of the coal, and the depth from the surface, affect the extent to which these troubles will manifest themselves. The conditions of the strata which give rise to these difficulties must all be considered in deciding on the percentage of coal to be removed in the whole working. The shape of the pillar left is also important. A square pillar is much stronger than a long and narrow one.

In the case shown in Fig. 1, the headways are driven 7 ft. wide, and the bords are driven 18 ft. wide. Headways are driven 82 ft. apart from center to center, and the bords 69 ft. from center to center. The dimensions of the remaining pillar of coal are, therefore, 75 ft. by 51 ft. Referring to the left side of the workings shown in the figure, the reader can estimate the total number of men employed in the whole workings, by allowing one man for each bord. Each man drives up his bord, and then goes around and proceeds to advance the headway to meet the bord, or as it is termed, "to wall."

It will be seen that the air goes up the center winning, and splits right and left. It is kept up to the working places, and passes through the last holed bord. As each new bord is holed, so far as the ventilation of the "whole" goes, the one behind can be drawn out and be allowed to close. The timber thus obtained can be used again. It will be seen, however, that the "broken" workings follow the "whole," and the air follows from the "whole" to the "broken." For this reason, in small pillar workings every other bord is generally kept good, and if the pillars are large, every bord is kept open.

## ROBBING THE PILLARS

Broken working consists in taking slices or lifts off the pillars that are left after the bords and headways have been driven. Generally every headway has been kept in good repair for the passage of the "broken" coal. Half the pillars on each side of each headway are brought out by that headway. In the case shown to the left of the figure, lifts are driven

right and left, opposite each other. These lifts are 17 ft. wide, and are driven up 37½ ft. The supporting timber is then drawn out, the roof falls, and two new lifts are begun. The first headway to start "broken" mining is finished first, and the face of the "broken" workings, therefore, assumes a stepped form, with the result that the lifts are easier to support.

Referring to the right side of the figure, it will be seen that the scheme for getting out the pillars differs from that employed in getting out the coal shown in the left half of the same illustration. The grade being steeper, 1 in 10, the work of getting coal out of the lifts on the dip side would be very heavy, so that the whole of the coal to the rise of each headway is brought down upon that headway. Moreover, there is this further difference: the men working in the lifts shown on the left side have goaf on both sides of them, while the men in the lifts shown on the right have solid coal behind them.

Some pitmen think there is a great deal in this as regards the safety of the men, and adopt the latter arrangement in all cases. Thus in the case represented in the left half of the figure, had the direction of dip been headways course, and toward the winning bords, only left-hand lifts would have been driven, carrying them up the full length of the pillar. Obviously the method having both right and left-hand lifts is by far the most rapid method of getting out the pillars.

Again referring to the right side of Fig. 1, it will be seen (the direction of dip being as shown on the plan) that before any "broken" work can be commenced, several headways must be up their distance. As shown, a series of three headways is taken, and the farthest inbye of these is the first to start broken. As the next headway inbye will be used for the next series, enough coal must be left for efficient support. Hence the first headways of a series of three under consideration will only take lifts up half a pillar. The next headway will take a full pillar, while the third will take a full pillar to the rise, and the half pillar to the dip, next to the goaf formed by the previous series. Sometimes the method adopted is to take three-fourths of a pillar to the rise of each headway and one-fourth to the dip.

## THE HAULAGE SYSTEM

The collecting and distributing base at the end of the haulage system is called the "flat." This flat simply consists of a

length of double road with a siding on one side for full cars, and one on the other for empty cars. For a large district as shown in Fig. 1, it will be convenient to keep the two sides separate, and the flats will be made as shown. It must be understood that the two sides of Fig. 1 show different conditions, and different applications of broken working. The two sides of a district would be kept about on a line, and the flats would be on

broken lifts will be taken to the most convenient flat. There will always be two flats in use on each side. All the "whole" coal will go to the flat furthest inbye. Most of the "broken" coal will go to the one farthest outbye. A careful look at the plan will make these details clear.

It will be seen that a large pillar of coal is left next to the return airway; this is most important, for if too little

the winning places run parallel with the cleat. They are then called "winning headways." The left side shows a suitable arrangement for a dip of 1 in 25, and the right side a system suitable for a dip of 1 in 12.

Before robbing can be commenced, a series of bords (or rooms) must be driven through to the bounds of the district. The bords on the left side of Fig. 2 are holing into a headway of a district

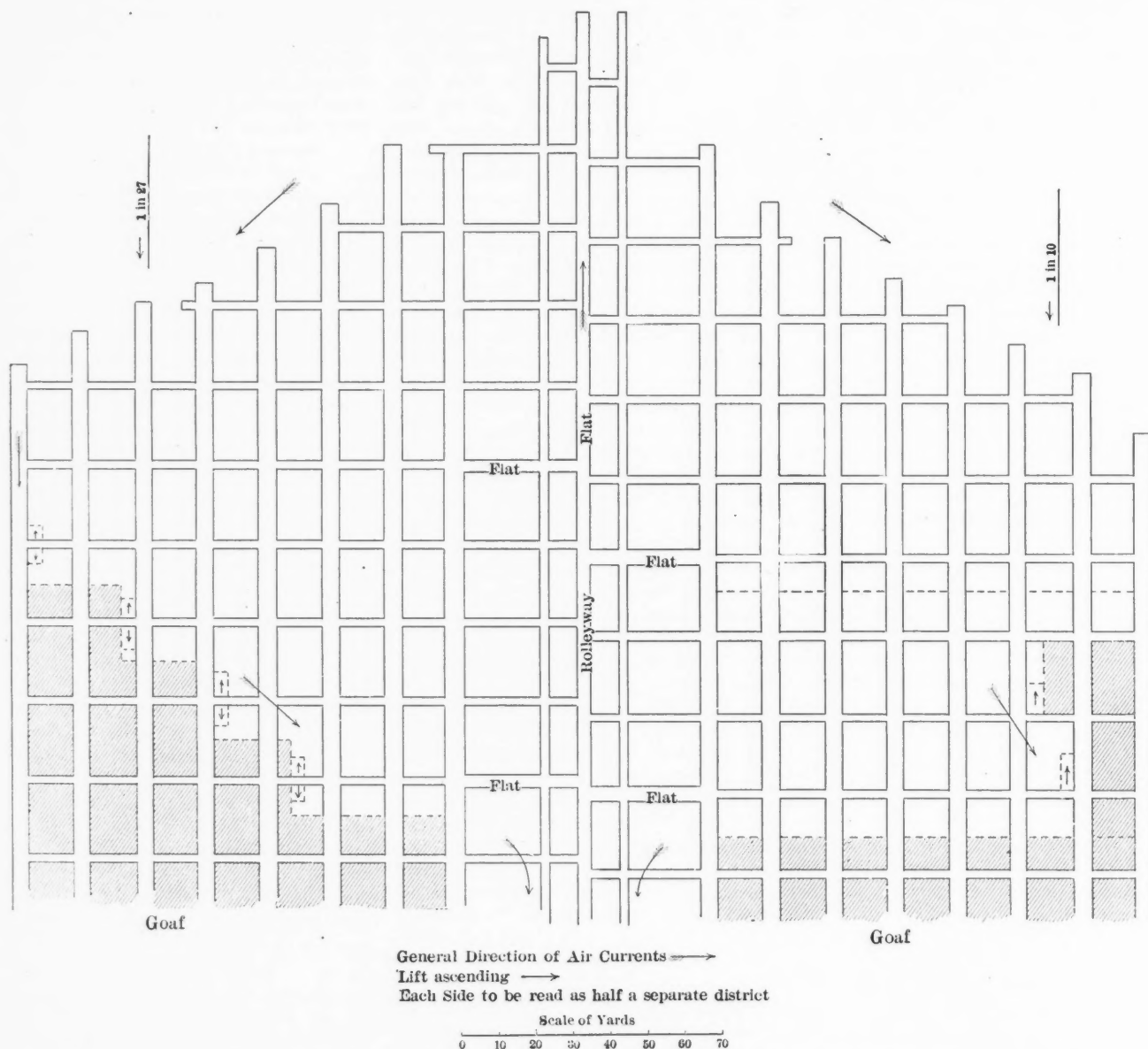


FIG. 1. BORD-AND-PILLAR SYSTEM. FACES AT RIGHT ANGLES TO MAIN CLEAVAGE PLANES

headways opposite each other. The first wide bord on each side will be kept as a "going bord," for the coal to come down to the flat (or parting) from the higher headways. If the roof is at all bad, this bord is therefore made narrower, about three yards.

In the system shown in the left half of Fig. 1, a flat is made in every fourth headway. In the system shown on the right in the same illustration, a flat is made in every third headway. The coal from the

coal is left to support the rolleyway and return airways, there will be constant trouble and expense in keeping these roads in repair. When the winning bords reach the boundary, and all the coal belonging to a district is worked out on both sides, these pillars are worked back till the point where the winnings commenced is reached.

#### WORKING PARALLEL WITH THE CLEAT

Fig. 2 shows a method of working when

which is further advanced. This headway has not been laid down broken, so that it serves as a means of communication between the two districts. In the same way, the extreme right headway is not being worked broken, so that a way may be left to get down to the district beyond.

Referring to the left side of the figure it will be seen that a flat is made every sixth bord, and that this bord is driven narrow, because it must stand for a long

time. The grade being easy, the coal may be carried either inbye or in an outbye direction. Advantage is taken of this to shorten the lead of the coal by taking half to the upper and half to the lower narrow bord.

A heavier grade is met in the arrangement shown in the right side of the figure. Every fifth bord is driven as a narrow bord. The coal can only travel in an outbye direction on the headways. Enough coal is left against the narrow bord above to support it.

is low, and stone (waste) must be taken up or down to make hight, the stone is stowed in the bords. Bords are generally turned away and holed narrow. Lifts are usually turned off bordways course, but in certain circumstances headway lifts are turned off.

PAY OF MINERS

To give an idea of how the "hewers" are paid, a scale of prices is given below for a seam of varying thickness at a depth of 243 feet:

PAY OF HEWERS IN YARD WORK.

	Width, Feet.	Price per Yard.
Winning headways	6	47c.
Winning headways	7	44c.
Winning headways	9	38c.
Narrow bords....	6	41c.
Narrow bords....	7	38c.
Narrow bords....	9	32c.
Narrow bords....	12	24c.
Holling walls....	6	44c.
Holling walls....	9	35c.
Crosscuts and water levels....	6	50c.
Siding over in broken (fast)	6	36c.
Siding over in broken	4	24c.
Taking off side coal		12c.

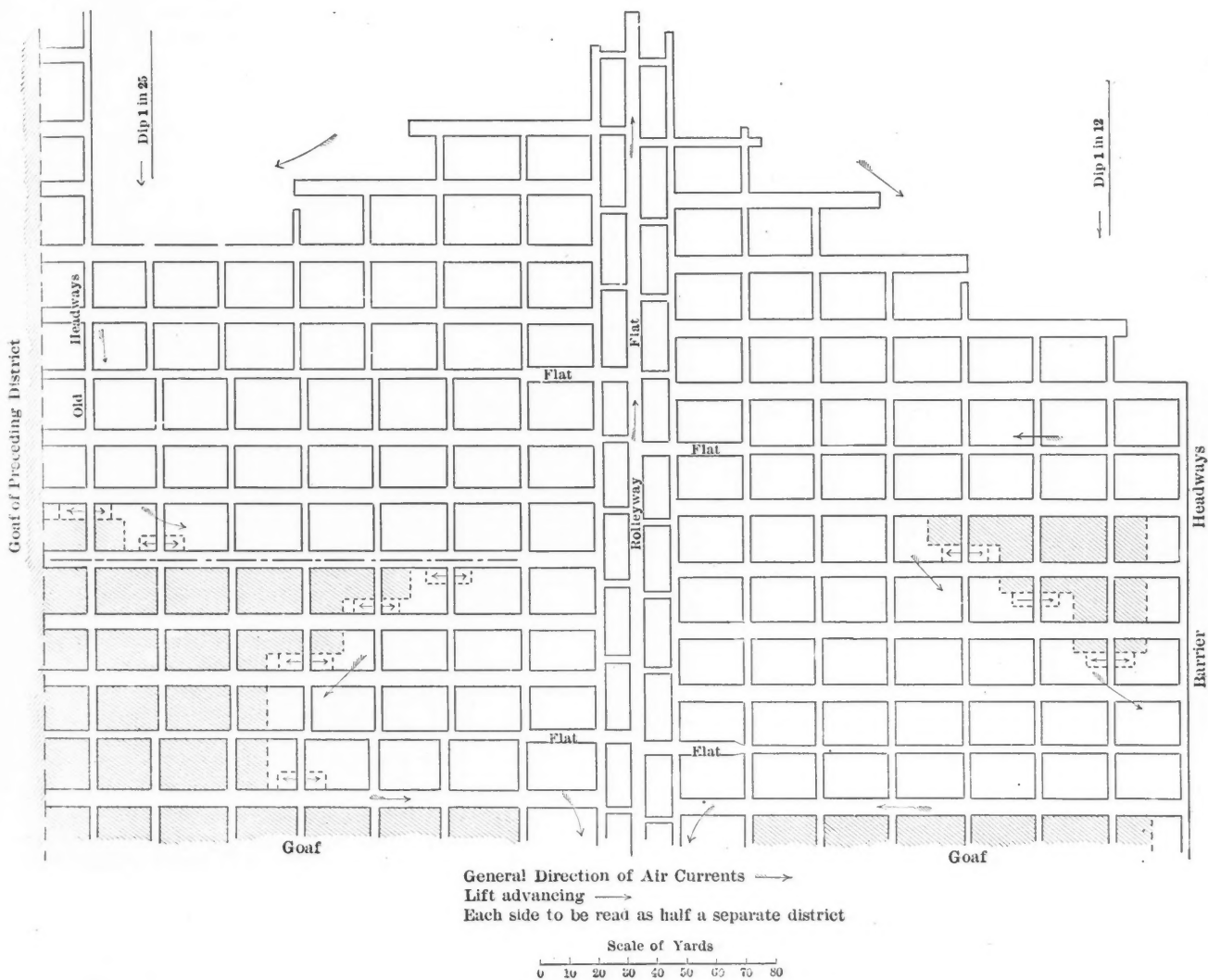


FIG. 2. WORKING PLANES PARALLEL WITH THE CLEAT

DRIVING CROSSCUTS TO WIN COAL

When crosscuts are driven as winnings, as they often must be, it is important to drive a wide crosscut to finish the goaf. Neglect of this precaution often causes trouble for through carelessness the goaf may approach too near. Fig. 3 shows a scheme for working with winning crosscuts. It needs no explanation. The tramway is generally laid next to the solid coal in wide bords and broken lifts. When a lift is going next to an old bord, the track is laid near the middle. When the coal

SCALE OF PRICES PAID HEWERS IN NORTHUMBERLAND COAL MINES.

Thickness of Coal, Feet.	Thickness of Coal, Inches.	Pay per Ton.	Thickness of Coal, Feet.	Thickness of Coal, Inches.	Pay per Ton.
5	6	30c.	3	6	39c.
5	0	32c.	3	4	41c.
4	6	34c.	3	2	43c.
4	3	35c.	3	0	45c.
4	0	36c.	2	11	47c.
3	9	37½c.	2	10	49c.

Prices continue in this way increasing 2c. per ton for every inch decrease of seam thickness. When the hewers are requested to pillar the bord or to "ramble" in narrow places 12c. extra per yard is paid:

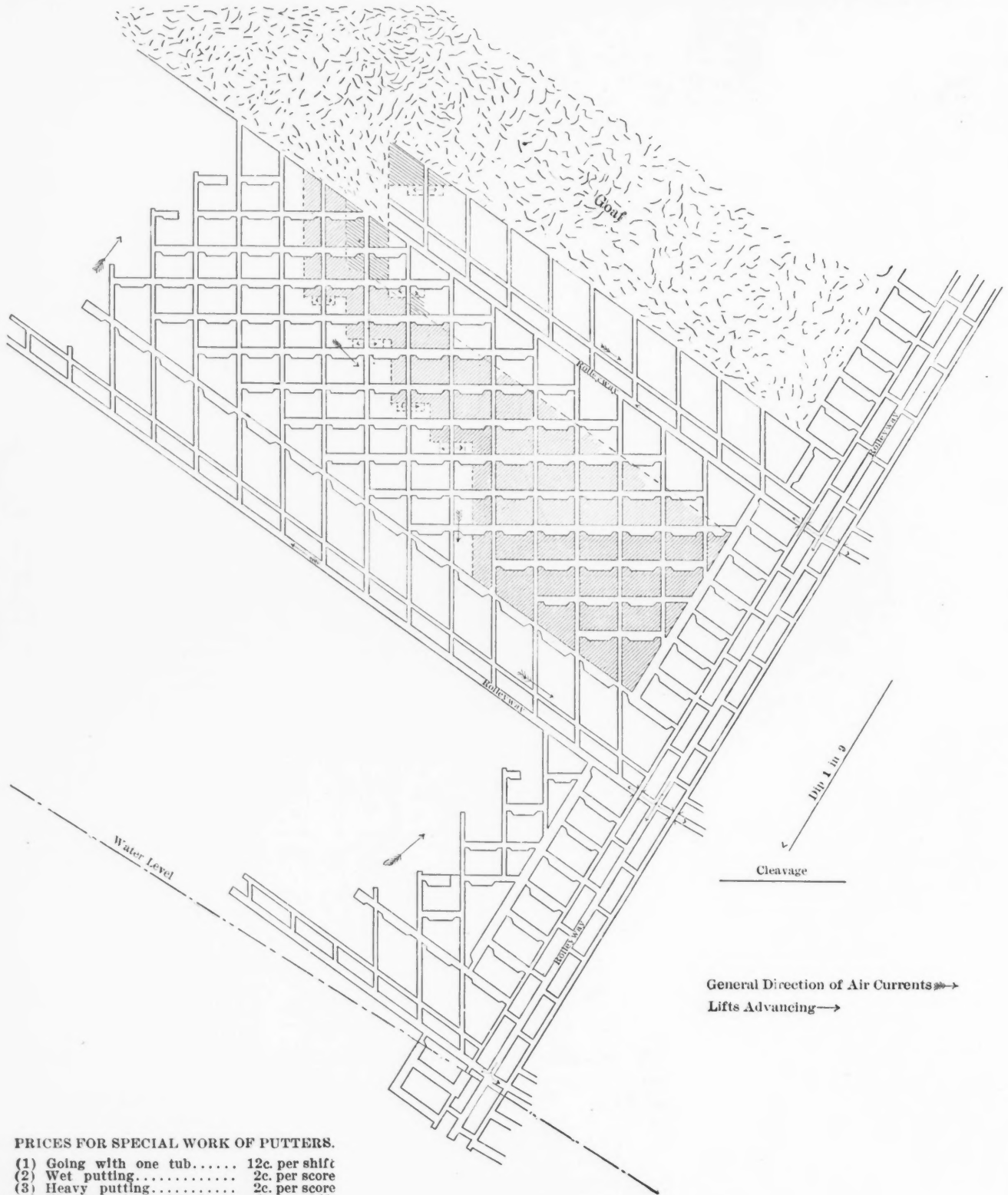
For wet working 1c. per ton is allowed, and for filling up bord stone, etc., 4½c. per car. Double working in whole places 6c. per shift is paid. If the quantity of stone in a car exceeds 25 lb. the hewer will be fined 8c. The cars in use in the seam to which these prices refer carry 9 cwt. of coal.

The prices paid for "putting" or placing cars are as follows: First rank, 130 yd., 22c. per 20 cars, and 2c. per score for every additional 30 yd., the rank to be measured from the middle of the flat, and

the two nearest with the two farthest places to be taken for measurement. This is the rate of pay for pony haulage. In addition, putters are paid to a scale for certain work under special conditions as follows:

the circumstances at the colliery are such that he cannot be so employed, the manager has a claim on him for a further six months to put. He is then paid at a higher rate; 24c. per day and 8c. per score on the scale putting price.

seams. When working deeper seams, the scale differentiates. The hewer in the whole getting 4c. to 10c. per ton more than the hewer in the broken. The price for broken work does not come into operation till a specified area of goaf has been



**PRICES FOR SPECIAL WORK OF PUTTERS.**

- (1) Going with one tub..... 12c. per shift
- (2) Wet putting..... 2c. per score
- (3) Heavy putting..... 2c. per score
- (4) Working with safety lamps 6c. per shift
- (5) Casting timber at the flat 6c. per tram
- (6) For taking in plates..... 4c. per shift
- (7) For taking timber from flat to working places..... 6c. per shift

When a lad employed as a putter in the mine reaches the age of 21, he is eligible for employment as a hewer; if, however,

FIG. 3. WORKING WITH WINNING CROSSCUTS

In the scale of hewing prices quoted above, there is no difference between hewing in the whole and hewing in the broken. This is generally so in the case of shallow

formed. The following is the rule in force at one colliery: "When commencing to work off the pillars where there is no goaf already formed, the whole hewing price



shall be paid for the first four pillars removed on each side of the flat, after which removal, the broken hewing prices shall be paid in every case for the first and second pillars from the goaf; but for any working or operation in the third pillar from the goaf, the whole hewing price shall be paid."

It should be explained in connection with this rule, that the term "flat," is not only applied to the putters' collecting and distributing base, but also more largely to the whole district. Thus instead of speaking of say "No. 4 district," the term "No. 4 flat" is generally used.

Coal cutting machines are used to a small extent in bord-and-pillar working. I know one colliery where percussive drills are in regular use for nicking and kirving, and am of the opinion that the next few years will see considerable development in this direction.

In a later paper I hope to describe some special applications of pillar working.

### Mines Company of America

The balance sheet of the Creston Colorado Company, the operating company, for Sept. 30, 1907, shows a surplus of \$435,696, while the surplus of the Mines Company of America, the holding company, at the same date amounted to \$165,513. The dividends paid during the year ending Sept. 30, 1907, included two monthly dividends of 1½ per cent. each and ten monthly dividends of 2 per cent. each, making a total of \$460,000. The total dividend disbursements during the period beginning in December, 1902, to September, 1907, amounts to \$2,785,000. The Mines Company of America is capitalized at \$2,000,000; George A. Schroter is consulting engineer for the company.

The Creston Colorado mines are situated at Minas Prietas, Sonora, Mexico. The property covers 7000 linear feet of gold- and silver-bearing veins. The equipment includes hoisting, milling and mining machinery installed at a cost of more than \$600,000. Costs per ton were reduced during the year by the introduction of improvements, installed at a cost of \$30,496. The directors have recently leased a cyanide plant of Chas. Butters & Co., Ltd., which will increase the monthly treating capacity from 6000 to 10,000 tons, and further reduce the operating costs.

Miners become careless of dangers. Because the engineer has never had any trouble with the hoisting engine after he has answered their blasting signal, they are apt to assume that he never will. They therefore, frequently become careless in regard to lowering, before "spitting" the holes, the chain ladder which hangs from the lowest set of timbers in the shaft. The lowering of this ladder must be made compulsory or the miners may forget this ladder once to often.

### A Suspended - frame Frue Vanner

BY GRANT B. SHIPLEY

A new vanner, constructed by the Allis-Chalmers Company, Milwaukee, Wis., and designed by Messrs. Bradley and Marcy, of Salt Lake City, and F. H. Blanding, of Chicago, differs from the ordinary type in certain mechanical features, but only slightly in principle. The construction is entirely of iron and steel, except the pulp distributor, which is of wood. Instead of supporting the frame by evenly spaced, rectangular steel bars on each side, this vanner is hung from two rods on each side, so arranged that the side shake imparts a peculiar motion to the belt; the longitudinal center line remains stationary in its vertical plane, but the sides of the

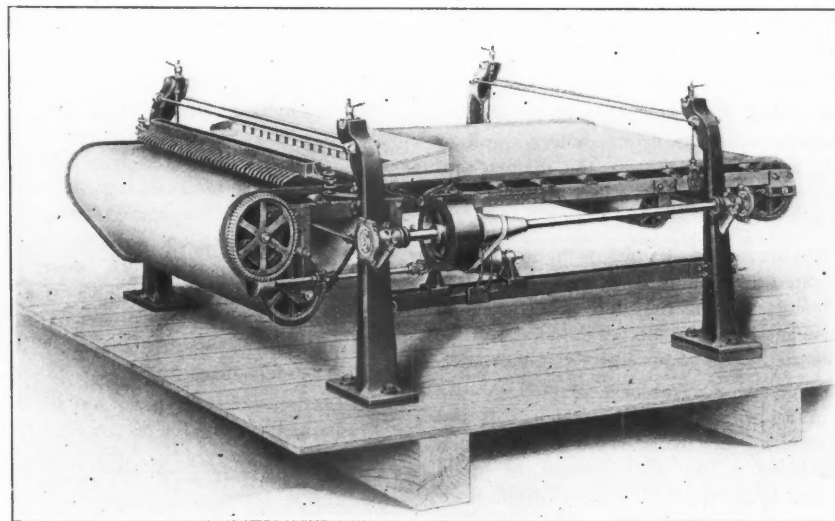
is estimated that from 1 to 1½ gal. of clear water per minute at the wash box and 1½ to 3 gal. per minute with the pulp will be required. The drive shaft makes 160 to 200 revolutions per minute and about 0.5 h.p. is required to operate the machine. The usual styles of vanner belts are used.

### Pig-iron Production in Canada

The production of pig iron in Canada, as collected and reported by the American Iron and Steel Association, was as follows for two years past, in long tons:

	1906.	1907.	Changes.
Foundry and forge.	130,120	84,979	D. 45,141
Bessemer pig.....	165,609	154,910	D. 10,699
Basic pig.....	246,228	341,257	I. 95,029
Total.....	541,957	581,146	I. 39,189

The increase, which was 7.2 per cent.,



SUSPENDED IRON FRAME VANNER

belt are alternately raised and lowered. This imparts a motion similar to panning. It is claimed that sand corners do not form along the sides of the belt, and that the pulp does not slop over on the working parts.

The particular features of this vanner are as follows: The peculiar motion imparted by the side shake; adjustable side-shake motion regulated by the eccentrics; combined cone-pulley belt tightener and adjustable support; adjustable gate on each pipe of the water distributor; independent adjustment at the four columns for regulating grade of belt; universal drive for worm and worm wheel on head roller; shaking frame built entirely of steel; access to all adjustments and clear space underneath machine.

The capacity of this vanner, depending upon the character and fineness of the ore, the quantity of water in the pulp, the efficiency of the operator and the running conditions of the machine, varies from 8 to 18 tons of material in 24 hours. It

was entirely in basic pig. The total production for 14 years past was as follows:

1894.....	44,791	1901.....	244,976
1895.....	37,829	1902.....	319,557
1896.....	60,030	1903.....	265,418
1897.....	53,796	1904.....	270,942
1898.....	68,755	1905.....	468,003
1899.....	94,077	1906.....	541,957
1900.....	86,090	1907.....	581,146

On Dec. 31, 1907, Canada had 16 completed furnaces, of which 14 were in blast and 2 were idle. Of the total 13 usually use coke for fuel and 3 use charcoal. In addition 3 coke furnaces upon which work was suspended some time ago were partly erected on Dec. 31. During the first half of 1907 the total number of furnaces in Canada actually in blast for the whole or a part of the period was 12, of which 10 used coke and 2 used charcoal. During the last half of the year the total number of active furnaces was 15, of which 13 used coke and 2 used charcoal. The most important addition during the year was the furnace of the Atikokan Iron Company at Port Arthur, Ont., which went into blast in July.

# Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

## DEVELOPMENT AND MANAGEMENT

The entire output of the coke ovens of the northern and southern districts of Australia is sold up to the end of July, 1908.

Ropes in a dry down-cast shaft should be oiled once a month, but in a wet up-cast shaft, they ought to be lubricated at least once every two weeks.

Cement intended for constructing a masonry mine dam should be used without an admixture of sand, so as to better withstand the high pressure.

Mine cars should generally be low and broad, thus placing the center of gravity of the load near the axle, which tends to give steadiness of motion besides being easier for the loader.

It is best to have shaft pulleys of equal diameter with the drum; where spiral or conical drums are used, the diameter of the pulley should not be less than the least diameter of the drum.

To prevent freezing of mine pumps operated by compressed air, heating the compressed air in the mine near the pump by means of steam has given good results. This method is comparatively inexpensive.

Pick-machines are best adapted for use in mines where the coal is thick, soft and spongy, as they work rapidly under such conditions. The roof should be good enough to permit the setting of props from 10 to 12 ft. from the face.

In bituminous coal mines, the miner should fire all shots from the return side of the air current toward the intake, so that the gases liberated by each shot will be blown away from the location of the next shot which he expects to fire.

Belts for use on dynamos should be of the endless variety, made without rivets and spliced with splicing cement. Machines of high speed should never be operated with laced belts. With new belts an allowance for stretching of  $\frac{1}{4}$  in. to the foot in its length should be made. In calculating speed allow 1 per cent. for slipping.

The briquetting of coals and lignites, which has been carried on for many years in Europe and has reached a high stage of development in France, Belgium and Germany, has made comparatively little progress in the United States, chiefly because of the abundant supply of cheap raw fuel with which the manufactured article has to compete.

The Bethune mines of France employ a force of about 8000 men. They possess 2000 workmen's dwellings which are

rented to miners at from \$1.15 to \$1.54 per month. The houses with gardens attached, are arranged in attractive villages, with broad streets and boulevards. Churches and schools have been built, the water supply, sanitary arrangements and electric light plant are all up to date.

The Pennsylvania Railroad motive-power department is making preparations for conducting a series of coal tests at Fort Wayne for the purpose of determining the most efficient fuel for the new engines recently purchased by the company. The coal is weighed and a complete record kept, and every step taken aids the experts to determine to a nicety the kind of coal best adapted. Edison T. Brock will have charge of the test.

The development of the briquetting industry has been retarded by attempts to exploit patented or secret processes, for which all kinds of extravagant claims have been made. The Patent Office has issued many patents on all sorts of inventions relating to binders, many of which are as fanciful as the idea of perpetual motion, and the investment of capital in enterprises of this character has been accordingly discouraged.

The coal survey in Indiana which is to be begun next spring by State Geologist Blatchley and George H. Ashley, of the U. S. Geological Survey, is expected to show remarkable development of the coal industry in the State, but in no portion will a greater development be shown than in the Linton field in Greene county. Mr. Blatchley says that Linton today is the principal mining town in Indiana, having won that distinction from Brazil.

The use of steam locomotives for mine haulage is limited, because of smoke, steam and gases generated. Under certain conditions, however, in mines free from fire-damp, and where the main haulage road has an air split of its own, steam haulage gives good results. Under these conditions it is the cheapest method of haulage, as it is self-contained, thus avoiding the transmission of power from a power house and obviating the possibility of leakage of power.

When installing a dynamo or motor, be sure and see that its foundation is substantial and level. Machines of 20 h.p. and upward should have a solid foundation of brick or stone, or seasoned timber. Machines of high voltage should have, in addition to the foundation proper, an insulating bed of timber. Select a light, dry and airy place, free from dust and dirt, for the location of the machine.

Access should be easy to all parts and the armature should be easily removable.

Consul F. M. Malin reports that a Nottingham miner has patented a safety mine cage which is considered an advance on all its predecessors. The cage is fitted with sliding bars, each having a gripping screw, with a weight or spring attached, by which the bars are coupled to the guides, should the winding rope break. A particular feature is the automatic gripping action exercised on the guide ropes by the weight of the cage itself, and its immediate but gentle arrest in the event of the breaking of the winding rope.

The use of steam underground in the anthracite field is now viewed with much disfavor, and quite a number of underground slopes, are at present operated by engines located on the surface, the ropes being conveyed through shafts or bore holes. When the power is obtained from an engine located in the mine, the disposal of the exhaust steam is a problem familiar to most pit-bosses. In addition to trouble from the exhaust, there is more or less loss from radiation and condensation. Steam locomotives in mines are now prohibited by law, but the use of those already installed is not forbidden.

The number of mine fires which start from explosions of gas are insignificant, beside the number due to carelessness on the part of the men employed in the mines. The practice that many miners have of hanging their lamps on timbering is a frequent cause of fires. Hot ashes should not be dumped along the caved outcrop of a seam as this is also a source of fires. Miners should be cautioned about leaving gas feeders burning in their chambers after they quit work, as it has often resulted in mine fires. Also the habit mine carpenters and timbermen have of working with open lamps is dangerous and should be prohibited.

Although the watering of coal dust in deep coal mines where the temperature is high is generally considered undesirable because it tends to produce a humid, tropical atmosphere which fosters the germs of miner's anemia, the miners working in the Produit Colliery, Mons, Belgium, where the shaft is 3773 ft. deep and the seam 3 ft. thick, seem to suffer no ill effects although they work in a temperature gradually rising in the workings to 103 deg. F. The air is dry and has considerable velocity, and the men do not suffer distress nor perspire too freely. The rock temperature is about 113 deg., the ventilation reducing it from 10 to 20 degrees.

**THE ENGINEERING AND MINING JOURNAL**

Issued Weekly by the

**Hill Publishing Company**

JOHN A. HILL, Pres. and Treas. ROBERT MCKEAN, Sec'y.  
505 Pearl Street, New York.

London Office: 6 Bonverie Street, London E. C., Eng.  
CABLE ADDRESS: "ENGINJOUR, N. Y."

Subscription, payable in advance, \$5.00 a year of 52 numbers, including postage in the United States, Mexico, Cuba, Porto Rico, Hawaii or the Philippines. \$6.50 in Canada.

To Foreign Countries, including postage, \$8.00 or its equivalent, 33 shillings; 33 marks; or 40 francs.

Notice to discontinue should be written to the New York office in every instance.

Advertising copy should reach New York office by Thursday, a week before date of issue.

For sale by all newsdealers generally.

Entered at New York Post Office as mail matter of the second class.

**CIRCULATION STATEMENT**

During 1907 we printed and circulated 507,500 copies of THE ENGINEERING AND MINING JOURNAL.

Our circulation for January, 1908, was 42,000 copies.

Feb. 1.....	12,500
Feb. 8.....	9,500
Feb. 15.....	9,500
Feb. 22.....	9,500

None sent free regularly, no back numbers. Figures are live, net circulation.

**Contents**

PAGE

Editorials:	
The Debris Question Again.....	417
Lake Iron Ore Prices.....	418
*Sinking a Five-compartment Shaft on the Rand..... <i>Eustace M. Weston</i>	391
*The Economic Geology of Northern New York..... <i>Frank S. Mills</i>	396
German Mining Interests in the Orient..... <i>Robert Grunshaw</i>	398
*Methods of Mining Iron Ore at Sunrise, Wyo..... <i>B. W. Vallat</i>	399
Leading Producers of Kalgoorlie, West Australia..... <i>Gerard W. Williams</i>	403
Phosphate Mining in Tennessee..... <i>H. D. Ruhm</i>	404
*Recent Developments in Electrolytic Cells..... <i>Henry Stanley Renaud</i>	405
Mining in South Carolina During 1906..... <i>Earle Sloan</i>	406
Mining in the Juneau District, Alaska.....	406
Rescuing the Men Entombed at Alpha Shaft, Ely, Nevada..... <i>E. W. Walter</i>	407
What Goldfield Thinks of the Presidential Commission.....	408
A California Debris Decision..... <i>Special Correspondence</i>	408
Equipment for the Prevention of Mine Explosions..... <i>Wilbur S. Mayers</i>	409
Foreign Metal Trade of the United States in 1907.....	410
*Coal Mining by the Bord-and-Pillar System..... <i>George Raylton Dixon</i>	411
Mines Company of America.....	415
*Suspended-frame Frue Vanner..... <i>Grant B. Shipleigh</i>	415
Pig-iron Production in Canada.....	415
Colliery Notes.....	416
Metallics.....	419
Correspondence:	
The Copper Belt of California..... <i>John A. Reid</i>	420
The Copper Belt of California..... <i>Herbert Lang</i>	420
The Monongah Explosion..... <i>W. Clifford</i>	421
Azure Mining Camp..... <i>Wm. R. Wade</i>	421
Meeting of the American Institute of Mining Engineers.....	422
Nevada Assemblyman Attacked by Miners at Goldfield.....	422
Assay of Tin Ores.....	422
Lake Superior Iron Ore.....	422
New Publications.....	423
Personal, Obituary.....	424
Societies and Technical Schools, Industrial, Trade Catalogs, Construction News.....	425
Special Correspondence.....	426
Mining News.....	428
Markets, etc.....	434
*Illustrated.	

**The Debris Question Again**

The decision of the Supreme Court of the State of California, that a license to mine by the hydraulic process issued to a mine owner by the California Debris Commission is not final, and is no bar to subsequent suits for alleged damages from mining debris, is the worst blow to the hydraulic mining industry of that State since the famous North Bloomfield, or Sawyer, decision which virtually ended hydraulic mining on a large scale in the drainage basins of the Sacramento and San Joaquin rivers, embracing the larger portion of the hydraulic mining area of California. The letter of our special correspondent at San Francisco, in another column, gives the essence of the decision. The point involved has been a matter of discussion ever since the Caminetti act was passed in March, 1893. For many years prior to the passage of that law the hydraulic mines had been closed down by injunctions. The California Miners' Association was organized in 1891, and its efforts were immediately turned in the direction of appealing to Congress for some relief measure which should permit these mines to resume operations. Congress did finally pass such a law permitting these mines to be worked under certain restrictions and regulations, and this same law established the California Debris Commission, composed of officers of the Corps of Engineers, U. S. A., with authority to see that the provisions of the act were carried out.

The essential features of the law are that all mines operating by hydraulic process must impound their tailings or debris and prevent them from entering the navigable streams, or injuring the lands of other parties. The Commission is empowered to issue licenses to mine by hydraulic process under this act when it is satisfied that the impounding works are sufficient to restrain the debris. The hydraulic miner must first make application for a license, and submit his plans for restraining works for approval by the Commission. Each separate application is advertised for a specific time and a hearing is held at which those opposed to the issuance of a license may state their reasons. When the plans are approved, and the restraining works have been built and officially passed upon, the license to mine is issued. This may be taken away at any time by the Commission if it becomes

satisfied that debris is escaping and damage is being done. The hydraulic miners bear all the expense of their individual dams and restraining works.

In the case in question, William Nichols, owner of the Polar Star mine in Placer county, California, complied with all the provisions of the law and with the regulations of the California Debris Commission. The dam was pronounced adequate, and the license to mine was issued, in due form. The Anti-Debris Commission, however, had suits brought in another county—Sutter—on the allegation that the debris from the mine coming down would damage bridges on the Feather and Yuba rivers. Mr. Nichols' defense was that he had complied with the law and was the holder of a license to mine by hydraulic process. The lower court held that although that was the case, the dam erected and approved by the Debris Commission was not sufficient to protect the property of the county. This decision was appealed from and now the Supreme Court of the State upholds the original decision.

In effect, then, the court decides that the opinion of the Federal engineers, skilled and trained men, is not sufficient to prove efficiency of impounding works and dams, and that their opinion may be controverted by testimony of Anti-Debris agents or others opposed to hydraulic mining. It establishes in effect, also, that the issuance of a license to mine by the authorities appointed by Congress and the President of the United States for that purpose is of no protection to the miner, even after he has complied, at his own expense, with all the requirements necessary before he can obtain such a license. Moreover, it holds that the decisions of local courts are of greater weight than the decisions of the Government engineers, when it comes to a question of the efficiency of works involving engineering construction.

Under this view of the case it seems hopeless for the owners of hydraulic mining property in the region of California affected by the Caminetti act to operate their ground with any reasonable degree of security from injunction suit or annoyance. Under such circumstances such ground can hardly be sold, as it is virtually valueless unless there is some legal assurance that it can be worked. The conditions of mining under the law were severe enough in the first place, as the

amount of gravel was greatly curtailed by the necessity of impounding the debris; but under the conditions of this decision there is seemingly no protection against litigation or enforced cessation of operations at any time.

The California Miners' Association will doubtless take this matter up with its accustomed vigor and bring it to the attention of Congress with a view to obtaining some relief. Without this relief, hydraulic mining on a large scale will hereafter be confined in California to Trinity and Siskiyou counties, or others where the Caminetti law does not apply. Nevertheless, we are bound to agree that the decision of the California court is based on a sound interpretation of the law of equity. The constitutional power of Congress is exhausted in the exercise of its control of the navigability of the rivers. This emphasizes the gravity of the recent decision.

### Lake Iron Ore Prices

At the meeting of iron ore producers operating in the Lake Superior region, held in Cleveland last week, a general agreement was made to continue last year's prices for ore during the coming season. The meeting was held at an unusually late date. Nearly all the buying of ore for 1907 was done in November, 1906; this year, however, there have been no sales made yet, partly because most of the blast furnaces have carried large stocks over from last season, and partly because most of them are very much at sea as to their needs for the coming season. So much of the Lake ore is now mined by the steel companies that the adjustment of ore prices no longer has the great importance which once attached to it; but it still affects a large section of the iron trade.

The course of prices of iron ore delivered on dock at Lake Erie ports has been as follows, since 1904, when the level was the lowest reached in recent years:

SEASON.	BESSEMER.		NON-BESSEMER.	
	Old Range.	Mesabi.	Old Range.	Bessemer.
1904.....	\$3.25	\$3.00	\$2.75	\$2.10
1905.....	3.75	3.50	3.20	3.00
1906.....	4.25	4.00	3.70	3.50
1907.....	5.00	4.75	4.20	4.00
1908.....	5.00	4.75	4.20	4.00

The increase made for the season of 1907 was really greater than appears in the

table, since at the same time the base guarantee was reduced from 56.7 to 55 per cent. iron content on bessemer ores, and from 52.8 to 51.5 per cent. on non-bessemer. This was equivalent to a further increase of 15 and 10c. per ton on the two classes, respectively. The prices of 1907 are those which are to be maintained for the coming season.

The price of ore to the large companies which own their mines is, of course, practically the cost of mining and transportation. The nominal price for them is largely a matter of bookkeeping, and in the end it makes no real difference whether the margin of profit appears on the balance sheet of the iron-ore mining or the steel-making department. The decision to maintain prices is, therefore, a notice to the merchant furnaces that they must maintain prices for their pig iron—if they can sell it. At the time the rates for 1907 were fixed, however, the current quotations at Pittsburg were \$21.50 per ton for both bessemer pig and No. 2 foundry. At the present time the nominal figures are \$18 for bessemer and \$17 for foundry, with little or no business at those prices, and with buyers refusing to take iron except at concessions. The difference shown by these figures, moreover, does not express the entire reduction in iron; for in May, 1907, when prices reached the maximum, the average for bessemer pig at Pittsburg was \$24.85, and for No. 2 foundry \$25.85 per ton. The total fall, nominally, has therefore been nearly \$7 on bessemer and \$9 on foundry iron, with possibly a greater actual reduction. At the boom prices there was a large profit; but at present it would seem rather difficult for those furnaces which buy ore and sell pig to make ends meet.

Taking Mesabi ores as a standard, the cost of mining averaged last season about \$1; railroad freight to Lake port, \$0.80; Lake freight to Lake Erie port \$0.75; dock charges, etc., \$0.15; total \$2.70, leaving \$2.05 for the value of ore in the mine, from which is to be deducted whatever royalty is to be paid to the fee-owner. The latter varies, but will probably average from 40 to 45c. Taking the higher figure, the sum left to the operating company would be \$1.60 per ton, which does not seem an extravagant price. On the part of the merchant ore producers, therefore, the present price does not seem exorbitant; but this does not relieve the merchant furnaces from a bad situation. The trade,

however, is so dominated by the large companies that no protest is likely to benefit the ore-buyers, and probably none will be made.

THE DISPUTE BETWEEN the Virginia Polytechnic Institute and the University of Virginia respecting the location of the proposed Virginia Geological Survey has been happily settled by a compromise. The university is to have the geological survey, while the institute is to have a school of mines. Moreover, the president of the institute is to be a member of the governing board of the geological survey. Inasmuch as the friends of the Virginia Polytechnic Institute are satisfied with this compromise, the University of Virginia is to be congratulated upon securing the geological survey, especially considering that Professor Watson will now be able to continue the valuable work which he inaugurated while occupying the chair of geology at the other institution. It would indeed have been much to be regretted if anything had prevented him from continuing the work for which he is so well fitted.

CHARLES G. YALE, of San Francisco, has retired from his position as statistician of the California State Mining Bureau, under circumstances which have excited much protest from leading mining men of the Pacific coast. In view of Mr. Yale's connection with the editorial staff of the JOURNAL, it would be unbecoming for us to discuss the matter, but we may be permitted to quote from the *Mining and Scientific Press*, which says, "The Governor of the State and the trustees of the Bureau alike protested against the summary dismissal of a man so long honorably identified with the Bureau . . . In fact, for the time of a whole generation he has been foremost in all that concerns the systematic recording of mineral production and mining advancement."

THE CENTENNIAL ANNIVERSARY of anthracite as a fuel was celebrated on Feb. 11 at Wilkesbarre. In 1808, Judge Jesse Fell demonstrated the combustibility of hard coal in an old fireplace, which is still preserved as a relic of an important event. There were addresses by prominent men, a dinner and exercises appropriate to the occasion.

## Metallics

The use of basket instead of pebbles for crushing in tube mills is increasing in popularity on the Rand.

Gravel carrying 5 lb. of tin stone, assaying 70 per cent. tin, or 3.5 lb. of metal per ton is profitably mined at the Amber mine, Tasmania, by simple washing.

At the Waihi mine 18 tube mills will be in operation by March 1. As the mesh of screens used in the battery is coarse, most of the fine crushing falls upon the tube mills.

Of the 9090 stamps erected on the Rand previous to June, 1907, five weighed 1600 lb.; stamps weighing 1250 lb. still remain the most numerous as 3645 stamps were of this weight.

Formerly smelters paid nothing for the antimony contained in lead ores. Now some European smelters pay approximately the market price for almost all the antimony in the ore as well as for the lead.

In the Witwatersrand the average gold content per ton of ore milled, during the year ending June 30, 1907, from the out-crop mines was 8.2 dwt.; from deep-level mines, 7.974 dwt.; average, 8.122 dwt.

Strong detonators should be used for detonating dynamite; for the more powerful the exploding blow the greater is the effect of the explosion. Caps of less than XXXX strength should never be used with 40 per cent. dynamite.

Mine fires are not as common at metal mines as at coal mines. Nevertheless, fires occur sufficiently often to warrant the keeping, at large metal mines, of breathing apparatus for fire fighting. When these are required, they are wanted badly. The having of these at hand may save lives and also property.

Calcium chloride is a valuable by-product in the production of salt in several parts of the United States. In the Ohio Valley the production is about 15,000 tons per annum. At present the substance fetches \$9 per ton f.o.b. cars. The increased employment of artificial refrigeration has greatly improved the demand for this substance.

The Highland Boy mine, which is noted throughout the West for low costs and the general efficiency of the mining, is conspicuous on account of the use of tripods in the square-set stopes, instead of machine bars, for mounting the drills. In other camps of the West, tripods are seldom employed, unless necessitated by the height of back in the working.

The MacDougall furnaces at the Garfield smelter near Salt Lake City, Utah, are 18 ft. in diameter and 18 ft. 6 in. in height, with about 1200 sq. ft. of hearth area per furnace. The average wear on the plows is said to be only  $\frac{1}{4}$  to  $\frac{1}{2}$  lb. of cast iron per ton of material treated. The power required for operating a single furnace ranges from  $2\frac{1}{2}$  to 4 horse-power.

The Oxland process for removing tungsten from tin, was formerly much used. This consists in roasting the tungsten-bearing ore with soda salts. Sodium tungstate is formed which is removed by leaching with water. Sodium carbonate or salt cake can be used for this purpose. Now most of the tungsten is removed from tin ore by magnetic separation of the roasted ore.

The placing of holes too close together will cause the cutting off of holes i.e., the tearing away bodily of part of the hole without exploding the rest of the charge. The stump of such a hole is a great source of danger as it is easily overlooked and therefore may be drilled into. The cutting out of holes is often due to slips in the rock which allow one blast to break more ground than is planned.

One of the chief dangers in mining where machine drilling is used is the liability of drilling into a missed hole. Missed holes arise from several causes. Defective fuse, torn-out fuse, and cut-off holes are the main causes of the failure of a blast to explode. The cost of fuse is a comparatively small part of the expense of blasting, therefore, the more reliable, even if more expensive, fuse is the cheapest in the long run.

The entire absence of any system of doing things is a cause of high operating costs at some mines. For instance in the blacksmith shop everything is thrown into piles or tossed helter skelter into a supply closet. Systematic arrangement of all supplies, whether in the office, the store room, the blacksmith shop or the mine, helps to inspire neatness and order in the employees. The pick handles, hammer handles, the drill steel should each have its own rack. Each weight of hammer head, where much single-hand drilling is done, should be kept separate. In short as much care should be used in arranging the blacksmith's supply closet as in providing for methodical filing of the maps, etc., in the office.

At all large mines machine drill-sharpeners should be installed for they save money for the company in more ways than one. Not only is the expense of sharpening the steel decreased but, as they are gaged, the drills follow and so time is not wasted in hunting for a drill to follow, as is often the case where hand sharpening is used. When machine sharpeners are used the men are furnished more steel and as they do not have to drill with dull steel, the footage drilled is increased. Owing to the fact that steel is improved by hammering, the machine should not form the bit too rapidly. When machine sharpeners are used it is possible by using them to upset the steel so as to form star bits without welding steel of star section upon octagonal steel.

The greatest number of accidents about mines caused by explosives result from drilling into a charged hole which has not exploded. On account of the fact that in a stope a miner can more readily judge from the ground broken the probable location of the holes drilled, the number of such accidents occurring in stopes is small. Such accidents happen chiefly in development work. As a remedy it is suggested that the position of the holes drilled in a shaft, a raise, or a drift be recorded by means of a rough plan of the face of the working, representing the holes by means of arrows, the direction of which will show the direction of the hole and the length of the arrow the relative length of the hole. This would save many lives if it were made compulsory. The Hercules mine on the Rand, South Africa, is one where such diagraming of the holes is practiced.

Where water is scarce and coal expensive, suction gas engines can well be used in case that oil engines are not more economical. Gas from wood or from coal can be used to run them. They are especially adapted to use in regions to which the transportation of boilers and heavy steam engines is difficult and expensive. According to the report of the Government mining engineer for the Transvaal for the year ending June 30, 1907, at the Alundi gold mine, near Barberton, a suction gas engine, developing 32 brake-horse-power and costing, when erected, £785, is driving a 10-stamp mill, the stamps of which weigh 750 lb., and auxiliary machinery. The cost of this power is, when gas is developed from anthracite coal, 22s. 9d., or \$5.46 per 24 hours, and when charcoal is used, 24s., or \$5.76 per 24 hours. The best efficiency is obtained when gas is generated from a mixture of both coal and charcoal.

Ore sorting is one of the most neglected phases of mining. Apparently there are but two classes of mines which recognize the importance of sorting the ore. The high-grade mine far from the railroad, on account of high freight rates, is forced to sort out only the high-grade ore for shipment. Consequently some sorting is done at such mines. At mines where the margin of profit is gradually falling with increasing depth, sorting is finally resorted to almost as an inevitable "evil" only to find that it has always been a blessing unappreciated. Formerly little sorting was done at Cripple Creek, Colo., but now considerable sorting is done. On the Rand sorting was resorted to rather early in the life of the district, owing to cheapness of native labor. The percentage of rock sorted out at surface increases with time, and in many, if not indeed in most cases, an increased profit results. On the Rand during the years ending June 30, 1906 and 1907, respectively, 16.61 per cent. and 17.01 per cent. of the rock hoisted was sorted out at surface.

# Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

## CORRESPONDENCE AND DISCUSSION

### The Copper Belt of California

In the series of articles by Herbert Lang on "The Copper Belt of California," which appeared recently in the *JOURNAL*, there are a few small errors which I wish to correct, in order that our record of this region may be more complete, and that the surrounding conditions may be more fully understood. I shall note these discrepancies in the order in which they occur.

(1) The United States Geological Survey, so highly complimented by Mr. Lang for its work on the copper belt, has merely touched the subject in its folios covering the northern half of the copper-bearing zone, and has not even completed the topographic surveys of the southern, and more important, portion. This fact is of great interest to us here in California, for the work of the survey is badly needed, and before it will be done a strong sentiment demanding it must be generated. Our real needs must therefore be made fully known.

(2) The "copper formation" of Mr. Lang does not appear to be complete. This may be an academic question, as Mr. Lang probably assumes. It may be bookish and "impractical" to distinguish between granite and granodiorite, but a healthy dislike of being considered academic seems hardly to warrant the assumption that amphibolite schist and andalusite schist are different species of the same rock. The latter is a metamorphosed sediment belonging to the Mariposa slate formation, and, forming the country rock of the mines in Mariposa county, east of Le Grande,\* it surely should be placed with the "copper formation." Also, neither the important hornblende at Copperopolis nor the similar rocks in Mariposa county have received mention. A true knowledge of the various rocks associated with the copper deposits is vital to a proper investigation and development of the ore-bearing ground. The granite rocks where I have examined them carefully, at Copperopolis and the Pocahontas mine, are distinctly later than the ore. From the conditions of ore deposition throughout the belt, it is nearly certain that most of the ore at least is of earlier age than the granite or granodiorite.

(3) The attempted correlation between the "markers" or "crestones" and the ore deposits is unfortunate. These well known "graveyard slates" can be found

for miles as one crosses the meta-andesite formation, and have no fixed relation to any ore deposition.

(4) While it may be correct to state that the general type of copper deposit in the belt consists of lenses of ore, it seems a matter yet open to discussion. There are true lenses of ore, as at Copperopolis; there are copper veins east of Lone; there are replacement deposits at the Pocahontas and Great Northern mines. The Pocahontas ore is not, as Mr. Lang states, a contact deposit between granite and schist, but is the metasomatic replacement of a basic dike, probably a diabase, which was introduced into the Mariposa slates parallel to the cleavage. The south end of the dike and ore is cut off by the later intrusion of granitic magma. The ore-shoot, as far as can be ascertained, pitches northerly, not southerly. The Great Northern ore is likewise due to the metasomatic replacement of a basic dike whose precise nature is still in doubt, with some ore deposited in the parting planes of the slates.

#### DO THE MINES GO DOWN?

(5) It would seem unnecessary to call the attention of engineers to the fact that the two questions, "Do the mines go down?" and, "Do the known lenses of ore hold out as depth is gained?" have no necessarily fixed logical relation. If a lens be a true lens it must give out in depth as well as in the horizontal directions. If a so-called lens have unlimited or undetermined depth it is not a lens but an ore-shoot. We all need more definitely to bound some of our conceptions. But all of the Belt mines are not lens-shaped deposits. The Pocahontas, as a type of orebody not a lens, shows better in the bottom today than at any previous time. Furthermore, the ore at Copperopolis is of better grade at the lowest point in the mine than at any other place. What appears to be the apex of a new lens of rich ore has been cut by a winze below the lowest stopes. The Campo Seco ore is noteworthy for its steady value as work progresses; the Napoleon and other mines all show variations in the quality of the ore, but at no place have results been obtained sufficient to justify the assumption that any one mine, to say nothing of the Belt as a whole, fails to "go down." In fact, the showing is exactly the reverse, that the ore holds its value as depth is gained.

This, of course, has nothing to do with individual lenses. Regarding this point of continuance of ore with depth, it is

worth while to contrast two statements made by Mr. Lang. In his conclusion he says: "I have shown that the almost universal rule that copper mines get poorer in depth holds good in the Belt." And a little later he writes "—and I speak more from hearsay than actual knowledge (of ore and depth) of most of these cases." What is illustrated by the perversion and contortion of facts and principles found in the substitution of one question about ore with depth for another of entirely different import may best be left to the reader's charity.

To those of us who are deeply and impersonally interested in the proper development of this truly wonderful belt of deposition of copper ore, it seems more than merely lamentable that such a paper as that of Mr. Lang, undoubtedly conceived in the right spirit, should prove to be such a perfect red-flag of danger to those investors who might consider the development of properties within the copper belt. Other articles putting the full facts forward may now be written by the score, yet always will it be said by the ever wary capitalist, "Here is an article by a reputable engineer which states that the mines of the Copper Belt do not go down." It is unnecessary to say more.

JOHN A. REID.

Stockton, Cal., Dec. 20, 1907.

I presume that the severity with which G. McM. Ross (*JOURNAL*, Jan. 25) criticizes my article (*JOURNAL*, Nov. 16, 23 and 30) arose solely from my remissness in not properly crediting him with the results of his difficult and honorable labors on the belt. I hasten to apologize to Mr. Ross and to assure him that the neglect was entirely unintentional. If I needed an excuse I have an excellent one in the fact that, so far as I am aware, Mr. Ross has never taken the trouble to publish these results, important as they undoubtedly are in various ways, and that therefore no one should be fairly expected to know much about them. His solicitude that the truth be told about his career is perfectly natural and justifiable, but may I suggest that he himself is the proper person to tell it; and, furthermore, that a man of such experience and observational powers rests under an obligation to communicate at least the more important of his findings to the public.

I do not agree with Mr. Ross that the fact that the Copperopolis copper ores contain no gold or silver or nearly none, is a fact of no practical import. It points

\*See Fourteenth Annual Report, United States Geological Survey, p. 455.

toward the production on the spot of salable ingot metal, instead of matte or bars to be shipped away for refining. When the matte product of the first smelting can be carried forward with no great expense to the condition of casting copper, saving the large costs of shipping to distant refiners, it seems to me that the process would be well worth looking into. Ingots quite pure enough for ordinary uses were made in crucibles at Campo Seco from less pure ores, many years ago, and found sale as casting copper on this coast, where the price of such material runs from two to three cents higher than in New York.

I endeavored to indicate that all of the Copper Belt ores contained at least a little gold and silver, although it had long been taught that those of Copperopolis were quite free from them. Thus Mr. Ross himself, in a letter to the *JOURNAL*, published in April, 1895, stated plainly that the Copperopolis ore contained no gold or silver. He now states that they contain a few cents per ton. Except in its bearing on the previous question gold and silver might as well be wholly absent, of course.

If Mr. Ross had read my article with more care he would not have fallen into the mistake of supposing that I prognosticate the giving out of the Belt mines with moderate depth. I endeavored to say that in my opinion the ore lenses (not the mines) will prove but moderately enduring. It is scarcely to be thought that a lens will prove to have a very much greater downward than lengthwise extension. Many of these bodies are but a hundred feet or so in horizontal extent and, so far as I can see, there is no warrant for believing that they go down indefinitely. There is, to my notion, a far greater chance that other bodies, disconnected from these, but quite within the same mineral-bearing zone, will be discovered, than that the present ones will prove persistent. Considering how many ore lenses are exposed on the surface it would be singular if there were no blind lenses farther down, to be in time discovered by cross-cutting or by core-drilling. That the Copperopolis mines show well at 700 ft. I believe on Mr. Ross's word, and rejoice at; but that comparatively short ore lenses should persist to this depth is surprising. I learn that one of the three lenses in that property is 100 ft. in horizontal extent. Are we to understand that it goes down to seven times that distance? If so, it partakes more of the nature of a pipe than of a lens, and although it does not conflict materially with theory, it varies from the ordinary form of orebody in the Belt, so far as I have been able to observe.

HERBERT LANG.

Oakland, Cal., Feb. 6, 1908.

### The Monongah Explosion

I notice in your issue of Feb. 1, a letter signed by an old acquaintance, Sydney Walker, of Bath, England, in reference to the Monogah explosion, in which Mr. Walker brings to bear his great electrical experience on the theory of firing the dust by the wrecked trip breaking the wires and causing short circuiting at the foot of No. 6 mine incline.

As one of those who made an examination of portions of No. 8 and No. 6 mines, I would like to say that the explosion did not originate in No. 6, but at a well defined spot in No. 8. The course of the blast could be traced throughout its path in No. 8 and toward No. 6 without ever being lost.

The evidences were of an out-bye explosion with its seat at the end of the third North, in No. 8 mine. It spread itself right and left over the main road into the face entries, their branches and rooms, gathering strength from the dust it licked up as it traveled. The North branch splitting at No. 2 North, a portion of it spread through the left and right entries out of that road, and ultimately reached No. 6. In this latter property, the evidences are that the blast traveled out-bye, or from the interior toward the outside.

Going back to No. 8, we have the converging forces of the previously divided blast, spending their strength on the overcast with evidences of vigor probably never before witnessed in a colliery explosion in this country.

It is a well understood principle that a blast will by preference, follow a straight line, or in the direction from which it receives its vitalizing air, and while so traveling the evidences of abnormal force are less pronounced than if the blast followed a crooked road; if two blasts meet in a confined space, we have the same manifestation of power as is exhibited in the destruction of these overcasts in No. 8 mine.

The destruction in No. 6 is much less marked than in No. 8, and in traveling along the main road from the foot of the slope toward the rear end of the workings, the massive stoppings separating the intake from the return were observed to be blown, sometimes toward the return and sometimes toward the intake.

In No. 6, the out-bye course of the blast could be traced with the same definite general direction, and even with greater regularity than characterized the ramifications in No. 8. It traveled toward the mouth of the mine along both intakes and returns, and in seeking equilibrium blew out the stoppings in the direction of the smallest force. The wide cavernous flats on the hauling road, on the one side, and the open spaces at the end of the cross-cuts in the return, furnishing fresh dust at those local points to swell the

blast on the respective sides, until forcing of the stoppings had restored equality in the two parallel forces moving along the hauling and return air roads toward the mouth of the mine.

Mr. Walker will remember that in the disastrous explosion at Risca, South Wales, in 1880 a heavy thunderstorm was in progress at the time of the explosion, and a vivid flash of lightning is said to have occurred just as the mine exploded. It was claimed by some people, and persistently asserted that this flash of lightning had traveled down the iron wire rope guides of the upcast shaft, and along the rails of the return airway to some place where there was standing gas. This theory was entirely disproved.

I have not been fortunate enough to get a copy of the report of the evidence produced at the Monogah inquest, but understand that the runaway-trip theory was disproved by competent witnesses.

W. CLIFFORD.

Jeannette, Penn., Feb. 8, 1908.

### Azure Mining Camp

In the *JOURNAL* of Jan. 25, Reinold V. Smith, in an article on "Mining in New Mexico During 1907," states under the heading, "Turquoise," that the Azure Mining Company's mines had been reopened, that machinery was installed preparatory to working in 1908, and that the district had been idle for several years past.

As a matter of fact, the Azure company produced only a small quantity of turquoise in 1907 because it gave its attention chiefly to developing copper. In 1906 the mine ran full blast for six months, and for 18 years before that never closed a day, being the world's biggest turquoise producer. The impression given in the article is that the whole Burro mountain district has been idle several years. I will venture to say that \$1,500,000 was spent here last year by the various copper companies and probably this estimate is far too low.

The Azure company installed a Cyclone drill in 1907, which is used in prospecting for copper. I know of no other machinery installed during that year. The turquoise mine is worked by open cut and two adits, no hoisting being necessary. The ground is easily drilled and since heavy shots would shatter the gems, hand steel is used. For this reason no machinery is used in working the turquoise deposit.

WM. R. WADE.

Azure Mining Camp, N. M., Feb. 3, '08.

According to the late Henri Moissan, the combination of titanium with nitrogen causes an evolution of heat and this, he stated, is the only indisputable example of the combustion of an element in nitrogen.

## Meeting of the American Institute of Mining Engineers

The winter meeting of the American Institute of Mining Engineers was opened Thursday evening, February 18, in the main auditorium of the United Engineering building. In the absence of President John Hays Hammond, who has lately undergone an operation for appendicitis in San Francisco, Professor Henry M. Howe, senior vice-president, presided. The vice-president proposed, and was authorized by the meeting, to send a telegram to Mr. Hammond congratulating him upon the successful outcome of the operation.

Dr. Raymond without further formality, read an abstract of his paper on "Humboldt and Swedenborg, Mining Engineers." Dr. Raymond said that in many if not all departments of Humboldt's cyclopedic knowledge and world-wide exploration and study the effect of his training as a geologist and mining engineer may be traced.

"Emanuel Swedenborg was one of the foremost if not the very foremost of all mining engineers and metallurgists who have ever lived," said Dr. Raymond. "In his versatility, his eager questioning of all natural phenomena, his combination of practical knowledge and skill with theoretical speculations and his perennial flow of spontaneous suggestions for the benefit of his own fellow-men he resembled our own Benjamin Franklin."

Concerning Swedenborg's mechanical inventions Dr. Raymond said that a letter written by him in 1714 showed that he had on hand the following inventions:

For a submarine ship, "which can do great damage to the ships of the enemy," a portable siphon for raising great quantities of water, a machine "driven by fire, which will put water in motion" (a steam engine?), new pumps of various designs, new air-guns, a new musical instrument, "by means of which one who is quite unacquainted with music may execute all kinds of airs that are marked on paper by notes," a water clock and a flying carriage, showing "the possibility of remaining suspended in the air and of being conveyed through it."

Dr. Raymond spoke of the statements by Swedenborg of great doctrines of modern science, such as the atomic theory, the solar origin of the earth and the planets, the undulatory theory of light, the nebular hypothesis, the recognition of heat as a mode of motion, and the connection between magnetism and electricity. Swedenborg's ability as an engineer has not been recognized for various reasons. His books and treatises were printed in Latin, and were, therefore, of little use to the majority of practical engineers. His discoveries were made at a time when the thoughts of men were engrossed in war. The chief reason for the neglect of Swedenborg by engineers was, however,

the fact that in middle life he turned to theology and believed himself in continued communication with the inhabitants of the spirit world. He was thought to be "cracked" on one subject, and was, therefore, naturally but erroneously supposed to be also "cracked" on every other subject.

At the conclusion of the paper Dr. Raymond showed portraits of Swedenborg, Humboldt, Martin Luther and Theodore Koerner. Dr. Raymond spoke of Luther and Koerner, both of whom had some connection with the mining industry at periods of their life, although not professional mining engineers.

After Dr. Raymond's paper David Rushmore, of Schenectady, N. Y., read a paper on "Electric Power in Steel Mills," which was profusely illustrated with stereopticon views. This was an extremely interesting paper, covering the general phases of power generation, and the application of electric energy not only to the smaller units, but also in larger operations, such as rolling, and in driving the heavier machines.

## Nevada Assemblyman Attacked by Miners at Goldfield

According to press despatches, Thomas Tighe, an assemblyman of Esmeralda county, was on Feb. 18 set upon by three members of the Western Federation of Miners at Goldfield, and in the struggle that followed was badly cut about the face. He fought off his assailants with a revolver, which he used as a club, the miners getting the worst of the encounter.

Assemblyman Tighe supported the State police bill in the special session of the legislature.

## Assay of Tin Ores

By GEORG HOHAGEN\*

Tin ores, as they generally come to a laboratory to be assayed, may be divided in two classes: (1) Ores from mines, and (2) stream ores. Ores of the first class never contain metallic tin, but those of the second class sometimes carry free metal. In the first class I include also the concentrates known here as *barrilla*, that generally contain from 50 to 70 per cent. tin.

The assay of ores of the first class is made as follows: Treat two grams (if *barrilla*, five grams) of the mineral with hydrochloric and nitric acids. When the acid appears to have no further action and the ore is decomposed, decant the liquid through a filter and test it for antimony, bismuth or lead, substances that are commonly found with tin ores. If antimony is present, add tartaric acid to

the insoluble residue and treat it again with hydrochloric acid. Filter and wash with hot water. The residue will now be free from antimony, bismuth or lead, but it may still contain tungsten. Digest the residue with dilute ammonia and filter; dry and calcine. Mix the residue with cyanide of potassium; cover the charge with a cover of salt and place in a crucible. The fusion is performed in a wind or a muffle furnace, and with a hot fire is complete in about 45 minutes. The crucibles are removed from the furnace, allowed to cool, and are broken; the button is then ready to weigh. The slag should be clear and well fused. When dealing with concentrates, two assays are made. The difference should not be more than 1/2 per cent.

If the ore to be assayed contains metallic tin, treatment with hydrochloric acid gives inaccurate results, since hydrochloric acid dissolves tin. In this case it is better to boil the ore with nitric acid first, and then to proceed as usual.

## Lake Superior Iron Ore

The shipments of iron from the Lake Superior region for the year, as collected by the *Cleveland Iron Trade Review*, are now finally revised and corrected. The total was as follows, in long tons:

Range:	1906.	1907.	Changes.
Marquette.....	4,057,187	4,388,073	I. 330,886
Menominee.....	5,109,088	4,964,728	D. 144,360
Gogebic.....	3,643,514	3,637,907	D. 5,607
Vermillion.....	1,792,355	1,685,267	D. 107,088
Mesabi.....	23,792,553	27,492,949	I. 3,700,396
Baraboo.....	128,742	76,146	D. 52,596
Total U. S.....	38,523,439	42,245,070	I. 3,721,631
Michipicoten.....	121,555	142,892	I. 21,277
Total.....	38,644,994	42,387,962	I. 3,742,968

The Michipicoten range is in Canada, and its ores are used mainly in the blast furnaces at the Sault Ste. Marie. The shipments were divided as follows:

	1906.	1907.	Changes.
By lake.....	37,513,589	41,288,755	I. 3,775,166
By rail.....	1,009,850	956,315	D. 53,535
Total.....	38,523,439	42,245,070	I. 3,721,631

Careful records of shipment of Lake Superior ores have been kept from the time of the first shipments, and it is possible to give the total quantity sent out by each range up to the close of 1907. The figures are as follows:

	Year Opened.	Total Ore.	Per Ct.
Marquette.....	1850	85,245,874	22.4
Menominee.....	1777	63,641,213	16.7
Gogebic.....	1884	54,107,342	14.2
Vermillion.....	1884	26,785,426	7.1
Mesabi.....	1892	150,235,558	39.5
Baraboo.....	1903	401,672	0.1
Total.....		380,417,085	100.0

In all there were 179 mines in the Lake region which made shipments in 1907; of these 89 were on the Mesabi range.

Borax soap is said to be excellent for cleaning battery plates. It is sufficiently alkaline to clean off any stray animal fats, it will emulsify mineral oils and will leave the plates bright and clean.

\*Director of the Casa Nacional de Moneda, and director of the School of Mines, Potosi, Bolivia.



## New Publications

THE "SOUTH AFRICA" MAP OF SOUTH AFRICA, 1908. 25½x37 in.; 1s.; mounted on cloth, 2s. 6d. London, 1907: *South Africa*.

THE STATE OF WYOMING. A Book of Reliable Information Published by Authority of the Ninth Legislature. Pp. 141; illustrated. 6x9 in.; paper. Cheyenne, Wyo., 1907: S. A. Bristol Company.

COMMISSION D'ENQUETE SUR LA DUREE DU TRAVAIL DANS LES MINES DE HOUILLE, SECTION DE MONS. Pp. 254; illustrated. 8½x11 in.; paper. Brussels, Belgium, 1907: Goemaere, Imprimeur du Roi.

INVESTIGATION OF CENTRIFUGAL PUMPS, PART I. A Discussion of the Theory of the Centrifugal Pump and Tests of a Six Inch Vertical Centrifugal Pump. By Clinton B. Stewart. Pp. 139; illustrated. 6¼x9¼ in.; paper, 50 cents. Madison, Wisconsin, 1907: University of Wisconsin.

TWENTY-EIGHTH ANNUAL REPORT OF THE DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY TO THE SECRETARY OF THE INTERIOR FOR THE FISCAL YEAR ENDED JUNE 30, 1907. George Otis Smith, Director. Pp. 79. 6x9 in.; paper. Washington, 1907: Government Printing Office.

A STUDY OF FOUR HUNDRED STEAMING TESTS MADE AT THE FUEL-TESTING PLANT, ST. LOUIS, MO., IN 1904, 1905 AND 1906. By Lester P. Breckenridge. U. S. Geological Survey, Bulletin No. 325. Pp. 196; illustrated. 6x9 in.; paper. Washington, 1907: Government Printing Office.

SOLAR EPHEMERIS FOR 1908. Pp. 44; illustrated. 3x6 in.; paper. Hoboken, N. J., 1908: Keuffel & Esser Company.

This little booklet is published annually and contains information of much value to engineers and surveyors. The publishers will be glad to furnish copies on request.

UNIONE ITALIANA FRA CONSUMATORI E FABBRICANTI DI CONCIMI E PRODOTTI CHIMICI, MILANO. Pp. 219; illustrated. 8x11½ in.; board covers. Milan, Italy, 1907.

This is a well illustrated description of the property and operations of an important Italian chemical company.

DIE ELEKTROCHEMISCHE UND ELEKTRO-METALLURGISCHE INDUSTRIE GROSSBRITANNIENS. By John B. C. Kershaw. Pp. 180; illustrated. 6½x9½ in.; paper, 9 marks. Halle a. S., 1907: Wilhelm Knapp.

This is a translation, by Dr. Max Huth, of Mr. Kershaw's book on the electrochemical and electrometallurgical industry of Great Britain. Nothing has been added, apparently, to the English edition, but the

material therein contained has been put at the service of German readers, who will, doubtless, appreciate it.

EXPLOITATION DU PETROLE. By L. C. Tas-sart. Pp. 726; illustrated. 7½x11 in.; paper, 35 fr. Paris, 1908. H. Dunod et E. Pinat.

Contents: Historique—Extraction—Procédés de Sondage—Géographie et Géologie—Richerches des Gîtes—Exploitation des Gisements—Chimie—Théories de la Formation du Pétrole.

RECENT CYANIDE PRACTICE. Edited by T. A. Rickard. Pp. 334; illustrated. 6x9 in.; cloth, \$2. San Francisco, 1907: *Mining and Scientific Press*.

This is a collection of articles published in the *Mining and Scientific Press* between January 1906, and October, 1907. It includes many valuable papers, which it is useful to have in this easily available form.

BRITISH MINERALS AND WHERE TO FIND THEM. By J. Stephen Neil. Pp. 222. 5x7½ in.; cloth, 2 shillings. London, 1907: Thomas Murby & Company.

Contents. An index of the principal mineral localities of the British Isles, with a list of the mineral species which have been found thereat. A list of British mineral species, with an outline of their physical features, and notes on the rocks or geological situation in which they actually occur. List of references.

REINFORCED CONCRETE IN FACTORY CONSTRUCTION. By Sanford E. Thompson. Pp. 249; illustrated. 6½x9 in.; paper, 50 cents. New York, 1907: Atlas Portland Cement Company.

The rapidly growing use of reinforced concrete in factory and mill construction creates a demand for literature on the subject. The treatise prepared by Mr. Thompson and published by the Atlas Portland Cement Company, is eminently practical, and will be found particularly useful by engineers who desire to study this new form of construction.

PRODUCER GAS. By J. Emerson Dowson and A. T. Larter. Second edition. Pp. 304; illustrated. 6x8½ in.; cloth, \$3. London and New York, 1907: Longmans, Green & Company.

Contents: Theory of producer gas. Furnace work. Various heating work. Engine work. Suction plants. Gas from bituminous coal for engine work. Stand-by losses. Comparison of gas and steam power. Fuel. Analysis of fuel and of producer gas. Calorific power of solid and gaseous fuels. Practical notes.

This is the second edition of an important and valuable work that has been previously reviewed in the *JOURNAL*.

PROCEEDINGS OF THE SYDNEY UNIVERSITY ENGINEERING SOCIETY, VOLUME XI, 1906. Edited by F. Danvers Power and W. E. Cook. Pp. 160; illustrated. 6x9½ in.; paper. Sydney, N. S. W., 1906: Published by the Society.

Contents. Presidential address, by J.

W. Roberts. Filter-pressing, by C. Nardin. Mine management, by F. Danvers Power. The flow of water through sharp-edged orifices, by T. P. Strickland. Chronographic methods of taking transmission dynamometer measurement, by P. L. Weston. The law of contracts, by D. S. Edwards. The drought antidote for the Northwest, or the utilization of the artesian resources of New South Wales, by Percy Allan.

THE GAS ENGINE IN PRINCIPLE AND PRACTICE. A. H. Goldingham. Pp. 195; illustrated. 6x9 in.; cloth, \$1.50. St. Joseph, Mich., 1907: Gas Power Publishing Company.

Contents. Introductory—historical—theoretical—losses—ratings. Various types of engines—comparison of the two- and four-cycle types. Valves and valve motions. Governors—igniters—self-starter and other details. Testing—use of the indicator and brake—representative indicator cards—defects shown by indicator. The use of crude oils, fuel oils, distillate and illuminating oils, vaporizers, etc. Notes on gas producers and gases. Installation—utilization of waste heat. Operation and correction.

FIRE ASSAYING. By Evans W. Buskett. Pp. 105, illustrated. 5x7½ in.; cloth, \$1.25. New York 1907: D. Van Nostrand Company.

Contents. Sampling. Reagents and Fluxes. Assay of Acid Ores. Assay of Base Ores. Lead Assay. Bullion Assay. Methods of Handling Work. Laboratory Tests.

This little book is based on articles that appeared originally in *Mines and Minerals*. The author has had an extensive experience as assayer and chemist at metallurgical works. The object of his present work is to give students the fundamental principles of fire assaying, together with a few practical processes of ore testing. He recommends it to those who have not had the advantage of a technical education, and to such readers it will probably be of value.

A PRELIMINARY REPORT ON THE OCHER DEPOSITS OF GEORGIA. By Thos. L. Watson. Geological Survey of Georgia, Bulletin No. 13. Pp. 81; illustrated. 6¼x9¼ in.; cloth. Atlanta, Ga., 1906; Geological Survey of Georgia.

This report is based on field work extending over three years, and gives an excellent description of the ocher deposits, which are of considerable importance. They are found chiefly in the Cartersville district, to which most of the report is devoted. It describes, in successive chapters, the geology of the district; the geographic distribution of the deposits; individual properties which are worked; the probable origin of the deposits; the development of the ocher industry and the methods of preparing the material for market.

## Personal

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

George H. Garrey is examining mines at Tavihe, Oaxaca, Mexico.

L. H. Mattair, formerly of New York, is now at Haileybury, Ont., in the Cobalt region.

M. J. Seller, of Goldfield, Nev., is visiting several mining sections of Mexico.

Louis S. Noble, of Denver, Colo., is in the western part of Chihuahua, Mexico, on professional business.

G. M. Ashmore, manager of the Smugler property at Rollinsville, Colo., has gone to Arkansas and Georgia on business.

William Rogers, manager of the Santiago mine and mill at Georgetown, Colo., has returned from a business visit to the East.

F. H. Sistermans, of Mexico City, has gone to Denver, Colo., on professional business and will be absent some four weeks.

W. C. Alexander, member of the executive committee of the Utah Mine-Owners' association, is in New York on mining business.

John Daniell, president of the Wolverine & Arizona Mining Company, is examining property in the lead and zinc districts of Missouri.

C. A. Schroder, manager of the Faraday Mining Company, has returned to Colorado from a business visit to Chicago and other Eastern points.

Managing Director Thomas Hoatson, of the Keweenaw Copper Company in Michigan, is in New York attending the annual meeting of the company.

William Mackenzie, president of the Canadian Northern Railway, left Toronto on Feb. 14 for Monterey, Mexico, where he has extensive interests.

D. B. Gillies and M. L. MacDonald, of Tonopah, Nev., have gone to New York after a month spent at Chihuahua, Mexico, on professional business.

Professor E. E. Brydon-Jack delivered the inaugural address at the opening of the engineering department of Manitoba University, Winnipeg, on Feb. 10.

Frederick Smith, superintendent of the Mohawk and Wolverine mines in the Lake Superior copper district, has gone to Florida for the rest of the winter.

W. Rowland Cox has been appointed consulting engineer of the Inde Gold Mining Company at Inde, Durango, Mexico; and is, at present, at the mines of the company.

Bailey Willis, of the United States Geological Survey, has been lecturing at various places in Indiana on the waste of

natural resources, especially fuel resources.

Oren W. Jackson, a graduate of the Colorado School of Mines, has left Golden, Colo., for Phoenix, Ariz., where he will assume the management of a mining property.

C. A. Pringle, general manager of the Calera Mining Company, San Isidro, Chihuahua, Mexico, has returned to the mines after an extended stay at his home in California.

Vice-president and General Manager McKeever, of the Copper Range Consolidated, has returned to Boston after a brief visit to the properties on the Lake Superior district.

Geo. F. Milliken, of New York, is making a thorough examination of the Santa Domingo mines, in the Hostotipaquilla district of Jalisco, Mexico, for New York and London capitalists.

J. M. Boutwell, of the United States Geological Survey, was in Park City, Utah, recently to obtain late data for his forthcoming report on the Park City district, which will be issued in a few months.

John Fritz, of Bethlehem, Penn., the well known metallurgical engineer and veteran ironmaster, has been elected a member of the board of trustees of Lehigh University and has accepted the position.

Dr. Henry T. Bovey, dean of the faculty of Applied Science of McGill University, Montreal, has been appointed rector of the recently organized Imperial College of Science and Technology, London, England.

A. G. Gullberg, for a number of years chief engineer for Frank Klepetko, has left New York to take the position of superintendent of construction and machinery for the Bigelow group of mines in Michigan.

Lafayette Hanchett, general manager of the Newhouse mining interests, has returned to Salt Lake, Utah, from attendance at the annual meeting of stockholders of the Boston Consolidated Mining Company, in London.

A. E. Dencker has been appointed metallurgical engineer to the Oriental Consolidated Mining Company, at Chittahalic, Korea. For some time past he has been conducting metallurgical experiments for the company.

William Leckie, formerly connected with the Pocahontas Consolidated Collieries Company, at Pocahontas, Va., as superintendent, has been appointed resident manager of the Jed Coal and Coke Company, at Jed, W. Va.

Wm. H. Shockley, of Tonopah, Nev., was married Jan. 20, in San Francisco, Cal., to Miss May Bradford, a young lady having the distinction of being the only woman holding the appointment as United States deputy mineral surveyor.

F. W. Burrell has resigned his position

as superintendent of the Daly Judge mine at Park City, Utah, to accept the management of some mines in Norway which are owned by a syndicate of Boston capitalists. He will leave Park City March 1 next.

A. Bement, of Chicago, member of the Board of Consulting Engineers to the Chicago Smoke Abatement Commission, has been appointed by the Illinois Coal Operators' Association, a member on its Coal Stoking and Anti-smoke Committee.

Robert H. Richards has just returned from Montana, where he has been installing some of his designs. He returns to his work of teaching at the Massachusetts Institute of Technology, and to the further work on his Volume 3 of "Ore Dressing."

Robert McF. Doble, consulting and supervising engineer, making a specialty of hydro-electric power development and transmission, formerly of San Francisco, Cal., has removed his office from Colorado Springs to 528 Majestic building, Denver, Colo.

J. Nelson Nevius, for several years past engaged in mining in Mexico, has removed to California, his new address being 809 South Los Robles street, Pasadena. He intends to devote part of his time to Nevada mines, while continuing his Mexican connections.

Professor C. F. Harding has been appointed head of the School of Electrical Engineering of Purdue University, Lafayette, Ind. Professor Harding is a graduate of Worcester Polytechnic and has had a broad practical training as an engineering teacher.

Joseph Irvin, managing director of the Western Canada Cement and Coal Company, accompanied by Frank Dunsford, representing the British shareholders, and W. McKinnon, resident manager, has arrived at Exshaw, Alberta, where the works have just been started.

John Hays Hammond, according to a San Francisco despatch, was operated on for appendicitis in that city Feb. 12. His condition is reported favorable for a rapid recovery. It is understood that Mr. Hammond has retired on account of his health from his position as managing engineer for the Guggenheim mining interests. He will, however, retain a connection with those interests as consulting engineer.

## Obituary

Frederick Morton Coombs, mining engineer, died suddenly last week at his residence in Buffalo, N. Y., aged 50 years. His death is thought to have resulted indirectly from malarial fever contracted in South America two years ago. He was born in Titusville, Penn., and had been connected with mines in Pennsylvania; in Colorado, where he resided for several years; in South America and elsewhere. During the past year he spent much time in the Cobalt district in Ontario.

## Societies and Technical Schools

*Michigan College of Mines*—The board of control has instructed the architects to prepare working drawings of the new library and museum, which will be erected the coming summer. This building will be approximately 125 ft. long by 49 ft. wide, with a wing 42x50 ft., and is to be constructed of re-inforced concrete and brick at a cost of about \$55,000.

*American Chemical Society*—The council of this society has voted to undertake the publication of a journal, to be known as the *Journal of Industrial and Engineering Chemistry*, the first number to appear in December next. It has also been decided to organize a new section of the society, to be known as the Division of Industrial Chemists and Chemical Engineers.

*Case School of Applied Science*—The catalog of this school at Cleveland, Ohio, lately issued, shows a number of students in the department of mining and metallurgy. The course covers four years, including all the subjects usually covered. It is varied at the end of the second year by a trip to the coal mines of Ohio, made for the purpose of practice in mine surveying. At the end of the third year an excursion to the mines of Michigan is made for studying the practice of mining and metallurgy.

*Iron and Steel Institute*—The secretary gives notice that the annual general meeting of the institute will be held in London, on May 14 and 15, 1908. The annual dinner will be held—under the presidency of Sir Hugh Bell—at the Hotel Cecil, on May 14. The autumn meeting will be held in Middlesbrough, England, on Sept. 29, the following days. The council will shortly proceed to award Carnegie research scholarships, and candidates must apply before Feb. 29. The awards will be announced at the general meeting.

*Montana Society of Engineers*—The 21st annual meeting was held at Bozeman, Jan. 9-11. The first and second days were devoted to general meetings and visits to the Montana State College and other points of interest. At the business meeting, Jan. 11, routine business was transacted, and the election of the following officers announced: President, Archer E. Wheeler; first vice-president, Charles H. Bowman; second vice-president, Frank M. Smith; secretary and librarian, Clinton H. Moore; treasurer and member of the board of managers of the Association of Engineering Societies, Samuel Barker, Jr.; trustee for three years, John C. Adams. At the closing session the retiring president, Edward C. Kinney, delivered his annual address. This was followed by an account of the progress of the work of the Reclamation Service in Montana, by H. N. Savage,

engineer-in-charge. Papers were read by Joseph H. Harper on the subject, "The San Francisco Earthquake;" "The Development of the West Coast of South America," by F. W. Blackford. A short talk on a "Placer Mining Fraud," in Wyoming, by E. W. King, completed the work. The trustees were instructed to try to hold a summer meeting during the current year. The usual banquet ended the annual session.

## Industrial

The McKiernan Drill Company has removed its office to 115 Broadway, New York.

A 24,000-h.p. steam turbine, which is probably the most powerful turbine for stationary service yet ordered, is under construction at the Mannheim works of Brown, Boveri & Cie., for the Krupp steel works and blast furnace plant at Rheinhausen, Germany.

The report of the American Iron and Steel Manufacturing Company, Lebanon, Penn., for 1907, shows cash on hand Dec. 31 amounting to \$1,278,707. This accumulation of cash due in part to the profitable operations of the company during the year, and in part to the reduction of stocks of both manufactured products and raw material. The sum of \$305,325 has been expended for betterments and additions, and has increased the capacity, efficiency and economy of the plants. A new office building has been completed and is now occupied. The reserve fund to provide for depreciation has been increased \$68,500, and all buildings and machinery have been kept to the highest standard. All the plants of the company have been equipped with modern apparatus for protection against fire.

Charles D. Thompson and Frank D. Berthold have been appointed, by the United States courts, receivers for the National Metallurgic Company, a New Jersey corporation, with New York offices at 43 Exchange place. The company has an uncompleted plant at Aspinwall, near Pittsburgh, for the conversion of fine iron ores and flue dust into nodules, after the process patented by T. C. King. The company's nodulizing plant on Newark bay, New Jersey, has three rotary kilns. Messrs. Thompson and Berthold are also receivers for the Newfoundland Syndicate, of which the Pilley's Island Pyrites Company is a subsidiary. The latter company has been mining iron pyrites at Pilley's Island, Newfoundland, and shipping to various sulphuric acid works at Atlantic coast points. The cinder from these works was afterward nodulized at the Newark bay plant. The liabilities of the Pilley's Island Pyrites Company are \$1,000,000, of which \$250,000 is mortgage indebtedness and \$500,000 is a liability to the Newfoundland Syndicate.

## Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

The Eureka Packing Company, 48 Warren street, New York. Eureka Bill Files.

Baker & Adamson Chemical Company, Easton, Penn. Price List. Pp. 24, paper, 5x8 in.; 1908.

DeRemer Water Wheel Company, Denver, Colo. DeRemer Water Wheels. Pp. 52, illustrated, paper, 7x10 in.; 1908.

H. W. Johns-Manville Company, 100 William street, New York. Asbestos Roll Fire-Felt. Pp. 4, illustrated, paper, 3½x8 in.; 1908.

Theo. Alteneder & Sons, Philadelphia, Penn. Catalog and Price-List of Drawing Instruments. Pp. 110, indexed, illustrated, paper, 5¼x8 in. 1908.

The Franklin Portable Crane and Hoist Company, Franklin, Penn. The Franklin Portable Crane and Hoist. Pp. 32, illustrated, paper, 4¼x7¼ inches.

Sullivan Machinery Company, Railway Exchange, Chicago, Ill. Bulletin 60-A. Sullivan Hammer Drills for Mining Work. Pp. 12, illustrated, paper, 6x9 in.; February, 1908.

The Hayward Company, 97-103 Cedar street, New York City. A Few Applications of the Hayward "Two in One" Hoisting Drum. Pp. 16, illustrated, paper, 5½x8¾ inches.

## Construction News

*Bartow, Florida*—A syndicate, headed by J. F. Beaty, Boston, Mass., proposes to develop a tract of phosphate land and to put in dryers and other machinery.

*Scott County, Tennessee*—The Swab Coal and Coke Company will open mines and put in machinery in the spring. D. C. Swab, Hartrant, Tenn., is president.

*Harriman, Tennessee*—The Baker Coal and Coke Company intends to open mines and put in machinery. Joseph N. Baker, Rockwood, Tenn., is president and general manager.

*Sugar Loaf, Colorado*—The United States Gold Corporation is arranging for the erection of a 200-ton cyanide plant at its Livingstone Dike property. Edward Monroe, Boulder, Colo., is president and manager.

*Rollinsville, Colorado*—The Frank Augustus Mining Investment Company will, it is reported, erect a 15-stamp mill for handling tungsten ores on its North Beaver creek properties. Frank Augustus, Rollinsville, Colo., is manager.

*Williamson, West Virginia*—The Lawson Coal and Coke Company proposes to put in a mining plant of a capacity of 500 tons per day; also an electric plant. It will build three miles of railroad. Harry Lawson, Williamson, W. Va., is president.

# Special Correspondence from Mining Centers

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

## REVIEWS OF IMPORTANT EVENTS

### San Francisco

Feb. 12—The California Débris Commission has issued a permit to mine by hydraulic process to the owners of the Indian Hill Gravel Mining Company, whose claims are on the North Yuba river a few miles above Camptonville. The work of constructing a large restraining reservoir for the tailings will be commenced at once. A new ditch system that will give ample water has been put in within the last few months.

A meeting of residents of San Juan, Nevada county, is to be held to discuss a proposition to resume hydraulic mining in that and the North Bloomfield section, which were in old days the principal seats of that branch of the gold-mining industry in the State. The larger properties, with their water rights, reservoirs, ditches, etc., are now the property of the Northern Water and Power Company, of which W. B. Bourn, of San Francisco, is the head. The company owns the North Bloomfield, Milton, Eureka Lake and other large properties. The company also owns immense worked-out hydraulic diggings along the ridge which could, with a comparatively small amount of work, be converted into enormous reservoirs for the storage of either water or mining débris. By converting these old diggings into restraining reservoirs for débris they could hydraulic out several million dollars in certain localities without a particle of tailings escaping into the natural waterways. The company is to furnish electric and water power, but a large amount of its water could be used for hydraulic mining if the débris reservoirs can be approved by the Débris Commission. There are immense quantities of gravel throughout that section which have never been touched.

Some thousands of acres of land along the Calaveras river have been acquired by dredging men, who already have one dredge at work there and are to build others. The city of Stockton, through its newspapers, is rather stirred up about the matter lest some turned-over silt may reach navigable waters during the operation of the dredgers. There is no necessity for any alarm. The dredge men do not turn over or loosen up as much soil in any year as one-tenth of the farmers in a given area do. Moreover, they do not, like the farmers, cut away the trees and shrubs along the banks of the streams, so that the winter freshets tear down the loosened earth. The dredge miners are careful not to do any damage to the

streams. The material is dumped back into the dredge pits and the rocks and gravel hold the soil down. Very few, if any, of the machines are working in the streams themselves.

The Pneumatic Dredge Company, which is preparing the East Side Park tract for a pleasure ground under contract with the city of Sacramento, has found auriferous gravel at a depth of 30 ft., which runs about \$1 a cu.yd. The Sacramento papers have been the most inimical to the dredging interests of Oroville and Folsom, and what they will say if extensive gold-gravel beds are found under and near their own city, we are yet to hear.

It was recently stated in one of these letters that the troubles had been settled between the conflicting interests owning the extensive iron-ore deposits near Kelso, in San Bernardino county. It is now believed that some consolidation will be effected between the Merritt-Smith and Jones-Patrick syndicates. In some of the claims, tunnels are being driven to determine further the extent of the deposits. Should prospecting now under way later prove what it is expected it will, doubtless these deposits will be utilized before very long.

In the Dale district of San Bernardino county, a large rotary rock crusher is being installed and a number of claims are being worked. At Twenty-nine Palms, in the same county, a custom mill is being installed as well as a cyaniding plant. Numbers of prospectors from Nevada are now in these two sections looking for the same class of ore found in the newer southwestern Nevada camps, which is not of the same character as that found in southeastern California. For this reason the Nevada men think the California prospectors have overlooked many good things, and hope to locate them.

Oakland men, composing the Placeritos Mines Company, are about to work the old dry placers near Lovelock, Humboldt county, Nev., by means of a land dredge. Pumps, gasolene engines, pipe, etc., have been shipped in to fit up the plant of the company.

Negotiations are pending with Oakland men to re-open, unwater and clear out the old Pittsburg mine south of Nevada City, on the Gold Flat slope of Banner mountain ridge. This is a very old location and has been worked off and on by several companies within the last 30 years or so. The shaft is down 1000 ft. and there is a 10-stamp water-power mill on the property. Some high-grade ore has

been taken from different parts of the mine in times past.

It is understood here that G. B. & Wm. Dennis, of Spokane, Wash., have started up their new furnace at the Black Butte quicksilver mine, Oregon. Considerable money has been spent on these properties, but they have not heretofore made any production of moment. The process of handling the ores is a new one devised by the Dennis brothers and was first tested on a 20-ton furnace. The new furnace now in use is 500-tons capacity.

The Rawhide Mining Company, of Tuolumne county, owned by W. A. Nevill, brought suit against the Dutch Mining and Milling Company alleging that it had trespassed on the property and extracted ore valued at \$150,000. The Dutch company, through S. L. Bright, its receiver, now comes with an answer and cross-complaint and accuses the Rawhide owner with going under its property and carrying off and utilizing ore to the value of \$250,000. Captain Nevill, who has become somewhat famous as a litigant in mining circles, has got to answer this charge.

### Salt Lake City

Feb. 14—The Snowflake and Mountainview groups, situated in the Gold Springs district and just over the line in Nevada, have been acquired by a local and Eastern syndicate which has formed the Buck Mountain Nevada Mining Company, with a capitalization of \$2,500,000. The property has been in litigation for several years, but the conflicting interests have recently effected a compromise. Charles A. Short, of Gold Springs, Utah, the manager, says that the company will erect a 100-stamp mill during the year.

The Utah Consolidated Mining Company has begun shipments to the Garfield smelter under its contract with the American Smelting and Refining Company, and is delivering ore at the rate of 800 tons per day. J. B. Risque, the manager, says there has been no change in the plans of the company to erect a smelter in Tooele county to take the place of the plant forced out of commission by the Salt Lake valley "smoke suits." However, the building has been somewhat postponed as the contract is signed for one year with the privilege of extending it for another year.

The citizens of Ogden have lost the opportunity to obtain the location of a large independent smelting plant near that city. Some weeks ago an option was obtained

on the plant, owned by the Utah Smelting Company, now idle, and located about 10 miles northwest of Ogden. The option was secured in the interest of the Utah Mine Owners' Association, but as the farmers within a radius of five miles of the site of the smelter have protested against the enlargement of the smelter, the matter has been dropped by the association.

D. C. Jackling, manager for the Utah Copper Company, states that the company will pay dividends before the close of the coming summer. He states that the ninth section of the Garfield mill will be in commission before March 1, and that the entire 12 sections will be in service by the end of 90 days. This, he declares, will enable a yearly output of 60,000,000 lb. of copper to be made. The January output reached 3,200,000 lb., with seven and eight sections in commission.

The Boston Consolidated Mining Company is steadily increasing its output of ore from its Bingham mines. Within a week four sections of the concentrator at Garfield will be in service.

The Tintic Smelting Company, which was originally planned to treat lead ores in connection with the copper smelter of the Utah Smelting Company at Ogden, is to equip its smelter at Tintic with a furnace for the treatment of copper ores. The Tintic plant now has no connection whatever with the Ogden plant and is controlled by Jesse Knight, of Provo. Construction is being pushed vigorously and at least the lead stack will be ready by the end of April. All of the equipment for the copper unit has been ordered and shipped from the factory.

There has been practically no change in smelting conditions in the Salt Lake valley within the past few weeks. Outside of the copper mines of Bingham, which have contracts with the American Smelting and Refining Company, the Cactus mine of Beaver county, which is sending its ores to the same place for treatment; the Yampa mine in Bingham, which operates a smelter on its own account; the Consolidated Mercur, at Mercur, Jennie, at Gold Springs, and Annie Laurie, at Kimberly, all of which are gold producers, the daily output of ore from Utah mines is considerably under normal. Excepting the Centennial Eurcka, which is sending 200 tons per day to Kennett, Cal., and 50 tons per day to the Yampa smelter in Bingham cañon, there are few mines in the Tintic district producing. The same condition exists at Park City; at Stockton the mines are shut down and at Ophir only about one-half the usual tonnage is being produced. The attempt of the smelters to exact higher treatment charges has been met with vigorous opposition from the mine owners, and this, together with the low metal prices, has caused them to keep their mines closed.

The United States Smelting Company is giving out no information regarding

its plans for the future. Its lead smelter at Bingham Junction is still being operated on reserve ores which have been pretty well cleaned up. Officials of the company claim that, with the system of bag houses installed, the operation of the lead smelter can do no harm to vegetation and it is believed it is the intention of the management to make this showing to the court at the proper time. The copper smelter is closed and has been for more than two weeks past.

The directors of the Lower Mammoth Mining Company have been authorized by stockholders to issue \$60,000 worth of bonds, the proceeds from the sale of which are to be applied toward the further development of the mine. Almost all these bonds have been subscribed for; they bear the date of March 2, and are redeemable within two years, bearing interest at the rate of 6 per cent., and may be converted into stock at \$1 per share. The company's mine is in the Tintic district.

The Boston Consolidated Mining Company has given a first mortgage on its Bingham mines and mill at Garfield in security for the loan, negotiated some time ago, of \$1,500,000. The Federal Trust Company, of New York, is named as trustee.

### Butte, Montana

*Feb. 17*—The Boston & Montana Company, one of the Amalgamated subsidiaries and the only one mining ore now, is not yet working to its full capacity, but is shipping from 3200 to 3500 tons of ore per day to the smelter at Great Falls. A section of the concentrator at the smelter is closed for improvements which will be completed by March 1, at which time it is said the shipments of ore will be increased at least 600 tons per day, and the mines, which are now working only six days in the week, will be operated continuously. The Boston & Montana is now mining in the Mountain View, Pennsylvania, West Colusa, Leonard and East Colusa mines. The fire and gas in the Leonard and West Colusa is gradually being brought under absolute control and it is claimed that by March 1 the company will be able to work in all parts of the West Colusa.

### Denver

*Feb. 14*—Mining conditions throughout the State are rapidly improving, but many of the properties at high altitudes, which were temporarily closed during the recent drop in price of the metals, although preparing to open again, are unable, owing to the snow, to do so until spring.

In the San Juan region, the Durango smelter of the American Smelting and Refining Company is kept busy chiefly on the ores of the Silverton district, the Silver Lake and Gold King groups being the largest shippers. The Ouray, Tel-

luride and Rico districts are all busy again, but have been somewhat hindered by the severe snow slides of the past two or three weeks. The Camp Bird made upwards of \$113,000 net profit in December, and paid 24c. dividend per share, Feb. 2. Work at the Chipeta tunnel, in the Ouray gold belt, has been resumed, 25 men being employed.

In Grand county and the Hahns Peak district in Routt county, miners and prospectors are usually active, especially in the latter region. On Willow creek, in Grand county, the grahamite mines of the American Asphaltum Company, are being opened, and an initial shipment has been made to Chicago. It is the intention to ship 100 tons a month from Granby, on the Moffat road.

At Leadville, shipments fell off about 30 per cent. during the late slump in the price of the metals, but shipments are increasing now and at several of the mines preparations are being made for extensive work in the spring. Orders were issued today to resume work on the Tucson shaft of the Iron-Silver mine, which closed about two months ago; about 100 men were then employed.

A fund is being raised in Colorado Springs to provide for Bob Womack, known as the "father of Cripple Creek," who is now in destitute circumstances. It is said that he was the first discoverer of the ore in the Cripple Creek district.

The new contractors on the Cripple Creek drainage tunnel are now employing two shifts per day.

The report of the president of the Findley Consolidated Mining Company, gives the shipments of ore for 1907 at 955,805 tons, which, after deducting treatment and sampling charges, netted \$155,159.

### Toronto, Ont.

*Feb. 19*—Hon. W. S. Fielding, minister of finance, stated recently that if gold of sufficient purity could be obtained from the smelters, the new Canadian mint would be in operation very shortly, otherwise it might be necessary to erect a refinery. The gold coins issued would be of the denominations of \$2.50, \$5 and \$10.

The first estimate of Canada's gold production for 1907 places the output at \$9,500,000, as compared with \$12,023,032 in 1906, a decrease of \$2,523,032. The British Columbia output has fallen off nearly \$1,000,000, and the decrease in the Yukon will be about \$1,500,000.

Captain McClelland, of Winnipeg, and Michael Ralph, of Port Arthur, have returned from explorations near Lake Nepigon, Ontario, and report the discovery of large quantities of red hematite ore. They have filed claims for locations.

Heavy storms have retarded work on the Kerr lake branch of the Temiskaming & Northern Ontario Railway so that it is unlikely that rails can be laid until early in March.

# Mining News from All Parts of the World

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

## THE CURRENT HISTORY OF MINING

### General Mining News

*Petroleum Exports*—Exports of mineral oils from the United States for the full year are reported as follows, in gallons:

	1906.	1907.
Crude .....	118,664,999	88,494,616
Naphthas .....	25,114,155	28,080,439
Illuminating .....	827,727,219	844,996,003
Lubricating .....	146,715,235	147,558,283
Residuum .....	63,292,493	74,162,347
Total .....	1,181,514,101	1,183,291,688

Paraffin is included in lubricating oils. The total shows an increase of 1,777,587 gal., or 0.15 per cent.

### Alaska

#### FAIRBANKS DISTRICT

United States troops have been sent to Fairbanks to restore order among the striking miners. The latest reports show that the district is quiet.

#### TANANA DISTRICT

The Mine-owners' and Operators' Association is endeavoring to secure a number of miners for this district, and has opened an office in Seattle, Wash., for that purpose.

#### VALDEZ DISTRICT

*Bonanza Mining Company*—This company is moving some heavy machinery from Valdez to the mine, to be installed in time for the summer work.

### Arizona

#### GRAHAM COUNTY

*Arizona Copper Company, Ltd.*—Production for January was 2,882,000 lb. of copper.

#### COCHISE COUNTY

*Bisbee-Sonora*—Copper sulphide ore has been struck in the adit in this camp near Paradise. The owners announce that power drills will be installed and the force of men increased.

*Tombstone Consolidated Mines Company, Ltd.*—In the orebody in which a winze is being sunk in the Emerald mine water was encountered at a depth of 83 ft., equivalent to the 600-ft. level of the pump shaft 1½ miles farther north. Another strike of copper ore was made from the 900-ft. level south. The quantity of water handled by the pumps has further decreased, making 740,000 gal. less than the total daily pumping on Oct. 1.

#### PINAL COUNTY

*Imperial Copper Company*—The smelt-

ing works at Sasco began operations on Feb. 1, with one furnace of 350 tons daily capacity. Another unit of the same capacity will be added at once. The ore from the mine is self-fluxing requiring no additions of lime or iron. The converter plant began work on Feb. 5, the first pour consisting of 10,000 lb. copper. The Imperial mine is situated 20 miles south of Red Rock which is on the Southern Pacific railroad about 30 miles west of Tucson, and was for many years known as the Old Boot mine. The present owners began developing in 1903. In September, 1904, shipments began to the Copper Queen smelter at Douglas, and from that time until January of the present year, the shipments averaged 100 tons per day. In development the mine has eight miles of shafts, drifts and crosscuts. The main shaft has three compartments; the greatest depth is 800 ft. and the water handled amounts to 250,000 gal. per day. The Imperial company is a subsidiary of the Development Company of America.

### California

#### EL DORADO COUNTY

*Jones Hill*—Work has been resumed at this mine, Georgetown, with W. S. Kerr as superintendent.

*Mount Pleasant*—The men who quit work at this mine recently, because they were not paid promptly, have been notified to send their time checks, etc., to a bank at Reno, Nev., which will pay them, so that operations will shortly be resumed.

*Warner Ranch*—This ranch at Georgetown has been bought by Koster & Berff and will be mined.

#### FRESNO COUNTY

*Mercy Quicksilver Mining Company*—E. F. Northey, president of this company, has arranged with Miller & Lux to obtain a supply of oil fuel, and the mine and furnace will resume operations.

#### INYO COUNTY

*Brockman & Middleton*—This claim near Benton, which has produced rich surface ore for some years, is now being sunk upon by J. M. Taylor and D. E. Cummins, who have made final payment on their bond.

*Standard Development Company*—This company, mining the Skookum group south of Benton, is running a 600-ft. adit under contract, intended to cut the main ledge at 300-ft. depth. The ledge is narrow but of high grade.

*Taylor*—A small but rich ledge has been cut in the tunnel of this mine, the ore showing free gold.

#### MADERA COUNTY

*Bazinet-Ryans*—Hotchkiss & Co., the new owners of this mine at Hildreth, have put up a small mill and are crushing 20 tons a day.

*Misfortune Mining Company*—At this mine at Hildreth, J. W. Ragsdale superintendent, a small mill has been erected and good ore is being milled.

#### NEVADA COUNTY

*Brunswick Consolidated*—At this mine, Grass Valley, the body of ore they are now working is 2000 ft. from the shaft, and the eastern strike of the vein is increasing the distance rapidly. The average width of the vein is 18 inches.

*Murchie Mining Company*—The grade of ore coming from the lower levels, is higher than that which has previously come from this mine at Nevada City; on the 1000 level the ledge averages 7 ft. Considerable free gold is found.

*Parallel*—This quartz claim near Maybert, adjoining the Lindsay and North Star, has been sold by Wm. Tiernan to J. H. Hunt.

#### PLACER COUNTY

*Southern Cross*—At this mine near Towle, James English superintendent, the ledge is large and the 20-stamp mill will soon be increased by five stamps.

*Trafton & Mameluke*—A new adit is being run on the Trafton mine by E. H. Drummond, and the adit on the Mameluke is being extended. Both mines are on Georgia hill, Forest Hill divide.

#### PLUMAS COUNTY

*Blue Bell*—When the main tunnel of this mine, now being extended, reaches the orebody, it will result in the deepest development in Genesee district, 1000 ft. in all.

*Cromberg*—Near this place L. V. Tefft is fitting up the Illinois claim to begin active work. The Lone Star and Concordia mines are also ready to run, the latter having an exceptionally large body of gravel.

*Genesee*—This mine, also known as the Gruss, is yielding some good ore to the leasers, Sobrero & McShane. The claim is under bond to Nevada men.

#### SAN BERNARDINO COUNTY

*Orange Blossom and Extension*—The former of these mines near Bagdad has

reached a depth of 400 ft., and a mill is to be installed. The Orange Blossom Extension is down 550 ft. The two companies now jointly own the Budweiser springs, seven miles from the mines, and a 4-in. pipe line is being laid to supply the camps, the flow being by gravity.

## SHASTA COUNTY

*Washington*—They have started milling ore at this mine, French Gulch, and new concentrators have been added to the mill. The mine is under bond to F. M. Leland.

## SIERRA COUNTY

*Dead River*—Some ore taken from a ledge found in this gravel mine was recently milled and yielded at the rate of \$500 in free gold. The mine is in Alleghany district.

*Red Star*—The tunnel in this mine is now in over 1400 ft. The mine is supposed to be an extension of the famous Tightner.

## SISKIYOU COUNTY

*Little Maggie*—At this mine near Callahan, the owners, Rostetter & Barendum, are running a new adit to tap the ledge at a point below the former one.

## TRINITY COUNTY

*Bronze Bear*—This mine at Deadwood is shortly to be equipped with an electric plant. About 25 miners are at work, including leasers.

*Lappin*—In this mine at Deadwood, development work only is being done. An electrical equipment is to be installed before the mill is started in the spring.

*Murphy*—These gravel properties at Junction City are under bond to J. D. McGilluvray, who will equip them for a trial run this season.

## TUOLUMNE COUNTY

*Contention*—Robinson & Delerey, who have a bond on this mine in Jupiter district, are hauling in some new machinery and will soon commence crushing ore.

*Ford*—Conlin, Peterson & Pownall have resumed the work of extending the Over adit on this mine, the water supply for compressor and drills having become available.

*Georgiana & Orphan Boy*—This mine, on the East belt of the Mother Lode, has been bonded for \$60,000 by the Floyd Mining Company to Danial Ellsworth, of Los Angeles.

*Kanaka*—The air compressor and stamps of this mine, P. DeSallier superintendent, will shortly be started up with power from water brought in by the new ditch.

*Noupareil*—At this property, A. P. Dron manager, the ore is yielding satisfactorily and at low cost of working.

Concentrators have been installed at the mill.

*Oakland*—Men and supplies have been sent to this mine, preparatory to starting up active work.

## Colorado

## LAKE COUNTY—LEADVILLE

During January about 55,000 tons of ore were shipped, about two-thirds the tonnage that is generally averaged in this district, but owing to the low metal prices it is an encouraging amount. When all the properties of the district are operating about 80,000 tons of ore are shipped during the month.

*Vinnie*—Many new strikes are reported from the Breece Hill section. One of the most recent of these is the discovery of a vein of good gold ore in the Vinnie property. The streak is at present small, but, owing to the situation of the property, it may develop into an important orebody. The Vinnie mining claim adjoins the famous group of the Ibex company; it has not been worked for many years. It is only lately that this property has begun to pay dividends. The recently discovered vein varies in width from 6 to 18 in. at a depth equal to the 10th level of the Jonny workings, through which developments on the Vinnie property are now being done. The ore is taken out through the Yak tunnel to California gulch where it is loaded on cars and shipped direct to the smelter.

*Helena*—A contract for deepening the shaft and doing a certain amount of driving has been let to W. J. Stevens, of Pittsburgh, Penn., one of the directors of the company, who is now on his way here to take immediate charge of the work. The shaft is now full of water, but pumps will be immediately installed. The shaft is 600 ft. deep, but it is to be sunk 200 ft. deeper.

*Forepaugh*—Work at this shaft on East Fryer hill has been resumed. A short time ago fire destroyed the shaft house and some of the upper timbers in the shaft. Fred Cretney and his associates have already started the erection of a new headframe, engine and boiler house, and the re-timbering of the shaft. The Forepaugh shaft has been drained by the El Paso pumps, but since the stopping of these pumps the water has been allowed to rise in the lower workings. For the present work will be confined to the upper level, but, if considered advisable, the mine will be unwatered later in the year. There is a large amount of unexplored ground in the upper workings.

*Hibschle*—Instead of giving up the lease on this property, as was stated in these columns some time ago, W. H. Covey sold ½ interest to the Lamphier Bros. and associates. Mr. Corey had already blocked out considerable iron ore before he sold a share in the lease.

## Florida

## MARION COUNTY

*Compagnie Generale des Phosphates de la Floride*—This company is making active preparations to develop 2700 acres of phosphate lands which it owns, and will erect a plant at Anthony, Fla. The company has begun the erection of its plant, including dwellings for its employees, spur track, etc., and has received much of its equipment.

## POLK COUNTY

The Baltimore *Manufacturers' Record* reports that negotiations have been closed by J. F. Beaty and associates of Boston, Mass., for the purchase of the Pharr phosphate property near Bartow, containing about 1000 acres. The purchasers, it is said, will organize the South Florida Phosphate Company and erect a modern plant for the development of the deposits.

## Idaho

## SHOSHONE COUNTY

*Gold Hunter*—The superintendent of this property has received instructions to resume operations at the earliest possible moment. Preparations have all been made and little time will be lost in putting the property in operation to its full capacity.

*Rex*—This old mine has recently been secured by a company headed by B. M. Francis, formerly of Missoula, Montana, and a shipment of 80 tons of concentrates has recently been made. The mill is at present working on ore from a large dump; the mine, which has several bodies of ore blocked out above the 300-ft. level, will be developed to a greater depth.

*Black Horse*—It is stated that a deal has been closed whereby Patrick Burke, of Mullan, Idaho, and associates, secure control of this large lead-silver property. The Black Horse is near Murray and will be the terminus of the Idaho Northern Railway.

*Snowstorm*—This property, which has been closed for several months on account of the low price of copper, will begin active operations at an early date. The management expects to bring the production up to 150 tons of ore per day before the end of February; 50 tons of this will go to the smelter at Everett, Wash., and 100 tons to the smelters at Salt Lake. This mine employs over 200 men when in full operation.

## Illinois

## BUREAU COUNTY

*Mineral Point Zinc Company*—The smeltery of this company at Depue continues idle.

## MACOUPIN COUNTY

*Superior Coal Company*—At No. 2 mine of this company, 3½ miles south of Gillespie, 3477 tons of coal were recently

hoisted in eight hours. During six consecutive days, of eight hours each, an average of 3038 tons was hoisted. This was done with a pair of 24x36-in. engines, with 8-ft. drum, furnished by the Litchfield Foundry and Machine Company, of Litchfield, Ill. The depth of the mine is 360 feet.

### Indiana

#### GREENE COUNTY

Despite the fact that the recent stringency has resulted in many of the miners of this field being idle, the Summit mine broke the record at the last pay day. Out of the 14 working days, this mine worked 10 and the average tonnage daily was 1000. The mine is owned by E. E. Neal, of Bloomfield. The Vandalia and Shirley Hill mines resumed operations on Feb. 3, after being idle during the last few weeks. The recent cold weather was responsible for increased orders.

*Black Creek*—The work of constructing 10 large coke ovens at this mine is being pushed. The ovens are said to be the property of the Chicago Coal and Coke Company, and in building them, \$25,000 will be expended. The Black Creek coal has been tested and found to be good coking coal; if the expectations of the company are realized other ovens will be constructed at several Fourth Vein mines.

#### VIGO COUNTY

Judge James E. Piety, of the Vigo Circuit Court, after long deliberation has decided that the "wash house" law, passed by the last legislature, requiring coal-mine owners to build and maintain suitable houses in which the miners may wash and change clothes, is constitutional and valid. The decision was rendered in the case of John Hewett, secretary of the Vandalia Coal Company, who was arrested shortly after the bill became a law for violating it, simply as a test case.

*Shirkle Coal Mining Company*—This company, at Terre Haute, has been incorporated. The directors are Edward and Hugh Shirkle, R. R. Hammond, J. K. Dering and J. E. Hitt.

### Iowa

#### BOONE COUNTY

Drilling operations on the Oakleaf property south of Boone have shown a good vein of coal at a depth of 340 ft. Arrangements are being made to sink a shaft and open the property, which is near the railroad.

### Kentucky

#### BELL COUNTY

*Interstate Coal Company*—This company, recently organized, is said to have taken over the holdings and mining plants of the Brush Creek Coal Company, at

Warren; the Evans-Jellico Coal Company, at Tinsley; the Matthews Coal Company, at Warren, and others, besides large areas of coal lands which have not been mined. Improvements are contemplated for the different operating plants, also the opening of new mines in various sections. Company is understood to be under direction of George L. Carter, president of South & Western Railway; offices at Johnson City, Tenn.

#### UNION COUNTY

*Kentucky Coal Mining Company*—This company is a consolidation of several operations, including mines at Waverley, Uniontown and Central City. Its intention is to mine largely for the river trade. Charles A. Baker, Dayton, Ohio, is president.

### Michigan

#### COPPER

*Allouez*—Shaft No. 2 is down about 1220 ft. and sinking is progressing at the established rate of about 100 ft. per month. This shaft has the best record for sinking of any shaft on the Lake, a distance of 120 ft. being obtained in one month. It is expected that the lode will be encountered at a depth of from 1600 to 1800 ft. At the stamp mill, which is owned jointly by this company and the Centennial, the extension to the building has been completed and the machinery for two of the three heads is on the ground; assembling will be commenced early in the spring and the whole mill will be ready to go into commission in time to take care of the increased production which will come from both properties.

*Osceola*—This company is making preparations to materially increase production; about 20 drills have been added and additional men taken on. During the period of curtailment the management has devoted much time to repairs and alterations both underground and in the shaft houses. This is necessary to take care of the larger skips that are to be used. Shaft No. 6 has been overhauled and put in a line from surface to the forty-sixth level.

*Copper Range*—The shaft on the Globe tract, which is held under option by this company, is down more than 650 ft. and is sinking rapidly to intercept the Baltic lode. It is expected that this will be accomplished at a depth of from 850 to 900 ft. Preparations are being made for levels as the shaft is being sunk and when the lode is reached drifting will commence simultaneously from the several levels. At shaft E of the Champion mine, drifts are being extended south to points beyond the proposed new F shaft; when sinking is started on this site the work will be greatly facilitated by raises and a large amount of stoping ground which has been opened. The company is trying an electrical pumping installation and an order has been placed for six small electric

hoists. Work on the power plant at the site of the Michigan smelter will in all probability be resumed early in the spring and a complete electrification of the mines will be undertaken.

#### BAY COUNTY

*Salzburg*—It is stated that this coal mine near Bay City is practically worked out, and will be abandoned as soon as the pillars are taken out. The mine has been worked about seven years, during which a large quantity of coal was taken out.

### Missouri

#### ZINC-LEAD DISTRICT

*Benna Lease*—The latest report from the rich drill strike of L. P. Benna in the city of Carthage is that the drill is down 190 ft. and still in ore. The drill has been in ore from 35 ft. to 190 ft. depth.

*Linzee*—This mine, at Carthage, is to be started up. Litigation over the ownership has kept it closed for 20 years.

*Lone Elm*—A strike of ore has been made at Lone Elm on the Granby land on Turkey creek. The ore was found in three levels. This was the scene of much shallow mining years ago but no work has been done since.

*Old Apple Tree Mine*—This company at Cave Springs is building a tram 850 ft. long to connect its mine with the mill of the Herald Mining Company with which company the Old Apple Tree has consolidated.

*Spring City*—The Alpha, Argosy and Alladin mines have resumed operations, after several months shut-down.

### Montana

#### BUTTE DISTRICT

*Boston & Montana*—A 400-gal. electric pump is being installed on the 1200 at the Leonard mine to aid in handling the water being pumped in on the fire. The company has just finished a big station at the 1000-ft. level of the Greenleaf and has put in a 500-gal. pump. The north crosscut recently released a big flow of water and exploration work was temporarily stopped. Work on the crosscuts both north and south have been resumed. It is expected that the first vein south of the station will be cut within about 200 ft. The north crosscut is merely a prospect.

*Davis-Daly*—The water has all been pumped out of the Colorado shaft and an electric pump has been placed at the bottom of the 1000-ft. shaft. Work in the crosscuts has been resumed. Work will also be resumed in the long Original crosscut which was driven south from the Original shaft at a depth of 1800 ft. The Original shaft has been retimbered and is ready for use again.

*Butte-New York*—Preparations are being made to resume work on the shaft of



the Colonel Sellers, which was suspended about a month ago on account of temporary financial troubles. A large hoisting engine, with a capacity to work to a depth of 3000 ft., built especially for the company, has been shipped from Milwaukee and will be placed in position as soon as it arrives. The shaft is down 730 ft. and a station has been cut at the 700 where an electric pump will be installed. The company has made a payment on the last option and has secured an extension on the remainder, amounting to only \$17,500.

*Amalgamated*—There is no copper stored either at the Washoe or Great Falls works. The product of the Great Falls plant is shipped east as soon as it can be handled.

*Elm Orlu*—A body of copper glance has been cut at a depth of 700 ft. and by its position it will probably be found in the property of the Butte Superior company if it extends that far, a distance of at least 250 feet.

*British-Butte*—Dr. Maurice Eisenberg, of New York, who organized and started the British-Butte Mining Company, has resigned the office of president to devote his time to other business, but he still remains the largest individual stockholder of the company. Colonel M. H. de Hora, representing the English syndicate which financed the company, has been elected president. Colonel de Hora has taken up his residence in Butte and will give his attention to the operations of the company.

## Nevada

### ESMERALDA COUNTY—GOLDFIELD

According to later information, instead of 4500 tons, as was stated last week, the output of the Goldfield mines for January was as follows: Shipped to the smelters, 947 tons; shipped to the Western Ore Purchasing Company at Columbia, 358; shipped to the Nevada-Goldfield Reduction Works, 400; shipped to the Combination mill, 2635; shipped to the Kinthead mill, 400; total shipments, 4740 tons.

The cost of living at Goldfield is said to have been greatly reduced since the strike began. Prices of merchandise have in many instances been reduced 50 per cent., and rents now are only half what they were formerly. The Federal troops have been ordered to leave Goldfield March 7, as the State police will be ready for work by then. W. L. Cox will be superintendent, and A. W. Cahlan, of Reno, inspector. As soon as equipments arrive 30 policemen will be sent to Goldfield. About 500 miners and mill men are working at the mines at present.

*Goldfield Consolidated*—While only sufficient ore is being produced to keep the Combination mill in operation, still much development work is being done. Non-union miners and members of the new organization, the Nevada Miners' Union,

are employed. Three shifts are being worked at the mines. Grading for the mill site and for the railroad tracks, over which the ore will be taken to the mill from the mines, is being done. Several of the shafts are being sunk deeper. A central air compressor is being installed at the Mohawk shaft; this is being constructed in duplicate. Boilers are being installed at the Mohawk to operate the hoist; at present an electric hoist is used. Crude oil will be used for fuel. Skips are now used in this shaft instead of cages. The experiment of the Consolidated company to board its men on company ground has been quite successful. The men are given good food at \$1 per day and the man running the boarding house is making money.

*Florence*—The Gem lease, formerly the Watson lease, has struck a streak of high-grade ore, 12 in. wide, on the 150-ft. level. The extent of this orebody has not been proved as yet. Work is progressing on the Florence mill but, owing to the failure of machinery to arrive, this mill will not be completed for several weeks.

*Kewanas*—The shaft is being sunk another 100 ft.

### WHITE PINE COUNTY

*Nevada Consolidated*—According to the terms of the new bond issue, each holder of 184 shares of stock on Feb. 17 is entitled to subscribe for one \$500 bond. Payments will be required 50 per cent. March 10, 1908, and 50 per cent. April 20, 1908.

## North Carolina

### ASHE COUNTY

*Ballou*—It is reported that Dr. Jones, who has been prospecting on the Ballou property, has found a good vein of maniferous iron ore. The property was worked for a time by the Virginia Coal and Iron Company, without much result. The vein was found on an extension of the old workings.

### JACKSON COUNTY

*Cullowhee Mining and Reduction Company*—Development is reported to be progressing favorably on this company's property at Cullowhee, and copper ore has been found in some quantity. J. R. Aiken, Spartanburg, S. C., is president, and Dr. Davis is in charge of the property.

## Oklahoma

The Corporation Commission of Oklahoma published a new schedule of coal freight rates on Feb. 1 to apply to all intra-State tonnage moved by the railroads. Some of the reductions ordered from the former basis are very radical. For instance, the rate from McAlester to Oklahoma City is reduced from \$1.55 to

\$1 per ton, while other rates have been cut down in proportion varying from 30 to 50 per cent.

## Oregon

### BAKER COUNTY

*Ben Harrison*—This property shipped a carload of ore to the Tacoma smelter last week. This mine is in the Greenhorn mountains near the old Morris silver mine. Some development was done about ten years ago, but only to shallow depths. Since the new company has obtained the property a crosscut adit 400 ft. long has been driven, which developed the mine at a depth of 250 ft. At that depth the vein is about 18 ft. wide and of milling grade with a streak of shipping ore near the hanging wall. About 10 miners are working at the property.

*Buffalo-Monitor*—This mine in the Sumpter district is shipping rich ore to the Tacoma smelter.

*Red Boy*—Rich ore is reported to have been found in the south drift. This is the third strike at this property reported recently.

### LANE COUNTY

*Black Butte*—This mine near Cottage Grove has resumed operation and the new 500-ton furnace has been blown in. This furnace is of special construction and was designed by William B. Dennis, one of the owners of the mine. The firebox in this furnace is situated above the ore and by a down-draft system electric fans suck the gases of combustion down over the ore. The furnace is 40 ft. high and nearly 40 ft. wide. The shaft at this mine is 1700 ft. deep and levels have been driven at 100-ft. intervals. About 60 men are employed at the mine.

## Pennsylvania

### ANTHRACITE COAL

*Hollenback Coal Company*—This company, owner of a tract of land near Wilkes-Barre, upon which a colliery was operated by the Lehigh & Wilkes-Barre Coal Company, has been given title to the culm bank which has been piled up on the property. A decision of the Supreme Court states that the lease, which dates from 1869, was not a sale of all the coal within the limits of the tract, but only of such portion thereof as passed over a 5/8-in. mesh. Therefore the fine coal that has been dug and hoisted by the lessee has, in effect, been piled up for the use and benefit of the land owner, and the increased use of small coal in recent years makes the present value of the culm bank a considerable item.

*Lehigh Coal and Navigation Company*—This company's report for the year 1907 shows total earnings of \$4,142,283. Expenses, interest, sinking fund, deprecia-

tion, etc., amounted to \$1,787,758, leaving a balance of \$2,354,525. From this, dividends of 8 per cent., amounting to \$1,387,604 were paid, leaving a surplus of \$966,921. The coal mined by the company was 2,428,660 tons in 1906, and 3,242,736 in 1907; an increase of 814,076 tons.

#### BITUMINOUS COAL

*Century*—This mine, near Brownsville, caught fire on Feb. 10 from a blow-out shot. Fire stoppings are being built and other steps taken to limit the area of the fire. The men employed in the mine all got out safely, though with some difficulty.

*Pittsburg Coal Company*—This company's statement for the year ended Dec. 31 is as follows:

	1906.	1907.	Changes.
Net earnings....	\$5,297,123	\$5,731,983	I. \$ 434,860
Charges .....	3,104,355	2,773,390	D. 330,965
Surplus.....	\$2,192,768	\$2,958,593	I. \$ 765,825

Charges in 1907 included \$725,937 for depletion of coal lands; \$964,809 for depreciation of plant and interest; \$1,082,644 for interest on bonds.

### South Dakota

#### CUSTER COUNTY

*Saginaw*—I. W. Herber, president and general manager, is in Detroit attending a meeting of the board of directors. Arrangements will be made to install stamps in the mill in place of the National ore pulverizer, which is to be removed. Drifting continues toward the ledges.

*White Spar*—The Westinghouse Electric Company has just put men to work on this mica property.

### Tennessee

#### SCOTT COUNTY

*Swab Coal and Coke Company*—This new company has leased 1500 acres of coal lands. The property is located on the mountain between Straight Fork and Rock creek on New river, southeast of Oneida, and is said to contain a 5-ft. vein of coal. It is the purpose of the company to begin active development in the spring. The officers include D. C. Swab, Hartman, Tenn., president, and W. A. Owens, La Follette, Tenn., secretary.

### Utah

#### JUAB COUNTY

*Gemini*—High-grade copper ore has been encountered recently in the winze sunk between the 1700-ft. and 1800-ft. levels. The ore is different in character than any ever found in the mine before. The Gemini is one of the oldest mines in the Tintic district.

*Swansea*—This property, which recently passed into the control of the Tintic Smelting Company, will be utilized prin-

cipally for the water it will provide for the operation of the new smelter.

#### PIUTE COUNTY

*Gold Mountain Consolidated*—This company now employs about 130 men in its mine and mill, the latter treating 100 tons per shift of eight hours. Recent developments in the mine have been of a most satisfactory character.

#### SALT LAKE COUNTY

*Ohio*—The stockholders of this company have voted to increase the capital stock from \$10,000,000 to \$15,000,000. Mr. Heinze, in a circular letter to the stockholders, says that \$653,579 have been expended up to date in the construction of the mill. He believes that the orebodies already developed warrant the increase of the milling capacity to 4000 tons per day.

*Utah Copper*—The January output amounted to 130,000 tons of ore which was treated in the company's two mills, one located at Copperton and the other at Garfield, from which 3,200,000 pounds of copper were smelted, making the largest single month's production in the history of the mine.

*Garfield Smelter*—Further enlargements will be required at the Garfield smelter on account of increased tonnage treated because of the shutdown of the other copper smelters near Salt Lake. The plant is now handling about 2500 tons of ore daily and within 90 days, so it is officially stated, it will be equipped for 3500 tons.

#### SUMMIT COUNTY

*Park City Shipments*—The shipments last week amounted to 398 tons. The Silver King shipped 195 tons; Daly Judge, 203 tons.

*Wabash*—This company has taken a lease and bond on the Star group, an adjoining property, for a consideration of \$100,000.

*New York Bonanza*—Late developments at this property are of a most encouraging character. A fairly good body of shipping ore has been encountered on the 600-ft. level.

*Ontario*—The water in No. 3 shaft is now 40 ft. below the 1100-ft. level and is subsiding at the rate of 4½ ft. per day. The four drill holes, put through to the adit from the parallel drift, are releasing the water at the rate of nearly 5000 gal. per minute. Apparently the last obstruction of any serious consequence has been passed. The adit was closed by caves nearly three years ago, since which time the company has labored diligently and at great expense to reopen it.

### West Virginia

#### MINGO COUNTY

*Lawson Coal and Coke Company*—This company has been organized to develop a tract of 3000 acres of coal lands which it

has acquired near Williamson. Harry Lawson, of Williamson, is president.

#### TAYLOR COUNTY

*McGraw Coal Company*—The fire in this company's New York mine, at Simpson, is reported to be under control. It will take some time to ascertain the extent of the damage done.

### Canada

#### ONTARIO—COBALT DISTRICT

*Ore Shipments*—Shipments of ore for the week ending Feb. 1 were: Buffalo, 110,750 lb.; Cobalt Lake, 50,890; Foster, 68,600; La Rose, 40,000; Nipissing, 59,290; O'Brien, 286,370; Silver Leaf, 62,000; Temiskaming & Hudson Bay, 66,000; total, 743,900 pounds.

*Buffalo*—The capacity of the concentrator is being doubled by the addition of new machinery. The mine has a large amount of ore sacked for shipment. Upwards of 4000 ft. of underground work has been done.

*Coniagas*—About 3000 ft. of development work has been done at the 75-ft. level from No. 1 shaft. No. 2 shaft, on the top of the hill, is down 75 ft. from the 75-ft. level and has been connected with the surface by an upraise, making a gross depth of 150 ft., at which point extensive drifting and crosscutting will be done. The concentrating mill is treating 60 tons of ore daily and is giving good results.

*Cobalt Lake*—The report of Supt. E. L. Fraleck states that a new calcite vein has been struck in the crosscut parallel to and 18 ft. south of No. 4 vein. The north shaft has been timbered and a drift run 8 ft. to the west. No. 4 shaft is down 164 ft. and a station has been cut at the 154-ft. level. The north crosscut has been run 200 ft. from No. 4 drift. The south crosscut of No. 5 shaft is in 117 ft. and the north crosscut 177 ft. During January about 15 tons of ore were taken from vein No. 3.

*Gillies Limit*—A shipment of ore will be made immediately on the completion of the Kerr lake branch of the Temiskaming & Northern Ontario Railway. The Ontario Government, which operates the mine, is desirous that the smelting should be done in the Province and is negotiating with the Deloro smelter at Marmora to treat the ore.

*Red Rock*—Native silver was recently struck in a cobalt vein from 3 to 6 in. wide on the 100-ft. level about 120 ft. from the main shaft. This is the best showing so far found on the property.

*Silbert Mining Company*—At the annual shareholders' meeting, held in Toronto recently, the president's report showed that of the \$2,000,000 capitalization, one-half remained in the treasury. The property includes the old Silver City and Albert claims in the Clear lake district.

*Nipissing*—This company intends to erect a concentrating mill at a cost of \$75,000.

*O'Brien*—A large vein, consisting of 20 in. of rich ore with about 2 ft. of milling ore has been found while crosscutting from No. 6 shaft at the 100-ft. level.

#### ONTARIO—VERMILLION LAKE DISTRICT

*Northern Pyrites Company*—A fire in the engine room on Feb. 1 occasioned \$4,000 damage which was not covered by insurance.

#### NOVA SCOTIA

*Dominion Coal Company*—The output for Jan., 1907, was 314,322 tons, as against 269,090 tons for Jan., 1907.

*Dominion Iron and Steel Company*—The output for Jan., 1907, establishes a new record in every department. The following are the figures in tons: Coke, 40,608; pig iron, 29,320; ingots, 26,245; blooms, 23,594; rails, 18,182. On Jan. 31 the day's output of the open hearth furnaces was 1169 tons, the highest hitherto obtained.

### Mexico

#### CHIHUAHUA

*La Republica*—This company operating in the Ocampo district has declared its first dividend of 0.5 per cent. on its capital stock. The 10-stamp mill and concentrator are turning out high-grade silver concentrates, which are shipped to the smelters.

*Mexican Mines Corporation*—This company has acquired the Ventura mine, at Almoloya, within a half-mile of the Cigarrera. A double-compartment shaft is down 230 ft. and more than 500 ft. of crosscuts have been made. So far no workable bodies of ore have been cut, but three vertical fissures have been found carrying streaks of gold-silver-copper ore.

*Parral Consolidated Mines Company*—The Prieta mine belonging to this company is waiting for pumps. All the surface equipment has been repaired and improved for an increased production. The shaft has been wired for electric lights and signals and the gallows frame has been raised 15 ft. The mine is dry above the 200-ft. level, and shipping may begin before the pumps arrive.

*Palmillo*—Frank C. Morehouse, the general manager, reports that a considerable portion of the shaft has been retimbered. A force is sinking the shaft below the sixth level. The bottom level has been connected with the north ore shoot, as well as the main shaft in the south ore shoot. From 20 to 30 tons of high-grade ore is shipped daily, ranging in value from \$200 to \$900 per ton. The property has been operated by the syndicate which leased the mine from Pedro Alvarado, but preparations are reported to be in progress to turn the lease over to a new company.

#### NACOZARI, SONORA

*Caridad*—This property on which the Guggenheims failed to take up their option has been made the base of a consolidation, including the Texas and Antigua properties in the Tabatacachi district and six more claims in that section. H. E. Crawford, of Los Angeles and New York, is now conducting the examinations for Major Whelan and associates, of Los Angeles.

*Dawson Mining Company*—This company was incorporated in Moctezuma by H. L. Roper and associates, of El Paso, Tex., to take over the La Mexicana mine. Plans are now being drawn up to install a 50-ton mill.

*Moctezuma Copper Company*—About 20 of the new 30-ton Ingoldsby side-dump cars for the high line have been received, and it is expected that the first unit of the new concentrator will be making concentrates on or about April 1. The new 1700-h.p. power plant is nearing completion. The new mill of this company, will have a maximum capacity of 2000 tons of ore per day.

*Belen Mining Company*—The property of this company west of Cumpas is sending out regular shipments to the El Paso smelter.

*Los Angeles*—This mine, lately taken over by C. B. Bell and Frank Douglas, has resumed shipments of ore taken out in development work. The property was closed down at the time of the slump in copper, and work was at a standstill until about a month ago. The ore carries silver and copper.

*El Globo*—An early resumption of work on the 1500-ft. adit is anticipated.

*Monte Cristo*—One car of ore is at Nacozari in transit from this mine of Carlos C. Soto. The ore is of a high grade.

*Mesa Rico Gold Mining Company*—This company operating below Sahuaripa reports five stamps now dropping on \$20-rock and five more stamps being placed in operation. A cyanide plant of 50 tons daily capacity is being installed. A. S. Tanner is superintendent.

*Creston de Oro, Rincon and Tres Amigos*—This group has been taken over by Mildon & Russell, of Nacozari, for Eastern capitalists, and development work will be instituted immediately. These properties have produced considerable high-grade ore in the past under the Mexican leasing system, but no systematic development work has been done.

*Credo Liberal Mining Company*—This company operating in the Tabatacachi district reports one car of silver-lead ore in transit and another at the smelter for January. The Tabatacachi and Alisus companies are also regular shippers from this section.

*Greene-Cananea*—According to information received at the company's offices in

Mexico City, the plant will be in full operation by April 15. The properties at Cananea have been thoroughly overhauled and the improvements introduced are expected to effect a saving in costs of 25 per cent.

*Indiana-Sonora*—This property controlled by Phelps, Dodge & Co., is said to have developed a large body of ore assaying well in copper. The company is capitalized for \$5,000,000, divided into 500,000 shares, of which 370,000 have been issued.

### Australia

#### WESTERN AUSTRALIA

Gold production in January is reported at 154,455 oz. fine in 1907, and 149,819 oz., or \$3,096,759, in 1908; a decrease of 4636 oz. this year.

### Europe

#### AUSTRIA-HUNGARY

Coal production for the year 1907 is reported as below, in metric tons:

	Coal.	Brown Coal.	Total.
Coal mined.....	13,828,438	26,048,073	39,876,511
Coke made.....	1,844,872	31,897	1,876,769
Briquets made.....	137,065	159,370	296,435

The total coal production showed an increase of about 2,200,000 tons over 1906, and 4,600,000 tons over that of 1905. The gain was chiefly in brown coal, or lignite.

### Philippine Islands

#### BAGUIO

*Bua Mining Company*—This company has started operations and has its 10-stamp mill and cyanide plant fully at work.

#### LUBANG

Three gold mines are now being opened in the Lubang district by M. Hann, and by Hern & Gilbert. The developments so far are reported to be satisfactory.

#### MARIVELES

Two large quarries are being operated by the Atlantic, Gulf & Pacific Company. About 1500 men are employed. The quarries are on Hombre mountain, near Sasi-man bay, which is the shipping point.

#### MINDANAO

A good deal of prospecting is being done in the neighborhood of Surigao, and some placer fields have been discovered.

The Mines Division has one exploration party at work in Mindanao, composed of M. Goodman, Warren D. Smith and H. M. Ickis, with their assistants. The party is now working its way across the island from Davao to Surigao.

# Metal, Mineral, Coal and Stock Markets

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

## QUOTATIONS FROM IMPORTANT CENTERS

### Coal Trade Review

New York, Feb. 19—No changes of importance are reported in the coal trade in the West. In some quarters a slight improvement may be noted, but in many districts mines are reported on short time. Demand for steam coal does not improve. Some manufacturers are storing coal in anticipation of trouble in the spring, but this movement is not extensive.

In the East bituminous-coal trade is dull. Steam coal continues in light demand, and manufacturers are buying little. Many of the mines supplying the seaboard markets are on short time.

The anthracite trade is dull also. The weather has not been cold enough to stimulate domestic demand. Steam coal is dull. The anthracite companies are putting many collieries on short time.

The coastwise trade is almost at a standstill, and no improvement is yet in sight.

#### COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania Railroad lines east of Pittsburg and Erie, year to Feb. 8, in short tons:

	1907.	1908.	Changes
Anthracite.....	566,356	546,046	D. 20,310
Bituminous.....	4,126,179	3,275,980	D. 850,199
Coke.....	1,488,540	725,922	D. 762,618
Total.....	6,181,075	4,547,948	D. 1,633,127

Average daily tonnage, 154,527 in 1907, and 116,114 this year.

Receipts of coal at Boston in January, reported by Chamber of Commerce:

	1907.	1908.	Changes.
Anthracite.....	172,843	141,579	D. 31,264
Bituminous.....	208,885	244,016	I. 35,131
Total domestic....	381,728	385,595	I. 3,867
Foreign.....	44,100	45,702	I. 1,602
Total.....	425,828	431,297	I. 5,469

Foreign coal is chiefly from Nova Scotia, though a little comes from Great Britain.

Shipments of anthracite coal by companies for the month of January, in long tons:

	1907.		1908.	
	Tons.	Per Ct.	Tons.	Per Ct.
Reading.....	1,070,898	20.4	1,099,480	19.6
Lehigh Valley....	883,360	16.8	1,011,436	18.0
N. J. Central.....	633,357	12.1	722,965	12.9
Lackawanna.....	862,500	16.4	842,953	15.0
Del. & Hudson....	526,020	10.0	569,129	10.1
Pennsylvania....	507,607	9.7	514,820	9.2
Erie.....	532,500	10.1	611,032	10.8
N. Y., Ont. & W....	233,704	4.5	246,524	4.4
Total.....	5,249,946	100.0	5,618,339	100.0

Increase in total, as noted last week, 368,393 tons, or 7 per cent. Only one company reported a decrease.

Coal tonnage, Chesapeake & Ohio Rail-

way, six months of fiscal year July 1-Dec. 31, short tons:

	Coal.	Coke.	Total.
New River.....	3,055,971	119,070	3,175,041
Kanawha.....	2,775,057	55,793	2,830,850
Kentucky.....	160,484	.....	160,484
Connecting lines.....	59,021	46,271	105,292
Total.....	6,050,533	221,134	6,271,667
Total, 1906.....	4,766,324	196,306	4,962,630

Deliveries, 1907: Points west of mines, 3,101,513 tons coal and 112,710 coke; points east, 921,737 tons coal and 62,153 coke; tidewater, 1,968,262 tons coal.

### New York

#### ANTHRACITE

Feb. 19—The hard-coal market is fairly active for small steam sizes, which are not at present in over supply. Prepared sizes are plentiful and in light demand. In order to furnish small sizes the mines have had to produce more prepared coal than the market would stand, hence most companies have considerable of these sizes on hand. The mines are operating on a short schedule, working only four days a week, and this will probably continue until conditions change materially. A few dealers are selling below circular prices, but the larger companies are holding rigidly to the regular schedule. In most cases where prices have been cut it was due to the fact that the company so doing had small storage facilities and was forced to get rid of its coal as soon as possible. Prices are as follows: Broken, \$4.75; egg, stove and chestnut, \$5; pea, \$3.25@3.50; buckwheat No. 1, \$2.75@3; buckwheat No. 2 or rice, \$2.15@2.25; barley, \$1.75; all f.o.b. New York harbor.

#### BITUMINOUS

There is no change in the soft-coal market from last week. Dullness prevails throughout the Atlantic seaboard and the demand for steam coal is very light. In New York harbor good grades of steam coal bring \$2.45@2.65, and the surplus, which has heretofore been lying at the various shipping ports, seems to have been worked off. Contracts are not being made and it is doubtful if many will be signed before the through rates on freight are announced by the railroads; when this will be done is problematical.

Trade in the far East is practically at a standstill. Along the Sound the trade is slightly improved and some inquiries have come in from this territory. Transportation from mines to tide is slow; car supply is far above all requirements.

In the coastwise trade, vessel-owners

are begging for business and one case was reported where a 1600-ton schooner was glad to charter for only 500 tons. Freight rates are practically in the hands of the shipper and are quoted nominally at 65@70c. per ton to Boston and equivalent points.

### Birmingham

Feb. 17—Resumption of operations at several of the coal mines in Alabama during the past week was a feature of the mining industry in this section. There is a better demand for the product and it is now believed that there will be steady operation for many months to come.

The report of the State mine inspector as to the output in Alabama for the year 1907, practically official, shows 14,323,748 tons of coal mined, against 12,851,775 tons in 1906. There may be a few thousand more tons added to the figures in hand already when the report is sent to the printers.

### Chicago

Feb. 17—Cold weather exists in Chicago territory with the result that the coal trade is stronger than it has been for weeks. City and country demand is good for domestic coals. Steam coals do not yet feel the quickening touch of business revival.

Dealers do not yet see a good market for the rest of the winter, in view of the large production at the mines. They assert that large consignments to Chicago will follow any temporary prosperity and result in disaster.

Illinois and Indiana coals are quiet to strong, lump and egg bring \$1.90@2.35, run-of-mine \$1.50@1.70 and screenings \$1.30@1.50.

Eastern coals are fairly steady, due to restriction of shipments. Hocking is \$3@3.15; smokeless is \$3.20@3.40 for run-of-mine; Youghiogheny sells lightly at \$3.15 for ¾-in. lump; Pittsburg No. 8 finds a steady market though light, at \$2.80 for ¾-in. lump.

Anthracite is firmer because of weather conditions. The taking of a certain amount of stove and egg being required by agents, the large sizes are in over-supply and nut is still scarce.

### Cleveland

Feb. 18—The local coal market has received a sharp setback this week in the shape of the reduction of the West Virginia coal rate to Cleveland from

\$1.15 to \$1.05 per ton. This change has been in effect since Jan. 1, but shippers did not take advantage of it until last week, with the result that there is now a large overplus in local yards of West Virginia slack and mine-run, the former selling at \$1.65 against the Ohio slack at \$1.70@1.75. No. 8 district Ohio mine-run is quoted this week at 90@95c., at mine, and 3/4-in. \$1.00@1.05 at mine.

It would seem that manufactories are running at least 40 per cent. below last year: dealers report that comparative difference in their sales.

### Pittsburg

Feb. 18—Demand for coal continues strong compared with the business since the opening of the year. Prices are firm at \$1.20 for mine-run coal at mine and slack cannot be had at less than 85c. The railroad mines are running to about 60 per cent. of capacity and all of the river mines are in operation. A flood stage of the rivers was reached on Feb. 16 and when the waters began to recede yesterday it left what is known as a "coal boat" stage. This will let out all the heavy tows which go through to New Orleans. A coal boat holds 25,000 bu. and requires over 10 ft. while barges with a capacity of about 12,000 bu. go out on 7 to 8 ft. The Monongahela River Consolidated Coal and Coke Company had about 3,400,000 bu. of coal hitched up in tows which were started today for the lower river ports. Independent companies had about 1,500,000 bu. making the total shipment fully 5,000,000 bu. The bulk of this is destined for St. Louis and New Orleans.

*Connellsville Coke*—There is no material change in coke conditions. Prices continue low, spot furnace coke being quoted at \$1.60@1.75 and on contract \$1.85@1.90. Foundry coke remains at \$2.35@2.50 on both spot and contract. But little new business is being placed. The *Courier* in its weekly summary gives the production at 185,375 tons. The shipments amounted to 6229 cars distributed as follows: To Pittsburg, 3000 cars; to points west of Connellsville, 2788 cars; to points east of Connellsville, 441 cars.

## Iron Trade Review

*New York, Feb. 19*—Little change is to be reported in any branch of the trade. In pig iron small orders from foundries are the rule, and there is little business being done, except with the pipe foundries, which are fairly busy. There are reports of cutting on Southern iron, but makers claim that they are holding prices, and that the cheap iron is from second hands which are overloaded.

In finished material the only approach to activity is in structural steel. A few contracts for buildings and bridge work have come forward, and more are said to

be under negotiation. In most of these the price question is a factor of importance and may cause delay.

Some railroads are following the example of the Pennsylvania and putting in orders for rails; but the majority of them are still holding back.

The maintenance of ore prices for the coming season was briefly referred to last week. No ore sales of any size are reported, and buying will be unusually late, as many furnaces have stocks enough to carry them for a time.

### Birmingham

Feb. 17—While the Southern pig-iron market is spoken of as being satisfactory, it is not denied that there is plenty of room for improvement. Because of a little improvement in the demand it has been necessary to blow in a furnace or two. The Sloss-Sheffield company will tomorrow start furnace No. 4 at North Birmingham, which has been out of blast for several weeks. One of the smaller iron companies in the Southern territory is reported to have sold up its probable make for the first half of the year. Two other small companies have sold up their probable make for the first quarter of the year and are selling on the second quarter. The business being transacted in this section is all in small lots. Notwithstanding statements to the contrary, iron prices are still announced from the offices of iron companies in this section at \$13.50 per ton, No. 2 foundry. A report that Southern iron could be obtained at \$12.50 and even lower cannot be verified here, all makers asserting that the regular price is \$13.50 per ton, No. 2 foundry.

The scrap-iron and pig-iron committees of the United States Steel Corporation held a meeting in the Birmingham district the past week, and one of the incidents of the meeting was a personal inspection of the various plants of the Tennessee Coal, Iron and Railroad Company.

### Chicago

Feb. 17—Dullness continues in the pig-iron market. The increases of business are neither large nor enduring. Buying is in small quantities, barely enough to allow each purchasing interest to run for the time being. Even inquiries, which in volume and tone promised much, have subsided. The market is flat.

A "stand-pat" policy seems agreed on by selling interests against reductions below the prices that have been standard for the last two or three weeks. Southern No. 2 at \$13, Birmingham and Northern No. 2 at \$18. Southern, it is reported, has on a few sales brought only \$12.50. The purchaser is more intent on keeping down his individual requirements than on bearing the market.

Coke is very dull at \$5.25 for the best Connellsville.

### Cleveland

Feb. 18—The movement of iron ore from the docks is about 25 per cent. under that for the parallel time last year. The meeting of the Lake Superior ore interests at the Hollenden last week resulted in the agreement to continue the same prices for iron ore throughout 1908. Business, however, is exceptionally dull, and it is not expected that this agreement will result in stimulating sales for some time to come.

Pig-iron business is nearly dead and since foundry pig makers have decided to maintain the basis of \$17 Valley for No. 2, buyers have refrained from entering the market. The following prices are quoted for first-quarter delivery: Bessemer, \$18.50@18.90; No. 1 foundry, \$17.50@18.00; No. 2, \$17.25@17.50; No. 3, \$16.50@17.25; No. 2 Southern, \$17.35@18.35; Gray forge, \$16.75@17.25; Lake Superior charcoal, \$23.50@24 per ton.

### Philadelphia

Feb. 19—Activity in pig iron is at present confined to pipe iron and this is due to the lower prices which have been named. There are inquiries on the market today for several large lots, and the pig-iron people are confident of securing them. An unusual amount of pipe work is in sight from cities and towns, and the makers of pipe iron are greatly encouraged by this news and by the beginning of inquiries from several sources where business has not been looked for. The demand for forge iron is very dull. Foundry iron is inactive, although there is some business in sight which Southern foundry makers expect to capture. A readjustment of pig-iron prices will have to be made in the opinion of some of our makers. The undertone of the market is weak.

*Steel Billets*—There has been a better movement in billets and slabs in a small way.

*Bars*—The base price continues at 1.65c., and there is a demand for concessions from a few large buyers who are disposed to place orders if their terms will be accepted.

*Merchant Steel*—The past week has brought out quite a little business from a number of consumers, who are showing a disposition to cover requirements if the mill owners will make small concessions.

*Pipes and Tubes*—This branch of the industry is in a slumpy condition, and it is impossible to come across any signs of business.

*Plates*—The plate manufacturers of this territory have been looking forward for several weeks to business for bridge construction and car work. These hopes appear to be blasted for the present.

*Structural Material*—The news is particularly scant this week. Even orders for

construction of buildings in cities are slow coming along. There is sharp competition for whatever business is to be had, and a good deal of it is going to the independents.

**Steel Rails**—Our rail-makers figure up that the inquiries at present foot up close to 200,000 tons, but this includes certain requirement which may not be met for two or three months. Light rail orders are again coming along, but they run in lots of a few hundred tons.

**Scrap**—A further improvement in demand has developed and sales are quite encouraging, especially for heavy steel melting scrap. Railroad scrap is held 50c. a ton higher.

**Pittsburg**

Feb. 18—The only improvement this week seems to be in tin-plate, but there is no falling off in the demand for steel pipe and wire products. Some of the mills along the Monongahela and Allegheny rivers were forced to suspend operations Saturday night on account of the high water, but all are going again as usual today, running to about 50 per cent. of capacity. New business in tin-plate is not coming in as freely as was expected, but the American Sheet and Tin Plate Company is taking on enough orders to warrant the starting of more plants; the total number operating is 166 out of 242 tin-plate mills. The independents are running about 40 per cent. of their capacity. A meeting of the independent interests was held here during the week and it was decided to reaffirm prices. This is regarded as an evidence of a weakness in the market, as publicity is not usually given to prices when the market is strong. The placing of 55,000 tons of rails by the Pennsylvania did not have the effect on the rail market that was expected. In structural material some new business is in sight, but the awarding of contracts is evidently being delayed in the hope of better prices.

**Pig Iron**—Despite energetic efforts by the large producers it is impossible to maintain the prices agreed upon for the different grades of pig iron. Sales continue to be made of small lots at low prices. While bessemer iron is being held at \$18, Valley furnaces, it is known that one carload lot was sold at \$16.75 and another at \$16.85 at furnace. Basic is stronger and while established prices are not being observed, it has sold at a trifle higher than the \$1 differential producers were trying to maintain. Several lots sold during the week at \$15.90@16 and No. 2 foundry sold at \$15.50@16. Gray forge is not in demand, but is quoted at around \$15. All these prices are f.o.b. Valley furnaces.

**Steel**—While both bessemer and open-hearth billets are "officially" quoted at \$28, Pittsburg, there has been some shading lately and it would seem that the com-

bination to maintain the rate agreed upon is weakening. It is known that several lots of from 100 to 500 tons of bessemer billets have been sold during the past week at considerably less. Plates continue to be quoted at 1.70c., but it is reported that 1.60c. has been done on some small contracts. Merchant steel bars are still quoted at 1.60c. and so far nothing less has been done.

**Metal Market**

NEW YORK, Feb. 19.

**Gold and Silver Exports and Imports**

At all United States Ports in Jan. and year.

Metal.	Exports.	Imports.	Excess.
<b>Gold:</b>			
Jan. 1908..	\$ 444,200	\$10,880,460	Imp. \$10,436,260
" 1907..	2,450,072	3,270,505	" 820,433
Year 1908..	444,200	10,880,460	" 10,436,260
" 1907..	2,450,072	3,270,505	" 820,433
<b>Silver:</b>			
Jan. 1908..	4,148,844	3,468,716	Exp. \$680,128
" 1907..	4,766,965	3,657,041	" 1,109,924
Year 1908..	4,148,844	3,468,716	" 680,128
" 1907..	4,766,965	3,657,041	" 1,109,924

Exports of specie from the port of New York, week ended Feb. 15: Gold, \$36,500; silver, \$2,085,651, to London and the West Indies. Imports: Gold, \$114,687, chiefly from Panama; silver, \$32,184, from Central America and the West Indies.

**Silver Market**

SILVER AND STERLING EXCHANGE.

Feb.	Sterling Exchange.	Silver.		Feb.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
13	4.8610	57 1/4	26 1/2	17	4.8600	56 1/2	25 1/2
14	4.8580	57	26 3/8	18	4.8625	56 1/2	26 1/8
15	4.8585	55 1/2	25 1/2	19	4.8685	56 1/2	25 1/2

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

The total purchases of silver for the United States Mint in January were 2,800,000 oz. The highest price paid was 57.579c. on Jan. 8 and the lowest 54.612c. on Jan. 2; the average price paid for the month having been 55.986c. This is 0.308c. above the average New York price; but the mint prices include delivery at the designated point.

**Other Metals**

Feb.	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	13 @13 1/2	12 1/2 @13 1/2	59	29 1/4	3.70 @3.75	4.80 @4.85	4.65 @4.70
14	12 1/2 @13	12 1/2 @12 1/2	58 1/2	29	3.70 @3.75	4.80 @4.85	4.65 @4.70
15	12 1/2 @12 1/2	12 1/2 @12 1/2	.....	29 1/4	3.70 @3.75	4.80 @4.85	4.65 @4.70
17	12 1/2 @12 1/2	12 1/2 @12 1/2	57 1/2	29 1/4	3.70 @3.75	4.80 @4.85	4.65 @4.70
18	12 1/2 @12 1/2	12 1/4 @12 1/2	57	28 1/4	3.70 @3.75	4.80 @4.85	4.65 @4.70
19	12 1/2 @12 1/2	12 @12 1/2	56 1/2	28	3.70 @3.75	4.80 @4.85	4.65 @4.70

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

**Copper**—Prompted by the unfavorable outlook in the home market, sellers have been endeavoring to find an outlet for their product in Europe, and by lowering their prices almost indiscriminately were able to effect sales of exceptionally heavy quantities in the foreign markets. The situation is as unsettled as it has been at any time, and no one ventures to express an opinion as to the future. The close is weak at 12 1/4 @ 12 1/2 c. for lake, and 12 @ 12 1/4 c. for electrolytic. The average at which casting copper has been quoted during the week is 12 1/8 @ 12 3/8 c., but the close is heavy at 12c.

The standard market in London declined from day to day, following the lower quotations which were being established for refined sorts, and the close is cabled easy at £56 12s. 6d. for spot and £56 17s. 6d. for three months.

Refined and manufactured sorts are quoted: English tough, £53 @ 54; best selected, £60 @ 61; strong sheets, £63 @ 64.

Statistics for the first half of the month show an increase of 1500 tons.

The Osceola Consolidated Mining Company reports 14,134,753 lb. of copper produced in 1907: 11,080,210 lb. sold at average of 18.17c.; and 3,054,543 unsold Dec. 31, of which 858,342 lb. was sold up to Jan. 31, 1908. The quotational average for Lake copper in 1907 was 20.661c. per pound.

Exports of copper from New York and Philadelphia for the week were 4485 long tons. Our special correspondent gives exports from Baltimore for the week at 997 long tons.

**Copper Sheets and Wire**—The base price for sheets is 20c.; wire, 15 1/2 c. per pound.

**Tin**—The London market has been rather soft throughout the week and declined at the close to £126 12s. 6d. for spot and £125 10s. for three months. The three months' quotation has not for a long time been at a discount as compared with the spot market.

The domestic market closely followed in the wake of London, especially as large arrivals have done away with the premium which has been exacted for spot material. Business has been insignificant, and the quotation for tin ex-steamer now in port has at the close been made as low as 28c. per pound.

**Lead**—Production being heavily curtailed, the requirements of the trade are sufficient to take care of the current output, and the market is holding steady at 3.70 @ 3.75c. New York.

Under persistent liquidation, the London

market gradually declined to £14 for Spanish and £14 2s. 6d. for English lead.

**Spelter**—There has been a fair inquiry from galvanizers, which has taken care of such quantities as were offered for sale, and the market has held its own at 4.85@4.85c. New York and 4.65@4.70c. St. Louis.

Reports of a more favorable outlook for the consummation of a syndicate of European smelters, caused prices in Europe to advance to £22 for good ordinaries, but a quick re-action brought the market down at the close to £21 5s. for good ordinaries and £21 10s. for specials.

The Prime Western Spelter Company and the Mineral Point Zinc Company have discontinued their ore-buying agencies at Joplin, Missouri.

**Zinc Sheets**—The base price is \$7 per 100 lb.—less discount of 8 per cent.—f.o.b. cars at Lasalle and Peru. The freight rate to New York is 27.50c. per 100 lb.

**Antimony**—The market is very dull and slightly easier. Quotations are 9½@9¼c. for Cookson's; 8½@9c. for Hallett's; 8½@8¼c. for ordinary brands.

**Aluminum**—The current price for No. 1 ingots, in ton lots, is 33c. per lb. For rods and wire, No. 0000 to 10, base price is 38c. For sheets, No. 13 to 24, B. & S. gage, base price is 40c. Tubes, 1¼ to 3½ in., base 50c. Higher prices are charged for small lots.

**Cadmium**—The price is \$1.25 f.o.b. Cleveland in 100-lb. lots. A higher price is asked for smaller lots.

**Nickel**—For large lots, New York, the chief producer quotes 45@50c. per lb. according to size and terms of order. For small quantities, 50@65c., same delivery.

**Quicksilver**—New York quotations are \$45 per flask for lots of 100 flasks or over, and \$46 for smaller orders. San Francisco quotations are \$44.50@45.50 for domestic orders; for export nominal, at about \$1.50 lower. The London price is £8 5s. per flask, with £8 3s. 9d. quoted from second hands.

**Platinum**—Market conditions are unchanged and little business is being done. Quotations remain \$28 per troy ounce for hard platinum, \$25.50 for ordinary, and \$17 for scrap.

**Missouri Ore Market**

**Joplin, Mo., Feb. 15**—Zinc prices were chipped off in considerable chunks this week, the highest being \$39; the base price was \$35@37 per ton of 60 per cent. zinc, all grades averaging \$33.82. Lead, on the contrary, continues to strengthen, one offering of \$52 for next week's delivery being reported. The highest price for this week was \$51.50, medium grades selling from \$49@51, and all grades averaging \$50 per ton.

Purchasing agents concede that the bot-

tom level of zinc prices has been found, and some are expecting a stronger market next week. Should any smelter attempt to enlarge purchases that result will come true, but with the same demand there is little likelihood of an advancing market, on account of the large stock in the bins.

Following are the shipments of zinc and lead from the various camps of the district for the week ending Feb. 15:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	1,913,180	491,990	\$45,780
Joplin	2,063,470	258,070	43,593
Galena	738,880	45,980	14,079
Badger	605,680	50,000	12,757
Duenweg	463,600	56,190	9,541
Granby	610,000	12,000	6,800
Alba-Neck	361,110	.....	4,961
Spurgeon	351,850	17,640	4,609
Aurora	251,750	.....	3,636
Prosperity	152,970	29,720	3,419
Quapaw	138,710	5,370	2,482
Carthage	127,470	.....	2,421
Sarcozie	75,210	.....	1,278
Wentworth	43,440	.....	738
<b>Totals</b>	<b>7,797,320</b>	<b>966,960</b>	<b>\$156,094</b>

7 weeks	50,213,920	7,235,630	\$1,060,689
Zinc value, the week	\$131,897	7 weeks, \$	887,071
Lead value, the week	24,197	7 weeks,	173,618

Average ore prices in the Joplin market were, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1907.	1908.	Month.	1907.	1908.
January	45.84	35.56	January	83.58	46.88
February	47.11	.....	February	84.58	.....
March	48.66	.....	March	82.75	.....
April	48.24	.....	April	79.76	.....
May	45.98	.....	May	79.56	.....
June	44.82	.....	June	73.66	.....
July	45.79	.....	July	58.18	.....
August	43.22	.....	August	59.54	.....
September	40.11	.....	September	53.52	.....
October	39.83	.....	October	61.40	.....
November	35.19	.....	November	43.40	.....
December	30.87	.....	December	37.71	.....
<b>Year</b>	<b>43.68</b>	<b>.....</b>	<b>Year</b>	<b>68.90</b>	<b>.....</b>

**Wisconsin Ore Market**

**Platteville, Wis., Feb. 15**—The highest price paid for zinc ore during the week was \$39.50 per ton on a base price ranging from \$36@38 per ton of 60 per cent. zinc ore. A little lead ore is reported sold at \$22@22.50 per thousand for 80 per cent. lead.

Shipments for the week ended Feb. 15 were:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	428,100	.....	.....
Platteville	358,780	.....	.....
Galena	240,000	.....	.....
Hazel Green	149,200	.....	.....
Livingston	140,000	.....	.....
Harker	131,620	.....	.....
Benton	70,000	65,000	.....
<b>Total</b>	<b>1,517,700</b>	<b>65,000</b>	<b>.....</b>
<b>Year to Feb. 15</b>	<b>7,793,840</b>	<b>125,000</b>	<b>.....</b>

Other camps report no shipments for the week.

**Chemicals**

**New York, Feb. 19**—The general market continues quiet and only a small business for immediate demands is being done outside of regular contracts.

**Copper Sulphate**—The market is quiet and the spring activity has not yet set in. Prices remain unchanged at \$5.50 per 100 lb. for carloads and \$5.75 for smaller lots.

**Nitrate of Soda**—The market is firm and a fair amount of business is being done. Prices are, for 95 per cent., 2.42½c. for 1908 delivery; 2.40@2.45c. for 1909, and 2.40c. for 1901. The 96-per cent. grade sells 5c. per 100 lb. higher.

**Phosphate Rock**—According to J. M. Lang & Co., of Savannah, Ga., shipments of phosphate rock through the port of Savannah, in January, were as follows, in long tons: To Germany, 8999; to Great Britain, 2330; to Spain, 408; total, 11,737 long tons.

**Mining Stocks**

**New York, Feb. 19**—The general stock markets have shown through the week rather a depressed tone, and prices have declined, in some cases making a low record for the year. The trading was still chiefly professional, and the general public is not doing much in a speculative way. Without any special incident the bear party was largely in evidence.

On the curb market a downward tendency was also in evidence, with some stiffening at the close. The copper stocks showed some activity, Cumberland-Ely and Nevada Consolidated leading, Goldfield and Tonopah stocks were dull and rather depressed.

One sale of Homestake, of South Dakota, was reported, at \$72 per share. Standard Oil has declared a dividend of \$15, being \$5 more than in December, but the same as in March of last year.

**Boston**

**Feb. 18**—Continued disappointment in the metal market is clearly reflected in the share market. The day following Lincoln's birthday prices made a pretense at being strong, in sympathy with those in New York, but it was short-lived. Prices in the meantime have been on the decline, and there is little public interest now in the course of quotations.

Amalgamated went to \$45.50 today, a decline from \$49. Bingham has really been the feature in the market, breaking from \$5 to \$1.50 per share. Offerings were comparatively heavy on a market barren of orders. The direct cause is a plan which practically assesses stockholders \$12 per share. For this they will receive, so it is said, 4/3 shares of Heinze's Ohio Copper, equal to \$12, and a share of Eagle & Blue Bell, which is quoted around \$1 per share. Bingham has a bonded and floating debt of about \$1,800,000, besides 200,000 shares of stock, not all of which is issued.

The reduction of the Quincy quarterly dividend to \$1.50 had little effect on the stock, although it has declined \$5, to \$77. Osceola is off \$4.25 to \$76.75. This company's annual report, issued today, shows a surplus of but \$49,705 for 1907 after dividend payments. The company received an average of 18.17c. lb. for its copper and the cost was 12.44c.

Calumet & Hecla is off \$20, to \$620, and Calumet & Arizona over \$6, to \$100. Copper Range has fallen \$3.87½, to \$55.12½, and North Butte \$4.75, to \$40.12½.

Balaklala has been stricken from the Stock Exchange list and is now traded in on the curb. Here also standard stocks have shown general declines.

STOCK QUOTATIONS

NEW YORK Feb. 18		BOSTON Feb. 18	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine.....	¼	Adventure.....	.....
Am. Nev. M. & P. Co. ....	.....	Allouez.....	25½
Amalgamated.....	46	Arcadian.....	4
Anaconda.....	28½	Atlantic.....	9¼
Balaklala.....	2	Bingham.....	2
British Col. Cop.....	4¾	Boston Con.....	13½
Buffalo Cobalt.....	95	Calumet & Ariz.....	100
Butte & London.....	16½	Calumet & Hecla.....	.....
Butte Coalition.....	.....	Centennial.....	.....
Butte Cop. & Zinc.....	.....	Con. Mercur.....	37
Cobalt Contact.....	.....	Copper Range.....	56
Colonial Silver.....	.....	Daly-West.....	8¾
Cum. Ely Mining.....	7½	Franklin.....	7½
Davis Daly.....	37½	Greene-Can.....	7½
Dominion Cop.....	2½	Isle Royal.....	18½
Douglas Copper.....	5½	La Salle.....	13¾
El Rayo.....	1½	Mass.....	.....
Foster Cobalt.....	62	Michigan.....	9½
Furnace Creek.....	23	Mohawk.....	47¾
Giroux Mine.....	3½	Mont. C. & C. (new).....	1
Gold Hill.....	11	Nevada.....	.....
Granby, Nev.....	.....	North Butte.....	41
Greene Gold.....	1	Old Colony.....	.....
Greene G. & S.....	.....	Old Dominion.....	31½
Greenw'r & D. Val.....	75	Osceola.....	77
Guanajuato.....	2½	Parrot.....	13¾
Guggen. Exp.....	150	Phoenix.....	1
Hanaph.....	20	Quincy.....	78
McKinley Dar.....	13	Rhode Island.....	.....
Micmac.....	3½	Santa Fe.....	2
Mines Co. of Am.....	1¾	Shannon.....	10
Mitchell Mining.....	10	Superior.....	17
Mont. Sho. C. (New).....	2¾	Tamarack.....	.....
Nev. Utah M. & S.....	3½	Trinity.....	12¾
Newhouse M. & S.....	.....	Unlted Cop. com.....	6
Nipissing Mines.....	6¼	U. S. Oil.....	9¾
Old Hundred.....	1	U. S. Smg. & Ref.....	31½
Silver Queen.....	94	U.S.M. & Re. pd.....	28
Stewart.....	7	Utah Copper.....	33¼
Tennessee Cop'r.....	.....	Victoria.....	4
Union Copper New.....	1¾	Washington.....	.....
Utah Apex.....	4½	Winona.....	5¾
West Columbus.....	.....	Wolverine.....	119
		Wyandotte.....	.....

N. Y. INDUSTRIAL		
N. of Com.	High.	Low.
Am. Agri. Chem.....	.....	.....
Am. Smelt. & Ref.....	56½	.....
Am. Sm. & Ref. pf.....	90	.....
Bethlehem Steel.....	.....	.....
Colo. Fuel & Iron.....	17½	.....
Federal M. & S. pf.....	15	.....
Inter. Salt.....	37½	.....
National Lead.....	.....	.....
National Lead, pf.....	.....	.....
Pittsburg Coal.....	15¼	.....
Republic I. & S.....	66¾	.....
Republic I. & S. pf.....	39	.....
Sloss-Sheffield.....	483	.....
Standard Oil.....	.....	.....
Tenn. C. & I.....	.....	.....
U. S. Red. & Ref.....	4¾	.....
U. S. Steel.....	27¾	.....
U. S. Steel, pf.....	91¾	.....
Va. Car. Chem.....	.....	.....
Va. I. Coal & Coke.....	.....	.....

ST. LOUIS Feb. 15		
N. of Com.	High.	Low.
Adams.....	30	20
Am. Nettle.....	03	02
Center Cr'k.....	2.15	1.50
Cent. C. & C.....	66.00	63.00
Cent. C. & C. pd.....	76.00	74.00
Cent. Oil.....	100.00	90.00
Columbia.....	5.00	3.00
Con. Coal.....	23.00	20.00
Doe Run.....	130.00	120.00
Gra. Blmet.....	24	20
St. Joe.....	15.00	14.00

NEVADA STOCKS. Feb. 19. Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.	Name of Comp.	Clg.
<b>TONOPAH STOCKS</b>			
Belmont.....	1.37	Golden Sceptre.....	.....
Extension.....	1.25	Homestake King.....	.55
Golden Anchor.....	.06	Montgomery Mt.....	.11
Jim Butler.....	.41	Mont. Shoshone C.....	3.00
MacNamara.....	.32	Original Bullfrog.....	.05
Midway.....	.76	Tramp Cons.....	.24
Montana.....	1.85	<b>MANHAT'N STOCKS</b>	
North Star.....	.16	Manhattan Cons.....	.20
Tonopah & Cal.....	.....	Manhat'n Dexter.....	.09
Tono'h Mine of N.....	5.12½	Jumping Jack.....	.07
West End Con.....	.33	Stray Dog.....	.11
<b>GOLDFIELD STOCKS</b>			
Adams.....	07	Indian Camp.....	.06
Atlanta.....	31	<b>GREENW'R STOCKS</b>	
Blue Bell.....	.09	Furnace Creek.....	.....
Blue Bull.....	.18	Greenwater & D. V.....	.....
Booth.....	.24	Green'r Cop. M. & S.....	.....
Columbia Mt.....	.23	United Greenw'r.....	.....
Comb. Frac.....	.68	<b>MISCELLANEOUS</b>	
Cracker Jack.....	.10	Golden Boulder.....	.10
Dia'dfield B. C.....	.20	Hayseed.....	.30
Goldfield Belmont.....	.15	Lee Gold Grotto.....	.10
Goldfield Con.....	4.56½	Nevada Hills.....	3.00
Goldfield Dalsy.....	1.15	Nevada Smelting.....	1.12½
Goldfield Mining.....	.....	Pittsburgh S. Pk.....	1.30
Great Bend.....	.38	Round Mt. Sphinx.....	.22
Jumbo Extension.....	.42	<b>COLO. SPRINGS Feb.</b>	
Katherine.....	.07	Name of Comp.	Clg.
Kendall.....	.17	Acacia.....	8
Laguna.....	.....	Black Bell.....	.....
Lone Star.....	.10	C. C. Con.....	4¾
Lou Dillon.....	.....	Dante.....	8
May Queen.....	.09	Doctor Jack Pot.....	5½
Mohawk.....	.....	Elkton.....	54
Oro.....	.12	El Paso.....	31
Red Hill.....	.30	Findlay.....	35½
Red Top.....	.....	Gold Dollar.....	6½
Roanoke.....	.07	Gold Sovereign.....	4
Sandstorm.....	.34	Isabella.....	37
Silver Pick.....	.30	Index.....	.....
St. Ives.....	.43	Jennie Sample.....	.....
Triangle.....	.09	Jerry Johnson.....	.....
<b>BULLFROG STOCKS</b>			
Amethyst.....	.....	Mary McKinney.....	38
Bullfrog Daisy.....	.....	Pharmacist.....	4
Bullfrog Mining.....	.09	Portland.....	1.01½
Bullfrog Nat. B.....	.11	Un. Gold Mines.....	5¼
Gibraltar.....	.14	Vindicator.....	80
Gold Bar.....	.37	Work.....	17

New Dividends

Company.	Pay-able.	Rate.	Amt.
Amalgamated.....	Feb. 24	\$0.50	\$765,440
Am. Cement.....	Jan. 23	0.30	60,000
American Coal.....	Mar. 2	1.25	62,500
Cambria Steel.....	Feb. 15	0.75	450,000
Camp Bird, Ltd.....	Feb. 3	0.24	246,800
Doe Run.....	Feb. 15	0.50	29,531
Dolores, Ltd.....	Feb. 27	0.15	59,400
El Oro.....	Jan. 15	0.36	388,800
Fairmont Coal.....	Jan. 31	2.00	240,000
Georges Creek C. & I.....	Jan. 22	2.50	55,000
Hinds Consolidated.....	Feb. 27	0.02	100,000
Homestake.....	Feb. 25	0.50	109,200
Jeff. & C. C. & I., pd.....	Feb. 15	2.50	37,500
Jerry Johnson.....	Jan. 15	0.01	25,000
Mexico Con. M. & S.....	Mar. 10	0.25	60,000
Mines Co. of Am.....	Feb. 25	0.02	40,000
Montezuma M. & S.....	Jan. 10	0.04	40,000
N. Y. Hond. Rosario.....	Jan. 25	0.10	15,000
Portland.....	Jan. 15	0.04	120,000
Providence S. J.....	Feb. 1	5.00	30,000
Quincy.....	Mar. 23	1.50	165,000
Standard Oil.....	Mar. 14	15.00	14,560,000
Tenn. Copper Co.....	Feb. 15	1.25	218,750
Vindicator Con.....	Jan. 25	0.04	60,000

Assessments

Company.	Delinq.	Sale.	Amt.
Blue Bell, Cal.....	Feb. 15	Apr. 15	\$0.01
Buller-Liberal, Utah.....	Feb. 15	Mar. 6	0.01
East Tintic, Utah.....	Jan. 14	Feb. 9	0.01
Enterprise, Nev.....	Jan. 9	Feb. 17	0.05
Imlay, Nev.....	Jan. 24	Feb. 10	0.01
Ingot, Utah.....	Feb. 17	Mar. 7	0.01
Lucky Dutchman, Nev.....	Jan. 16	Feb. 8	0.01
Moduff, Utah.....	Jan. 3	Feb. 4	0.01
Nevada Superior, Nev.....	Jan. 24	Feb. 21	0.05
New Stockton, Utah.....	Feb. 26	Mar. 18	0.02½
Pacific Tin Mines, Alaska.....	Feb. 17	Mar. 23	0.02
Penn. Con., Cal.....	Jan. 13	Jan. 29	0.10
Posey Canyon, Utah.....	Jan. 7	Jan. 25	0.01
Spanish Ridge, Cal.....	Jan. 15	Feb. 5	0.02
Sunflower, Cal.....	Jan. 30	Mar. 30	0.05
Tetro, Utah.....	Feb. 21	Mar. 17	0.03
Wabash, Utah.....	Jan. 17	Feb. 8	0.12
West Tonopah, Nev.....	Jan. 16	Feb. 15	0.03
Wild Goose, Alaska.....	Feb. 1	Mar. 16	0.10
Zeibright, Cal.....	Jan. 6	Feb. 1	0.05

Monthly Average Prices of Metals  
AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January.....	68.673	55.678	31.769	25.738
February.....	68.835	.....	31.852	.....
March.....	67.519	.....	31.325	.....
April.....	65.462	.....	30.253	.....
May.....	65.981	.....	30.471	.....
June.....	67.090	.....	30.893	.....
July.....	68.144	.....	31.366	.....
August.....	68.745	.....	31.637	.....
September.....	67.792	.....	31.313	.....
October.....	62.435	.....	28.863	.....
November.....	58.677	.....	27.154	.....
December.....	54.565	.....	25.362	.....
Year.....	65.327	.....	30.188	.....

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

Month.	NEW YORK.				LONDON.	
	Electrolytic		Lake.		1907.	1908.
	1907.	1908.	1907.	1908.		
January.....	24.404	13.726	24.825	13.901	106.739	62.386
February.....	24.869	.....	25.236	.....	107.356	.....
March.....	25.065	.....	25.560	.....	106.594	.....
April.....	24.224	.....	25.260	.....	98.625	.....
May.....	24.048	.....	25.072	.....	102.375	.....
June.....	22.665	.....	24.140	.....	97.272	.....
July.....	21.130	.....	21.293	.....	95.016	.....
August.....	18.356	.....	19.255	.....	79.679	.....
September.....	15.565	.....	16.047	.....	68.375	.....
October.....	13.169	.....	13.551	.....	60.717	.....
November.....	13.391	.....	13.870	.....	61.226	.....
December.....	13.163	.....	13.393	.....	60.113	.....
Year.....	20.004	.....	20.661	.....	87.007	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1907.	1908.	Month.	1907.	1908.
January.....	41.548	27.380	July.....	41.091	.....
February.....	42.102	.....	August.....	37.667	.....
March.....	41.313	.....	September.....	36.089	.....
April.....	40.938	.....	October.....	32.620	.....
May.....	43.149	.....	November.....	30.833	.....
June.....	42.120	.....	December.....	27.926	.....
			Av. year.....	38.166	.....

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1907.	1908.	1907.	1908.
January.....	6.000	3.691	19.828	14.469
February.....	6.000	.....	19.531	.....
March.....	6.000	.....	19.703	.....
April.....	6.000	.....	19.975	.....
May.....	6.000	.....	19.688	.....
June.....	5.760	.....	20.188	.....
July.....	5.288	.....	20.350	.....
August.....	5.250	.....	19.063	.....
September.....	4.813	.....	19.775	.....
October.....	4.750	.....	18.531	.....
November.....	4.376	.....	17.281	.....
December.....	3.658	.....	14.500	.....
Year.....	5.325	.....	19.034	.....

New York, cents per pound. London, pounds sterling per long ton.