

The Engineering and Mining Journal

VOL. LXXXVI.

NEW YORK, OCTOBER 24, 1908.

NO. 17.

The Silver-Lead-Zinc Mines at Broken Hill

The Orebodies Are Large and Regular, but Mining Costs Are High Owing to Inefficient and Expensive Labor and Inadequate Supply

BY G. W. WILLIAMS*

The town and mines of Broken Hill are situated in the western part of New South Wales about 30 miles from the South Australia border. The town is connected by rail with Adelaide, the capital and chief port of South Australia, the distance being 330 miles. Discovered 22 years ago, the field has produced lead and silver bullion to the value of \$325,000,000, while more than \$60,000,000 has been paid in dividends. The lode is one of the largest and certainly the most consistent silver-lead lodes in the world. The metallurgical treatment, owing to the presence of zinc sulphide is of considerable com-

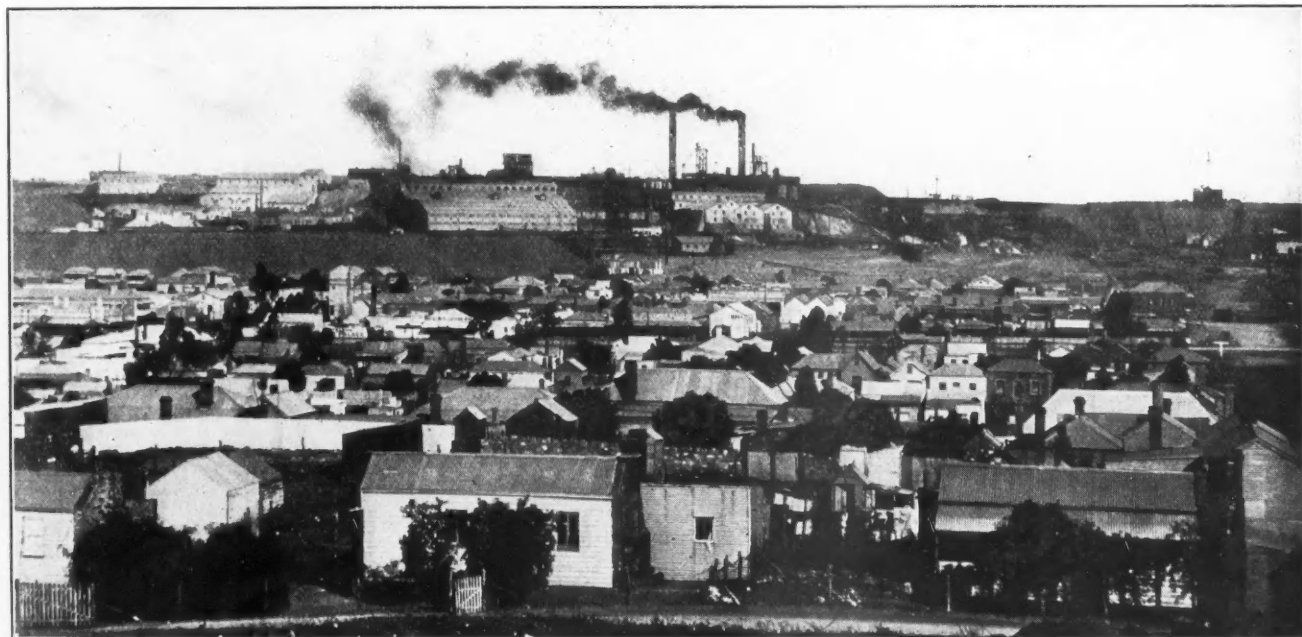
south to north the mines upon the deposit are as follows: South Blocks; South; Block 10; Proprietary, embracing blocks 11, 12 and 13 in the center of the line of lode; Block 14; British; Junction; Junction North, and, at the north end of the field, the North mine.

Generally speaking, the mines at the southern and northern ends of the field have a quartz-calcite gangue, while the more centrally situated mines have more or less garnet-sandstone and rhodonite in the gangue. An exception to this is the Junction North where the rhodonite runs about 40 per cent. The presence of these

chloride and iodide of silver have been found, the former in very large quantities, while native silver and copper were characteristic of the richer portions of the carbonate zone. At present only a small amount of carbonates remain and the mines are all treating sulphide ores.

EXTENT OF THE SULPHIDE ORES

Considering the age of the field, but little development in depth has been accomplished. The deepest shaft, situated on the Proprietary mine on the center of the line of lode, is down only 1400 ft. The Block 10, which adjoins to the south,



BROKEN HILL, NEW SOUTH WALES, AUSTRALIA

plexity, while the labor supply is certainly the worst in Australia. Until recently the zinc, which averages 15 per cent., was regarded as an impurity, but of late years several processes have been introduced, which promise to give the zinc in the ores an even greater value than the lead.

The Broken Hill or Barrier mines are situated on a line of lode that runs in a general north-northwest-south-southwest direction for about $2\frac{1}{4}$ miles. From

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minerals naturally enhances the difficulty of crushing and concentration.

The line of lode is continuous for $2\frac{1}{4}$ miles, but it varies considerably in width both laterally and vertically. The zone of carbonates extended down to about 250 ft. vertically, while from 250 to 400 ft. the ore was partially oxidized. Below this the solid sulphides come in and these have been proved down to 140 ft. All zinc has been leached out of the carbonate ores and these ores, which averaged 33 per cent. of lead and 20 to 30 oz. silver per ton, were smelted direct on the fields.

is down to 1200 ft.; the South mine has opened up the 970-ft. level while the North and Central mines are down about 1000 ft. The centrally situated mines attained their greatest width in the upper levels and the lode has narrowed considerably below the 600-ft. level. It is satisfactory to notice, however, that from that level down the orebody remains practically constant in width, averaging 55 ft. of clean ore.

The mines on the southern and northern ends of the field, which originally worked very small lodes in the carbonate

and sub-carbonate zones are all widening in depth. On the South mine in particular the orebody at the 425-ft. level was small in extent and averaged only 45 ft. in width. On the 750 level the length had more than doubled and the width increased to 150 ft. The 850 level averages 200 ft. in width of pay ore while on the 970 level the orebody, although somewhat irregular in width, is opening up remarkably well and promises to equal the 850 level in extent. The same is true, but on a smaller scale, of the British, the Junction North and North mines where every level is looking better than the one which preceded it.

The Proprietary attained its greatest width (300 ft.) in the carbonate zone, the immediately adjoining mines in the 500- to 600-ft. zones, while the northern and southern mines take the "bulge" at still greater depth. It is, therefore, reasonable to assume that, as in the centrally situated mines the "bulge" was succeeded by a uniform width of 55 ft., so the mines where the lowest level is now in the enlarged portion of the lodes will be succeeded by a uniform orebody in depth. At present none of these mines shows any signs of contraction in depth, but the lode at the 970 level in the South mine is certainly less regular in outline than it was on the 850 level.

It is much to be regretted that these mines have not been proved to greater depth. Kalgoorlie, six years younger than Broken Hill, is explored to 2300 ft. and the Rand, about the same age as the Barrier mines, to a depth of more than 4000 feet.

Despite the small depth to which the mines have been developed and the enormous tonnages extracted, the mine ore reserves are very large. The Proprietary and the South mines each show 3,500,000 tons, the Central has 3,000,000, while the other mines run from 500,000 to 1,000,000 tons each. All Broken Hill tonnages are based on the long (2240 lb.) ton and this ton will be used through this article.

Speaking generally, the ore assays 16 per cent. each of lead and of zinc, while the silver varies from 5 to 10 oz. per ton. The relative proportions of zinc and lead vary in the several mines. The ores tend to become harder in depth, for more rhodonite and garnet comes in on the lower levels, but the metallic contents remain unaltered except in the case of the silver which shows a slight increase in depth.

MINING PRACTICE

In the earlier days all mining was accomplished either by open cut from the surface or by square-setting. The open-cut method, although suitable for a mine such as the Proprietary, where the widest portion of the ore lies comparatively close to the surface, was inapplicable to the adjoining mines where the ore in the upper portions of the mine was of small width or even altogether too small to pay for ex-

traction. The open cut on the Proprietary extended to 270 ft. vertical depth. Expert timbermen were imported from America and square-setting was introduced at almost all the mines. The result was entirely disastrous. The vast stopes, often exceeding 250 ft. from wall to wall were worked out and in place of the ore there remained a skeleton of 10x10-in. Oregon-pine sets. These sets, while offering considerable resistance to direct pressure, crumpled up like a pack of cards when the pressure came diagonally. Diag-

used only in the extraction of crushed ore from stopes which suffered during the "creeps," for taking up the floor of the level from the stope below, and in the few carbonate stopes which remain. In every case the sets are filled with waste as the work proceeds.

The mines which suffered most severely from the creeps were the Central, the Block 10 and the South mines. The boundary line of the first two mines ran diagonally across the lode at a point where the orebody attained a width of several

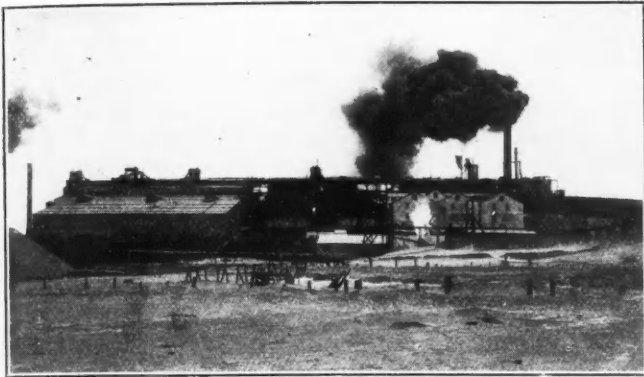


OPEN CUT, 270 FEET DEEP, BROKEN HILL PROPRIETARY MINE

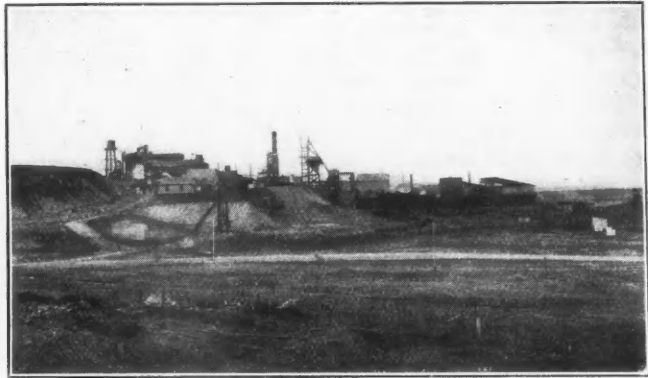
onal stays were practically useless. A series of "creeps," involving the loss of enormous tonnages of ore, the destruction of shafts and the complete wrecking of two large concentrating mills, together with some loss of life, brought home to the companies concerned the imperative need for some more secure method. Today forests of Oregon pine, crushed to match wood, are buried in the upper levels of the Barrier mines.

At the present time square-setting is

hundred feet. The Central mine stoped its ore on the "block" system. Under this system the main drive is carried in the footwall and at intervals of 50 ft. cross-cuts are put in through the orebody, thus dividing it into blocks 50 ft. wide and running from the foot to the hanging wall. The alternate blocks were stoped out with square sets. In the old days the sets were not filled with waste but were left as an open framework. The adjoining Block 10 and South mines were working "on their



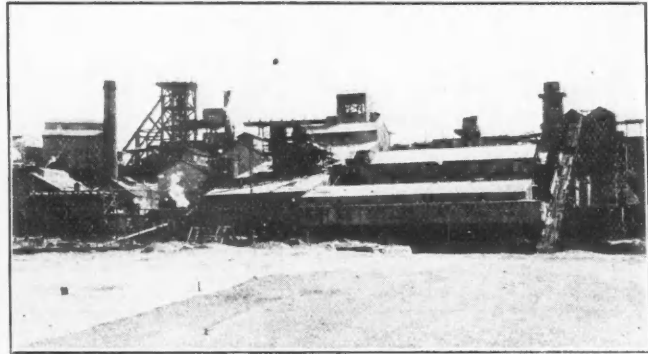
MILL, PROPRIETARY COMPANY



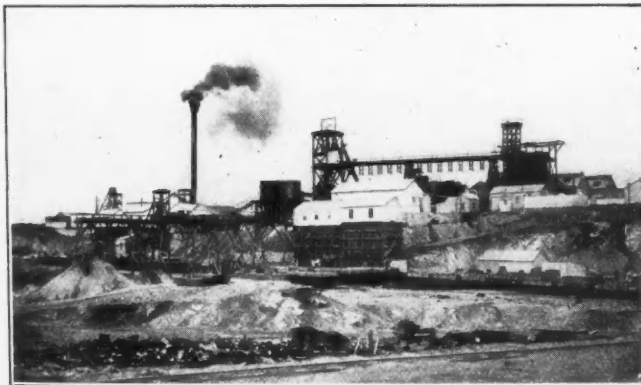
SOUTH MINE



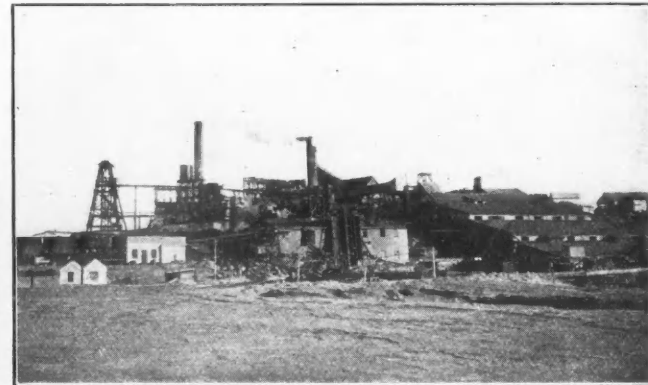
BROKEN HILL PROPRIETARY MINE



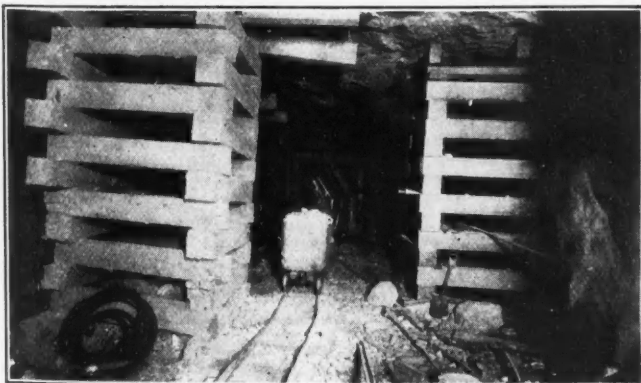
BLOCK 14 MINE



NORTH MINE



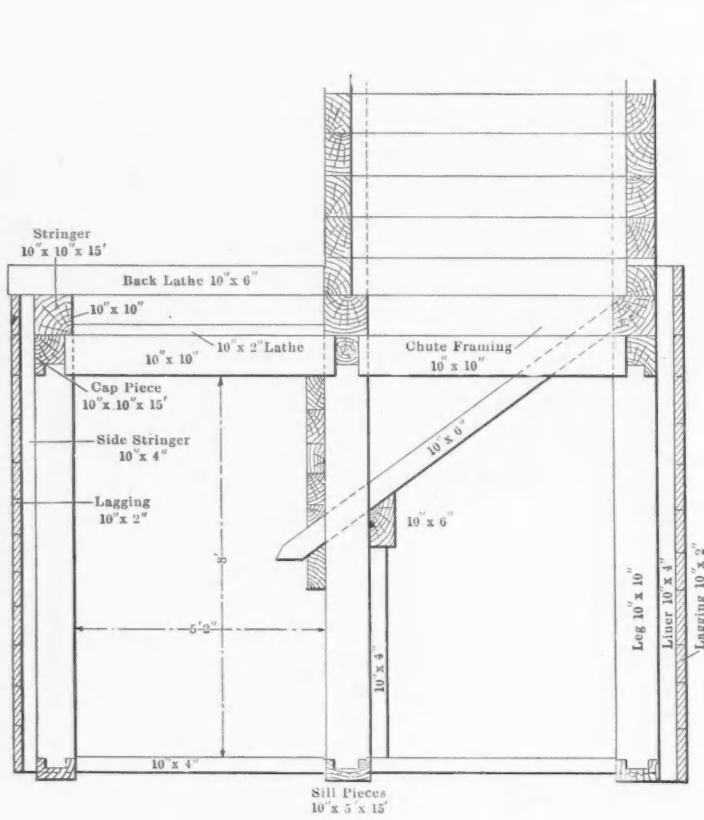
BRITISH MINE



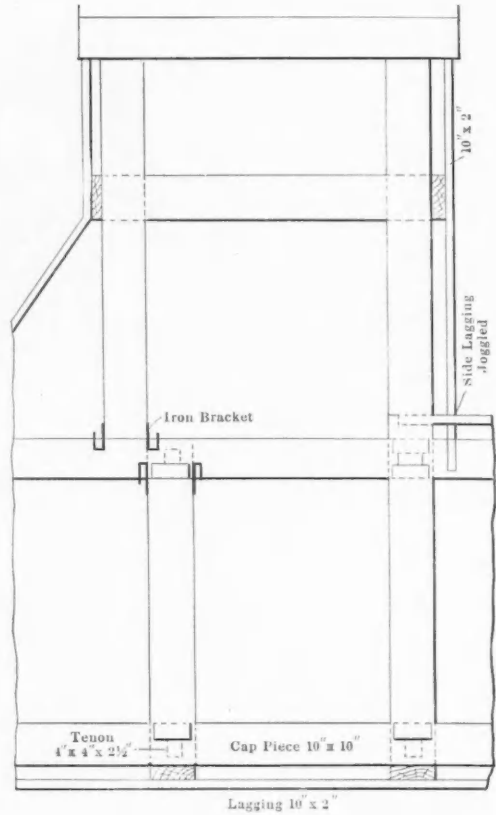
WIDENING OUT INTO THE LODE



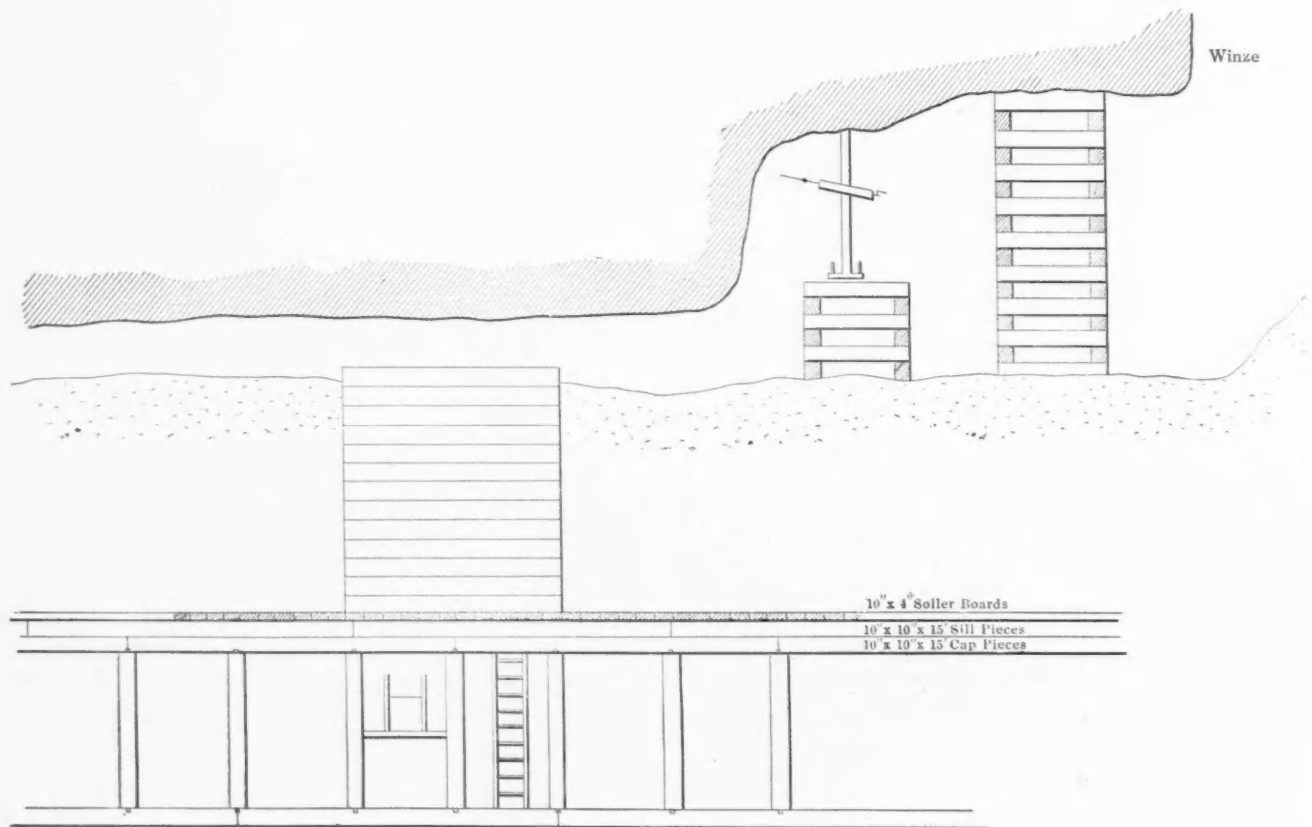
OPEN STOPE



SECTION THROUGH DRIFT AND ORE CHUTE



FRAMING REINFORCED BY METAL BRACKETS



METHOD OF WORKING "OPEN STOPE"

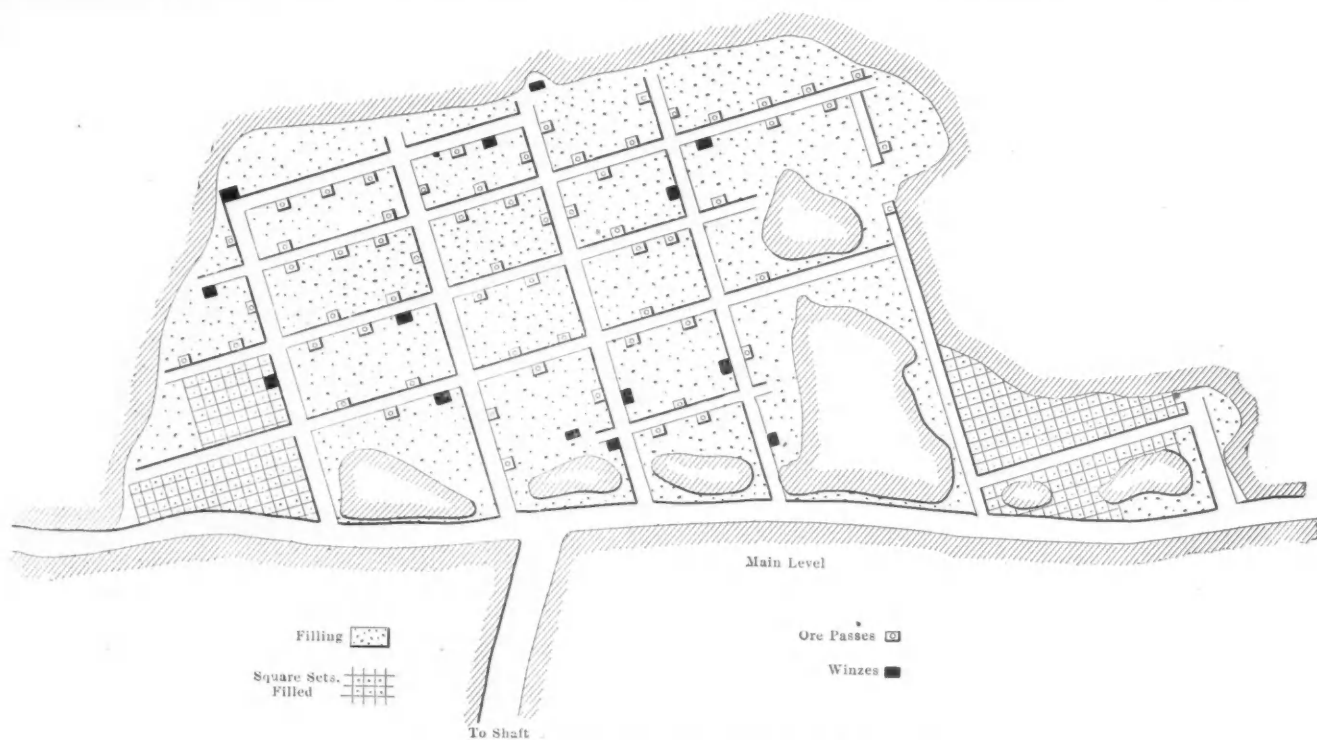
own" following out the ordinary square-setting practice.

The net result of this independent work was that a serious creep set in which caused the loss of some millions of dollars. A creep which had been much more serious but for the support given by the "pillars" in the Central which although unable to prevent "creep" certainly minimized its effect. At present these three mines are removing the crushed ore from the region of the creep by means of square sets followed by careful filling, but in other parts of the mine the square sets have been abandoned in favor of the open stope method. On the Central mine the block system is still in vogue but it is materially modified. The blocks are extracted without square-setting, the roof being supported on bulks while the waste is kept well up to the face. After the al-

soon as the drive and the crosscut are timbered, the whole of the sill floor is stoped out to either wall, the face of the stope being supported on bulkheads of Oregon timber. The latter are built up of 5-ft. lengths of 10x10-in. pieces.

The compact sulphide ores stand well and accidents from falling ground are very rare. When the whole of the sill floor is stoped out waste is run down from the waste passes above and spread over the floor. Prior to running in waste the floor is boarded over with 4-in. Oregon planks. This is done, of course, to enable the stope from the level below to come up safely against the filling. When the sill floor is filled with waste a fresh stope is started off from the winzes, and this is carried right out, the face being supported on bulks. As this stope works ahead the fillers follow on and keep the

siderable extent. In the South mine the lode not infrequently exceeds 200 ft. in width and the breast of the stope is carried from wall to wall. The footwall is usually more or less vertical, but the hanging wall varies in pitch according to whether the lode is increasing or decreasing in width. It seems almost as if the carrying of these wide stopes might involve considerable danger to the mine; 200 ft. is a very considerable swing for any stope, no matter how solid the ore may be. As the stope works upward to the level above, the bridge of solid ore remaining will, despite the filling in the stope which takes time to settle, have to sustain a tremendous thrust. The Broken Hill ores give a remarkably good face, but from their nature (they contain about 35 per cent. of lead and zinc sulphides) they are incapable of withstanding any great crush-



PORTION OF 725-FOOT LEVEL, SOUTH MINE, BROKEN HILL

ternate blocks are removed the pillars are removed in a similar manner, lagging being carried up to keep any loose waste in place. The method has little to recommend it and seems to involve some danger.

The bulk of the ore won in Broken Hill today is broken from stopes which are worked on what is locally called the "open stope" method. This method of stoping, which has proved both safe and economical in working is really an extension of the Kalgoorlie "flat back" system. The usual procedure is as follows: The main drive is carried along the approximate center line of the lode and crosscuts are put into the hanging and footwall at frequent intervals. Ore passes are placed along the main drive and in the crosscuts; the latter are necessary only when the width of the orebody exceeds 60 ft. As

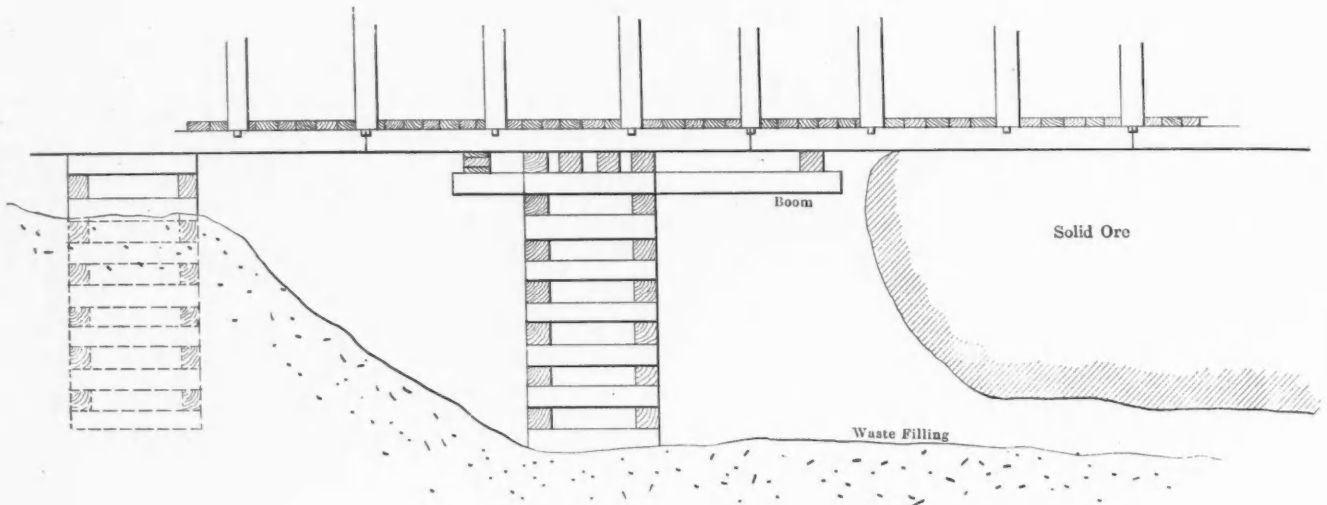
waste well up to the face; all bulkheads are removed as the filling is brought forward.

The method of taking up the floor of the level above the stope varies somewhat in different mines. In most cases when the back of the stope approaches within 20 ft. of the level, the ore is rilled away from the winzes, the filling being kept close up to the face. In other cases the last cut off the stope is square-setted, while in many mines the form of the stope remains unaltered, but from the bulkheads booms are shoved forward which catch up the floor of the stope or level above and hold it until another bulk can be erected. These bulks in the last cut of the stope are usually left in position as they have to carry the whole of the sill floor timbering.

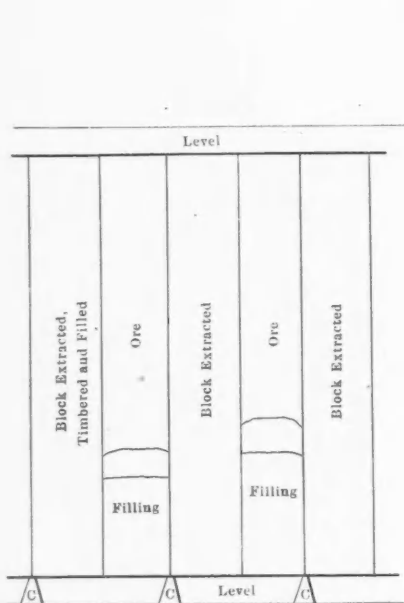
These open stopes are often of con-

ing strain, as was abundantly demonstrated during the big creep on the Central mine. It would seem that a safer method would be to carry up the wide orebodies in sections of about 50 or 60 ft., starting from the footwall side. When any section has been stoped up to the level above the next section could be attacked, side boards being used to hold back the waste. In this manner all danger of collapse of the bridge of ore under the level would be avoided. This method has not the disadvantages of the block system in which the ore is taken out in 50-ft. blocks across the lode. A sill floor may be carried the whole length of the section and all crosscutting for ore passes avoided.

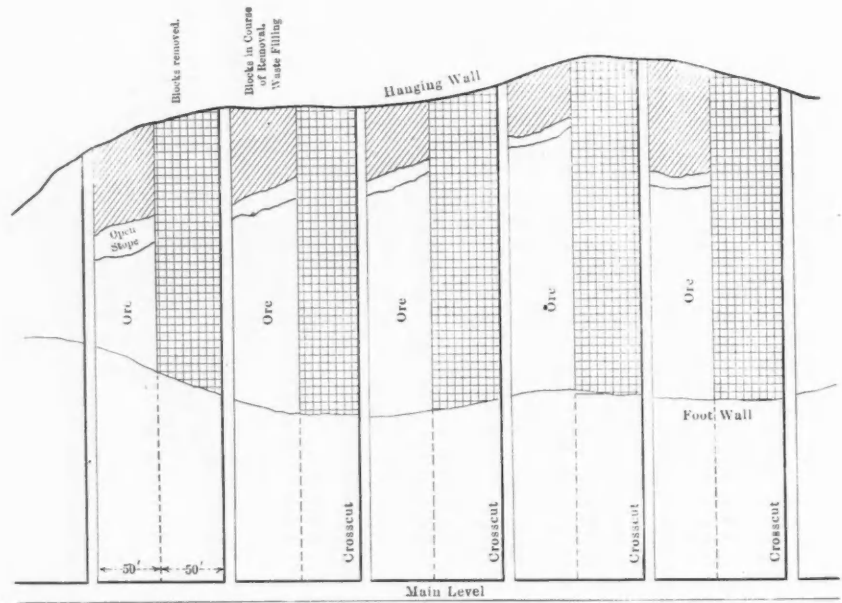
An indirect advantage lies in the fact that the stopes can be rilled and the cost



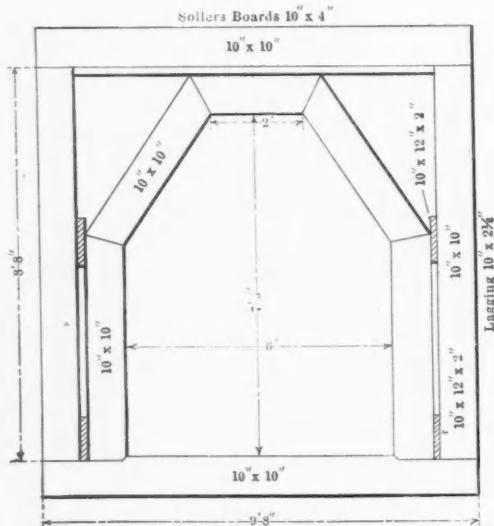
CATCHING UP FLOOR OF LEVEL WITH BULKHEADS AND BOOMS



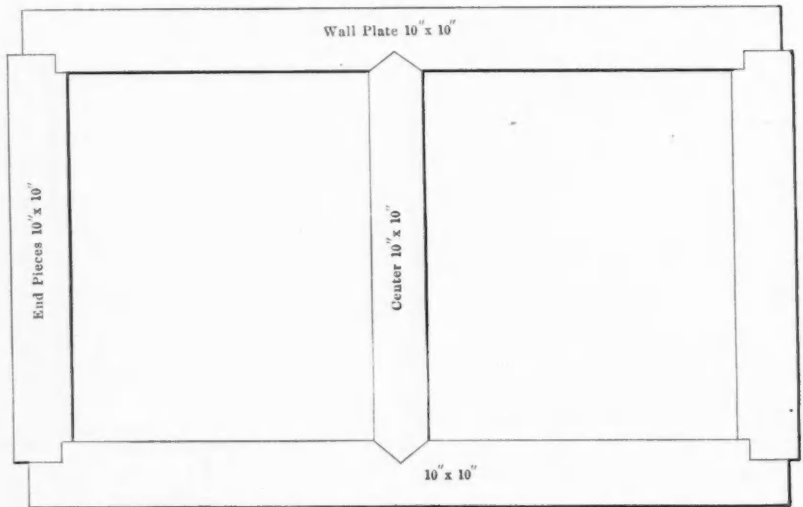
VERTICAL SECTIONS AT RIGHT ANGLES TO CROSSCUTS



IDEAL PLAN OF STOPES, BLOCK SYSTEM



MAIN LEVEL SETS, PROPRIETARY MINE



PLAN OF FRAMING CHUTE TIMBERS

of mucking thus reduced. The great disadvantage of the open-stope method in large stopes lies in the fact that all waste has to be trammed and shoveled from the pass to the face. This is no small item in a wide stope where costs of mucking run as high as 30c. per ton of ore. In regard to mucking the general practice is to carry the main pass in the footwall of the lode, and to tap this winze on each level by means of a short crosscut. From the chute the ore is trammed along the levels to the chutes leading to the stopes.

METHODS OF TIMBERING

There are in vogue three distinct methods of timbering the levels. The drive timber used in the British mine is shown in accompanying illustrations, which are from plans supplied by the manager, Mr. Sampson, who devised this method, which is generally in use, with

10x4-in. planks. The side slabs are not laid directly against the legs, but a 10x4-in. plank is interposed.

The side laggings are 10x2-in. planks set closely together. The object of the side liner is to enable any laggings broken by lateral pressure to be replaced without moving or interfering with the main legs. The ore-passes and ladder-ways each measure 5x5 ft. in the clear, and are constructed of 10x10-in. timber. When an ore-pass wears out the ladder-way is changed over and the ladder-way used as an ore-pass.

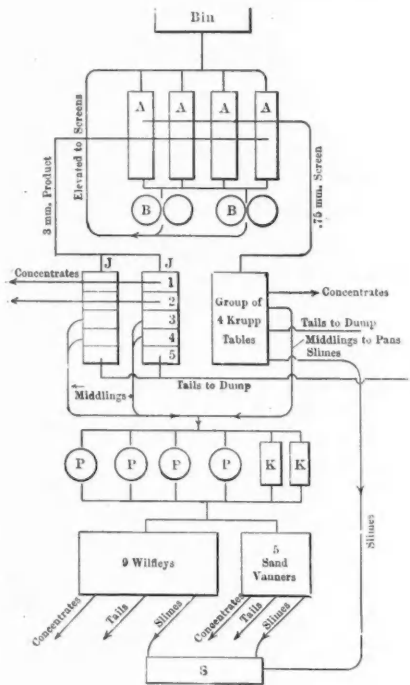
Some mines line the passes with 10x15-

the leading stope is taken off, and is then floored with 10x6-in. planks in the usual manner. The result is that a continuous pillar of ore is left on each side of the level, the pillars being removed as the stope from the level below comes up. The sets are plain 10x10-in. "clap-me-down" sets, i.e., the legs, sills and caps are not joggled or tenoned.

The removal of the pillars of ore alongside the level is accomplished not without difficulty. It is true that these pillars permit the use of a less solid type of drive timbering, but it seems not unlikely that the trouble is deferred, not overcome. As yet, none of these pillars has been removed as no stopes are yet worked up to the levels constructed in the manner described.

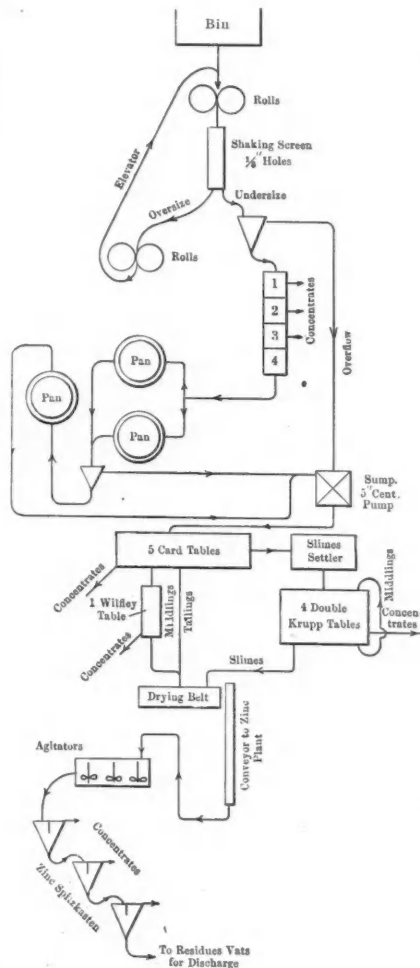
BREAKING THE ORE

Almost all the ore broken in these

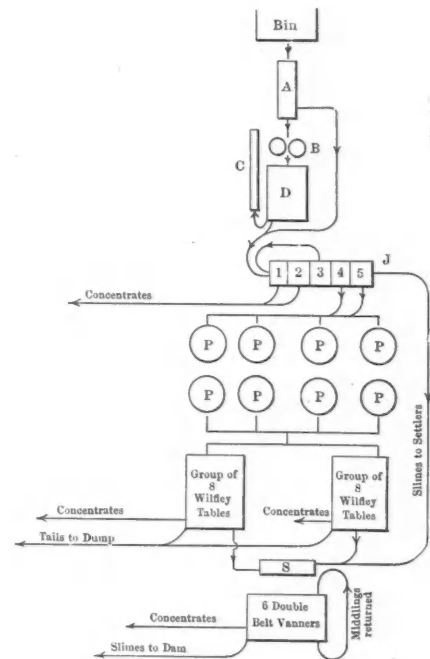


FLOW SHEET, CONCENTRATOR, JUNCTION NORTH SILVER MINE

A Three-deck oscillating screen. B Rolls. J Jigs. P Pans. K Krupp ball mills. S Slime settlers.



FLOW SHEET, MILL, CENTRAL MINE



FLOW SHEET, ONE OF FOUR UNITS, NEW MILL, BROKEN HILL SOUTH

A Shaking screen. B Rolls. C Raff wheel. J Jig. P Grinder pans. S Slime thickener.

slight individual modifications on the majority of the Broken Hill mines. The drive, which carries a double line for trucks is 5 ft. 2 in. wide by 8 ft. high within timbers. The sets are placed at intervals of 5 ft. between centers, and are composed of 10x10-in. Oregon timbers joggled into the cap pieces (10x10 in. x 15 ft.), which run along the length of the drive. The struts are 10x10 in. On top of the cap pieces are laid other pieces of timber equal sized, and across these rest the roofing slabs of 10x6-in. Oregon timber. The sets stand on 15-ft. sill pieces running along the drive and the level, and the whole sill floor is laid with

in. hardwood timber obtained from West Australia or Tasmania.

The Proprietary mine employs plain "clap-me-down" sets stiffened with an inner bridgework. On the Junction North mine the method of laying out the level is quite different from that on any other mine. The sill floor is not carried out from the floor of the level, but the level, which is carried in the center of the lode, is cut just wide enough to carry the sets arranged for three sets of trucks. Emp-ties go up the center and are filled from ore-passes placed at alternate sides of the level. The lode averages 60 ft. in width. The sill floor is laid down when

mines is mined on contract, and owing to the shortage and general inefficiency of the labor supply, the contract rates rule very high. For breaking and delivering to the ore chutes the price averages 92c. per ton. At this rate the contracting parties have averaged \$3.24 per shift for the past 12 months. Owing to the present drop in the price of lead and the consequent reduction of output, there is more labor available, and contract prices are falling somewhat. All contracts are paid for on the actual weight of ore delivered by each party at the pit mouth. Every truck as it leaves the cage is run over a weigh bridge, and the weight recorded

by an employee of the company and checked by a tally clerk appointed and paid by the men.

Each truck bears a tin label giving the number of the party of miners who have broken the ore. This method works admirably; no disputes are possible, for the men have their own representative present all the time. Moreover, the mine obtains an exact record of all ore raised. The ore drills somewhat hard, but it breaks well, and comparatively few holes will break a large tonnage. Exact figures as to the footage drilled per ton were not available. Neither underground nor on the surface do the Broken Hill mines keep costs with that care which is characteristic

Commonwealth there was a strong demand for men to open up new mines, or to reopen mines which only pay when lead and copper stand at a high price. The Barrier mines, normally employing from 7500 to 8000 men required fully 10,000 to cope with the demand for increased output, and as a result working costs increased by something like 40 per cent. A general increase in wages of 12.5 per cent. was granted, and this, together with the decreased efficiency due to the compulsory employment of anyone who called himself a miner, resulted in a surprising increase in the cost of mining and milling. At present mining costs vary between \$2.88 and \$3.24, or twice the

Tramming, like mining, is all on contract, the price paid averaging 14c. per ton (2240 lb.). The trucks generally in use have a capacity of about 16 cwt. of ore. The larger mine shafts are provided with cages taking two trucks on one floor. Cages are used in all mines.

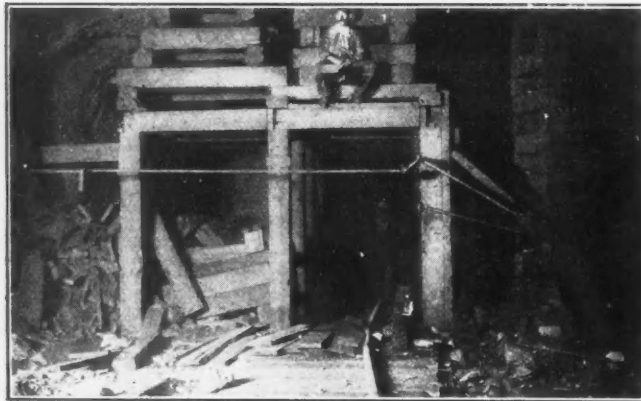
The shaft arrangements at the South mine deserve more than passing notice, for the arrangements at the various levels are singularly complete. The shaft is 12 ft. 10 in. by 9 ft. 6 in. within timbers. There are two compartments and the single-deck cages carry two trucks at a time. The shaft has a capacity of 10,000 tons per week. Signaling is by means of the return-bell electric system, and telephones,



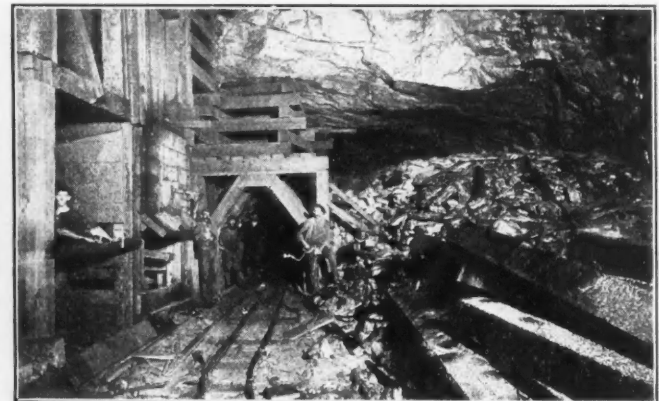
MUCKING



UNDERGROUND HAULAGE, PROPRIETARY MINE



CATCHING UP A STOPE



METHOD OF REINFORCING DRIFT TIMBERS, PROPRIETARY MINE

of the Kalgoorlie mines. It is difficult to obtain even the aggregate costs, while itemized costs for individual portions of the work are absolutely unobtainable.

Mining costs fluctuate considerably in inverse ratio to the demand for labor. Situated in the midst of an arid, treeless plain, the dirty, cheerless town has little to attract men to settle there permanently, so that when prices of metals rise and every mine is endeavoring to secure a maximum output, the demand for labor is out of all proportion to the supply, and as a natural consequence the costs go up rapidly. This was apparent during the recent boom in base metals. All over the

cost of mining in Kalgoorlie where, if the ore is not quite so hard, the smaller extent of the orebodies greatly diminishes the tonnage broken per foot drilled. Of the mining cost about 70 per cent. represents labor.

Underground mechanical transport of ore is unknown. The Proprietary did install electric traction, but it has been abandoned in favor of horses which are used in some numbers in that mine.

TRANSPORT AND HAULAGE OF BROKEN ORE

With the exception of the Proprietary mine, where horses are used on all main levels, all tramming is done by hand.

communicating with the central mine exchange, and thence to all parts of the mine and town exchange are placed at every level. The shaft chairs are actuated by levers which are in electrical connection with the engine house. At the side of the indicator cylinders are placed a row of little red lights, each light corresponding with the position of the levels on the cylinder. When any chair is thrown in gear the fact is signaled to the driver by the lighting up of one of these lamps. As the indicator pointer travels down the row of lamps it would require extraordinary carelessness on the part of the driver to overwind through the chairs. A small

pilot lamp between the two rows of lights indicates any accidental break in the circuit.

The plats in this mine are constructed in such a manner that the full trucks running upon the cage discharge the empties which, running down a ramp over self-closing points and then up an incline are returned to the main line of empty trucks without any handling. At each plat a large and well lighted store is provided, as well as a magazine. A storeman is in charge of these supply depots and he is responsible for the issue and return of all store and equipment. Every tool is numbered, so that each party of contractors is held strictly responsible for all tools lost or broken.

Spares for drills and a small fitter's bench are provided at the depot. All plats and main crosscuts are lighted with

end of the field was only extinguished after the four mines affected had been completed flooded. The present fire in the Proprietary is confined between water curtains. All drives passing through the affected portions have been closed and fresh drives have been carried in the footwall. The fire curtains maintain a wet zone, water being run from perforated launders placed across the lode and percolating vertically downward through the old stopes. At each end of the fire area there are two parallel "curtains" or launders. The fire appears to be quite under control and will die out slowly. Fans remove the air from all stopes and workings in the vicinity.

A new automatic inclined hoist installed at an iron blast-furnace plant in Germany (*Oest. Zeit. f. B. u. H.* Sept. 26, 1908)

Working Costs in the Transvaal

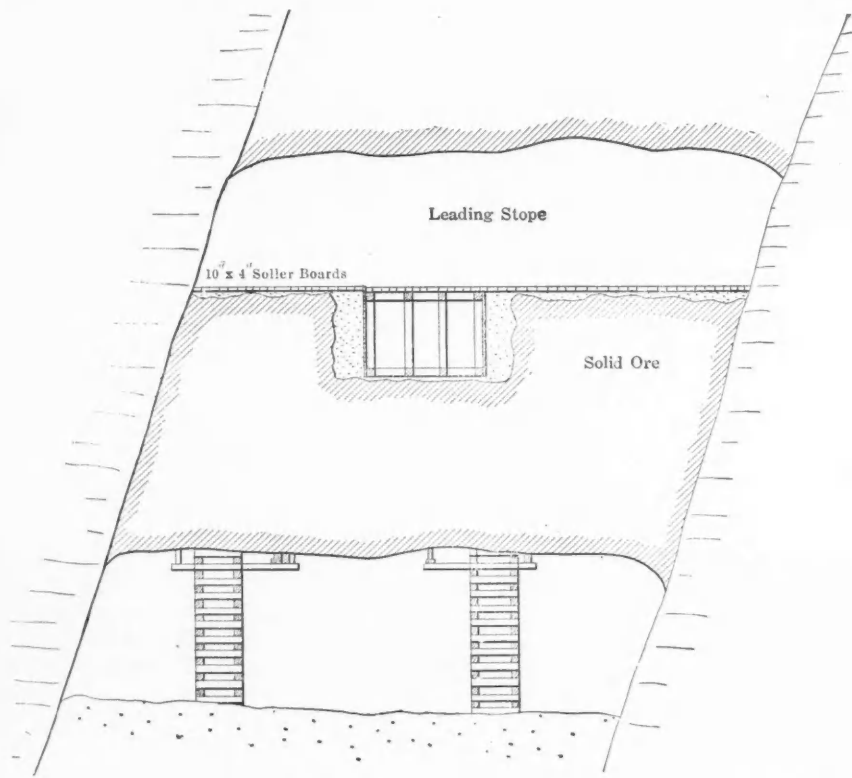
SPECIAL CORRESPONDENCE

A full report, just published, of the general meeting of the New Modderfontein Gold Mining Company, of the Transvaal, contains some interesting data given by the chairman, Samuel Evans, with regard to the working costs. Figures are given showing the beneficial effect of large plants. The average working cost of four of the larger mines with mills treating from 43,800 to 70,760 tons per month was for the month of July \$2.58 per ton milled excluding development, or \$3.38 including development charges. An analysis of returns from all the crushing mines of the Witwatersrand, with one or two minor exceptions, given below, demonstrates the advantage of working on a large scale.

Output Per Month.	No. of Companies.	Cost Per Ton Milled.
10,000 tons and under.....	8	\$5.28
10,000—20,000.....	14	3.96
20,000—40,000.....	22	3.68
40,000 and over.....	4	2.98

Development costs are omitted owing to the difficulty of bringing them to a fair basis for comparison. It must not be lost sight of in comparing working costs that depreciation of plant is generally not allowed for, and the amount properly chargeable on the extra additional plant required to gain reduced costs must cancel to some extent the advantages gained. A maximum output, provided regard is paid to keeping the grade of ore within the payable limit, is the right principle to aim for. Large outputs mean reduced working costs and increased pay ore, with the advantage of extracting the gold from the ground and making it productive earlier than when working on a small scale. Another point to be remembered in making comparisons of costs over several years is that conditions have changed; wages, for example, on an average are probably considerably less than they were a few years back, while stores, no doubt, show some reduction. The striking improvement shown by Mr. Evans between the working costs at the New Modderfontein between May, 1899, when the costs including development were \$7.32 and July, 1908, when they were \$4.70 per ton, is not entirely due to the increased scale of operations. To some extent the improvement has been gained by a general all-round economy in working.

According to *Indian Engineering* (March 14, 1908, p. 175), plaster of paris may be used as a flux for melting scrap metals containing small amounts of iron. About 5 lb. of plaster are mixed with 100 lb. scrap and when melted, the whole is stirred. On cooling the plaster is removed by a blow with a hammer. The iron is thus removed and the flux, being neutral, does not attack the crucible.



METHOD OF LAYING OUT LEVELS

electric light. This system of underground depots is also in use at the Proprietary. The close check which the mine is enabled to exercise in the matter of the issue and return of tools effect a saving considerably in excess of the cost of maintaining these underground storemen.

FIRES

The great quantity of timber used underground, especially in the older workings renders these mines very liable to fire. Several disastrous fires have occurred, and at the present time a fire is burning in the Proprietary mine.

A serious fire which occurred some years ago in the mines on the northern

picks up a loaded circular bucket having the same diameter as the hopper, places it accurately upon the furnace top and dumps the charge through a drop bottom. The advantages claimed for the device include, more uniform feed, and less fracture in the coke charge, the material remaining undisturbed in the bucket during the transfer from the stock-pile to the furnace hopper.

There were 1,062,000 lb. of bromine produced in the United States in 1907, valued at \$138,060. This compares with 1,229,000 lb. (\$184,350) in 1906.

Cadmium was manufactured in the United States for the first time in 1907.

Use of Basic Refractory Brick in Metallurgy

The Sources and Cost of Magnesite and Chromite and the Advantages and Disadvantages of Employing These Minerals for Furnace Linings

BY FRANCIS T. HAVARD*

There are few charges which figure so largely on the cost sheets of a smeltery employing reverberatory furnaces as those for the erection and the maintenance of brickwork. Even the blast-furnace superintendent deplors the cost of the quantity of lining which must be renewed on all occasions before he may recommence smelting with a furnace which has been blown down. It is therefore a feature worthy of note that, in many cases which have come before my notice metallurgists have not availed themselves of the full advantage of the improved kinds of refractory brick which have been placed on the market in recent years, nor developed other types of mortar and breast mass beyond the original popular mixtures.

Perhaps this unusual condition is sometimes due to the inclination of the superintendent to leave the question of the choice of the brick used in the hands of the master mason, who is responsible for the maintenance of the masonry. The mason approves and uses the best kinds of refractory acid bricks and highly aluminous silica bricks which have deservedly won their way to his heart. The most satisfactory results have, however, been obtained with the true basic magnesite and the neutral chromite brick. It is chiefly with the advantages which the use in general metallurgical practice of these two kinds of brick offers that my notes deal.

REVERBERATORY COPPER FURNACES

The regular brick formerly in use in the reverberatory copper furnace was a highly aluminous firebrick with about 40 per cent. Al_2O_3 and about 45 per cent. SiO_2 . For copper refining dinas, or a low aluminous silica brick, was chosen. This kind of brick, however, was rapidly eaten, particularly on the slag line; consequently it was found necessary to repair the furnace linings about once every week by a process called "claying."

This process consisted in throwing an aluminous sand against the corroded parts of the hot walls of the furnace in which the metal had been tapped as low as was safe. In the case of the reverberatory or smelting furnaces some matte was always retained in the furnace to keep the bottom hot. The sand thrown against the walls sweated and filled in the interstices. This work was and is a task which taxes heavily the physique of the men and the temper of the foremen; the shift which clays is fit for little other work.

*Metallurgical engineer. Helena, Mont

By the use of magnesite instead of fire-clay in the walls of the furnace this work of periodical claying is avoided; for the magnesite withstands the corrosive action of the slag, not, however, the abrasive action of a bath which is set in considerable motion by constant rabbling or blowing with air.

REVERBERATORY LEAD FURNACES

In lead work the superiority of the basic and neutral chromite lining is still more marked; for in this case the very refractory brick is required to withstand the corrosive action of the oxides of lead and antimony in the softening furnace and of bismuth oxide in the cupelling furnace.

In the case of the softening furnace either the lining of all the walls is made of magnesite or only that part on which the slag ebbs and flows.

In the cupelling furnace, and more particularly the litharge-producing furnace, walls as well as roof and bottom should be of magnesite or chromite brick. If the roof be made of firebrick it is apt to be attacked by the lead fume, and the drops of lead silicate which fall onto the bath hinder the flow, of a silver-free slag in the one case, and in the other of the pure litharge.

CUPELLING FURNACES

In American test hearths magnesite has replaced to a great extent other materials, such as marl and clay, cement and marl and boneash, of which hearths were formerly made. The magnesite is used in the form either of mass or of bricks.

The old type of round or elliptical German driving furnace with a hearth of marl is now being replaced by a standard-shaped oblong furnace with a lining of magnesite. Despite the most careful laying and heating cement hearths have not proved a success in driving furnaces; the cement would always crack and the broken pieces rise to the surface, destroying all chance of making silver-free slags and of successfully driving the charge to the "blicker" of the silver.

ANTIMONY REVERBERATORY FURNACES

In resisting the extremely corrosive slags produced in the reduction of antimony ores or oxides to metal, chromite lining has been proved superior to all other kinds. Since the oxides of lead, bismuth, antimony, arsenic and tin act as acids in attacking a basic lining it can be readily understood that a neutral material, which possesses the physical qualities of

chromite, would be the most desirable material for refractory lining.

COPPER-BLAST FURNACES

In the construction of the copper-blast furnace, it is usual to make the walls above the jackets $13\frac{1}{2}$ or 18 in. in thickness, of which the inside lining (a header and stretcher alternately) is of firebrick, while the other two-thirds of the walls is of ordinary red brick. For the lining of the walls of the crucible magnesite or chromite brick should be used.

If the settlers of the blast furnace have the form of a small movable forehearth, its floor and walls may be made of firebrick. In the case of the large stationary settlers used in both blast furnace and reverberatory practice, which are much less often put out of commission by reason of the freezing up of their contents than by the corrosive action on the lining, magnesite or chromite should be used on the walls and fireclay on the bottom.

In its quality of resisting corrosion, abrasion, and withstanding the effects of high and rapid changes of temperature chromite is superior to magnesite, and it would be preferred for almost all work were it not that the price of crude chromite ore is more than twice that of burnt magnesite.

Magnesite has the disagreeable quality of becoming soft at high temperatures, although it regains its hardness when cooled. For this reason it has been found advisable to surround magnesite-furnace linings with water jackets. Magnesite also requires much more delicate handling in laying than chromite.

All burnt magnesite should be stored in a dry place, and it should at all times be kept away from contact with water with which it forms a hydrate.

The bricks should either be laid dry or pointed with a mortar free from mechanically admixed water, such as a mixture of magnesite and tar. The percentage of tar, in this particular mortar, should be kept low; only enough should be present with the dry, fine magnesite to enable the mason to point with it; for the tar in the mortar which is exposed to the action of the heat of the furnace burns off and makes the mortar porous. But this will not result in any appreciable weakening of the wall provided too much tar be not used.

Another mortar used is a mixture of magnesite with magnesium chloride, a by-product from Stassfurt, yet another mixture contains magnesite and hydrochloric acid. I have obtained the best results with the first-named mixture.

Magnesite does not resist the abrasive action of a metal or slag bath which is poled or agitated by air. The hot, soft bricks peel, and the chips of magnesite make the surface of the bath or the slag viscid and difficult to work. Notwithstanding that magnesite expands considerably on heating, the use of expansion joints of wood between the bricks is deprecated; rather let the expansion and contraction of the furnace be met by the slackening and tightening the tie bars.

For breasts and bays of reverberatory furnaces and cupelling hearths magnesite is successfully used in the form either of blocks or of mass. Blocks of all sizes are made by factories on demand by hand pressing the once- or twice-burnt magnesite. These blocks are of the right degree of hardness and permit of cutting to keep the same level as the sinking bath. For breasts of mass a mixture of magnesite and litharge has been found successful in many cases, excelling the well known fireclay and marlclay breasts by reason of its firmness and durability after it has once been sweated by the heat of the furnace. This same mixture is more serviceable in replacing defective furnace floors and walls.

Before starting up a new reverberatory furnace it is advisable to sweat a thin layer of this material over the whole floor. I would here point out, too, that the loss of one or several bricks from the floor of a furnace is not sufficient cause for renewing the whole bottom. One should fit in new bricks as tightly as possible and shove down with a trowel between the bricks and in the interstices a mixture either of magnesite and tar, or magnesite and litharge. It will be found in most cases that the floor thus repaired will be perfectly tight after the furnace has been heated up.

In water-jacketed reverberatory furnaces, the magnesite lining will in the first month be eaten to within a couple of inches of the jacket, the progress of corrosion for the succeeding months being scarcely perceptible.

THE MAGNESITE INDUSTRY

It is only within comparatively recent years that magnesite has obtained a large market both as a source of carbonic-acid gas and as a refractory-furnace lining. The value of the pure deposits has become greatly enhanced as the demand in recent years correspondingly increased. Before the value of the mineral to the metallurgist had become fully realized, magnesite had been sought by makers of carbonic-acid gas. A large part of the mineral now used in furnace work is obtained in the form of burnt residues after the carbonic-acid gas has been won from the original carbonate. Magnesium carbonate is preferred to calcium carbonate as a source of carbonic dioxide on account not only of the larger quantity, but also of the greater purity of the car-

bonic acid produced from a ton of material and also by reason of the ready and good market obtained for the residue. Carbonate of magnesia is burned in a kiln with 10 per cent. coke in the same way as lime is burned. It yields 52 per cent. of carbon dioxide while limestone yields only 34 per cent.

SOURCES

The sources of magnesite are: In the United States, California, where considerable quantities are burned by raising to a white heat for 20 minutes in oil-fired reverberatory furnaces; Austria-Hungary; Germany; Greece; India, and South Africa. The two greatest producers of the crude magnesite are Styria, in Austria, and the island of Euboea, in Greece.

In Styria, the Veitscher Magnesitwerke Aktiengesellschaft, of Vienna, mines and burns the magnesite and produces a very fair brick in eager demand by steel-makers all over the world for linings in open-hearth furnaces. The growth of the Veitsch company has been remarkable;

bison-Walker Refractories Company, of Pittsburg. The Kaliwerke, of Stassfurt, makes large quantities of chloride and sulphate of magnesia as end-products, for which they try to effect large sales. A company has also installed a factory in South Africa which produces carbon dioxide from magnesite. The value of burnt magnesite is from \$7 to \$8 per ton.

The accompanying tables show the production of magnesite in the years 1901 and 1905, and also analyses of some varieties of American magnesite and magnesia.

THE CHROMITE INDUSTRY

Even more remarkable than that of magnesite production and manufacture has been the growth of the industry of chromite, which, however, is more concerned with the manufacture of chrome salts and of ferro-chrome alloys than with the production of refractory brick. Crude chromite ore, suitable for furnace linings, is sold at the rate of \$17 per ton. The chief source of chromite ores is New Caledonia, which produces the purest

METRIC TONS PRODUCED.

Year.	Austria Hungary.	Germany.	Greece.	India.	United States.
1901	40,236	67,988	13,410	.....	4,256
1905	92,359	58,578	35,989	2,096	3,567

ANALYSES OF MAGNESITE AND MAGNESIA.

	1	2	3	4	5	6	7	8
SiO ₂	0.10	0.5	1.1	3.3	2.48	{ 1.81 insol.	6.68 }	6.90
Fe ₂ O ₃	0.23	0.30	0.47	7.25	6.02	} 0.08	15.1	0.49
Al ₂ O ₃.....	.....	.....	0.76	0.84	1.18			
CaO.....	0.62	0.70	.....	2.48	4.34	Trace	.....	1.49
MgO.....	47.10	46.90	97.35	84.72	84.56	46.53	37.23	44.39
CO ₂	51.98	51.6	.....	.....	.....	51.25	40.98	50.06
Water.....	.....	.....	0.32	1.40	1.33	0.32	.....	2.57

Nos. 1 and 2 Alameda claim, American Magnesite Co., Livermore, Cal.; Nos. 3, 4 and 5 the same calcined; No. 6, Chiles Valley; No. 7, the same poor, not shipped; No. 8, Porterville.

within the last five years it has more than doubled its output, and has made very large profits out of the Styrian magnesite, the mining of which it has developed on a very large scale along with its complete control of the local industry. In Hungary, a fair quality of magnesite is mined and worked by the Hungarian Magnesite Industry Company.

The purest magnesite comes from Greece. The product from this source contains in contra-distinction to the Austria-Hungarian mineral very little lime. Two companies, the Anglo-Greek Magnesite Company and the Society of Public Works, at Athens, are exploiting the deposits on the island of Euboea. The Greek magnesite is worked into bricks by various Dutch, German and English manufacturers; the German and Dutch brick is black and much softer and less refractory than one of the English varieties which has a grayish color.

In the United States the control of the manufacture of both magnesite and chrome brick is in the hands of the Har-

grades, carrying from 30 to 57 per cent. Cr₂O₃. That containing above 40 per cent. is shipped directly to Europe; that below 40 per cent. is subjected to dressing before it is shipped. Other large producers are Greece and Russia. Turkey has fallen from its former high estate of being one of the chief purveyors of chrome ore, probably on account of the difficult and expensive transport of ore to the coast.

The production of chromite ore in tons in 1896 and 1905 is shown in the accompanying table:

PRODUCTION OF CHROMITE ORE IN TONS.

	1896.	1905.
Russia.....	6,682	20,000
Bosnia.....	443	.....
Canada.....	2,125	7,781
Greece.....	1,600	15,000
New Caledonia.....	16,018	51,000
Newfoundland.....	1,031	.....
New South Wales.....	394	53
United States.....	793	122
Turkey.....	Figures not available.	

Chromite ore in the United States is found principally in California.

Appended are analyses of samples of Turkish and New Caledonian ore:

ANALYSES OF CHROMITE ORES (PER CENT.)		
	Turkish.	New Caledonian.
Cr ₂ O ₃	51.70	55.70
FeO.....	14.20	16.60
Al ₂ O ₃	14.10	16.20
MgO.....	14.30	9.80
SiO ₂	3.50	0.25
CaO.....	1.70	0.25
MnO.....	.....	0.20
P ₂ O ₅.....	.....	0.05
H ₂ O.....	0.30	1.05

It seems strange that neither magnesite nor chromite has been generally used as a basic lining in copper converters. It is quite possible that the reason for this has been the difficulty of securing a brick or a mass of sufficient tenacity to stand the physical action in the converter. Some of the mixtures of magnesite with certain alkali-metal salts have given such good results that it is quite probable that a satisfactory basic or neutral converter lining may yet become the vogue in metallurgical copper work.

Iron Ore Statistics of Iron County, Mich.

The report of William Carlson, inspector of mines for Iron county, Michigan, for the year ending Oct. 1, states that 2258 men were employed by the 40 mines operating in the county which produced 1,383,138 tons of iron ore. There were 11 fatal accidents during the year; nine of the victims were employed underground.

The report states the average number of men employed and the tonnages at the principal mines of the county. The average production per man for all producing mines was 613 tons. In the following table the statistics of production per man are given for those mines producing 100,000 tons or more.

PRODUCTION OF SIX IRON COUNTY MINES.			
Mine.	Production Tons.	No. of Men Employed.	Production per Man.
Great Western.....	190,000	300	633
Tobin.....	185,000	200	925
Bristol.....	175,700	200	878
Baltic.....	126,800	181	755
Caspian.....	117,811	176	669
Dunn.....	100,000	85	1176

Assuming 300 working days in the year, the daily production per man at the Dunn mine was 3.92 tons; for the six mines enumerated, 2.64 tons; and for the 40 operating mines, 2.04 tons.

The ores from which the larger part of the world's supply of bismuth is derived are native bismuth and bismuth glance, the oxide and carbonate ranking next in importance.

Weighing Ore in Stamp Mills

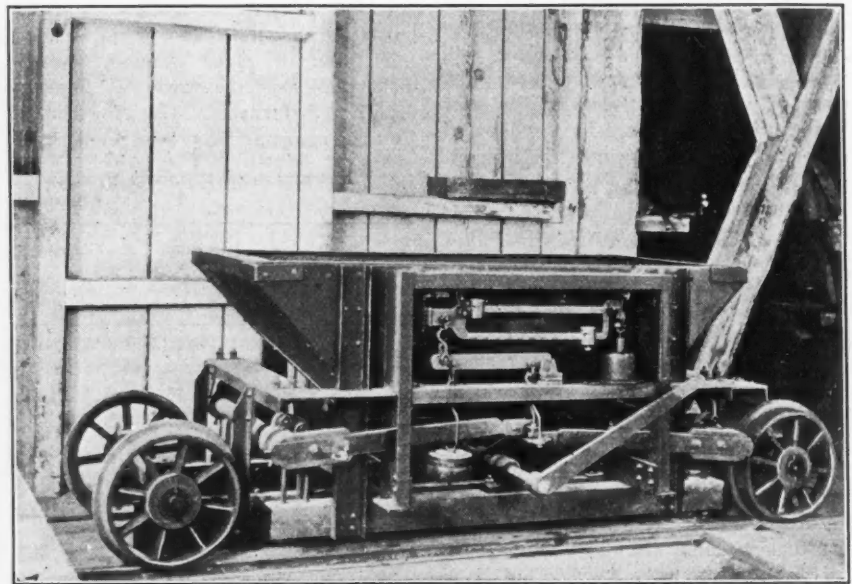
BY FRANK A. ROSS*

The stamp-mill of the Daly Reduction Company, Ltd., at Hedley, B. C., is, perhaps, the only large plant today in which the ore is weighed immediately behind the batteries. In this mill I determined to carry out certain ideas, long entertained, regarding the proper point at which scales should be located to obtain best results in all departments for the practice of not weighing at all, or of doing so between mine and mill, has many serious defects. It was first intended to install an automatic system, as is advisable wherever a continuous stream of any material is to be weighed, but the cost and time required for installing caused the use of a hopper-

coupled by a rod to a shaft running the entire length of the mill and operated by a lever at one end thereof. At stated intervals the samples are taken simultaneously by throwing this lever and holding it down during 12 drops of the feed-stamp; the sample taken in 24 hours weighs about 2000 lb. This we find very satisfactory on an ore that varies greatly in its gold contents, and in which gold occurs along the cleavage planes of mispickel crystals, being the only valuable constituent of the ore except arsenic, which is saved but not at this plant.

ADVANTAGES OF THIS SYSTEM

The several advantages of any inexpensive system of weighing behind the batteries become evident upon brief consideration. When head-samples are taken



SCALES-CAR USED AT MILL OF DALY REDUCTION COMPANY

scales car running over a track laid upon the cam-shaft floor.

THE WEIGHING CAR

This car, shown in the accompanying illustrations, has proved satisfactory. It runs easily upon roller-bearings, delivers a load of 2000 lb. and weighs accurately notwithstanding the jarring of the stamps, for its beam is dead-beat. New chutes were cut in the ore-bin above the regular ones and simple gate-mechanisms make loading easy and rapid. The car has two hopper-gates that work well and deliver the ore to the feeders through trap-doors in the cam-shaft floor.

Head-samples are taken by means of a hinged apron hung midway between the feeder-lip and the hopper of the mortar. Normally, this apron shoots the ore into the mortar, but when dropped at intervals it deflects the entire ore-stream into a sample-box. Each mortar is fitted with one of these aprons, and each apron is

at the feeders and the ore is weighed at any point between the mine and the breakers it is impossible to arrive at an accurate valuation of the ore being milled, for the ore that is weighed today will not reach the feeders until tomorrow, or the day after, or even next month, according to the size of the battery bins. Therefore, any given sample fails to represent a known weight of ore, and all calculations regarding the value of the ore going to the stamps, the concentrators and the vats are mere guesswork.

To be sure, in the case of a cyanide plant, following stamps or concentrators, this daily guess may, in the long run, hit sufficiently close to true weights to satisfy those that attach little importance to accuracy in accounting, but it remains guesswork at best—something that is never excusable. For instance, in our own case the calculated tonnage for June, 1908, came within 0.8 per cent. of the total shown by the new scales-car, or 28 tons short in 3837 tons actual weight. We do not yet know how far the law of com-

*Managing director, Daly Reduction Company, Hedley, British Columbia.

pensation applies but, whether or not it will make up this difference in a year's run, there is profit and great satisfaction in being able to know at any given moment exactly what is being done.

Weighing before the feeders gives the mill foreman a constant check upon the performance of each battery, and enables a close study to be made of the causes influencing the duty per stamp. Daily tonnage curves show clearly the extreme sensitiveness of a battery to changes of screen, shoes, dies, water supply, rock, etc.

With an ore of extraordinary hardness and with cost of supplies high we have found it impracticable to use cast-iron dies, although they would increase our tonnage by wearing more evenly under steel shoes. We plane the special chrome-steel dies as soon as pitted, having found this by far the most economical thing to do. As soon as a pitted die is replaced by a planed one the tonnage-curve jumps

unnecessary. Since trying it in practice the writer is more than ever convinced that it is the only way, and that the benefits derived from such a system much more than counterbalance the slight extra cost of providing therefor, especially if the system be made as nearly automatic as possible.

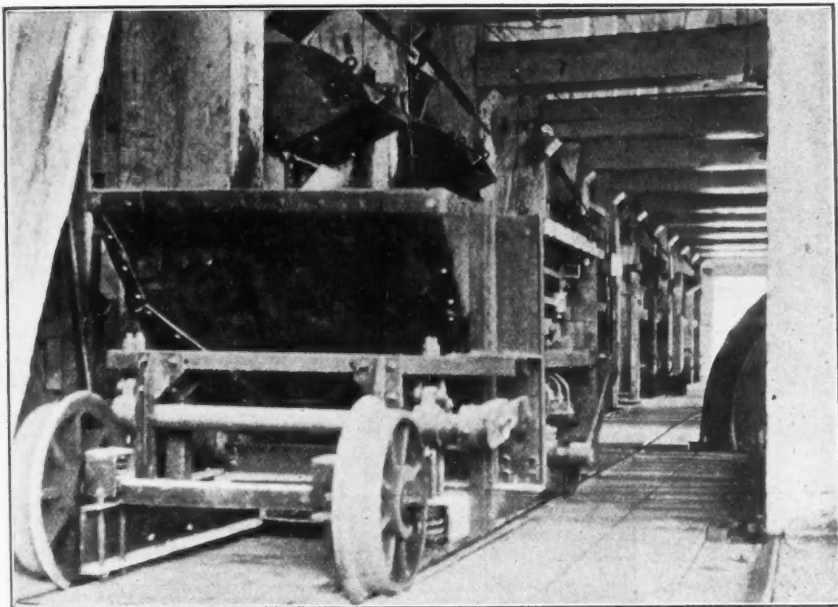
Lead and Zinc Mining in Iowa

SPECIAL CORRESPONDENCE

The lead- and zinc-mining industry of the Dubuque district in Iowa has been in a quiescent condition during the present year. All of the large producing mines have been closed down and what work has been carried on has been by smaller operators and in a more or less desultory manner. Very little ore is being mined at present, and none is being shipped. The largest concern in the district and the only

ness methods which were certain to lead to trouble. Hence when the money stringency affected prices the boom subsided and has not yet recovered. When or whether the recovery will be made and to what extent is at present largely a matter of speculation. The present prices, of \$36 to \$38 for 60-per cent. zinc ore and \$60 to \$61 for 80-per cent. lead, as quoted by the Wisconsin market reports, do not stimulate much activity.

There is another reason, though it is one which is at present of indeterminate value, and the importance of which can be understood only after trial and development. Many of the present mines are located upon properties which were opened and developed by the early operators after the crude fashion of those times. These early miners took out only the richest bodies of ore, worked only a very little below the water level and left extensive and thorough development to their successors. It has all along been the hope of the later workers that by means of modern methods of mine working and pumping, deeper bodies of productive ore might be reached than had been possible in the early days. It has been found feasible to remove economically some of the ore which had been rejected by the pioneers, but so far the rich bodies at depth have not materialized to the extent hoped for. If by reason of more complete knowledge of the field these large deposits shall be proved to exist, then Dubuque may see a renewal of its former activity as a mining center. Until this condition becomes a certainty, or prices advance to their former range, there is little encouragement in prospect for the immediate future.



SCALES-CAR USED AT MILL OF DALY REDUCTION COMPANY

up sharply; but it falls just as readily when a new screen is put in or water fails, stamps grow light or dies become pitted.

The benefits of weighing behind the batteries do not end at the batteries; they extend to the concentrators and down to the cyanide vats, giving accurate data on the tonnage passed from one step in the process to another, as well as upon the performance of each unit in the system. Moreover, experimental tests under differing conditions are easily made at any time with single batteries without in any way interfering with the rest of the plant. This is a valuable feature where improvement is desired.

Any method of calculating tonnage from weights of wet samples taken from vats or slime-tanks is certain to be more or less misleading; therefore, this question of weighing behind the batteries deserves the careful consideration of all millmen, even if some may decry it as

one having a concentrating plant—the Avenue Top Mining Company—is at present in the hands of a receiver, although this may not be a permanent state of affairs. The 50-ton Avenue Top concentrator was built last year when prices for zinc were high, and it did considerable work for a time. At present it is not in operation, and has only a few tons of concentrates—perhaps 100—in its bins.

The immediate cause for this state of affairs may be said to be the decline in the prices of lead and zinc accompanying the financial panic of last fall. Earlier in the season, when prices were high, the mining industry sprang into great activity. Every old prospect was worked and new ones were opened up in all of the districts. A larger amount of ore was raised than had been mined for a number of years previously. But accompanying this activity was a recklessness in the conduct of financial affairs and a laxity of busi-

A gas producer for the use of pulverized fuel (*Le Genie Civil*, Vol. LI) consists of a receiver, circular in plan, lined with refractory material. Near the bottom and almost tangential to the circumference of the lining is inserted the discharge pipe of a fan blower by means of which the pulverized fuel, together with the requisite quantity of air, is introduced. The producer is started by means of a wood fire and then by blowing in the coal dust by means of the fan. A very high temperature is produced which slags much of the ash which is withdrawn every six or eight hours, this being the only cleaning required. Owing to the high temperature the tar is converted into gas. The largest plant at present using the system yields 600 h.p. continuously from an inferior quality of coal.

According to an authority on silver cyanidation in Mexico the presence of manganese has, in itself, no hindering effect on the dissolving of silver in cyanide solutions provided the silver be present in some soluble form and the manganese present is a constituent of the ore separate and uncombined with the silver.

The Working Mines of Guanajuato

The Bonanza Mines on Veta Madre Are Being Reopened; Some Mines near La Luz and Some in the Sierra System Are Working

BY CLAUDE T. RICE

In a previous article¹ the Guanajuato district in Mexico was described, and its history and present conditions treated. That paper is now supplemented by an account of the principal mines of the district.

THE VETA MADRE MINES

In the Sirena mine the vein strikes north 70 deg. west and dips 47 deg. to the southeast. The ore occurs in chimneys and the ore-shoots vary from 40

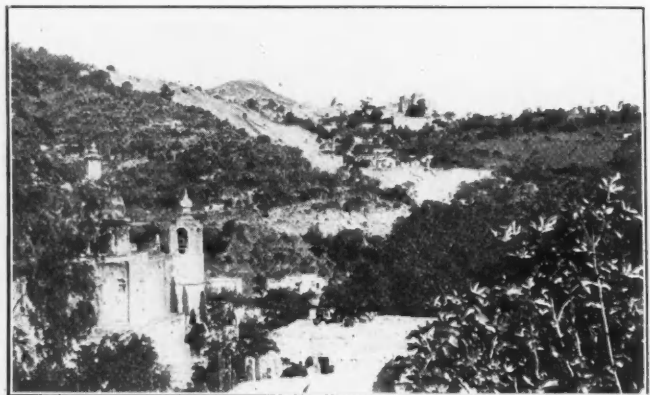
the mine is being put in shape to use the Alaska Treadwell method of ore-filled stopes. But as the dip of the vein is too low for the ore to run, several raises will be driven from crosscuts in the footwall from the different levels. These will be put in at such distances that little shoveling will be required to get the ore out of the stope. Rock-lined chutes will be used owing to the proficiency of the Mexicans in dry-walling. The level interval in the lower part of the mine will be 50 meters.

ton; development, 50c. per ton. About 1000 men are employed underground at the Sirena mine.

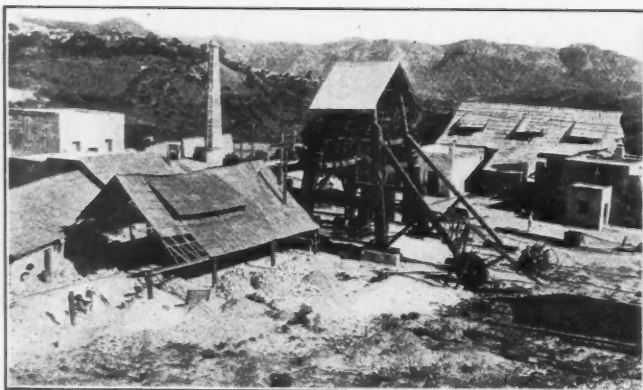
The Guanajuato Mines and Reduction Company is at present concentrating its work on its Veta Madre mines, although it owns considerable ground in La Luz part of the district. The Cata mine has been unwatered; 150 tons of virgin ore and old fills are mined per day from it. The unwatering of the Rayas and Mellada mines has progressed so far



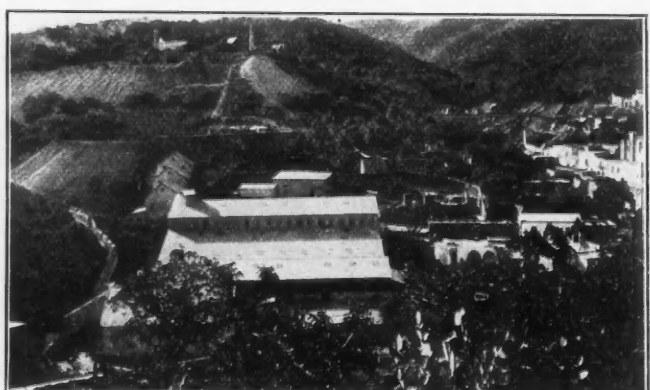
RAYAS DUMP



RAYAS DUMP



THE CATA MINE



CATA MINE; BUSTOS MILL

to 150 ft. in width. The mine is worked through an adit from which underground shafts have been sunk on the vein. The Principe shaft is 800 ft. on the incline below the adit level. Above the adit old stopes are being worked. Below the adit level the mine is mainly virgin. In mining the ore no timber is used. Sometimes the ore is worked by underhand, but generally by overhand stoping. Gradually

¹ENGINEERING AND MINING JOURNAL, Oct. 3, 1908.

Most of the ore is mined on contract, the men paying for their own dynamite and fuse. The price paid for drilling and breaking varies between 0.60 and 1 peso per ton. Drilling when done with a machine is paid 15 centavos per meter. Several Murphy hammer drills are used. The men on large piston machines work on day's pay or on contract. Much of the drilling is done double-hand. A pair of miners will drill about 8 ft. in quartz in a 10-hour shift. Mining costs about \$2.25 per

that active work began underground at the San Miguel shaft Aug. 1. Work underground has been going on at the Tepeyac mine for some time so that in July the erection of an aerial tramway, having a capacity of 200 tons in 10 hours, to connect this mine with the Bustos mill was begun. Thus gradually the company is extending its work north along the veins toward the Valenciana. These old mines of the Reduction company were the most extensively worked in the district.

Some of the old shafts are immense. The Valenciana shaft is 1800 ft. deep and 35 ft. diameter. It was completed before 1810. The Rayas-Mellada mine has several shafts; the largest is 39 ft. diameter and 1400 ft. deep. While very old, this shaft was found in perfect condition when the mine was unwatered as the upper part of it is lined with massive masonry. The pumping at the company's Veta Madre mines is to be concentrated at the Cata mine, where two Aldrich quintuplex pumps, having a combined capacity of 600 gal. per min. against a head of 1000 ft., are installed on the lower level. After the mines have been unwatered they will make only about 250 gal. per min. The Sirena mine

virgin; considerable ore is also left in the old workings in pillars, in *ramaléos*, and in the old filling. In the mine there are two veins the Plateros, having a strike north 41 deg. west and dip 56 deg. to southwest and La Luz vein, having a strike north 12 deg. west and dip 60 deg. to west. These veins cross at the inclined shaft on the south which is to be the main working shaft. Most of the ore has been found north of the junction of the two veins. South of the junction only the Plateros vein has been worked. South of the junction extends a branch vein which is thought by some to be the southern extension of La Luz vein. This vein is being developed by the Montana & Mexican Mining Company under the management of

are granite that has been intruded from a nearby laccolith. The lower part where the ore is found has agglomerate and schist walls. Sometimes this wall rock resembles diorite. In the granite the veins carry little ore. In the northern part of the mine the gangue is about equally quartz and calcite; in the southern part the calcite predominates, but silica increases with depth. The veins are faulted in several places, but never enough to cause them to be lost. The ore-shoots occur near where faults cut the veins. The dumps at this mine have been almost exhausted, and in the future most of the ore will have to come from the mine.

The drilling is done mainly by hand; two men drill 6 m. per day. They are



THE SIRENA MINE



PEREGRINA MINE; BARRENO DUMP



PINGUICO MINE



HUMBOLDT SHAFT NO. 2

makes only 45 gal. per min. About 700 men are employed underground at present, and 500 men on the dumps and at the mill and cyanide plant. Most of the ore comes from the Rayas dump where it is sorted on a traveling belt before being sent to the mill.

LA LUZ MINES

These mines were extensively worked years ago. Some work is being done on the San Cayetano adit, but the Guanajuato Amalgamated Gold Mines Company is doing the main work. Its mine, the Jesus Maria—years ago called the Jesus, Maria y José—has been opened to a depth of 320 m. Below the 265-m. level the mine is

D. F. Meiklejohn. To the north at the Jesus Maria shaft La Luz vein splits into two branches.

La Luz vein is 4.5 m. wide; the Plateros vein 3.5 m. wide, but sometimes these veins widen to 20 m. All the ore as yet developed along these veins is rich enough to mill. The rich ore occurs in two large ore-shoots; one near where the veins cross, the other, the San Brunos, to the south of that in the Plateros vein. Along these rich ore-shoots the hanging wall is shattered and the *ramaléos* occur; in these the ore carries mainly gold but some silver; the filling is mostly quartz and seldom calcite.

The walls in the upper part of the veins

paid 72 centavos per meter for drilling, loading and blasting the holes, the company furnishing candles, powder, caps and fuse.

The Montana & Mexico Mining Company owns 3 km. along its supposed continuation of La Luz vein. It is working 30 men and sinking two double-compartment, incline shafts in the footwall of the vein. These in July were 50 m. and 82 m. deep; at each, a crosscut driven at the 50-m. level developed low-grade ore. The vein is said to have a strike north 12 deg. west and a dip of 60 deg. southwest, this being the same as that of La Luz vein in the Jesus Maria mine. At the deeper shaft, drifts are being driven both

north and south from the crosscut. The vein where intersected is 12 m. wide. The shafts are still in granite. If this vein proves to be as rich in depth as La Luz vein, this will be one of the most important mineral developments in the Guanajuato district in recent years.

THE SIERRA SYSTEM

The only vein of this system at present worked extensively is the Peregrina mine, where 500 tons of ore are being mined per day. The Peregrina mine belonging to the Guanajuato Development Company has been developed to a depth of 300 m. It is worked through two shafts, both having two compartments. There are three veins having a general strike of north 70 deg. west. The Guadalupe vein dips at a high angle to the west; the La Cruz dips to the south, and the San Pablo to the north. At a depth of 400 ft. the San Pablo and Guadalupe veins meet. Near the surface the wall rock is andesite,

Guanajuato Development Company, is opened to a depth of 225 m. below the Pinguico adit and the shaft is being sunk still deeper. The vein strikes north 30 to 35 deg. west, and dips 80 to 85 deg. to the east toward the Veta Madre. The vein varies from a few feet up to 30 ft. in width. The main ore-shoot is 600 ft. long and averages 16 ft. wide. The average width of the whole vein is probably 10 ft. About 250 tons of ore are being mined per day.

The neighboring Carmen mine is not producing. Near the Pinguico mine the Humboldt Mining Company is prospecting to find the northern extension of the Pinguico-Carmen vein. Ira C. Clokey is superintendent of the company. This company has sunk two shafts, one 600 ft. deep and the other 700 ft. deep, in July. From the shaft 600 ft. deep, a crosscut has been driven. In July the Pinguico vein had not been intersected, but a vein showing some low-grade ore is said to



JESUS MARIA MINE

deeper rhyolite, and still deeper agglomerate. The gangue is mainly silicious with some calcite. The ore mineral is mainly argentite, as there is very little pyrite; where breccia occurs in the veins the pyrite fragments are banded. Considerable country rock is included in the vein. The ore occurs in shoots and lenses. The vein varies in width from 3 to 20 ft. The vein is stronger in the rhyolite than in the agglomerate.

Both overhand and underhand stoping are being used; principally overhand stoping with ore-filled stopes will be used in the future. Cleveland air-hammer drills have recently been introduced and these have decreased the cost of drilling. Little timber is used underground. The mill is treating about equal quantities of mill and dump ore, in all 500 tons per day. There are 400 men working underground.

The Pinguico mine, belonging to the

have been cut since then. Whether this is the Pinguico vein, which in its upper portion is low grade, is not known, for the Pinguico vein does not outcrop, being completely hidden to the north by the andesite capping. For a number of months Mr. Clokey averaged 6.1 m. per week in sinking these 5x7-ft. shafts; the greatest monthly average was 24 m. This is the fastest sinking done in the Guanajuato district. The shaft cost, excluding timbering, power, and superintendence, 48 pesos per meter.

Several small companies are working on veins in the hanging wall of the Veta Madre, and one or two are working on a small scale in the Sierra vein system.

Bismuth minerals, like those of lead, do not lend themselves to heap or kiln roasting; hence they are treated in reverberatory furnaces, the smelting being conducted either in crucibles or reverberatories.

The Dolcoath Tin Mine

SPECIAL CORRESPONDENCE

The report of the Dolcoath Mine, Ltd., in Cornwall for the six months ending June 30, 1908, shows a considerable falling off of the profits from the previous half year, and the amount earned is not sufficient to justify the payment of a dividend. For the last half of 1907 the net profits were £16,755, while for the first half of 1908 they were £6293. The decrease is due partly to the fall in the price of tin and partly to increased working costs, which have gone up owing to a decrease in the tonnage treated, and to increased charges for rates, labor, coal and materials generally. The receipts per ton of ore amounted to \$7.26, while the working costs were \$6.17. The Lord's royalties amounted to \$0.47 per ton, leaving a net profit per ton to the company of \$0.62. The tons crushed during the six months were 48,849, yielding 40.38 lb. black tin per ton. The quantity of black tin sold was 88 tons which realized £71,768. The new vertical shaft (Williams) has been sunk 2019 ft. from surface, a progress of 61 ft. per month having been made. This is a circular shaft and is lined with 9-in. brickwork. A connection with the present workings will be made at a depth of 2940 ft., so that on June 30 there remained 921 ft. to sink, which will take at the present rate of sinking about 15 months. A small quantity of copper ore is being won from the upper levels, and the ore is being concentrated by the Elmore vacuum plant.

The high working costs at this mine are noticeable. They are in excess of any previous figures since the mine was worked on the limited liability system. For the six months ended Dec. 31, 1902, they averaged \$4.49 per ton, the lowest figure reached. The turnover during that period was 52,295 tons as against 48,849 tons for the six months ended June 30, 1908, a decrease in tonnage of only 3446 tons. Yet the costs have risen from £48,928 to £62,811, an increase of £13,883 or 28.4 per cent.

The report would be much improved if a statement were given showing the working costs distributed by departments. It is also desirable that information should be given as to the quantity and value of the ore reserves.

The total amount of capital invested in mining and smelting works in Mexico is more than \$250,000,000 (A. F. J. Bordeaux, *Trans. A. I. M. E.* Sept. 1908) while the yearly metallic production is \$160,000,000. There are in the republic more than 20,000 recorded mining properties.

Frequent cleaning of the main haulage drifts soon pays for itself by decreasing the number of cars upset.

Hahns Peak, Colorado

SPECIAL CORRESPONDENCE

The name, Hahns Peak, has been given to a conical-shaped mountain of porphyry in Colorado, which rises through the sedimentaries to an elevation of 10,862 ft. The village of the same name, consisting of a dozen buildings, is about three miles south of the peak itself, and is the present county seat of Routt county. It is reached from Denver by the Moffat road as far as McCoy, 157 miles, and thence by stage via Steamboat Springs and up the valley of the Elk river, a distance of 95 miles.

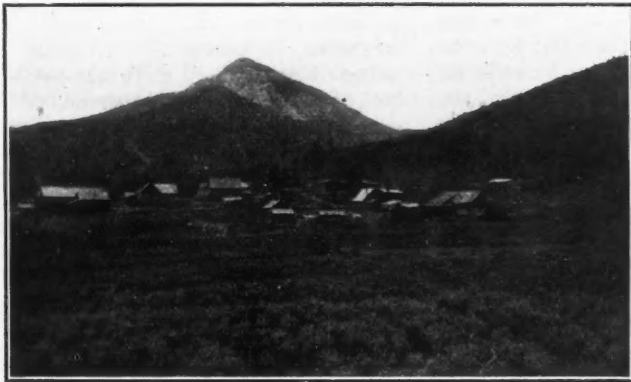
The village itself is built upon placer ground, and the vast pits on the outskirts are evidence of the hydraulicking which has been done in the past. These bars were worked as long ago as 1870, the value of the gold produced being variously estimated at from \$1,000,000 to \$1,500,000. The gold was from 650 to 700 fine, and, as the then melter at the Den-

tunnels in the hope of striking a lode, or of intersecting a known lode which had not been proved from the surface first, has been amply exemplified here. One of these adits, which has been driven 800 ft. to intersect a small crevice which higher up on the mountain showed some free gold, intersecting a mineralized shear zone in the porphyry when about 200 ft. in. This has been drifted on from the tunnel about 50 ft., and shows from 2 to 14 in. of ore that can be hand-picked to run \$150 to \$200 per ton; it carries chiefly silver, ruby and brittle silver associated with iron pyrites. Outside of this streak is from 1 to 2 ft. of milling ore which may run about \$10 or \$12 per ton. A winze has been sunk 60 ft., and some drifting done from the bottom, showing the same ore. What is called a wall shows on the north side where the pay ore is found, with slickenside as usual in these shear-age zones, but none could be seen on the other side, where in all probability the milling ore fades gradually into the country rock. A mill to treat 100 tons a day

tered at Columbine, a small settlement at the base of the peak, and inspired by the approach of the railway in the Yampa valley, are all digging and searching energetically.

Looking north from Hahns Peak may be seen Mount Bridger of the main continental divide, near the Grand Encampment copper district of Wyoming, about 36 miles distant as the crow flies.

The formation in this northwest corner of Colorado is in general sedimentary, the main uplifts which have broken through the strata being, (1) Pilot Knob, of the Elkhead mountains, 12 miles to the west, the basaltic lava from which has flowed over a portion of the formerly bituminous coal measures of the Yampa field and anthracized them; (2) Hahns Peak, a rhyolite porphyry; (3) about four miles southeast of Hahns Peak is Farwell mountain, 10,500 ft. high, which is chiefly granite and schists. Here about 40 mining claims have been located, the ore being copper, chiefly the blue and green carbonates, but no bodies of ore



HAHNS PEAK, COLORADO



PLACER GROUND NEAR HAHNS PEAK

ver mint informed me, a great deal of the gold was attached to fragments of porphyry. There seems to be little doubt that the derivation of the gold in the bars is due to the erosion of the peak itself, and it is apparent from the nature of the ground, and the comparatively small portion worked, that there must be a great number of good bars as yet untouched. These placers have been idle for some time, partly owing to dissension among the owners which prevented the granting of leases, and partly to the lack of dump ground, an obstacle which will eventually be overcome by the use of dredges. The railway will this year be within 30 miles of Hahns Peak, instead of 150 miles as formerly, and all these abandoned mining districts are taking on new life and will be worked again.

WORKINGS IN HAHNS PEAK

On the supposition that the gold in the bars came from lodes in the peak, numbers of tunnels were driven into it in the early days, but these have long since been abandoned, and the folly of driving long

is to be erected, which seems scarcely warranted at the present time. The fact of its being a shear zone or fault fissure, instead of a true fissure vein, does not necessarily detract from its potentialities, for the Gold Coin, in the Cripple Creek district, was a shear zone in the granite, outside the main gold-bearing breccia area, and produced gold to the value of more than six million dollars.

OTHER PROPERTIES IN THE VICINITY

A short distance south of these workings is another mine, which, however, has not been worked for eight years, as the long wagon haul killed the profits. This also is a shear zone, but the character of the ore in it differs entirely from the former. The ore is a bright galena, 200 tons of which are reported to have been shipped, a representative assay of the ore showing 52 oz. silver, 2 oz. gold, and 51 per cent. lead per ton. This mine is owned by business men in Steamboat Springs, who are preparing to open it up and work it vigorously.

A number of prospectors are now quar-

which will pay to extract have as yet been opened up.

Russian Tax on Gold

According to the *London Mining Journal* (May 16, 1908) the mining tax on gold will be decreased in order to promote private gold mining on lands belonging to his Majesty's Cabinet in the Altay and Nerchinsk districts Russia. The tax will not be calculated progressively any more, but will amount to only 5 per cent. per pood of placer gold extracted; the existing tax of 10 per cent. on quartz gold will also be decreased. If improved methods of working be adopted this tax will be still more diminished; thus, for instance, if hydraulic methods or dredges be used, it is proposed to collect only 3 per cent. Moreover, it is intended to mine several heretofore prohibited localities along the Kondoma, Mrassa, and Lebed rivers, as soon as the present lessees—the Altay & South Altay Gold Mining Company—turns them over to the Cabinet.

Gayley Dry Air Blast at Warwick Furnace*

Results Obtained by Drying the Blast at a Merchant Furnace of Moderate Size. The Plant Used and the Savings Which Were Effected

BY EDWARD B. COOK†

The installation of the Gayley dry-air process appealed specially to the management of the Warwick Iron and Steel Company, for the reason that for 15 years records had been kept at the works of the company, showing the amount of water entering the furnace in the form of aqueous vapor, and careful observations had been made of its effect upon the working of the furnace. Some years had proved much worse in their effect than others, on account, not only of excessive moisture, but also of great variation in the moisture from day to day, and sometimes within a few hours. It had been found impossible to make a satisfactory percentage of high-silicon foundry-iron in summer, even on high fuel; and for some years the endeavor had been made so to arrange the sales that, during July and August, only a small percentage of the iron produced would be required to carry more than 2 per cent. of silicon. Our larger furnace, running on basic iron, year after year, produced in February a tonnage 20 per cent. higher than in August, on a much lower fuel-consumption, while, at the same time, the summer months were marked by messes, tuyeres closed by slips, and other irregularities, constituting serious additional business losses.

THE DRYING PLANT

In the spring of 1906 it was decided to install a plant of sufficient capacity to treat 70,000 cu.ft. of air per min., an amount much larger than that treated at the Isabella plant, and sufficient for the maximum requirements of our No. 1 and No. 2 furnaces. The form in which Mr. Gayley's invention was applied at our works may be outlined as follows: Ammonia, liquefied by pressure, is allowed to expand in pipes inclosing smaller pipes which carry brine; and this brine, thus cooled to a point 0 deg. C., is conducted through a refrigerating chamber in coils of pipe, over which the air of the blast for the furnace passes, and upon which it deposits its moisture before entering the blowing engine.

The refrigerating part of our plant, which was furnished by the York Manufacturing Company, of York, Penn., comprises five vertical single acting compressors, each employing about 220 h.p. and having 175 tons refrigerating capacity. The object in having so many units is to guard against serious results from break-

downs, and also to have a more adaptable apparatus. Only in the summer months is the total capacity required. In winter one compressor will do the work for one furnace. An atmospheric condenser was installed above each compressor.

The brine coolers are of the double pipe class, with 3-in. outer pipes, in which the ammonia expands, and 2-in. inner pipes, through which the brine passes in the opposite direction. Through these coolers, and thence through the coils in the refrigerating chamber, the brine is forced by one of two flywheel pumps. The cold brine enters the coils at the top.

The refrigerating chamber contains 57 miles of 1¼-in. wrought iron pipe, divided into seven sections by partition walls and doors, so that one section can be washed free from frost without affecting the other sections or increasing the moisture in the treated air. A large Sturtevant fan was installed to furnish air to the refrigerating chamber, and maintain therein a pressure of about 1 oz. per square foot, in order to insure a proper distribution of the air rising through the coils, and also to overcome the friction in the pipes to the blowing engines, so that there should be no doubt as to the proper filling of the blowing tubs. It also guards against the entry of untreated air through possible leaks in the pipes. We have found, however, that the plant can be run for a short time without this fan.

Upon the assumption that 4.5 tons of air are required to make one ton of iron, the production of 720 tons of iron a day calls for the treatment every hour of 135 tons of air, moving at a rapid rate, and varying both in temperature and in contained moisture. We had our share of troubles at the beginning, but for several months past none has been experienced, and the dry-air plant is earning the reputation of being the only "sure thing" about the furnace.

DRY BLAST ON NO. 2 FURNACE

The first application of the dry blast was made on our No. 2 furnace, which was 100 ft. high by 22 ft. bosh and 15 ft. crucible and stock line. This furnace had been in blast for nearly three years and had made more than 500,000 tons of pig iron. Down to June, 1907, with the exception of the three summer months of each year, the fuel consumption had been kept low and the iron satisfactory.

APPLICATION OF THE BLAST

The first application of the blast was made to No. 2 furnace in August, 1907,

and was attended with many difficulties, owing to the fact that the application was made too suddenly; and that the furnace was not in good condition. Notwithstanding all the difficulties the furnace was kept running, and its work steadily improved until it was blown out on Dec. 27, on account of an accumulation of basic iron, due to the closing of steel works. There were short periods of good work, when the pressure stayed down and there were no stops, in which 515 tons a day were made on 2000 lb. of fuel per ton for several days in succession.

Figs. 1 and 2 show the condition of No. 2 when blown in and when blown out. In Fig. 2, the stock-line, 22 ft. 8 in. in diameter, is shown, with a large shelf below it, where the brick had stopped disintegrating on account of a change in quality. Farther down there was another shelf, made up of scaffold material. The scaffold did not fall until a week after the furnace had been cleaned out, and then filled the hearth 5 ft. above the tuyeres, so that it began to yield gas and had the appearance of being in blast again. We never imagined that the scaffold could be so high up, and consequently did not find it, since we did no drilling higher than 4 ft. above the mantel. Three times during the summer the furnace had been blown down to below the mantel.

The following is the record for the last six months of the blast. The increased percentage of basic iron and the lowering of fuel consumption, in a furnace without a stock-line, and with a large ring-scaffold, are remarkable:

RECORD OF FURNACE NO. 2.

1907.	Fuel per ton of iron.	Tons of iron per week.	Proportion of basic iron. Per Cent.	Average stoppages per week, in minutes.
July	2534	3025	89.2	194
August	2452	2649	69.0	528
September	2503	2638	78.2	441
October	2501	2927	82.2	336
November	2339	2735	80.4	336
December	2261	2880	88.5	319

No. 2 furnace has since been repaired, but up to the present time (August, 1908), trade conditions have not been such as to render it advisable to blow in. We have not, therefore, had the opportunity to test the virtues of the dry-air blast on the newly lined furnace.

DRY BLAST ON NO. 1 FURNACE

On Sept. 25, four of the compressors having been completed, the dry blast was put on No. 1 furnace. In three days the moisture per cubic foot of air was reduced from 6.5 grains to 1.50. There was the

*Abstract of paper read at Chattanooga meeting, American Institute of Mining Engineers, October, 1908.

†Furnace manager, Warwick Iron and Steel Company, Pottstown, Pennsylvania.

same evidence of greatly increased heat, shown by tuyeres, slag, and iron, as at No. 2 furnace.

No. 1 had been in blast for 2½ years on high-silicon foundry iron. The settling for the first year had been entirely by 4-ft. jumps, and the fuel consumption had been consequently high, and the iron irregular in grade. After the first year, the three top rows of the total five rows of bosh-plates were pulled out of the furnace. This resulted in regular settling on foundry iron and lower fuel consumption.

In March, 1907, however, an attempt was made to turn this furnace to the production of basic iron. It proved impracticable, because an arch formed on the step left by pulling out the plates. The furnace stuck fast for 24 hours, and would not settle at all, so that it had to be put back on foundry iron. During the summer of 1907 its work became extremely bad, and the iron was irregular in grade.

Upon the application of dry blast in September, the furnace acted much as it had done in March, when the attempt was made to make basic iron. That is to say, the reduction of fuel (or, what is the same thing, the increase of burden) and the consequent lowering of the zone of fusion brought about a tendency to arch at the offset on the bosh.

The daily product increased about 10 per cent., and the quality of the iron improved. The fuel consumption had to be kept relatively high in order to run the furnace at all. It was blown out on Nov. 11, on account of our accumulation of foundry iron. The dry blast had been used for 45 days, hardly long enough to get significant results from an old furnace. Fig. 3 shows the original, and Fig. 4 the wear lines and the step on the bosh.

The effect of the dry blast on these two worn-out furnaces was a matter of great interest to the management. The first effect was to make them more troublesome, but this was explained by later experience as due to the too sudden application of the dry blast. The improvement in their work was slow by reason of the necessity of forming gradually somewhat different interior lines.

No. 2 was eventually properly burdened; but, in the light of recent experience, we are wondering whether No. 1 would have not done better had we had the courage to put on a heavy burden, in spite of the shelf on the bosh.

to maintain the lines of the bosh, so that basic iron can be made if desired.

The furnace was lighted March 12, 1908. Ten days after the first iron was made the dry blast was applied. The moisture was lowered from 4.5 grains on March 24, to 1.5 grains on March 25. The revolu-

iron. In this case, as with No. 2, the dry blast was probably put on too suddenly, and there was trouble from the furnace sticking and settling irregularly.

Some difficulties were experienced, but they were overcome by increasing the burden. The furnace gradually improved

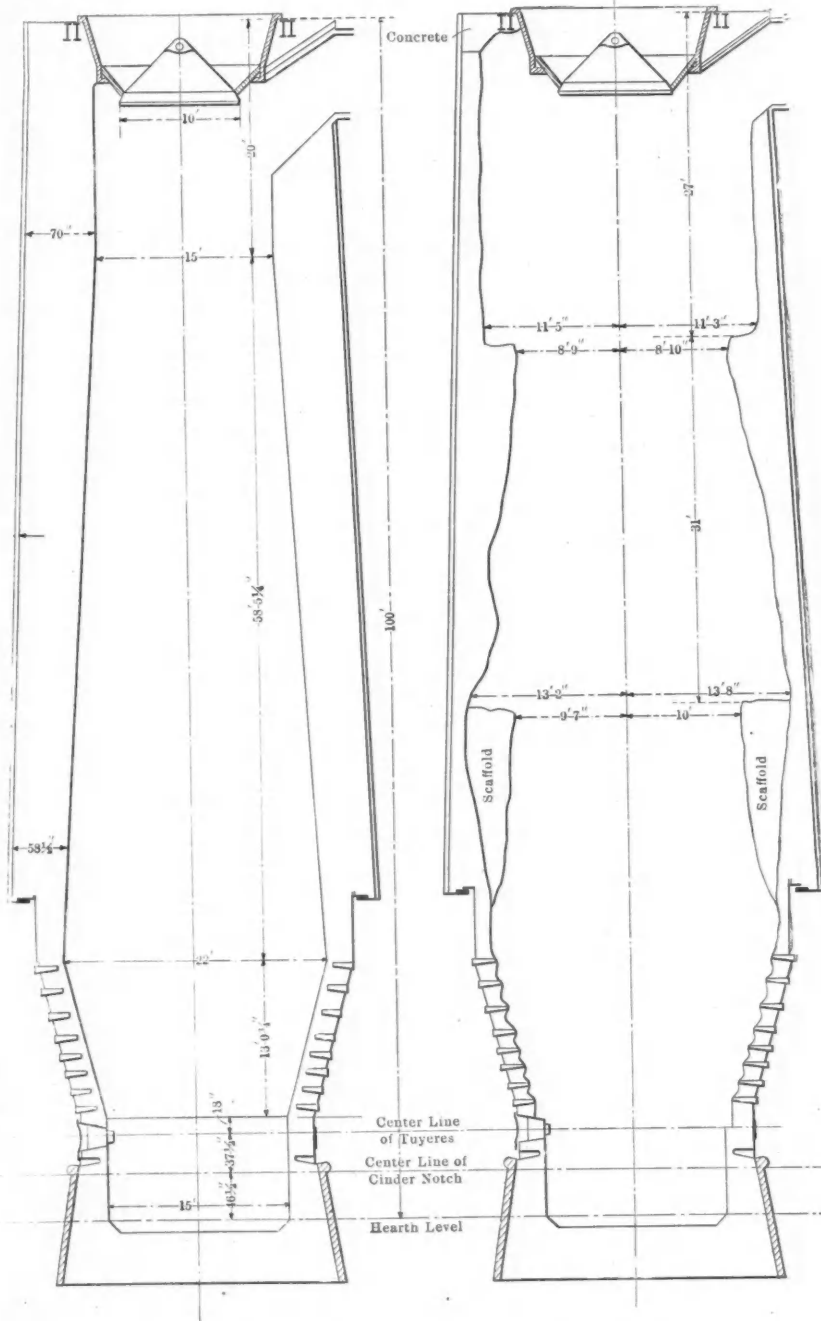


FIG. 1. FURNACE NO. 2, BLOWN IN NOV. 1, 1904

FIG. 2. FURNACE NO. 2, BLOWN OUT DEC. 27, 1907

DRY BLAST ON NO. 1 FURNACE RELINED

No. 1 furnace was relined, as shown in Fig. 5, there being practically no change in the lines, except that the crucible was made larger in diameter. The bosh is held by two rows of plates with a bosh-jacket above, on which there is 9 in. of brick. The idea is to avoid the cooling on the upper bosh (which seemed to cause the stock to settle irregularly during the previous blast), and still to be able

tions of the engine were reduced 10 per cent. at the same time and the burden was increased 5 per cent. The effect was immediate. At 9 a.m., when dry blast was applied, the silicon in the iron was 2 per cent. At 5 p.m. it was 2.75 per cent. Increased heat in the hearth was indicated by the appearance of tuyeres, slag and

its work, and has since in several different weeks, made nearly 1700 tons a week on less than 1900 lb. of fuel, which heats under 900 deg. and an ore mixture of 50 per cent. magnetic concentrates, and only 25 per cent. of Lake ore. It has made 1400 tons of iron, averaging 2 per cent. of silicon on less than 2200 lb. of fuel per

ton, on the same mixture, but with 1000 deg. F. of blast temperature. The monthly records are as follows:

RECORD OF NO. 1 FURNACE.

1908.	Product per week, tons.	Percentage of foundry iron.	Yield of ore, per cent.	Blast temperature, degrees Fahr.	Fuel per ton of iron, pounds.
April	1,392	3	57.5	882	2,061
May	1,532	21	56.7	920	2,059
June	1,451	77	57.1	968	2,131
July	1,501	32	57.4	907	2,006

Warwick is a merchant furnace, and the iron made must suit the order book. At the present time the changes of grade are consequently frequent, and the convenience of the furnace is not considered. We have no comparative records on basic iron, the nearest being the record of forge iron, 1898, when the ores were entirely different, and the blast temperatures much higher. This shows: Product per

with the margin of safety and running on a small slag volume and a silicious slag, makes the furnace more sensitive to changes of coke and variations in the character of the ore mixture.

The blast pressure varies from 9 to 10 lb. per sq.in., according to variation in blast heat, and the use of three different kinds of coke. The dry-blast plant is about 150 ft. from the No. 1 blowing engine, and the pipe is not protected from the sun. The temperature of the air arriving at the engine varies about 15 deg. in summer, between day and night. This makes a difference of, roughly, 5 per cent. in the volume of air that the blowing engine delivers. The effect upon the furnace is to make it drive about 5 per cent. faster at night. On one or two occasions this faster driving has lowered the silicon in foundry iron; otherwise it has given no trouble. An attempt was made for a

and a reduction of burden to the proper amount have brought the furnace back on good iron immediately.

There are, of course, two ways of running a furnace: first, carefully, to make a regular grade of iron. Second, up to the limit, to make a large tonnage and reduce fuel consumption, without reference to maintaining a given grade of iron.

Running in the first way with the dry blast, it is possible, with ordinary care in keeping the stock regular, to make every cast of the grade desired. Running in the second way, some variation in silicon and sulphur occurs in the product of the dry blast, but not nearly so much as with natural air, irregular in moisture.

The gas stays high in CO (up to 26 per cent.) on account of the use of 50 per cent. of magnetic ore. The temperature of escaping gases on a 70-ft. furnace averages 300 deg. F. on basic and 500 deg. F. on foundry iron.

On account of the irregular settling, the fine dust must necessarily be less; but our ore mixture has been so changed that it is difficult to make comparisons. We are inclined to think that it was a mistake to make the stock line so small in diameter, since, with the fine mixture now used, the amount of the flue dirt made is considerable. It varies from time to time, even on the same mixture. For several days the amount made is excessive, as if the furnace were channeled; then it decreases again.

EXPLANATION OF DRY BLAST RESULTS

Many furnace managers who have seen the Warwick dry-blast plant have asked how we explain the results obtained. The following hypothesis satisfies us and may be of interest to others:

Of all the heat value of coke that goes into a furnace, only about one-fourth is available for heating the hearth, about one-half is sensible heat in the gas, about one-quarter reduces the ore, some is required to carburize the iron. Now the hearth is the only limit, the only place where the ordinary furnace requires more heat. It was estimated for years that dry blast would save only 3 per cent. of coke, but the fact was neglected that this 3 per cent. of the total fuel would be saved to the hearth alone, and that this would amount to four times as much, that is, 12 per cent. of the heat of the hearth, and as the hearth is the only weak place, the efficiency of the furnace would be increased 12 per cent.

In this case, the dry blast decreases the duty of the hearth 12 per cent., and allows the resultant heat to be utilized upon increased quantities of iron and slag.

Further, this increased burden, together with regularity of heat supplied to hearth, enables the slag volume to be decreased and the slag made more acid. This again saves fuel. The increased product decreases the radiation per ton of iron, and makes another saving. This will vary

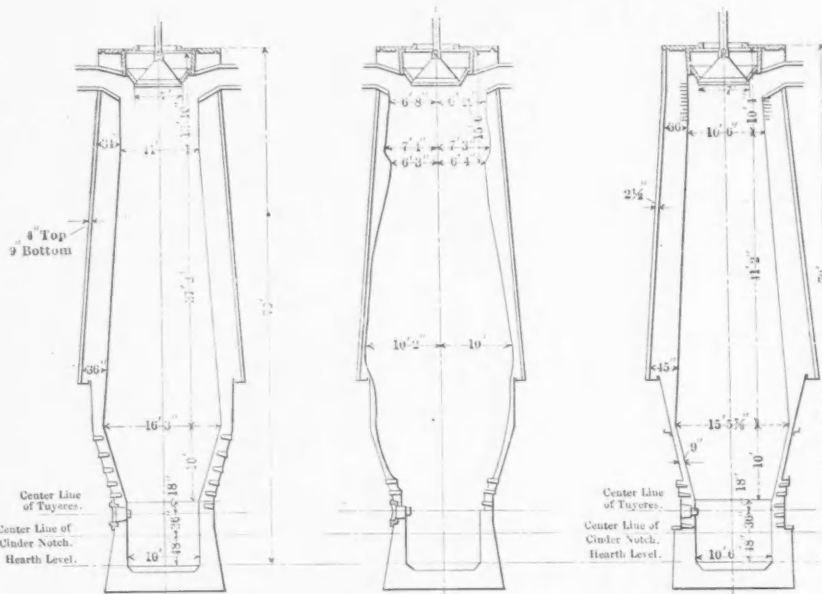


FIG. 3. FURNACE NO. 1, BLOWN IN AUG. 3, 1905

FIG. 4. FURNACE NO. 1, BLOWN OUT NOV. 11, 1907

FIG. 5. FURNACE NO. 1, RELINED

week, 1246 tons; yield of ore, 61.21 per cent.; heat of blast, 1234 deg. F.; fuel per ton of iron, 2378 lb. The best previous record of recent years on foundry iron is that of 1906, as follows: Product per week, 1016 tons; yield of ore, 57.3 per cent.; heat of blast, 1016 deg. F.; fuel per ton of iron, 2633 pounds.

We feel that, at a moderate estimate, we are saving 400 lb. of fuel per ton of iron, and making 350 tons more iron a week, notwithstanding our lower blast temperature, and a much more refractory ore mixture. It is a remarkable fact that all the furnaces using dry blast are showing about the same percentage of saving of coke and increase of product as compared with their previous work.

The dry blast is by no means a cure-all. Although it greatly increases the regularity of the furnace, and enables it to be run closer, this very fact of doing away

time to run the engine 5 per cent. faster on the day shift if the sun was shining, or 2.5 per cent. faster if the day was cloudy. But this was soon given up, as it was too complicated, like the changing of blast temperature to meet variations in humidity.

UNIFORMITY IN GRADE OF IRON

When the furnace is running on foundry iron, the product is wonderfully uniform in silicon and sulphur, as between one cast and another, or different portions of the same cast. On basic iron we can safely carry our silicon from 0.2 to 0.5 without fear; and the sulphur can be held more constant than in a furnace blown with natural air. On two occasions, through a desire to lower fuel consumption, the furnace has been overburdened, and hard iron and buckshot have resulted; but a small amount of extra coke

with individual furnaces, and will be particularly great on those that will stand more wind. The writer believes that a very close estimate can be made on the amount of saving dry blast will make on each furnace.

The temperature of a furnace is increased enormously when dry blast is applied, particularly if it is foolishly put on too fast, as on the No. 1 furnace, but the increased temperature is soon equalized with burden and more work and the temperature kept at the desired point as in any furnace.

Costs

Some estimate of the cost of operating the plant may be of interest. Based on a product of 720 tons a day, and running all the ammonia compressors, the labor cost is 2.5c. a ton. In the fall, winter and spring months it is 2c. a ton. The oil, waste, etc., should not exceed a maximum of 1.5c. a ton. Estimating on an excessive loss of ammonia (one-third of the entire contents of system yearly) the ammonia cost will be 1c. per ton. The brine cost is insignificant. We estimated that 10c. a ton would cover the cost of operation and maintenance; and we now feel that this will be more than ample.

Judging from the experience of general refrigerating machinery and plants, an annual depreciation charge of 5 per cent. will be sufficient.

No charge is made for steam; for, in our experience, the dry-blast plant has made no additional firing of coal necessary. The reduction in revolutions of the blowing engines spares enough power to run the refrigerating machinery, brine pump, and fan. Although the gas is leaner, and of lower temperature, so that it is not as good fuel, its flow is regular; and there is no sticking after casting, with loss of gas and consequent heavy firing.

SUMMARY

The management of Warwick feels fully satisfied with its adoption of the dry blast. No explanation is needed to show its great value during this summer, of extremely high and irregular humidity, at a time when the iron market has been totally demoralized.

We are now installing new Roberts center-combustion-chamber stoves at No. 1 furnace, in order to obtain 1300 deg. to 1400 deg. F. of heat in the blast. It is a matter still open for discussion; but we feel that the dry blast will make possible the use of higher heats, and thereby indirectly lead to an additional saving in fuel.

In conclusion, attention is called to the fact that the efficiency of the dry blast has been demonstrated on a small furnace, and that the results warrant the statement that its application will be of particular value to small furnaces, as it gives them the efficiency, and somewhat of the production of iron, of the larger furnaces.

Colorado Fuel and Iron Company

This company owns iron and coal mines in Colorado, Utah and Wyoming; coke ovens, blast furnaces, steel works, rolling mills and other manufacturing plants. Its report is for the year ended June 30, 1908. At the end of the year the company had outstanding \$34,235,500 common stock; \$2,000,000 preferred stock; \$19,945,000 mortgage bonds of various issues.

The income account for the year was as follows:

	Earnings.	Expenses.	Net.
Iron dep't.	\$13,175,747	\$11,342,580	\$1,833,169
Fuel dep't.	8,486,085	7,571,136	914,949
Denver ret.	438,048	408,348	29,700
Total	\$22,099,880	\$19,322,064	\$2,777,816
Management			224,449
Net earnings			\$2,553,367
Interest, etc.			327,127
Total income			\$2,880,494
Interest and taxes		\$1,231,432	
Sinking fund, railroads, etc.		422,279	
Rentals		899,659	
Prospecting		32,760	
Total charges		\$2,586,129	
Net surplus			\$294,365

The gross earnings, as compared with the previous year show a decrease of \$1,692,419, or 7.1 per cent. Operating expenses decreased \$1,611,806 and management \$37,935, so that the decrease in net earnings was only \$42,678, or 1.6 per cent. The report says: "The improvements referred to in the last annual report were completed early in the year, and the expenditures for maintenance at all of the properties have been on a liberal basis, with the result that their physical condition has been improved, and the company is now able to do a much larger business than ever before. It can safely be said, that, with a renewal of the demand for the company's products sufficient to permit of full operations, the gross earnings will exceed those in former times, and the ratio of net income to gross earnings will be increased."

The general profit and loss account was as follows:

Net surplus for the year	\$294,365
Sundry accounts adjusted	14,207
Total	\$308,572
Debit balance from previous year	\$1,077,196
Depreciation	398,307
Old accounts charged off	63,001
Total debits	\$1,538,504
Debit balance June 30, 1908	\$1,229,932

The final result of the operations for the year was an increase of \$152,308 in the debit balance of profit and loss.

The production statement is as follows for the year:

	1906-07.	1907-08.	Changes.
Coal	4,844,461	4,276,095	D. 568,366
Coke	992,667	789,989	D. 202,672
Iron ore	893,454	647,270	D. 246,184
Limestone	417,612	391,128	D. 26,484
Iron and steel	1,994,410	2,077,231	I. 82,821

Sales were 2,203,278 tons of coal, 145,463 tons of coke 37 tons iron ore and 388,499 tons iron and steel. The balance of the iron reported appears to have been

pig, used at the company's plant for conversion into steel and finished products. Coal used in operating mines was 156,968 tons. Coal used in making coke was 1,385,409 tons, showing an average of 1.74 tons to 1 of coke.

Transvaal Gold Statistics

SPECIAL CORRESPONDENCE

Students of Transvaal mining statistics should always watch the figures of gold reserve. Most of the mines have now abandoned this system of equalizing the monthly returns, but there are some mines, the Eckstein group especially, which continue this absurd custom. In order to arrive at the true profit for the month it is necessary to add or subtract from the declared profit the difference between the gold reserve figures for that and the previous month. Some of the mines have during this year been building up handsome reserve balances under the name of gold reserves. The Robinson, for example, increased its gold reserve from 13,494 oz. in March to 19,524 oz. in August, equivalent to a sum in round figures of £25,000 in five months. This little sum is really profit, but is not declared as such.

The Ferreira is perhaps the worst offender in this direction. The reserve gold in March was 7180 oz. and in August 16,350 oz.; in other words a profit of £38,000 is returned as gold reserve and not as profit. This amount is more than the average monthly declared profit. Very few shareholders probably take note of the gold reserve, and are, consequently, misled as to the amount of the actual profit earned.

Another stumbling block to the statistician, although at present of minor importance, is the inclusion of gold from accumulation in the monthly returns. Gold won from old tailings heaps, or slimes, figures in the yield of the current ore milled. It is easy to see that a quite erroneous value of the grade of ore milled might be arrived at, if extras amounted to a considerable figure.

From what has been said it must be clear that Rand statistics require to be treated with caution. Two reforms seem specially needed, one, the abolition of the gold reserve account, and the other the declaration of profits more in harmony with the dividends.

In a method of preparing hydrogen on a large scale, described in the *Scientific American*, water gas, which consists of hydrogen and carbon monoxide, is passed over hot pulverized calcium carbide. The carbon monoxide combines with the carbide forming calcium carbonate and graphite leaving the hydrogen almost pure (97 per cent.)

The Problem of Treating Dust in Coal Mines*

Dust, as Such, Is Not Explosive. Preheating the Intake Air to Saturation by Exhaust Steam Is More Effective than Sprinkling

B Y F R A N K H A A S †

The subject of dust in coal mines, is one that has disturbed the keenest minds of engineers for a century or more, and it may be unnecessary to state that I do not assume to explain the problem fully, nor with complete satisfaction.

By dust, I take it, is meant such particles of coal as are transported from their original location by the air current. The sizes of the particles so affected will vary with the kind of coal and velocity of current. The term "dust" has in past literature had a loose definition, in fact a satisfactory one has not been discovered. No experiments, at least no results of experiments, are reported as to the size of particles which are maintained in suspension by air currents of certain velocities. The definition of dust, if it ever will be developed, will be flexible and will depend on various conditions, of which, velocity of air currents will be the most important. Recent French writers in conducting their experiments on dust have used the size that passes through a 200-mesh screen. In this country (probably merely as a starting point) a 100-mesh screen was adopted and in some cases an 80-mesh screen. By actual experiment it was determined that such coal which will pass through an 80-mesh and over a 100-mesh, is not maintained suspended in a velocity of 1200 ft. per minute, which is a comparatively high velocity when considering mine currents, and it would appear from this that our standard of 100 mesh is still too coarse.

However, this need not enter into the discussion, as we know that in case of an explosion there is no discrimination as to the size of the particles affected. In fact I am satisfied, in my own mind, that the bulk of the force of the Monongah explosion originated in the solid coal. From a strictly technical standpoint I would say that dust is not explosive, no more so than solid coal.

AN EXPLOSION IS RAPID COMBUSTION

An explosion is defined as rapid combustion. How rapid it does not state, but we know that it must be almost instantaneous. If it were possible to get ten parts of air by weight in immediate contact with one part of coal, an explosive mixture would be obtained. This, however, is impossible, as one volume of coal

is equal to 1065 volumes of air. It would, therefore, require 10,650 volumes of air, each particle of which would have to be in intimate contact with one volume of coal. Furthermore, the temperature of volatilization of coal is less than that of ignition, therefore, coal dust would become coal gas and coke before the temperature, where explosion is possible, is reached. The argument then is this, that the explosions which are attributed to coal dust are really explosions of coal gas. This distinction, insofar as the results are concerned, is slight, but it is essential, nevertheless, for no investigation of dust can be successful without accounting for the volatile gases, and furthermore, there are other sources of coal gas, the solid coal, which might be overlooked if dust alone was considered the source of all the danger. With this explanation we can repeat that "dust as such" is not explosive.

All coals when exposed to a temperature of over 250 deg. F. will liberate gases, the amount so liberated will depend on the character of the coal, the temperature and the time of such exposure. If such temperatures should occur in a mine, combustible gases would be formed and the formation of explosive mixtures highly probable. It is not to be inferred, however, that gas or high volatile coals are the most dangerous. It is a question of how much coal is affected rather than the amount given off by each particle, and a very low volatile coal may give off some gas just as readily as a higher volatile one.

THE AMOUNT OF HEAT GIVEN OFF

Some time ago some experiments were made to determine the rate of burning and amount of heat given off in successive units of time, in which three kinds of coal were used: First, a highly volatile gas coal, containing some 35 per cent. of volatile matter; second, a semi-bituminous coal of about 20 per cent. volatile matter, and third, anthracite coal with about 3 per cent. of volatile matter. While the experiments were made in the furnace of a steam boiler for the purpose of purely practical results, and, therefore, lack the accuracy of laboratory determinations, they show the tendency, if not the exact measure of the reaction involved.

Among other data of interesting and useful application elsewhere, there were developed these facts pertaining to the subject in hand. The first 5 per cent. of the total volatile matter given off by an-

thracite coal had a heating value of 27,000 B.t.u. per lb. of volatile matter. For the semi-bituminous, this figure was 19,300 B.t.u., and the gas coal but 16,600 B.t.u. This would indicate that irrespective of other conditions, the first gases given off by anthracite are the most powerful explosively, and the general statement can be made that the lower the volatile matter in a coal, the higher the calorific power of the first gases given off. Following the curve farther, we find that at 23 per cent. of total volatile matter given off, the value of the gas of the anthracite and semi-bituminous are the same at 20,400 B.t.u., while the gas coal volatile was 16,600 B.t.u. At 38 per cent. of total volatile gas, the anthracite had dropped to that of the gas coal at 16,900. The semi-bituminous was not determined.

DUST EXPLOSIONS IN ANTHRACITE MINES ARE POSSIBLE

These results will warrant the statement that if an equal quantity of gas is given off from these three kinds of coal in the first unit of time, the anthracite will, by far, produce the most violent explosion. Anthracite is not immune from dust explosion, and while the conditions are difficult and improbable, they are not impossible, and should ideal conditions for an explosion present themselves in an anthracite mine, we may prepare ourselves for the most violent explosion that has yet occurred.

The probability of favorable conditions is decidedly minute with anthracite, as compared with semi-bituminous or bituminous coals, and should dust explosions occur in the future, as they probably will, we will likely find them in coals of the bituminous or semi-bituminous class.

The composition of the gases given off is extremely variable and a discussion of all the different combinations that are possible would be an endless task and but little could be learned from it, but a single case can be taken and its physical and chemical features discussed, and for such an example we will take a gas which is the complete volatilization of a highly volatile coal.

The subject requests that reactions be given, but as there are problems of stoichiometry involved, which are both laborious and uninteresting, the reactions which can be readily reproduced will be omitted.

The composition of such coal gas is approximately as follows:

*Paper read before the West Virginia Mining Association at Charleston, W. Va., Oct. 7, 1908.

†Assistant general manager, Fairmont Coal Company, Fairmont, W. Va.

	By Volume, Per Cent.	By Weight, Per Cent.
Illuminants, C ₂ H ₄	2.8	6.1
Marsh gas, CH ₄	25.1	30.7
Hydrogen, H ₂	41.3	6.3
Carbon monoxide, CO.....	7.2	15.4
Carbon Dioxide, CO ₂	2.3	7.7
Oxygen, O.....	0.4	0.9
Nitrogen, N.....	5.4	11.6
Moisture, H ₂ O.....	15.5	21.3

The first so-called illuminants (because of its high illuminating power) is mostly ethylene, a combustible gas of high heating power. Marsh gas which is the same as the principal gas of the miners' "firedamp" is also combustible. Hydrogen is a very light gas of high heating power; it combines with the oxygen of the air, forming water. Carbon monoxide, which is the miners' "whitedamp" is not only combustible, but highly poisonous when inhaled. Carbon dioxide or "blackdamp" is the result of the combination of carbon or such gases as contain this element; it is non-combustible. Oxygen and nitrogen are the two elements of the air. The water is the evaporated moisture of the coal, together with its combined water.

In some of the literature which has referred to gas given off by coal, it is stated that carbon monoxide is the principal gas so given off. This, I believe is in error, for at no time during the complete volatilization of coal, is carbon monoxide the principal ingredient of the gas mixture. A failure to find any considerable quantity of this gas after an explosion would by no means be evidence that the coal was not volatilized.

The illuminants, marsh gas, hydrogen gas and water vapor, would, in all probability form the bulk, if not all of the gases previous to their explosion. The combination of these gases is combustible, with a steady supply of air, and explosive within certain percentages in a mixture with air. For an explosion of maximum intensity, it requires by volume one part of gas to four and one-half parts of air.

THE MANIFESTATIONS OF FORCE

Under the conditions of perfect mixture and ignition, three manifestations of force are in evidence—a rise in temperature, an increase in pressure, and an expansion in volume. If there is no space for expansion and the volume remains constant, a temperature of about 4300 deg. F. would be theoretically reached, with a pressure approximating 134 lb. to the square inch. If, however, there is room to expand under atmospheric pressure, the volume would be increased to about nine times the original volume. These manifestations of force are all reciprocal, and none of the above theoretical figures is even approximated. The pressure depends on the temperature, the size of the area affected and the area of escape from the explosion center. The volume depends on the temperature and the quantity of gas exploded, while the

temperature, which is really the initiative, is widely affected by the quality of the gas and quantity of air with which the gas is mixed. Radiation, conduction and convection, all antagonistic to temperature, tend toward a decided diminution from the maximum.

MAXIMUM PRESSURE OF AN EXPLOSION IS 50 POUNDS

The maximum pressure of a theoretical mixture is alarmingly high; but with all these counteracting forces it is my opinion that 50 lb. to the square inch would cover the maximum pressure encountered in actual explosions, at least those which have come under my observations. While such a pressure is capable of enormous power, it is still within human control.

Air, as has been previously stated, is a necessary element for an explosion. Coal and coal dust are always in excess, and the amount of gas that could be given off is incalculable. The air, however, is limited, and the quantity is readily determined by a measurement of the volume of the mine from which coal has been displaced. From this it can readily be seen that the quantity of air, rather than the quantity of dust or coal, is really the measure of the magnitude of an explosion.

A DUST EXPLOSION CAN REGENERATE ITSELF

There is considerable difference in the physical results of an explosion from firedamp and from coal gas. Firedamp at its maximum will develop a theoretical temperature, practically the same as the gas coal; the difference between the two, however, is in the character of the products of combustion. The gases which result from the explosion of coal gas when cooled down to their original temperature and pressure occupy 10 per cent. less volume than the original explosive mixture, while from an explosion of firedamp they occupy 19 per cent. less than the original volume. This would explain, in part, the greater violence of so-called dust explosions and would also show that they would not be followed by a "back-lash" to the extent of a firedamp explosion.

Another important feature about a coal-gas explosion is that it is able to regenerate itself; that is, after an explosion has occurred, it can continue to volatilize gas and explode if it should come in contact with air. This could continue until the temperature was below the volatilization point, or until the mine was on fire. With a pure firedamp explosion this could not occur, for, after the gas is once exploded there is nothing further to feed it.

Coal dust has the property of absorbing and holding moisture when surrounded by favorable conditions in the atmosphere. A direct mixture of dust and water is very difficult and practically impossible. It appears that the time element has considerable to do with the absorption of

water by dust, and moist atmosphere is necessary for it to retain the water so absorbed. A series of experiments was carried out to determine the amount of water which dust will absorb and retain. In normally dry atmosphere, the dust which was experimented on contained about 1.50 per cent. of water. In the return airway of a mine in which the air was held to its highest point of saturation, dust was collected from the side walls of the entry where it had lodged on the small projections of the solid coal. The results as obtained were extremely variable, running from 4 per cent. moisture as a minimum to 42 per cent. as a maximum, with an average of 25 per cent. The atmospheric conditions surrounding each particle being practically the same there should be more uniformity in the results, if the water so determined was one of the physical properties of the dust. As this was not the case, however, it was concluded that the minimum was more nearly the absorptive power of the coal, while any additional water, over the minimum, was merely mechanically held in contact.

For all practical purposes it is immaterial whether the water is chemically or mechanically held; its effect is the same. The quantity is surprisingly large, and it is a most fortunate circumstance. If such conditions could be maintained uniformly throughout a mine, a formidable obstacle, if not preventive, is placed in the way of the possibility of volatilization and explosion of coal dust.

The difference in calorific intensity of the volatile gas of dry coal and that of wet dust (containing 25 per cent. of water) is insignificant from a practical viewpoint. It is in the quantity of heat necessary to volatilize coal and to bring the gas to the ignition point that is the most important consideration. If we assume the average per cent. of moisture (25 per cent.) which we have determined, it would require two and one-half times as much heat to bring the wet coal and dust to the critical point as with dry dust. Considering the comparative infrequency of dust ignition, this additional obstacle can be accepted as of considerable magnitude. In addition to its effect as a preventive, the water so contained would have a marked effect on the force of the explosion as well as a cooling effect on conditions subsequent to the explosion, when danger from fire is always imminent.

DANGERS ARE NOT INCREASED BY A WET CONDITION

It has been asserted by some few that a wet condition in a mine is a source of danger; that explosions are more liable to occur and that conditions for propagation of an explosion are more favorable. Such a statement is incomprehensible to me, as I can find no law in physics nor chemistry that would substantiate it. Water either as liquid or vapor has the highest specific heat of any matter, either

as liquid, solid or gas, which can occur in any considerable quantity in a mine, and it therefore requires more heat with a corresponding greater drop in temperature. The argument is evidently based on the decomposition of water vapor forming hydrogen and oxygen. That the decomposition of water vapor by heat and temperature is possible we do not deny, but it is not only heat and temperature, but also pressure which enters into the conditions. Under ordinary pressure the temperature necessary for such decomposition is high, and with 50 lb. to the square inch pressure, this temperature would have to be enormously increased, and in my opinion to an extent beyond practical possibility. I do not question the records of facts and observations which have led up to this opinion, but I do question the interpretations that have been put on these observations, and am of the opinion that other conditions, perhaps unnoted, occasioned such misinterpretations. Water has been, and always will be, the most efficient, and by far the most economical, material that can be introduced into a mine as a preventive of initial, as well as the propagation of an explosion.

WETTING COAL DUST BY THE DIRECT APPLICATION OF WATER NOT ADVISABLE

With no further thought on the subject the question would be simple indeed, but there are several physical properties and characteristics of coal dust that must be considered. The effect of a spring rain on a duck's back is proverbial. To make mud out of coal dust by the direct application of water is practically impossible. Coal when in a finely powdered form has some of the characteristics of oil, and it is probable that if the mineral ingredients were completely removed it would make a lubricant of some value.

Water by direct application is obstinately resisted by coal dust, yet we know that it has some absorptive power, and this leads one to suspect that the element of time and temperature as well as the manner of application play important parts in the operation. Water vapor has the property of greater penetration than the liquid, and it is in this form of water that practical results may be realized. A saturated atmosphere at a high temperature, and in constant contact would be the most efficient method. Saturation to a certain degree can be attained, but the temperature of a mine is fixed with but slight variation between the seasons of the year. A change in this temperature would be impractical and objectionable for various reasons. The best that can be done would be to maintain the uniform temperature of the mine and hold it to the highest point of saturation. This would fulfil the requirements for maximum absorption. The mines with which I am most familiar have a temperature of about 60 deg. F.; with a complete saturation, the mine air would contain

nearly 10 gal. of water per 100,000 cu. ft. Complete saturation can hardly be attained by practice and 85 per cent. would probably be more nearly the best result that could be attained; this would mean about 8.8 gal. of water per 100,000 cubic feet.

As a cause of explosions, I have no faith in the theory of occluded gas, in the distant discharge of explosive mixtures by pressure, in the combustion of coal by friction or the unknown atmosphere generated by electric current. The causes of mine explosions, I believe, are well within the present knowledge of chemistry and physics, but it is the lamentable ignorance in the interpretation of the multitudinous and, therefore, complicated conditions which exist, each of which, simple of comprehension in itself, but enormously complicated in the aggregate, that has so far prevented a rational explanation of all.

It would be advisable then, to study more the conditions which are possible to occur, rather than to call on the mysterious or supernatural for new theories.

THE PREVENTION OF DUST EXPLOSIONS

In proposing "efficient preventives," which the subject calls for, we confine ourselves strictly to coal dust. The first and by far the most effective is "keep the atmosphere of the mine saturated by whatever means practicable." Sprinkling in itself is not very effective, local and intermittent in application as it necessarily must be, it does not supply the moisture uniformly, nor in its most available form, yet it must be admitted in the absence of other methods it can be considered as a precautionary measure. The system of water sprays, which is elaborate and expensive, is probably more effective, but still falls short of complete success, unless the temperature of the mine is under control. A third method which has so far given much promise, is the preheating of intake air to saturation by exhaust steam. This method in its preliminary trials has given satisfactory results. A thorough study of the process is now under way, the results of which will appear in a subsequent paper on the "Control of Humidity of Mine Air."

Removal of dust should be carried out as thoroughly as practicable; so many considerations exist outside of danger, from a sanitary and economical standpoint that no argument is needed.

The suggestion recently made to abandon mining machines on account of the dust made is a statement based on lack of knowledge of conditions. The quantity of dust (as we understand the term) produced by puncher, chain and pick mining, has been investigated recently, and the conclusions reached were that the amount of dust produced was practically the same for all these methods of mining.

I do not believe any conditions which might arise from the presence of an elec-

tric current, by short circuit or otherwise, are capable of affecting dust to such an extent as to make an explosion possible. The volume of application of the temperature is too limited and the quantity of heat supplied insufficient.

Ventilation has no bearing on the question of danger from dust explosions, nor need safety lamps be considered in this connection. In fact the absolute preventive for a dust explosion is to prevent an initial explosion from some other source, for under no other circumstance can dust be considered dangerous.

Outside of the efforts of the individual operators, our hopes of safety lie in the mining laws and in the intelligent and faithful interpretations and enforcement of such laws by the district mine inspector.

Intelligent, honest, experienced and broad-minded men are needed, men fully appreciative of the authority vested in them and comprehensive of the responsibility that rests upon them. Compensations for such mine inspectors should be such as to attract the best men in the mining profession in the State.

The State should, through its department of mines, establish and maintain in each mining district instruments for recording the condition of the atmosphere; this would furnish the district mine inspector with facts instead of opinions as regards the atmosphere, and would enable him to caution the operators on short notice of any unusual or dangerous conditions. As an example it might be remarked here, that during four weeks in September, of the present year, such an unusual condition of circumstances existed. During this time the atmosphere was unusually dry, and it was estimated, from the records of recording instruments, that during this period the return airways carried out fully 20 per cent. more water than was furnished by the atmosphere in the intake, which in an ordinary sized mine would represent a loss of about 3000 gal. of water per day.

In the operation of a mine, the area under active development should be held to a minimum. I do not mean by this that the total acreage to be worked out by one opening should be limited, but that the working places should be contracted to within as small a space as possible.

We have sufficient evidence to believe that an explosion once started may spread to every nook and corner of the mine, and by minimizing the area, the chances for such local explosions are reduced, as well as the ultimate magnitude diminished. The panel system should be adopted throughout, abandoned panels which are not pilared (because of surface rights or other causes) should be closed by substantial brattices capable of withstanding the pressure of an explosion.

The present method of mine rating used by some railroads in which the number of working places is the principal

factor should be condemned, as it encourages or even forces overdevelopment, which in my opinion, is a dangerous practice.

A Central Power Plant for Anthracite Mines

Considerable attention is being directed to the great power plant which the Delaware, Lackawanna & Western Railroad Company has just completed near Scranton, Penn. The installation here established is the largest of its kind in the anthracite region. Five collieries are supplied with steam and 15 additional mines are furnished with electricity. The nearest of the collieries is only a few hundred feet from the plant; the most distant mine is three miles away.

Three hundred tons of coal are consumed under the boilers every 24 hours, and during one month 187,695,700 lb. of water were turned into steam. On a regular working day the boiler plant is run at a capacity of 10,000 h.p. The plant represents an investment of about \$500,000 in all.

Because of the many mines dependent upon this central plant, it is absolutely necessary that no interruption occurs; for this reason, all the equipment, even to the pumps and the big fans for the forced draft, are supplied in duplicate. The water supply is brought down from West mountain nearby and flows into a reservoir that will hold 750,000 gal. Before the water reaches the boilers, it enters a preliminary heater and is raised to a temperature of 208 deg. After leaving this heater it is run through an "economizer," where it is further heated, keeping its liquid form owing to the artificial pressure to which it is subjected. By the time the water gets to the boilers, it is far above the normal boiling point; however, it is heated still further and turned into steam at 368 degrees.

AUTOMATIC ARRANGEMENT FOR FEEDING THE FIRES

The coal for the fire-boxes comes from the washeries in ordinary railroad cars. From these cars the fuel is dumped into a concrete pit from which it passes onto an endless rubber belt and is then conveyed up an incline and along an upper floor in the boiler house. Along the path of the belt is an arrangement known as the tripper which causes the coal to be emptied into a chute, which latter carries the coal down into the bunkers. The tripper moves slowly along the track made for it, at just the proper speed to load the bunkers, and when it gets to the end, starts back again. The belt handles 50 tons an hour. The bunkers have a capacity of 1000 tons.

ASHES ARE FLUSHED INTO THE MINE

All the ashes collected at the plant are put to use. They fall from the fire-boxes into a funnel which slopes at a grade of $\frac{3}{8}$ in. to the foot. Water pumped from one of the nearby mines is brought into this tunnel and flushes the ashes into a bore hole which leads into the mine. It is estimated that about 50 tons of ashes are flushed into the workings from under the boilers every day.

THE ELECTRIC-POWER PLANT

The electric-power plant includes five 500-kw. Curtis turbines, with direct-connected alternators. The turbines run at 1800 r.p.m. and generate a current of 2300 volts. Running crosswise of the room toward one end is an Allis-Chalmers turbine, direct connected to a 2000-kw. Bullock generator. This represents the very latest development in turbines, having been in operation only a few weeks. It also runs at 1800 r.p.m., and generates a current of 2300 volts. Four of the Curtis turbines are equipped with Worthington jet condensers and one is equipped with a Worthington surface condenser. The Allis-Chalmers turbine is equipped with a jet condenser of another type. The water for all these comes from the mine, reaching the power house through a 24-in. concrete pipe. The plant has two traveling cranes with a carrying capacity of 10 tons each.

The current is sent through overhead wires; it lights the mines and breakers and runs all the electric locomotives in the neighboring mines. It also lights the passenger station in Scranton and the railroad shops there, this being the only respect in which the Keyser valley plant is devoted to other work than the mining of coal.

There is no wood used in the construction of the new plant. Everything is of reinforced concrete, iron or steel. The oil house is concrete as well as the wash house, where there are shower baths, lockers and tubs for the men. The incline for the rubber belt conveyers is supported by concrete columns. All the construction is absolutely fireproof.

Limit of Safety in Stored Coal

The coal department of the Arthur D. Little laboratory, Boston, has found instances where a small coal pile cooled down after being as hot as 165 deg. F. This was probably a rare occurrence as the temperature generally increases rapidly as the coal heats up above 150 deg., and there is no doubt but that when 212 deg. F. is reached the coal must be moved, or soon steps will have to be taken to cool it in order to prevent fire. Temperatures as high as 485 deg. F. have been observed, and at that temperature the coal ignited when exposed to the air.

Coal Dust Experiments

SPECIAL CORRESPONDENCE

Interesting experiments have been carried on for months past at the Altoft colliery, near Normanton, England. The tests have been conducted by the Mining Association of Great Britain with the object of studying the explosive character of coal dust and the mitigating influence of stone dust. In the evidence taken before the Royal Commission on Mines in the early part of the year, there had been a good deal said about the connection between coal dust and explosions, and also concerning the uncertainty that existed as to the part played by coal dust in past explosions.

The Mining Association of Great Britain raised about \$50,000 from the collieries, contributions being levied on the basis of the coal raised, with a view to making practical experiments. These experiments were carried out with the object of inquiring into (1) the part played by coal dust in engendering and fostering explosions; (2) the means of preventing such explosions, and (3) the means of preventing the extension of such explosions.

The experiments were made in a wrought-iron tube 7 ft. 6 in. in diameter, built up of a number of boiler shells bolted together, having a total length of 1083 ft. The coal dust was laid on wooden ledges inside the tube and scattered by means of a cannon having a 4-oz. charge of blasting powder. The firing of the coal dust was effected by another cannon placed farther in the tube. The charge of this cannon was 16 oz. and the firing was supposed to represent a blown-out shot. The coal dust was obtained by grinding in a crusher so that 79 per cent. would pass through a screen having 40,000 apertures to the square inch.

Between May 6 and Aug. 14 of this year 26 experiments were made with only one failure. On Sept. 24 an experiment was conducted to decide if a barrier of stone dust would have the effect of limiting the area of an explosion. A zone of 367 ft. of coal dust was sandwiched in between two stone-dust zones of 210 ft. each. The experiment was entirely successful, no flame issuing from the end of the tube. On the following day an explosion of coal dust was made without the protection of a stone-dust zone and in this case a blinding flame issued about 90 ft. from the mouth of the gallery. The coal dust was distributed for a length of 250 ft. from the downcast end, the firing cannon being placed 90 ft. in the coal-dust zone. It will be some time before the data are worked up and a report issued. So far as the experiments have gone, it is safe to say that if stone-dust zones are established in dusty mines, the dangers of a coal-dust explosion will be much reduced.

Colliery Notes

Leather washers smeared with soap will not leak gasolene.

The factor of safety in colliery winding ropes should not be less than 10.

Manure is injurious to green concrete but does not affect well made concrete after it is set and hardened.

One investigator claims that a chain-mining machine using chisel-point bits will make more dust than a similar machine using pick-point bits.

One part of good portland cement thoroughly mixed with three parts of sand and six parts of broken stone makes good material for mine dams.

On main haulageways where electric cables are carried, the positive cable should be on one side and the negative on the other side of the roadway.

The advantages of the "rope over the car" system of endless-rope haulage are: (1) The rope is kept out of the water, thus lengthening its life; (2) less rope friction than where the rope runs under the cars.

Tamping cones made of hard burnt clay have proved themselves one of the most effective methods of preventing explosions. They take the place of coal dust or wet clay in the drill hole and prevent blowout shots on the solid.

The nut of a stag-bolt on a boiler can be protected from the intense heat by filling a tomato can half full of stiff asbestos putty and pushing it over the nut. The can will probably burn away but the asbestos will remain on the nut.

An accurate record should be kept of all explosives given to miners and only just enough to fire the allotted number of holes should be furnished each man. Miners should be required to take all explosives into the mine in tin boxes.

A few inches of tamping is as good as a foot for protecting dynamite and retaining the fuse. The use of more tamping consumes more time and increases the danger of missed holes by tending to conceal them if they are full to the collar.

When about to develop a new coal mine by shafting, ascertain, by means of the diamond drill, the lowest point of the coal basin and in what direction the strike runs; failure to determine these points often results in serious loss to mine operators.

The structure of coal plays a prominent part in determining what the crushing load will be when the direction of the force is not perpendicular to the bedding. Partings in coal tend to increase its strength, while cleats favor vertical splitting under compression.

Submarine coal can be successfully mined by the bord-and-pillar methods, and under certain conditions, all the coal can be won. At the Whitehaven collieries of

Cumberland county, England, coal is being extracted at a distance of four miles from the shore. Falls, dislocations and anticlines are numerous.

Where a mining company handles its own timber from the woods to the mines, the saving in freight on peeled and seasoned timber is an important item, often reaching as high as 30 or 40 per cent. Such timber is also in better condition for its work in the mine and is in readiness for preservative treatment.

The sphere of usefulness of disengaging hooks is limited. They afford no protection to the descending cage and the protection afforded the ascending cage is limited to comparatively slow overwinds, since in case of quick overwinds the cage crashes into the frame which carries the detaching hook and smashes it.

When a squeeze is of considerable extent, draw all timber in abandoned places. Rush the drawing of back pillars. As a protection for the entry pillars, the roof over them may be broken by shots placed just inside the opening to abandoned rooms. Strengthen all doubtful places by additional timber-frames, cogs and posts.

An experienced mine superintendent states that wooden air bridges give better results than similar structures built of brick, stone, iron, or concrete, as they are less apt to be destroyed by explosions; wood is more yielding than any of the above named materials, and, when broken, wooden overcasts are more easily repaired.

The Transvaal Government is coöperating in the contest for a prize of £1000 offered by Mr. Reyersbach, on behalf of the Chamber of Mines, for the best drill produced by January 1, 1909. The Government proposes to offer an extra prize of money and to allow drills for competition to be imported free of customs duty and railway freight.

When handling coal and ashes it is well to make as much use as possible of gravity. Have the chutes, hoppers and slopes steep enough to prevent clogging of the material; 40 or 45 deg. is sufficient for coal while 50 deg. is necessary for ashes. Provide guards to keep the ashes away from the moving parts, as ash is destructive to machinery.

In case of mine accident do not remove the clothing by pulling over the head or injured limb, but cut it away until the injury is exposed. If the injured person vomits, do not raise him from a horizontal position, but turn face to one side. In case of burns do not give whisky, as it tends to bring the blood out to the surface and thus increase the pain.

With main and tail-rope haulage with its variable load, it is advisable under ordinary conditions to use a shunt-wound motor, or if the start is made under load, a few turns can be added to the windings. If a three-phase motor is used it should

be so arranged as to start on no load and get up to normal load before the load is put on. This is usually done by clutches.

The importance of recapping winding rope at regular intervals cannot be too strongly emphasized, as the wires immediately above the capping, where the rope loses its flexibility as it enters the socket, are subject to a certain amount of rather severe bending and the rope strain near the capping is of a more trying character than the strain on other parts of the rope.

From 12 to 15 per cent. of the entire amount of fuel used by the Northern railway, of France, consists of briquets. They are used for starting the fires, raising steam and producing extra hot fires for quick runs. Each briquet weighs about 22 lb., is cubical in form and contains from 18 to 22 per cent. of volatile matter. The cost of this fuel ranges from \$3 to \$4.25 per metric ton of 2204 pounds.

In order to secure perfect stratification when washing coal, it is necessary that the raw material be fed evenly in thickness and that the rate of supply be constant, otherwise the aggregation is uneven and imperfect stratification takes place. Plunger systems of washing coal, with constant resistance under the bed, work best when there is a wide difference between the relative specific gravity of the coal and stone.

A large English colliery installed superheaters, with the result that the number of hoists were increased from 60 per hour to 70, giving an increased output of 400 tons a day. This was due to the superheated steam acting immediately on the pistons of the engines, and the cylinder being free from water, the full power was obtained at once and with a higher speed than when the water from the saturated steam flowed to the cylinders.

When installing an electric pump to deal with the water in dip workings, remember that the resistance must be as nearly uniform as possible. Three-throw pumps which give a fairly constant flow of water and are adapted to a uniform turning moment on their own driving shafts give good results. The speed of the driving motor must be necessarily high which necessitates the use of gearing. It is better to give the pump a short stroke.

A good system of firing where a mine is worked by the room-and-pillar system is to divide the mine into four sections, have the shot-firers work together and fire, for instance, the northeast quarter of the mine, then fire the southwest quarter; after this, return to the bottom of the air shaft and remain there for about 30 minutes, in order to give the parts of the mine fired time to cool off and the smoke clear away. The two remaining sections should then be fired. In this way the mine can be kept cool and free from explosive powder gases.

THE ENGINEERING AND MINING JOURNAL

Issued Weekly by the

Hill Publishing Company

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

London Office: 6 Bouverie 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 September, 1908, was 40,800 copies.

October 3.....	13,000
October 10.....	9,800
October 17.....	10,000
October 24.....	10,000

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

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Coal Dust Explosions

The paper on this subject read at a recent meeting of the West Virginia Mining Association, published elsewhere in this issue, is an important contribution to the literature of a danger which has excited more discussion among colliery engineers than almost any other. The practical experience and high scientific attainments of Mr. Haas will attract especial attention to his views, particularly inasmuch as they are at variance with many that have previously been expressed. Thus, Mr. Haas differs radically from many colliery engineers in his statement that as a cause of explosions he has no faith in the theory of occluded gas, in the discharge of explosive mixtures by pressure, in the combustion of coal by friction, or the unknown atmosphere generated by electric current. He asserts also that mining machines produce no more dust than pick mining, that the effect of a short circuit of electric current is too limited to cause an explosion, and that anthracite dust may cause a terrific explosion if conditions are favorable. These and many other statements will no doubt be hotly disputed.

Mr. Haas argues that coal dust is not directly explosive, inasmuch as one part of coal by weight requires more air than can come into intimate contact with the particles of coal. He does not deny the occurrence of coal-dust explosions, but considers the origin of the latter to be the ignition of carbureted gas distilled from the coal. At first sight this appears like splitting a hair, but the distinction has an important practical difference, as appears when Mr. Haas presents the statement that the absolute preventive for a dust explosion is the avoidance of an initial explosion from some other source, "for under no other circumstance can dust be considered dangerous." This is to say, a dust explosion may be produced by an initial explosion of gas, or by a blown-out shot, but not by a naked light or the arc of an electric short circuit.

It must be admitted that there is a good deal of evidence in support of this idea. In the elaborate experiments conducted by Professors Peckham and Peck nearly 30 years ago in connection with the flour-mill explosion at Minneapolis, Minn., it was found that a mixture of flour dust and air would not ignite explosively from

glowing coal or sparks, but could easily be exploded by the injection of a live flame. However, Professors Peckham and Peck considered the careless use of lamps and lanterns to be a source of danger.

We think that many investigators of this subject have been mistaken in considering as coal dust what is not really so. In this country a starting point of experiments has been the fine coal which will pass through a 100-mesh screen. Mr. Haas expresses the opinion that this is too coarse, in which he is clearly correct. In metallurgy, nowadays, material is hardly considered as dust unless it will pass a 200-mesh screen. We understand that material from 100-mesh to 200-mesh in size is now actually being separated by means of pneumatic tables, while in the dust-collecting chambers of smelting works the reduction of velocity of the gas current to 4 ft. per second in order to settle the dust is not uncommon, and in some cases it has been caused to be so little as 1 ft. per second. Yet even the last extremely favorable condition will fail to settle all dust, some of the particles of which may be almost infinitesimally small. Some years ago, after the volcanic explosion of Krakatoa in the Pacific ocean, a cosmic dust circulated entirely around the world and was more than a year in settling, if our recollection be correct. One day this week the atmosphere of New York was smoky and murky from forest fires in the Adirondacks. In the preparation of his deflocculated graphite, E. G. Acheson reduces that form of solid carbon to a condition wherein it will not settle in water, being in what chemists call the colloidal form. Similarly, the water of muddy rivers, like the Mississippi, does not clear in their entire course of many hundreds of miles. Acheson considers that he subdivides his graphite to the molecular state. Without accepting that conclusion, it is to be admitted that solid carbon may occur in an extremely fine state of subdivision, and in that state it is conceivable that it may readily come in contact with sufficient air to explode directly.

Other points in Mr. Haas' paper are equally open to criticism. He does not give consideration to the injurious effect of water on the colliery roof, and does not answer the statement of W. N. Page that inasmuch as more men are killed by

falls of roof than by explosions of all kinds, water cannot be used with impunity for laying dust. The statement that the maximum pressure of an explosion is about 50 lb. per square inch seems far too low. These and other points are open to serious discussion, which we hope will be entered into by colliery engineers. Our criticisms in the above respects are no disparagement of the practical value of Mr. Haas' contribution. The interests of coal mining would be promoted if there were more expressions of such thoughtful ideas, which would lead to expert discussions, eventually bringing out the truth.

Prime Western Spelter

A correspondent has requested us to define what is "prime Western" spelter, and what would be a good delivery of that class of spelter. Replying to this inquiry, we must say in the first place that there is no well established trade, much less official, definition; and consequently it is necessary to trace the history of the term. The term originated in the days when the smelters of Kansas and Missouri were producing a single grade of spelter from ore obtained from the Joplin district. This spelter contained about 0.8 to 1 per cent. of lead, 0.05 per cent. of iron and a small percentage of cadmium, usually undetermined. Later, the smelters adopted the practice of keeping separate the first draw of metal from the subsequent draws, and marketing it as "brass special," "extra select," or under other names, which may be generalized as "specials." The remaining draws continued to be called "prime Western."

The practical effect of this separation was to produce "specials" containing about 0.4 to 0.6 per cent. lead, and about 0.4 per cent. cadmium; and "prime Western," containing about 1 to 1.1 per cent. lead and 0.2 per cent. cadmium; in each case the percentage of iron remained about the same, viz, 0.02 to 0.05 per cent.

Later, most of the smelters entered upon the use of Colorado and other Western ore, some of them employing it exclusively. The spelter obtained from these ores was apt to be higher both in lead and in iron than that obtained from the Joplin ore, but it has continued to be marketed as "prime Western," although there has been from time to time some

complaint respecting certain deliveries as such.

As a tentative definition for "prime Western" under present conditions we offer the following: Spelter produced from virgin ore by the retort process, containing not to exceed 1.1 per cent. of lead and not to exceed 0.08 per cent. of iron. This definition corresponds closely with the conditions which prevailed when the term "prime Western" originated, before special brands were made and before ore from west of the Rocky mountains was treated, and is sufficiently liberal to include the best of the metal made from the latter class of ore. Some of the spelter produced from Colorado ore is relatively high in lead—1.5 per cent. and occasionally more—the percentage of this impurity being governed largely by the temperature of distillation, but the lead content of such spelter can be reduced to 1 to 1.1 per cent. by a simple process of refining as practiced in Upper Silesia, and also in the United States.

Multiplicity in the grades of spelter, not to speak of the brands, is undesirable. Leaving out of consideration the superior grades of metal, made from peculiar and selected ores, which command a large premium, there exist at the present time among the Western smelters the following kinds of spelter:

1. Spelter made from Joplin ore, no separation of draws.
2. Spelter made from Joplin, and other ores in admixture, (a) with no separation of draws, and (b) sold separately according to draw, in some cases the first and second draws being united, while in other cases the three draws constitute distinct grades.
3. Spelter made exclusively from Rocky mountain ore, its composition varying according to the character of the ore and the method of smelting.

As above remarked, some of the spelter of the last class is of inferior quality and its delivery under the guise of "prime Western" is properly refused.

The Anthracite Miners' Agreement

Nearly six months before the expiration of their present agreement, the anthracite coal miners have formulated their demands for the new contract, which will not take effect till April of next year. The present agreement is practically that

made by the Anthracite Coal Commission after the great strike of 1903; the movement made to secure changes in 1906 having failed, and ended in a continuation of the existing contract. The demands include briefly the full recognition of the union; the check-off—that is the deduction of union dues from the miners' pay; the payment for coal mined by weight instead of the carload; and the eight-hour day. No increase in the mining rate will be asked, but an advance will be demanded for the lower-priced laborers.

Not all of these demands will be accepted by the companies, and a prolonged controversy may be anticipated next spring if they are insisted on. It is perhaps well to have the demands formulated and known well in advance, though it is not likely that any answer will be made by the companies until the time comes to make the new contract.

Dry Air Blast Results

The paper on the use of the Gayley dry-air blast at Warwick furnace, given in another column, is of interest as showing the application of the drying plant at a merchant furnace of moderate size. There has been a general impression that it would pay to adopt this process only at large furnaces, or where several stacks are in use, as at steel plants where the make of pig iron is necessarily large and uniform quality is required. At Warwick furnace, however, where the iron made is sometimes basic pig, and at others different grades of foundry, as orders may be received, it has been found that considerable advantages resulted. Coke consumption was reduced, the output of iron increased, and the grade of iron was more nearly uniform. All of these results were secured at such moderate operating cost that the expenditure required to install the drying plant seems to have been fully justified.

The result of this working test, as it may be fairly called, is to increase largely the field of the dry-air blast in a practical way. Theoretically there was no doubt as to the gain with small as well as large plants. Practically it might have been—and was—argued that the saving on a small furnace, and especially a merchant furnace, would not warrant its introduction. This seems now to have been a mistaken conclusion.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and
Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Corrosion of Steel and Iron Tubing

In the *Iron Age*, of Sept. 17, p. 790, G. Schuhmann raises some points concerning a late paper by Professor Stoughton and myself on the corrosion of steel and iron tubing.

To our assertion that "nobody has a right to say either that defects which may in the past have lessened tube steel's resistance cannot be cured by skill and care, or, except on valid evidence, that they have not been cured," he replies, "It is an admitted fact that it is generally a very difficult matter to prove a negative." Negatives are often easy to prove. Mr. Schuhmann's letter proves that he was not dead when he wrote it. Every word he utters proves that he is not dumb. The fact that I have my cake proves that I have not eaten it. If the defects in steel have not been cured, that can be proved easily by showing that the best tube steel of the best makers habitually corrodes and pits worse than wrought iron under service tests.

He misleads his readers unwittingly by speaking of our evidence as "laboratory tests." In point of fact our conclusions were based in very large part on service tests, many of which were pushed to destruction. He explained to me privately that under "laboratory tests" he includes "all tests which deviate from average service conditions, that is, not only those that are made in the laboratory, but also all tests made under such extraordinary service as to push corrosion to an unusually early destruction of the metal, and that the proof of the slow actual average service is still lacking." With this explanation, and with his misapprehension in supposing that all the tests, which we reported, were under "extraordinary service," his words which I have just quoted are intelligible, but still likely to mislead. There are true service conditions of every degree of severity from that of carrying sulphuric-acid coal-mine water to that of carrying petroleum. For all I know there may be conditions under which either iron or steel would last indefinitely, indeed until worn through by the friction of the passing fluid. The iron tool found in the Pyramid of Kephron had resisted corrosion for forty centuries. What the true average degree of severity of all these conditions is would always be debatable, and would change from year to year. But to say that all service conditions more severe than that

average, or more severe than the majority, are not service conditions at all, but are laboratory tests, seems to me at least to strain the meaning of these words in a misleading way. I believe that on reflection Mr. Schuhmann will admit this.

Now in point of fact, locomotive boiler tube service, which is certainly true service and in my opinion cannot fairly be called a "laboratory test," is sometimes favorable, but sometimes extremely severe, with every intermediate degree of severity. Our trials K and KK, I understand, were under normal service conditions in locomotive boiler tubes, and were pushed to destruction. The respective railroads made these in order to learn for their own information whether it was more profitable to use steel or iron, and not to uphold either. In K steel lasted better than iron, in KK no material difference was found.

By this and other evidence we have shown that, in certain rather severe true service conditions pushed to destruction, and in others of very moderate severity, such as the hot-water system of Principal Thomson, not carried to destruction, but still to measurable pitting, some modern steel has lasted as well as wrought iron. I fancy that the impression which Mr. Schuhmann wanted to convey was that this sort of result is not conclusive proof that steel will last as long as iron under other service conditions which are so much less severe that iron lasts not two, but twenty years. In that I should agree with him fully. Proof of equality under one set of service conditions is no proof of equality under others; but then it certainly raises a very strong presumption against there being any great difference under those other conditions. Has Mr. Schuhmann given due weight to this presumption?

But under mild service conditions, too, steel has behaved admirably; for instance, in the great Rochester steel conduit, made about 13 years ago. Though laid in wet soil, many steel plates which had long lost their protective coating were uncorroded, and four-fifths of the plates were in good condition when examined lately. Thus in 1895 steelmakers already could make four-fifths of their steel so that it would not corrode under these trying conditions. The failure of certain steel plates in this conduit seems to me to mean simply that methods of manufacture and inspection had not been so perfected that every plate would be good, or that every bad plate could be detected and rejected. It does

not seem to imply that such perfection cannot be attained.

He asks how it is that, if the difference of potential between cinder and iron in wrought-iron tubes may more than offset the mechanical protective action of the cinder, yet cast iron corrodes less than steel? Whether such difference of potential shall or shall not outweigh mechanical protection depends on how great the difference of potential is and how effective the mechanical protection is. In one case the difference of potential may outweigh the mechanical protection, in another it may not. Actual experiment must decide in each case.

The difference of potential between the graphite and the cementite of cast iron on one hand and the iron itself on the other, is presumably very different from that between the cinder of wrought iron and the iron. Moreover, the difference between iron and any one mechanically protecting impurity, graphite or cinder, will differ greatly with the environment.

There may be conditions under which the difference of potential between cinders and iron is so slight that its effect is far outweighed by the mechanical protection of the cinder. In such cases wrought iron should have a material advantage, and might be much more resistant than even the best steel.

In point of fact, it is chiefly the continuity of the skin of cast iron which makes it resist corrosion. So far as I have seen, when the skin of cast iron is removed its resistance is not so much greater than that of wrought iron or steel. It is most misleading to speak of the cinder in wrought iron as the equivalent of the skin of cast iron, because that skin is continuous, whereas the cinder in wrought iron is very far from continuous, and exists chiefly in threads and rods. It is this discontinuity that lessens its protective action.

He asks why the present steel resists corrosion better than older steel. That is beside the mark. The makers are not called on to disclose to their competitors by what steps they have bettered their product. If they can prove that betterment, that should suffice. Personally I should be glad if they would disclose those steps, but such disclosure should not affect materially the effect of the direct evidence as to the present resistance of steel. Users wish to know whether steel actually is as resistant as wrought iron, rather than whether it ought to be, or why it ought to be.

He points out that two years ago I said

that the burden of proof was on the steel-makers. Things have moved in those two years, and in them the steelmakers have actually furnished much proof. That they have furnished all the proof needed I have never suggested. They seem to have proved that they can make steel as resistant as wrought iron. It remains for them to prove that their processes and inspection are so perfected that they can do this every time.

HENRY M. HOWE.

Columbia University in the City
of New York, Sept. 25, 1908.

Rights of Junior Locators

Albion S. Howe, in the JOURNAL of Oct. 17, points out what appears to be a lack of harmony between my statements about the right of junior locators in the JOURNAL of Sept. 5, page 460, and the opinion on the same subject found in "Martin's Mining Law."

The law is correctly laid down in "Martin's Mining Law." It is not in conflict with the statement made by me in "Short Talks," and criticized by Mr. Howe. The doctrine is broadly stated by Mr. Martin, but a careful reading of the text does not support the theory that the overlapping locator secures the surface within the overlap. The case of Del Monte Company vs. Last Chance Company, 171 U. S., 55 (not cited on this point by Mr. Martin, but cited in the decision noted by him [Empire State Company vs. Bunker Hill Company, 131 Fed., 59]), is the leading one upon the point, and holds that "any of the lines of a junior lode location of a mining claim may be laid within, upon, or across the surface of a valid senior location for the purpose of defining or securing to such junior location underground or extralateral rights not in conflict with any rights of the senior location." * * * It matters not to the prior locator where the end lines of the junior location are laid. In the case of Davis vs. Shepherd, 31 Colo., 141, also cited by Mr. Martin, it is said: "Provided no forcible entry is made, a junior locator may project the end lines of his claim across the surface of a senior location for the purpose of fixing extra lateral rights to so much of the vein as is subject to location."

That relocation is necessary to secure the territory within the overlap, is shown in Oscamp vs. Crystal River Company, 58 Fed., 293, in which the court said: "A failure to work a claim to the extent required by the statute simply entitles a third party to relocate it in the mode prescribed by existing laws. * * * If the statutes in that respect are not pursued, the status of all persons remain unaltered, barring the possible effect of limitations or laches, and if at any time the original owner re-enters and resumes work, the right of relocation is then lost."

See also Omar vs. Soper, 11 Colo., 380; Johnson vs. Young, 18 Colo., 625.

Mr. Martin states (Section 197, page 152) that the law does not tolerate a provisional location, the validity of which is to depend upon the future action of a prior locator. Citing Lockhart vs. Farrell (Utah), 86 Pac., 1077, in which case it is said that "a location of a mining claim must be good when made, and each claimant must stand on his own location and can take only what it will give him under the law." And it is clear that the law only gives the junior locator the right of paralleling his end lines by the invasion of the territory of another.

Furthermore, Mr. Martin states (Section 198, page 153) "that property abandoned reverts to its original status as a part of the public domain." If so, it does not become the property of the overlapping locator.

A. H. RICKETTS.

San Francisco, Cal., Oct. 12, 1908.

The Nomenclature of Zinc Ores

My attention has been called to the following statement on page 267 of "Lead and Zinc in the United States," by W. R. Ingalls. "Deposits of smithsonite and hemimorphite classed together as silicate ore by the miners of the district occur at Aurora and Granby." Why is the silicate now called hemimorphite, when in the literature published in the past it is referred to as calamine? Dana gives the name calamine the preference. B. A. H.

Joplin, Mo., Oct. 1, 1908.

I wrote a paper entitled "The Nomenclature, of Zinc Ores" which was published in the Transactions of The American Institute of Mining Engineers for 1895. In that paper I called attention to the fact that the name "calamine" was used commercially and metallurgically to include all of the silicates and all of the carbonates of zinc and had been so used for upward of 100 years, the term being in use before it was known that there was any difference between the carbonates and the silicates; I called attention, moreover, to the fact that mineralogists had appropriated the name calamine for the designation of a mineral species, but that there was confusion in this respect among mineralogists, some using calamine as the name of the anhydrous carbonate and others using it for the hydrous silicate, the latter usage being that of Dana.

In order to obviate this confusion in nomenclature, I proposed that the hydrous silicate of zinc, called calamine by Dana, be renamed "hydrowillemite." This proposal did not draw out any particular discussion and I considered it to have failed of acceptance. Consequently I decided, inasmuch as the old confusion in nomenclature was vexatious and inexact, to adopt the second name given by Dana for the hydrous silicate of zinc, namely

hemimorphite, and I used that term in my "Production and Properties of Zinc," published in 1901 and my "Metallurgy of Zinc and Cadmium" published in 1902.

All of this antedated the litigation which has been going on during the last three or four years as to the dutiability of certain ores of zinc, "calamine" being on the free list in the Dingley tariff. Of course, it was merely consistency on my part to continue to use the term "hemimorphite" in my recent work "Lead and Zinc in the United States." I have no doubt that my usage of that second name of Dana will constitute a precedent which will be generally followed because it is necessary in order to secure precision in language. If a metallurgist today speaks of calamine, I know what he means, because I know that he is referring to the carbonate and silicate ores of zinc in general as metallurgists have been doing for a century; but if a geologist or mineralogist speaks of calamine, I am bound to ask what he means. Of course, this in an indefiniteness which cannot long be permitted to exist.

W. R. INGALLS.

New York, Oct. 6, 1908.

Mining Practice on the Rand

I should like to correct some slight errors in the article, "New Mining and Milling Practice on the Rand," which appeared in the JOURNAL of Aug. 15, 1908. My reference to the cumbersome and useless system of central administration referred to the abuse of this system which deprived mine managers of all initiation. Some groups retain the services of a general manager who is generally the most successful manager they have had, and who is able to check work and make fair comparisons of the work on different mines.

My remarks on the supply of drill steel should also be qualified by stating that in soft ground on the outcrop mine drills can be used twice, often to advantage; so the figures given were scarcely a shocking example. The "Murphy" drill is not at present at work on the Robinson mine. The drill referred to was the "Waugh," which has been working for several months on the Robinson Deep, putting in dry holes, "Cripple Creek style," with solid steel in the steeper stopes where the dip of reef is 35 deg. and more. Several machines for use with hollow steel and water injection are also at work and are stated to be giving most promising results. This drill is manufactured by the Denver Rock Drill and Machinery Company.

E. M. WESTON.

Brakpan, Transvaal, Sept. 18, 1908.

Cadmium forms alloys with many other metals and possesses the property of reducing the melting point.

The New Ohio Law on Explosives

George Harrison, chief inspector of mines, of Ohio, has issued the following circular relating to the law passed by the Ohio Legislature at its last session, which took effect Oct. 3. This law is as follows:

THE ACT

SECTION 1. Storing Blasting Powder or Other Explosives. No blasting powder or other explosives shall be stored in any coal mine, and all powder sold to miners by the keg shall be packed in kegs which have an opening at the edge 2 in. in circumference, and that can be conveniently opened, to avoid the dangerous use of picks to open the same; and no workman shall have at any one time more than one 25-lb. keg of black powder in the mine, nor more than 3 lb. of high explosives; and no explosive shall be taken into or out of any part of the mine in mine cars propelled by electric power; and no person shall keep blasting powder, or explosives, dangerously near the electric wire or power cable in any part of the mine where electric wires are in use.

(a) **Boxing and Distance.** Every person who has powder or other explosives in a mine, shall keep it or them in a wooden or metallic box or boxes, securely locked, and said boxes shall be kept at least 5 ft. from the track, and no two powder boxes shall be kept within 25 ft. of each other, nor shall black powder and high explosives be kept in the same box.

(b) **Handling Explosives.** Whenever a workman is about to open a box or keg containing powder or other explosives, and while handling the same, he shall place and keep his lamp at least 5 ft. distant from said explosive and in such position that the air current cannot convey sparks to it, and no person shall approach nearer than 5 ft. to any open box containing powder or other explosives with a lighted lamp, lighted pipe or other thing containing fire.

(c) **Tamping.** In the process of charging a hole, whenever in the opinion of the mining department this becomes necessary, the needle used in preparing a blast shall be made of copper and the tamping bar shall be tipped with at least 5 in. of copper. No coal dust nor any material that is inflammable, or that may create a spark, shall be used for tamping, and some soft material must always be placed next to the cartridge or explosive.

(d) **Firing Shot.** A miner who is about to fire a shot with a manufactured squib shall not shorten the match, saturate it with mineral oil nor ignite it except at the extreme end; he shall see that all persons are out of danger from the probable effects of such shot, and if it be a rib shot, he shall notify the person or persons working next to him on said rib before said shot, and shall take measures to prevent anyone approaching by shouting "fire" immediately before lighting the

fuse; no person shall return to a missed shot until five minutes have elapsed. And when it is necessary to tamp dynamite, nothing but a wooden tamper shall be used.

SECTION 2. Penalty. Any person violating any part of this act, shall be deemed guilty of a misdemeanor, and upon conviction be fined, not more than \$100, nor less than \$5, at the discretion of the court.

COMMENTS OF THE INSPECTOR

It is not necessary to say that the above law covers a number of very important points, which, if reasonably observed, may result in preventing much loss of life and injury to persons in mines. It is no hardship to anyone, simply a little proper discipline and exercise of necessary care in handling explosives.

Clause (c) provides that: "Whenever in the opinion of the Mining Department this becomes necessary, the needle used in preparing a blast shall be made of copper, and the tamping bar shall be tipped with at least 5 in. of copper." The promoters of the law no doubt considered it essential that copper needles and tampers should be used as a safeguard against premature blasts, and loss of life or injury resulting to miners, and every inspector in the department is fully in accord with the law, hence this notice:

"That copper needles and copper tips on tamping bars must be provided without any unreasonable or unnecessary delay, and the use of all other materials as needles and tip ends of tamping bars dispensed with both by regular miners and by day men and any person or persons engaged in charging any hole, either in coal, rock, or any other material in any mine in the State except where the law requires that nothing but a wooden tamper be used to tamp dynamite charges."

Detection of Mercury in Nitroglycerin Compounds

Mercuric chloride, as is well known, has the effect of prolonging the "heat test" of nitroglycerin explosives, making the explosive appear purer than it really is. For a long time the small amount of mercuric chloride required to produce this effect made the quantitative determination of the mercury difficult. The following method is the one used by the inspector of explosives for West Australia to determine the amount of mercury in nitroglycerin compounds.

Two hundred grams of explosive are ground up with 400 grams french chalk; 250 c.c. water are added, and the whole allowed to stand for 24 hours. The solution is filtered; the filtrate is made slightly acid with H_2SO_4 ; then an electric current of 1.5 amperes is passed through the filtrate and the mercury deposited on a gold cathode, a platinum anode being used.

The current is left on for three to six hours; then the cathode is detached, washed with water, alcohol, and ether, carefully dried at a low temperature, and finally weighed, the increase in weight being taken as mercury. The cathode is cleaned by heating to redness.

QUALITATIVE TEST

The following qualitative test is used: Two hundred grains of explosive are ground up with French talc, and then placed in a large test tube, closed with a cork stopper from which is suspended a piece of silver foil. The test tube is then heated at 71 deg. C. for two hours. After cooling the silver foil is placed in a test tube and heated strongly, the upper part of the tube being kept cool so that any mercury present deposits in the upper part of the tube. The presence of mercury is detected by heating a small piece of iodide in the test tube, any mercury deposits turning red owing to the formation of mercuric iodide.

Effect of Compression on Burning of Fuse

In order to determine whether or not the quick burning of fuse is due to "burning through" of fuse so that the fire short-circuits in the hole, the inspector of explosives for West Australia made a series of experiments to determine this point. The inspector in reporting his experiments (report for 1907, Department of Mines, West Australia, p. 221), states that after testing many thousand samples of fuse in the course of 13 years he has never found a sample of fuse that "ran" (burned with extreme rapidity through its length).

In order to test the possibility that in coiling up the fuse and poking it into the hole (as is customary with some miners in order to avoid the tearing out of fuse by flying rock from other holes) the fuse may become cracked and broken at the sharp turns and so may "short-circuit," he either coiled or bent and tightly crushed 6 ft. of fuse into a galvanized-iron pipe having an inside diameter of $1\frac{1}{4}$ in. and 12 in. long. At the same time the same length of fuse was burned unconfined, and the rate of burning of each sample was timed. Out of 287 fuses tested 107 showed a retardation, and only two an acceleration, and that very slight. In many cases the retardation in the rate of burning amounted to 20 per cent. This retardation is an additional reason why miners should not hasten back to holes which they suspect have missed fire.

The addition of 0.5 per cent. of cadmium to silver imparts malleability and partially prevents blisters in the manufacture of silverware.

Questions and Answers

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure of the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

SEPARATION OF CHALCOPYRITE AND MOLYBDENITE

I would like some information with regard to the concentration of molybdenum sulphide. Our ores carry copper—5 to 15 per cent.—gold, silver and iron. The matrix is quartz and lime—gypsum and carbonates—all of which contain more or less molybdenite, some ores carrying as high as 14 per cent. On the Wilfley tables a small streak, $\frac{1}{4}$ in. to $\frac{3}{8}$ in. wide, comes over and we find that the metal settles fairly well, its specific gravity being so much greater. In shoveling out the copper-iron concentrates a streak about $\frac{1}{2}$ in. thick, mixed with some copper and iron, is always found on the bottom of the box; but it is so elusive and fine that I doubt whether the hydraulic classifier would give any result. What I would like to know is what is the lowest grade of known solvent of molybdenum which will not attack copper and iron. I would also like to know what is the lowest grade of concentrates salable, and what is the price. Any further information would be acceptable.

M. M. S.

Molybdenite is soluble in sulphuric acid. However, we do not believe that a chemical process on that basis could be worked out to solve the problem stated. The specific gravity of molybdenite is only 4.7 to 4.8, wherefore we do not see how our correspondent can be making any separation by washing on Wilfley tables. The problem is one that should be referred to a metallurgical engineer for experimental investigation. It is possible that some separation can be made by a magnetic, electrostatic or flotation process.

Molybdenite is commonly guaranteed to be 90 to 95 per cent. pure. As such, it is worth \$400 to \$450 per 2000 lb. Not being a staple product, the price is subject to wide fluctuation, and usually is a matter of negotiation between buyer and seller. The Primos Chemical Company, of Primos, Delaware county, Penn., and De Golia & Atkins, of San Francisco, Cal., are the principal dealers.

QUARTZ, FLINT AND SAND

Can you give me any information about the uses of silica sand and ground quartz in the clay industries of the United States? I am led to believe that there is a wide demand for these materials. What I want to know is: (1) What are the uses; (2) about what volume is used annually; (3) the present source of sup-

ply; (4) what constitutes a good sand; (5) about what is the value of the various grades per ton; (6) the suitability of the almost pure silica sand of the Woodbridge district in New Jersey for these purposes.

J. B. H.

Quartz and flint are extensively used in pottery manufacture, wherein they serve to diminish shrinkage in the body of the ware. Quartz is used also in the glaze. Sand and ground sandstone are, however, steadily gaining ground as a substitute for the more massive form of quartz in the pottery trade. Quartz of any variety, to be suitable for pottery use, must be free from iron; in general, there should be less than 0.5 per cent. of ferric oxide. Quartz, quartzite and silica sand are also used for the manufacture of silica brick. The largest uses for sand are for building purposes, for the manufacture of glass, for molding iron, and for the manufacture of sand-lime brick. The total production of sand for all of these purposes amounts to millions of tons per annum. For the manufacture of glass and silica brick freedom from iron is an essential requirement. Building sand must be clean and sharp. Molding sand varies from clay loam to a clean, sharp, coarse sand. The value of sand ranges from 8c. per ton for ordinary building sand to nearly \$5 per ton for some of the finer grades of glass sand. Much depends, of course, upon the proximity to market. Silica sand is of very common occurrence. As to the suitability of the silica sand of the Woodbridge district, New Jersey, professional advice should be secured. We cannot undertake to answer such specific questions, requiring an examination for which we have not the time; nor is it our business.

THE CHEAPEST PRODUCER OF COPPER

Which company, operating in any part of the world, produces copper most cheaply?

W. K.

We do not know, and moreover we think that an answer to this inquiry would be of no value. The cost of producing copper in many cases is simply a matter of figuring. When ores contain gold and silver, the deduction of the value of those metals from the total cost of production causes the copper to be comparatively cheap. In this way the Utah Consolidated and North Butte companies are producers of very cheap copper. Both of them are surpassed by the Rio Tinto if the sulphur value of the latter's ore be deducted in the same way. Similarly, we venture to guess that the Orford Copper Company would be the cheapest producer of copper if the nickel value of its ore were deducted. However, the matter becomes rather absurd before that point is reached.

CHLORINE GAS FOR GOLD CHLORINATION

In looking through the volumes of the JOURNAL, I find many articles on the use

of chlorine gas for chlorination purposes, but I am unable to find recent articles giving data on the cost and actual method of production. Can you inform me where I can obtain such data and also how I can learn where the gas is used?

F. S. McG.

Chlorine gas for the chlorination of gold ore is usually produced in the barrel wherein the ore is treated by the action of sulphuric acid on bleaching powder, the charge of 15 lb. of bleach requiring 30 lb. of sulphuric acid and yielding about 5 lb. of chlorine, the cost of which is 75c. This is required per ton of ore in some cases. It has frequently been proposed to employ chlorine generated by the electrolytic decomposition of common salt, and it has been estimated that the chlorine required per ton of ore can be obtained in this way for 15c. against 75c. by the present process, but in spite of this estimated economy, the electro-chlorination process has not yet come into use.

THE MARKET FOR MAGNESIUM

Will you please inform me respecting metallic magnesium, its uses and the probable demand for the metal; also its approximate value. I am interested in a large deposit of magnesite of very high quality in British Columbia and am looking for a market for the various products that can be made from it.

M. P.

There are no available statistics as to the production of magnesium. However, it may be stated that the aggregate amount is very small, probably not more than 100 tons per annum. Magnesium finds its chief use in photography. An alloy of aluminum and magnesium, called magnalium, has recently been introduced, which promises to have considerable commercial value and perhaps will be the chief consumption of magnesium. The present price of magnesium is \$1.25 per lb. At present it appears unlikely that this metal will ever attain the industrial importance that aluminum has, but progress in the arts and cheapening of cost of production often work wonders. But at the present time a deposit of magnesite is not considered valuable because magnesium can be produced from it. The chief use for magnesite is as a refractory material. The market for magnesite on the Pacific coast is limited. The product cannot be brought from there to the Atlantic coast in competition with the magnesite of Austria and Greece.

The United States imported 259,881 lb. of bismuth in 1907 against 254,733 lb. in 1906. The values were \$325,015 and \$318,452 respectively.

The production of borax in the United States is confined almost entirely to Inyo, San Bernardino and Ventura counties, California.

Personal

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

H. W. Turner, of San Francisco, has been making examinations in the Coalinga oil district in California.

J. W. Mercer, of Denver, Colo., has been at Houghton, Mich., and is now on his way to South America.

H. W. Hardinge, of New York, has returned from Cobalt, where he has been engaged on professional work.

Richard A. Parker has removed his office as consulting mining engineer to 404 Colorado building, Denver, Colorado.

Walter Fitch, superintendent of the Calumet & Hecla mines, has tendered his resignation to take effect Nov. 1 next.

S. E. Bretherton, consulting mining and metallurgical engineer, has removed his office to 422 Montgomery street, San Francisco.

Lewis T. Wright, general manager of the Mountain Copper Company, is visiting mining and metallurgical districts in the East.

F. F. Sharpless, of New York, returned from the West Oct. 17 and on Oct. 21 sailed for London where he will be for about six weeks.

Walter S. Keith left Seattle, Wash., on Oct. 11 for Cooke City, Montana, to erect a 250-ton smelting plant for the New World Power and Reduction Company.

Etienne A. Ritter, of Colorado Springs, Colo., has been appointed consulting engineer of the Burleigh Mining and Milling Company operating at Silver Plume, Colorado.

Charles B. Strecker, president of the Commercial-Financial Association has been in the Lake Superior copper district looking over the various mining enterprises.

Richard S. McCaffrey has resigned as superintendent of the Tintic Smelting Company, in the Tintic district, Utah. He has been succeeded by G. C. Vivian, of Butte, Montana.

Dr. George F. Kunz and Charles Hugh Stevenson have just published a work called "The Book of the Pearl," in which no possible point of interest relating to pearls is left untouched. It is an elaborate work which surely will excite much interest.

W. B. Gohring has been made superintendent of mines of the Calumet & Arizona and the Superior & Pittsburg companies. The position has been created for Mr. Gohring, who will now be next in charge to Col. L. W. Powell, general manager of these companies.

Obituary

Captain John Wicks, a pioneer of the Lake Superior country, died at Iron Mountain, Mich., Oct. 12, aged 88 years. He was born in Cornwall, England, in 1820, and had been in Michigan since 1852, with the exception of four years, from 1866 to 1870, when he had charge of the Ophir Cañon mine in Nevada. He served as mining captain at a number of mines, including the old Minnesota, the Hamilton, the Kimberly, the Lake Antoine, the Millie and others. He had charge of the exploration work for the Menominee Iron Mining Company, which resulted in the discovery of the great Chapin mine. His last active work was at the Millie mine; in 1896 he retired on account of his advanced age.

William S. Tretheway, superintendent of the underground work on the Osceola and Kearsarge lodes for the Calumet and Hecla Mining Company was accidentally killed by a descending skip in No. 21 shaft of that property. He was born at Cambourne, Cornwall, England, and had been in the Lake Superior district since 1875. He had charge of sinking the Central company's vertical shaft and from there he went to the Atlantic. It was under his management that the first dividends from that mine were paid. From the Atlantic he entered the employ of the Calumet & Hecla and had charge of the reopening of the shafts on the Osceola lode.

Bennett H. Brough died at Middlesbrough, England, Oct. 3, after a short illness, aged 48 years. He had been connected with the Iron and Steel Institute for 24 years, having been associate editor of its *Transactions* from 1884 to 1893, and secretary from 1893 until his death. He was a well known figure in the mining world, having been an active member of many of the scientific societies of London. He was an associate of the Royal School of Mines, a fellow of the Geological Society, and of the Institute of Chemistry, and a member of several other kindred societies. In former years he had held the appointment of instructor in mine surveying at the Royal School of Mines. He was the author of many professional papers; perhaps his best known work was his "Textbook on Mine Surveying," first published in 1888, a book which has run into twelve editions. He served on the councils and as examiner for the Royal School of Mines, the Cambourne Mining School and Glasgow University. He served on the mining and metallurgical committees of the British sections of the Paris Exhibition of 1889 and of the St. Louis Exhibition of 1904. More recently he was secretary to the Iron and Steel Committee at the Franco-British Exhibition, and was instrumental in forming the important collective exhibit of the pig-iron industry.

Societies and Technical Schools

American Institute of Chemical Engineers—A circular from the secretary says that the first annual meeting of this institute will be held at Pittsburg, Penn., Dec. 28 and 29. It is essential that this meeting be well attended and that an excellent program be presented. Members are requested to notify the secretary as soon as possible in regard to any contribution which they can make to the meeting. The committee desires early notification regarding both classes of subjects in order to prepare the printed program. The committee also has in view the preparation of new features which will make the meeting of exceptional importance and interest. Early and hearty cooperation by all members, however, is imperative in order to assure success. The secretary is J. G. Olsen, whose address is at the Polytechnic Institute, Brooklyn, N. Y.

American Electrochemical Society—The next meeting of this society will be held in New York, Oct. 30 and 31. Headquarters will be at the Hotel Cumberland. The meetings will be held at the Chemists' Club, and in the Doremus lecture hall of the College of the City of New York. The annual dinner will be held on the evening of Oct. 30. The program includes a visit to the Balbach Smelting and Refining Works at Newark. The following papers are to be presented:

1. "The Use of a Mercury Cathode in the Determination of Metal." A. Harold Porter and Francis C. Frary.
2. "The Passivity of Nickel and Iron." E. P. Schoch.
3. "Equilibria in Standard Cells." G. A. Hulett.
4. "Chemical Energy." J. E. Mills.
5. "The Formation of Nitric Acid from Air by Means of Low-Voltage Direct Current." G. W. Morden.
6. "Electrolytic Corrosion of the Bottom of Oil Tanks." A. A. Knudson.
7. "The Corrosion of Underground Structures." Albert F. Ganz.
8. "The Function of Oxygen in the Corrosion of Metals." W. H. Walker.
9. "The Theory of Electrolytic Paints." W. D. Bancroft.
10. "Simple Methods for the Prevention of Electrolytic Corrosion." Maximilian Toch.
11. "The Lash Steel Process and the Electric Furnace." F. A. J. Fitzgerald.
12. "Utilization of Power Stations for Electrochemical and Electrothermal Processes during Periods of Low Load." E. A. Sperry.
13. "Electrochemical Loads and the Central Station." John Meyer.
14. "Correct Methods of Measuring Stray Currents." Clayton H. Sharp.
15. "The Latent Heat of Vaporization of Zinc." W. McA. Johnson.
16. "Heat Losses of Furnaces through Walls." Carl Hering.

Special Correspondence from Mining Centers

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

REVIEWS OF IMPORTANT EVENTS

San Francisco

Oct. 14—There are a few dredges working in Calaveras county, but until 1908 there was only one. The field in that county is somewhat limited in extent as far as known. This year, however, two or three new ones have been built and set at work. They are at Jenny Lind on the Calaveras river not far from the boundary of San Joaquin county. As there has been some little muddy water coming down the river the Chamber of Commerce of the City of Stockton, in San Joaquin county, following the example of the Sacramento county men, has appointed a committee to see how the dredging in Calaveras county may be controlled.

Up to the present time 11 men have been arrested and lodged in jail to be placed on trial for stealing amalgam from the dredges at Folsom. About \$15,000 has already been traced to these men and it is expected that there has been \$10,000 more taken.

The Gold Bar Dredging Company in Butte Creek cañon has been trying to mine its property with some kind of a steam shovel and the venture has been virtually given up. On behalf of the stockholders, however, the Black Sand Mining Company has taken hold of the property and promises, by saving more gold, to make the scheme a success. This latter company has put in a newly patented sluice.

New York men are running Keystone drills on ground on Butte creek, Butte county. Options have been taken on land along this creek from the Diamondville bridge down, so as to cover 500 acres of possible dredging land. Gravel has been found to the depth of 50 ft. and the drill will test the value before any steps are taken to build dredges.

Henry Spencer, of the Cascade Valley district, Butte county, is about to put in a new type of hydraulic gravel elevator in the gravels of that section. It is intended to work the machine on the second layer of gravel in the channel, first breaking the lava above it with powder.

The course of the old buried river with its channel of gold-bearing gravel from North San Juan, Nevada county, to Camptonville in Yuba county, has long been a matter of surmise among miners. The channel was first found at Smartsville and was followed and worked at Mooneys Flat, French Corral, Sweetland and North San Juan. Crossing the Middle Fork it was lost, and then found again at Camptonville, but the intervening

portion, while long sought for, has only recently been found. Now the Sylvester Gravel Mining Company has found the rim of the channel in which the river originally flowed, while digging toward the center of the ridge from an old out-break. The discovery is considered of great importance to that section and will incite others to prospect thereabouts in hope of again finding this channel which has proved rich in the portions where it has been mined.

Goldfield, Nevada

Oct. 14—An application for a receiver for the Mohawk Jumbo Lease Company has been filed in the district courts. Sensational charges are made against the management who are made defendants in the action personally, as well as officially. McMillan and Holleran, who own the controlling interest, are charged with fraudulently selling to the Mohawk Jumbo Lease Company, 300,000 shares of Mohawk Red Top Leasing stock at 15c. per share, which it is claimed was a grossly exorbitant price. The defendants' answer states that their employees, including their superintendent and shift-bosses, were taking stock in payment for their services, which should be sufficient proof of the value of the property as a leasing venture. They claim that the sale was made to perpetuate by means of the lease sold, which had then 10 months to run, the Mohawk Jumbo Lease Company, whose original lease was soon to expire. The payshout within the Mohawk Jumbo lease was exhausted before the lease expired. The lease has some money in the treasury and its assets are being converted into money so as to pay a final dividend to the stockholders.

D. Mackenzie has returned from an extended trip East, and states that he will immediately resume work on his various properties and leases in this camp, all of which, except the Combination Extension, have been idle since their funds were tied up a year ago by the closing of the State Bank and Trust Company. The Jupiter, one of these properties, just before closing down installed a pumping plant which successfully handles a flow of 220,000 gal. per day. It was proposed to use this water for the city water supply, but during the idleness the Lida Water Company has completed its installation.

For the month of September, Goldfield produced 11,817 tons of ore valued at \$871,275. The number of men on the payrolls of the mining companies is 2050,

and the wages paid during the month amounted to \$1,246,000. The mines of the Consolidated company are only producing sufficient ore to supply the Combination mill, and the Florence company, owning the second largest mine in the district, is not working any men underground on company account, as it is awaiting the completion of the mill before it resumes mining.

Thomas B. Rickey, formerly president of the different banks belonging to the State Bank and Trust Company throughout the State, has given himself into the custody of the sheriff and was locked up in the county jail. Rickey's downfall began with the financial distress of the Sullivan Trust Company two years ago. The latter starting with \$3000 had \$3,000,000 worth of assets, according to market quotations, in less than a year. The money stringency sent the Sullivan Trust Company to the wall; Rickey being more or less involved assumed all the obligations. His banks could not bear the load and they closed their doors a year ago. The receiver has just declared the first dividend of 5 per cent. Wildcatting in Nevada is about over, and a few more summary punishments would end it altogether.

The oilfields, 15 miles from Goldfield, are showing considerable activity. The Western Core Drilling Company has drilled to a depth of 600 ft., the limit of the machine, and will resume operations with a larger drill as soon as it arrives. Oil formation was encountered, and the prospects are encouraging.

Butte

Oct. 15—Last week a petition was filed in the United States District Court asking that the North Butte Extension Copper Company be declared bankrupt. The petitioning creditors are the Butte Machinery Company, Butte & London Copper Development Company and the Rocky Mountain Bell Telephone Company, representing claims aggregating \$859,75. In the petition it is alleged that the company has allowed several of its creditors to obtain judgment by default for the purpose of giving certain creditors preference. At about the same time that the bankruptcy proceedings were instituted here the directors of the company held a meeting in New York City and appointed a committee for the purpose of reorganizing the company. The plan of reorganization, as outlined by a circular letter to the stockholders, contemplates the formation of a new company to be known as the North

Butte Extension Development Company, with a capital stock of \$1,500,000 with shares of the par value of \$1 each. It is proposed to issue 1,000,000 shares of the new stock in exchange for the stock of the old company, each stockholder of the old company to have the privilege of exchanging his stock for a like number of shares in the new company upon payment of a 50c. assessment per share. The money thus raised will be used to pay off the indebtedness of the old company.

The Amalgamated company has declared a regular quarterly dividend of 50c. per share.

At the annual meeting of stockholders of the Butte-Radersburg Mining Company, held last week, the following were elected directors for the coming year: F. H. Symons, Charles D. Horton, E. R. Dornblut, E. E. German, M. J. Evans, M. Morley and L. E. Symons.

In the action of the Compagnie des Mines et Minerals, a Belgian corporation, against Sabastino Rodoni, brought in the local district court to quiet title to a portion of the Last Chance quartz lode claim, situated four miles southwest of Butte, the court directed a verdict for the plaintiff adjudging the company to be the owners of the claim in question.

Denver

Oct. 17—The fierce attack of the *Denver Post* on Simon Guggenheim who, it is asserted, purchased his seat in the United States Senate, and upon the smelting company with which he is connected, has caused no little excitement in mining circles, and while it is admitted that smelting charges have been reduced since the American Smelting and Refining Company practically absorbed all the smelting interests in this State, yet it is not believed that the mining companies are receiving proper treatment at the hands of the so-called "smelter trust." Before the amalgamation of the smelting interests, each separate works had to look out for its own ore supply, and to insure the smooth running of its furnaces, not only had to keep large stocks of ore on hand, but occasionally break into the market for certain desirable ores at prices that tickled the heart of the mine owner. Since the amalgamation, all this is a matter of book-keeping, and the ore is diverted by the purchasing department to the particular plants where it is required. This, it will be readily seen, has immensely reduced the ore stocks necessary under the old system, and released a large amount of money formerly tied up in ore. In the next place, the American Smelting and Refining Company is believed to control the lead interests of the United States, and is able to fix the price of pig lead, although the experience of 1907 showed that it cannot do the latter when market conditions are adverse. However, these two points are looked upon as the direct

result of consolidation of the smelter interests and trust manipulation, and to a considerable extent are believed to have reduced the price of smelting and given enormous benefit to the trust in marketing its lead at the highest prices. The mine owners believe they are entitled to a share of the profits obtained, and do not believe that they are receiving it.

The numerous advances made in smelting—mostly of a mechanical nature—have further cheapened materially the cost of smelting ore, and while the mine owners admit the smelting charges have been reduced, they do not believe they are receiving as low smelting charges as the present depressed condition of mining would warrant, taking also into consideration the enormous earnings of the smelter trust. This is the viewpoint from which the principal mine owners of Colorado look on the situation.

The various charges brought by the *Denver Post* regarding incorrect weighing and sampling, and enormous moisture deduction, are scarcely taken seriously by practical men, and the charge that there is no competition against the smelter trust, and that independent samplers have been abolished, is not quite true. The Ohio Smelter, at Salida, is an active and successful competitor for the Leadville ores and through the Southwest, while in the Cripple Creek district the competition of the big cyanide mill of the Golden Cycle Company with the trust's affiliated company, the United States Reduction and Refining Company, is a factor that cannot be lost sight of, more especially as the "mill trust," after cutting rates for about a year past, has found it necessary to restore them, which is, of course, temporarily a detriment to the mining interests of Cripple Creek, and the next move is looked forward to with extreme interest. It should be stated that the Cripple Creek mines have enjoyed the lowest treatment charges known during the past year, and it is generally believed that the \$3.50 rate for freight and treatment on ores up to \$8 per ton valuation does not cover expenses. This rate was some time ago advanced to \$4 by the mill trust, and is now \$5.

The foregoing outlines the situation as it is viewed by the practical and level-headed mining men of Colorado.

The effort by the same paper to show an alliance between the Federal Forestry Bureau and the smelting trust to block mining development in Colorado is absurd, simply because to curtail mining would kill the business of the latter. The chief forester means well, and is just commencing to do what Japan did 1000 years before Columbus sailed from Spain, and what Germany and France did 150 years ago, but in his zeal, and through the arrogant officiousness of some of the understrappers employed to carry out his policies, there can be no doubt that great injury has been done to the State in his

withdrawal of 16,000,000 acres from the public domain in Colorado.

For instance, the paragraph in the "Use Book" that "the discovery of a mere trace of mineral is not sufficient to make a claim valid, unless both the character of the mineral and the manner of its occurrence are such as to warrant expenditure for development and reasonable expectation of a valuable discovery," is silly, for the reason that whether a claim will warrant expenditure or not can only be approximately determined by allowing the prospector first to do some work on his discovery, and he certainly will not do this unless he can stake it, do his assessment and record it. This results from the chief forester's ignorance of the subject he was handling, but he has shown his readiness to remedy this wrong by agreeing to meet a committee of mining men to discuss what reforms are necessary to right these evils.

Calumet, Michigan

Oct. 16—Forest fires have again broken out throughout the upper peninsula, and several of the outlying locations are in great danger.

Mine Inspector Dawe, in his annual report to the board of supervisors of Houghton county, states that for the year ended Sept. 30, 1908, there were 17,224 men employed in the mines and that there were 58 casualties.

Indianapolis

Oct. 20—A number of old coal mines have resumed operation and several new mines opened. The new mines of Massey, near Oakland City, which have been opened since the destruction of the old works by the flood last March, are now in operation. The mine and tippie are models of convenience in the coal industry, and the vein of coal which the mine opens is from 7 to 9 ft. thick. The mines are the property of the Peacock Coal and Mining Company, of Indianapolis; the principal stockholders are Fletcher Hines and T. C. Bugg. The coal which the works penetrate is of the peculiar formation known as a "lost" or "floating" vein. It covers a limited territory, and further than the established boundaries no trace of the coal can be found. The miners find many fossils in the coal, samples of which interest scientists.

The mine is of the slope variety and the tippie is reached by a long incline, up which the coal will be pulled by endless cables.

Much of the product of these mines will be shipped long distances to market, and the tippie is equipped with a box-car loader, the first to be installed in this field. A large number of men are also employed in constructing a railroad switch necessary to reach the mine.

The Brazil Factory Promoting Club has been organized at Brazil, which is in the

heart of the block coalfield. The club will make an effort to add to the industries already established, the plan being to establish an immense power plant to generate and transmit electricity, the chief points being cheap fuel and excellent shipping facilities.

Thomas Bennett, a miner in mine No. 34, belonging to the Brazil Block Coal Company, was seriously and perhaps fatally injured while discharging a shot. It is reported that he used one of the large bits recently authorized by the legislature over the protest of the State mine inspector, who declared that such accidents had been reduced to the minimum by the enforced use of the smaller bit.

The Indiana Appellate Court has decided that a coal-mining company is under no general obligation to pay for medical treatment for an injured miner, except the immediate relief necessary to meet an emergency at the time the workman is injured. A superintendent of a mine has no authority to bind his company by employing a physician to attend an injured man other than for necessary and immediate relief.

Scranton, Penn.

Oct. 19—The convention of the anthracite district of the United Mine Workers was largely attended and more enthusiasm for the union was shown than has been evident for some time past. The current agreement does not expire until April 1, 1909, but the convention formulated the demands to be made in negotiating a new agreement. They are as follows:

"First, that an agreement shall be negotiated between the representatives of the miners and the operators of the Anthracite region, and all disputes arising under the contract shall be adjusted as provided for in said agreement.

"Second, we demand the complete recognition of the United Mine Workers of America as a party to negotiate a wage contract and that the United Mine Workers of America shall be recognized in our right to provide any method we may adopt for the collection of revenues for the organization.

"Third, that we demand an eight-hour day with no reduction of wages.

"Fourth, that all coal shall be mined and paid for by the ton of 2000 pounds.

"Fifth, that we demand a definite and more uniform scale of wages and prices for all classes of labor at all collieries in the anthracite region; and that all employees paid less than \$1.50 per day shall receive a 10-per cent. advance; and all employees paid more than \$1.50 and less than \$2 a per day, shall receive a 5-per cent. advance.

"Sixth, that the system whereby a contract miner has more than one job, or employs more than two laborers, be abolished.

"Seventh, that the employers be required to issue uniform pay statements, designating the name of the company, the name of the employee, of the colliery where employed, the amount of wages, and the class of work performed.

"Eighth, that the contract shall be made for a period of one year."

The existing agreement is that made by the Anthracite Coal Commission after the strike of 1903. Not all of the demands made will be accepted by the companies, but they will not take any action at present.

The object in holding the convention and putting out these demands so far in advance was undoubtedly to revive interest in the union and to hold the miners together; also to bring back the numbers who have dropped out, as they are apt to do in quiet times. From this point of view the convention has been, so far, a success.

Toronto

Oct. 16—The Sturgeon lake gold region near Port Arthur, Ont., is attracting much attention. Peter King, the original discoverer of gold in this area who located the St. Anthony's Reef mine nine years ago has been prospecting there this season and recently brought to Port Arthur a number of rich samples of gold ore. He located three claims from which several sacks of ore have been taken which are said to be rich enough to ship direct to the smeltery. Other prospectors have located claims. Two of them have built a crude smelter and have produced gold bars valued at several thousand dollars. Many prospectors are going in including some who have been working in the Cobalt district; several parties have fitted out at Port Arthur and expect to remain in the field all winter.

London

Oct. 10—Much regret is expressed at the approaching retirement, owing to superannuation regulations, of Prof. William Gowland, from the chair of metallurgy at the Royal School of Mines. The salutary custom of enforcing the retirement of officials on reaching an age limit has its advantages, and the case of Professor Gowland is an instance. His successor has not yet been appointed. The position is one of much responsibility on account of the great importance of the metallurgical industries of Great Britain and her colonies. It is essential in order that these industries should hold their own in the struggle of nations, but that the men who direct them are men of the highest training. The Royal School of Mines is one of the principal recruiting grounds for metallurgical engineers and, therefore, the post of professor of metallurgy is one that should be filled by the best man that the country can give. Those who realize the great influence for good

or evil that the position carries must naturally be anxious that a suitable man will be found.

The Iron and Steel Institute has been holding the annual meeting at Middlesborough, when papers on the iron and steel industry of the district, on the progress of electrical installations, on gas-producer practice and on the scientific control of fuel consumption were presented. The meetings were presided over by Sir Hugh Bell, president.

The ninth ordinary meeting of the Cobar Gold Mines, Ltd., with property in New South Wales, was held in London Sept. 30. Difficulties have been met with in finding a suitable process for the treatment of the ore which contains gold and copper. The Elmore oil process has been tried and abandoned, as the existing crushing machinery did not provide a suitable product. Experiments have also been made with the process belonging to the Minerals Separation Company; but, while the experiments are said to have been satisfactory, the directors have hesitated, after their experience with the Elmore plant, to install a working plant. The agents of the company have been examining the process used at Mount Morgan, which appears to them suitable for the Cobar ore, and further experiments on these lines are to be undertaken. The process consists of dry crushing, roasting and leaching. The directors express confidence in their mine, which, on Sept. 30, 1907, was reported to contain ore reserves of 141,053 tons containing 1909 tons copper and 74,651 oz. gold. With a faith that is commendable they stake their belief that the difficult problem of extracting the values at a profit will in time be solved by the ingenuity of scientific men. The company has £30,000 cash, and science, let us hope, will not disappoint them.

The San Francisco del Oro Mining Company, of Mexico, announces a scheme of reconstruction in order to raise further funds. It is proposed to form a new company with a nominal capital as before of £375,000 in £1 shares and to allot to the old shareholders 330,000 £1 shares, 15s. paid, for the same number of shares now issued in the old company. If these shares are applied for, the company will have £82,500 for working capital and 45,000 shares in reserve. The ill success of this company is attributed to difficulties connected with the treatment of the ore and the separation of the various minerals. The ore carries zinc, lead and silver and is similar to the Broken Hill ores of Australia, the treatment of which is being closely watched by the technical advisers of this company. In order to erect a plant capable of treating 200 to 300 tons a day a sum of £50,000 is considered necessary, while a further £10,000 is required to build a railway to the mine from Molino station.

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

Arizona

COCHISE COUNTY

Sylvanite—This new camp is situated about 12 miles from Hachita station on the El Paso & Southwestern in the Little Hachita mountains. Last February a small rush to these mountains was caused by the discovery of placer gold. The excitement died down, owing to the small returns of free gold, the difficulty of working, etc. The gold was associated with a mineral subsequently identified as sylvanite. This has renewed interest in these fields and prospectors are flocking to the new find. One shipment from the Neirhart claims of four cars had a reported value of \$105 per ton. The Hachita mountains have a core of igneous rocks occasionally capped with limestone. The country is traversed by many porphyry dikes and the general appearance indicates mineralization.

Calumet & Arizona—The drift prospecting the rich strike on the 1300 level of the Hoatson is still in good ore, making 125 ft. of ore exposed. The pump station on the 1550 level Junction is nearly completed.

North Star Shaft—This shaft of the Warren Realty Company has a depth of 795 ft., 50 ft. having been made in September.

Anderson-Apache—This mine in the Hachita mountains has made a shipment of 11 cars of ore valued at \$500 each.

MARICOPA COUNTY

Climax—This company near Phoenix, has let a contract to drive 400 ft. in tunnel No. 5 to tap the Quartz Mountain vein at a depth of 500 ft. This tunnel is in 600 feet.

MOHAVE COUNTY

Tom Reed—This mine is making a monthly clean up of \$75,000. A drift 240 ft. on the 250 level has had good ore all the way. At present, a 10-stamp mill will handle the output.

YUMA COUNTY

Clara Consolidated—This mine near Bouse, is pushing development. A drift from the bottom of the Signal shaft has 80 ft. of good ore. The company has in operation a second gasoline hoist and has also purchased a smelter consisting of one water-jacket blast furnace of 300 tons capacity and ironwork for one reverberatory furnace of 75 tons capacity.

California

AMADOR COUNTY

South Eureka—It is reported that this Sutter Creek property has a good body of pay ore and is in better condition than for a long time past.

BUTTE COUNTY

Banner—This mine, four miles from Oroville, was at one time a large producer, but the vein pinched out and it has been idle some years. The lower workings are now being unwatered and the old tailings are being worked.

CALAVERAS COUNTY

La Franchie—At this mine near Glencoe, Jerome Burt and others are sinking the old shaft deeper, preparatory to cross-cutting for a body of good ore known to exist.

Nelson Contracting Company—A force of men has been put on the old works of this company putting the mine in shape to begin working when the water supply is sufficient.

FRESNO COUNTY

Arkansas—A new tunnel is being run at this mine so the ore may be taken to the mill by gravity instead of hoisting it out through the shaft. Crushing has been stopped until completion of the tunnel.

INYO COUNTY

Tecopa Consolidated Mining Company—Numbers of additional men are being put on at this mine at Tecopa and all the available teams are hauling ore to the railroad station. The main drift from the 600 of the Gunsight claim is in shipping ore and in the raise in No. 1 crosscut they are in 30-per cent. lead ore. There is some gold and silver in all this ore.

MONO COUNTY

Masonic District—At this place the mill is running steadily on a good grade of ore, and the cyanide plant is nearing completion.

Empire—At this property a number of men have been laid off and 20 of the 40 stamps hung up, on account of lack of water power.

NEVADA COUNTY

Kentucky Ridge—Money has been left with A. Adams, superintendent of this Grass Valley mine, to start reopening it.

Morydena—At this mine in Kentucky Ridge district, good ore has recently been

developed. A new adit is to be started, and buildings are being put up so that work may be carried on all winter.

Rose Hill—This old mine at Grass Valley, after an idleness of eight years, has been bonded by W. L. Hemmington and J. H. L. Green, who have started work on it, and will install a compressor and hoist.

PLACER COUNTY

Pine Avenue—This mine on the northern side of Shirt-tail cañon, has been bought from the Power estate by Harold Power, Jr. Two tunnels have been run for the gravel, one of which is 1600 feet long.

PLUMAS COUNTY

Old Bullion—From the ledge on the 150-ft. level of this mine near Clo, high-grade copper ore is being taken out. This ore will be sacked and shipped to smelters in Shasta county.

SAN BERNARDINO COUNTY

Kewanee District—In this district there are now four companies developing their properties. The Chicho Mining Company of Los Angeles is the principal company and is taking out considerable \$16 ore. The Morning Star has a wide gold-bearing ledge.

SHASTA COUNTY

Mammoth Mining Company—At this copper mine 1100 tons of sulphide ore are being mined and shipped daily.

Sybil—At this mine, French Gulch, owned by G. A. Von Krusze, the grade of ore being taken out is so high that it is being sacked and shipped to the smelter for reduction.

SIERRA COUNTY

Alaska—At this mine, Pike City, a crosscut is being run from the bottom of the new shaft to tap the body of water in the old shaft. This will result in draining the old workings.

TUOLUMNE COUNTY

Confidence—The shaft at this mine is being retimbered and electric power has been supplied to the hoist.

Colorado

CHAFFEE COUNTY

Benson Granite Company—This company has completed arrangements to reopen its quarry, near Salida. It is expected that shipments will be begun early in the spring.

Stratton—Work is progressing on this granite quarry at Salida. It is said that some good contracts for stone have been secured.

LAKE COUNTY—LEADVILLE

Big Six—In this mine, Breece hill, the lessees are driving the incline shaft toward Big Evans gulch, following a small body of ore that runs high in gold. From the present showing it is expected that the main ore horizon will be encountered shortly. The mine is shipping in the neighborhood of 75 tons per week.

Wolfstone—The best of the heavy machinery at the Penrose shaft, Carbonate hill, operated recently by the Western Mining Company, is being hauled to the Wolfstone. When it is installed considerable development work will be carried on.

SAN JUAN COUNTY

Ore Shipments—Shipments from Silverton in September included 2200 tons concentrates and 1850 tons crude ore. The largest shipment of crude ore was 1075 tons from the San Antonio. Shippers of concentrates were the Hercules, 650 tons; Silver Lake, 600; Iowa, 325; Sunnyside, 250; Ross, 275; Old Hundred, 100 tons.

Bonanza Tunnel—Contracts have been let for the new mill, and materials are being delivered.

Gold King—At this mine, at Gladstone, 40 stamps are now at work.

TELLER COUNTY—CRIPPLE CREEK

The United States Reduction and Refining Company has given notice of the following new rates on Cripple Creek ores, effective with bills of lading dated Oct. 16:

	Freight and Treatment.
Up to \$ 8 value	\$4.50
\$8 to \$10	5.25
1/2 oz. to 1 oz.	6.50
1/2 oz. to 1 oz.	6.75
1 oz. to 1 1/2 oz.	7.25
1 1/2 oz. to 1 1/2 oz.	7.50
1 1/2 oz. to 2 oz.	8.50
2 oz. to 3 oz.	9.25
3 oz. to 5 oz.	9.75
	Delivered f.o.b. Cars Denver or Pueblo.
5 oz. to 7 1/2 oz.	\$7.50
7 1/2 to 10 oz.	8.50
10 oz. to 12 1/2 oz.	9.50
12 1/2 oz. to 15 oz.	10.00
15 oz. to 20 oz.	11.00

This is an increase of from \$1 to \$1.50 per ton. It is believed that the advance will reduce the shipments of low-grade and dump ores which have recently been large.

Idaho

SHOSHONE COUNTY

Golden Winnie Tungsten Mining and Milling Company—The control of this company has just passed into the hands of Arthur Amon, of Kennewick, Wash. E. M. Smith, who originally located the property in 1893, and who has been inter-

ested in it ever since that time, retains a large stock interest.

Murray Development Company—This company has been formed of Boston capitalists for the purpose of operating the Mother Lode group of 11 placer claims. This property is already equipped with a 10-stamp mill.

Big Murray Tunnel—A movement is on foot for driving of a 7000-ft. tunnel in this district on something like a coöperative plan. Such a tunnel could have a portal practically on the tracks of the Idaho Northern Railroad; running through the mountain in a straight line, it would tap the leads of the Bear Top, Chicago-London, Black Horse, Paragon, Jewell group, and Orofino mines, every one of which is waiting the completion of the Idaho Northern Railroad to commence shipments.

Orofino Company—About \$80,000 worth of ore has been piled on the dump of this mine awaiting shipment on the completion of the Idaho-Northern Railroad. It is reported that a deal is pending for the sale of the property to a number of Eastern capitalists.

Chicago-London Company—Work in the face of this company's lower tunnel was resumed this week with a force of 10 men. Hand power will be used until power can be secured for the big 15-drill compressor owned jointly by this company and the Paragon company.

Indiana

GREENE COUNTY

Johnson Brothers, owners of the Cherry Valley mine in the Jasonville district, which has been shut down since June, have resumed work, giving employment to 100 men. The Island Valley mine resumed operations Oct. 19, after having been shut down since April 1. This mine gives employment to 200 men.

SULLIVAN COUNTY

The mine near Carlisle belonging to the Carlisle Coal and Clay Company, which caught fire a week ago, is still burning. Although the fire is shut up in one entry, it is doing great damage. Workmen succeeded in closing the fire up, so that it will smother itself in a few days and the hoist may be started.

VERMILION COUNTY

At an average cost of \$30 a day, each of the six coal mines in the Clinton field is using water bought from the Chicago and Eastern Railroad Company. Three of these mines belong to the Clinton Coal Company and three to the Deering Coal Company. The water purchased comes from the Wabash river, but is filtered through a tower tank before being shipped to the mines. This is the first instance of water being purchased by the mines of this district.

Louisiana

Oil production in September was 437,800 bbl., an increase of 10,200 bbl. over August. Rail and water shipments for the month were 463,158 bbl., showing a decrease of 25,358 bbl. in stocks. There were 18 new wells completed in September, of which 15 were producers. There were 42 wells drilling at the end of the month.

Michigan

COPPER

Calumet & Hecla—This company has resumed operations at the White Pine property in Ontonagon county. Trenching will be extensively carried on in an attempt to disclose an amygdaloid ledge; drill cores, taken from this lode, were well charged with copper, and it is now planned to locate the outcrop.

Isle Royale—This company has started to sink a new shaft to open up the Baltic lode on its property. At the stamp mill a second head will soon be compounded and will go into regular service. At No. 4 shaft the new compressor will enhance progress at the shafts in the southern portion of the tract.

Keweenaw—Sinking has been resumed at the Medora shaft of this company. Prior to starting the mill run, sinking was discontinued at the 13th level, and all attention was given to the lateral openings in order to maintain a rock supply sufficient to keep the mill in continuous operation. The mill is now running only one shift per day, and most of the rock is coming from the lower openings from which better copper returns are being made. The Medora shaft will be sunk an additional 1000 ft. and the lode will be extensively opened up at that depth.

Wyndot—This company has encountered an amygdaloid lode well charged with copper in the crosscut, being driven from the 700-ft. level of its exploratory shaft. As this strike is a considerable distance from the approximated line of the Lake and Adventure lodes, its identification has not yet been established, nor has it been sufficiently opened up to ascertain its value.

Arnold—This company has a small force of men employed and is about meeting expenses in taking out mass and barrel copper.

Superior—Work of widening No. 1 shaft to two compartments is nearing completion, and when ready, shipments will begin to the Atlantic mill. The railroad into the property has been completed and the alterations to the mill finished. At the shaft a stock pile has accumulated, during development, sufficient to keep the mill running some time.

Ahmeek—This company is vigorously pushing work on the recently acquired mill site on the shore of Torch lake, and will have everything well in hand before

the snow falls. Excavating on the site of the two new shafts is going forward favorably, and a depth of about 35 ft. in the pit has been obtained; the overburden at this point is about 70 ft. These shafts will start with a common collar and diverge. They will go down on the hangingwall side of the lode. The lode is expected to be cut at about 1250 ft. from surface.

Ojibway—No. 2 shaft has reached the second level, at a depth of 500 ft., and preparations are underway to begin cross-cutting to the lode, a distance of approximately 90 ft. The lode opened from the first level, 250 ft. from surface was broken and shattered, but it is believed that this additional depth will be beyond the effect of surface influences and a more uniform formation will be opened up. The first level of No. 1 shaft will be established at 500 ft.; this shaft is down about 435 ft., and, like No. 2, is being put down in the footwall. In sinking this shaft a seam of calcite, well charged with copper, has appeared for a considerable distance. It is undoubtedly a stringer of the lode.

Tamarack—This company is installing a large fan at No. 4 shaft to aid in the ventilation of No. 3 shaft.

Montana

BUTTE DISTRICT

East Butte—The unwatering of the main shaft on the company's properties is nearly completed.

Sarsfield Claim—This claim lies east of Butte on the large north and south fault vein which has been opened up on the Bullwhacker and Bertha claims. A lease has been given to James McNabb and Ed. Schmitt. The shaft is now down to the 120-ft. mark and it is stated that the leasers will sink to a depth of 150 ft. where crosscuts will be run.

Davis-Daly—Within the past week deeds have been filed for record conveying to the company portions of the Ramsdell, Silver King and Morning Sun lode claims.

Richmond Claims—A lease on the three claims, Nos. 1, 2 and 3, has been given by George L. Gotlieb to Hugh Monroe and Harry Gorber. The lease is for a term of 18 months, with 15 per cent. royalties reserved; an option to purchase for the sum of \$10,000 is given.

BEAVERHEAD COUNTY

Silver Fissure Mining Company—The company's smelter at Polaris was blown in last week and 30 additional men given employment. The smelter has a capacity of about 100 tons daily. Harry H. Armstead Jr. is in charge of the property.

GRANITE COUNTY

Granite Bi-metallic Company—The company's mine situated at Granite has resumed operations under the direction of general manager John R. Lucas. The work

at present is chiefly repairing, but the number of men employed will be increased as rapidly as possible. A contract has been entered into with the American Smelting and Refining Company providing for the treatment of between 75 and 100 tons of ore daily at the smelting company's plant at East Helena. The mine has been shut down for the past six months.

Nevada

CHURCHILL COUNTY—WONDER

Nevada Wonder—Operations have been temporarily suspended for reasons not given. A trial shipment of ore is ready to send to a testing plant in order to ascertain the best method adaptable to the treatment of the ore. It is reported that a 50-ton mill will be constructed soon.

Jack Pot Consolidated—This week 180 sacks of ore assaying \$200 per ton was shipped to the smelters. It is stated that the 50-h.p. engine that has been on the property for some time, will be installed, and that a new and permanent working shaft will be sunk. Arrangements have been made for an ample water supply and a mill has been decided upon; construction to begin at an early date.

Wonder Queen—At the Flynn-Horgan lease on this property the shaft has been sunk 25 ft. and from it 50 sacks of high-grade ore has been obtained.

ELKO COUNTY—TUSCARORA

Rose Group—This group of claims has been sold to Kansas City men, who have made the first payment and will erect a mill within 90 days.

ESMERALDA COUNTY—GOLDFIELD

The production for the week amounted to 1958 tons valued at \$154,425. The Combination mill treated 595 tons of ore from the Combination mine and the development work done in the Mohawk mine. The Western Ore Purchasing Company handled: From the Baby Florence, 48 tons; Florence Consolidated, 390; Engineers lease, 204; Consolidated Red Top, 123; Gem Florence, 11; Kendall lease, 7; Daisy, 39; St. Ives, 11 tons. The Nevada Goldfield Reduction Company treated: From the Combination Fraction, 130 tons; Begole Syndicate, 240; Baby Florence, 60; Florence Annex dump, 30; Eisen lease on Little Florence dump, 50; Great Bend, 120 tons.

St. Ives Lease—This lease has begun shipment from the vein on the 50-ft. level that was lost by the former leasers.

Mitchell Fairfield Lease—The shaft is now 520 ft. deep. The west crosscut on the 310-ft. level is 50 ft. long and the south crosscut 45 ft. long. On the 400-ft. level the west crosscut is 105 ft. long, and on the 500-ft. level the northwest workings are 95 ft. from the shaft.

Combination Fraction—Owing to a breakdown in the compressor plant the

mine was shut down for four days last week; hence the small shipments. The timbering in the shaft is being repaired.

Goldfield Fissure—The whim on this property is to be replaced by a gasolene hoist and a headframe. In the crosscut on the 90-ft. level the quartz in the breast looks promising.

Red Hills Mining and Leasing Company—Last week fire destroyed the blacksmith shop, hoist house and practically ruined the hoist. The fire caused the cable to break just as the men were coming out from the ladderway, having been warned by a danger signal to come up. The buildings and hoist will be replaced immediately.

ESMERALDA COUNTY—DUTCH FLAT

Dutch Flat Mining Company—A carload of pipe and supplies have arrived and are being delivered at the property. The trench for the pipe is being dug to the water supply two miles from the camp and will be completed by the time the pipe is ready.

ESMERALDA COUNTY—HORNSILVER

Great Western—Returns from the last shipment of 28 tons showed the ore to average \$68.30 per ton, all but \$4.40 being silver. The ore was treated at Millers; freight and treatment charges amounted to \$14 per ton.

HUMBOLDT COUNTY—SEVEN TROUGHS

Seven Troughs Mining Company—Work on the Fairview claim is being pushed with good results. The shaft is now more than 750 ft. deep; it will be continued to a depth of 1000 ft. A complete new pumping and hoisting plant, together with new surface equipments will be added.

LANDER COUNTY—BATTLE MOUNTAIN

Peggy Group—This group has been bonded by H. E. Taylor who will install machinery and begin development work.

LANDER COUNTY—AUSTIN

Austin-Manhattan—Two big hoists are being installed on this property. Three shifts are at work in the adit, which is 6000 ft. long, and in the north crosscut, which is 2800 ft. long.

LYON COUNTY—YERINGTON

Knight-Merigan Option—A. G. Gutheil has taken up an option for the Knight-Merigan interests of Utah on 16 claims adjoining the McConnell and Yerington Consolidated properties. Extensive development is planned.

Nevada Douglas—A large body of good copper ore has been developed on the 65-ft. level.

Wabuska Copper Company—This company has installed a 25-h.p. gasolene hoist and will sink their two-compartment shaft, at present 200 ft. deep, to water level, which it is expected will be found at a depth of 500 feet.

EUREKA COUNTY—EUREKA

Little Chief—The shaft-house and machinery were totally destroyed by fire this week. The loss is estimated at \$20,000.

NYE COUNTY—TONOPAH

The production last week was 5513 tons valued at \$140,975 as follows: Tonopah Extension, 90 tons; Tonopah Mining Company, 3150; Belmont, 750; Montana-Tonopah, 708; Midway, 100; MacNamara, 350; West End, 165; Jim Butler, 200 tons.

Mac Namara—Two sensational strikes were made last week. The first one was made in the raise from the west drift from the south crosscut at a point 260 ft. west of the shaft on the 200-ft. level, the orebody being 580 ft. southwest of the shaft. This raise intersected the ore at a point 52 ft. vertically above the level. The vein is 7 ft. wide, the whole width is good ore. This is the same vein which in the West End mine has been stoped for several months on the 150-ft. level. The second strike was made in the raise east of Apex raise No. 3, driven from the west drift on the 200-ft. level, and is fully 250 ft. northwest of the first strike. The vein contains 3 ft. of good milling ore.

Belmont—On the 1000-ft. level, the station on the vein found along the north or hanging wall of the Mizpah fault has been completed, and an air hoist installed. The winze on this new vein is already 30 ft. deep.

Montana-Tonopah—Preparations are being made to carry out the extensive development decided upon at the last annual meeting of the company. Drill holes will be put down from the 765-ft. level to determine the best place to sink the three-compartment winze which will be sunk through the dacite intrusion to prospect at depth the ground which has produced so well in the upper levels. One of the reasons that the contract was made for the treatment of ore from the MacNamara mine was to enable the mill to work at full capacity, for it is impossible to hoist the 1100 tons of ore per week necessary for the mill, and also to handle the waste which will come from this development.

Tonopah Mining Company—Development work done last week amounted to 349 ft. The Mizpah three-compartment shaft is 1243 ft. deep. No progress was made with the calyx drill hole. The ground has caved so badly in the hole that it was filled up with cement and then a hole has been drilled through it in order to save the hole and to get to solid ground.

West End—The extent of the new orebody on the 400-ft. level is still undetermined. Ore is exposed for 50 ft. the full height of the stope, and for a length of 60 ft., with ore in the faces at both ends and in the roof.

NYE COUNTY—ROUND MOUNTAIN

Round Mountain Combination—After extensive sampling and examining of that

portion of the property exposed and developed by the hydraulic operations, the company has practically decided to work the entire property by means of steam shovels.

Round Mountain Reduction Company—The mill will be running soon. A new general manager has been appointed. Several changes in the plant have been made, and an effort is being made to secure a greater water supply.

NYE COUNTY—SKIDOO

Skidoo Mill—Gold bricks worth about \$10,000 have just been forwarded to the mint via Rhyolite as a result of a 15-days' run at this mill. This is about the average for the past three months. The mill is treating 35 to 40 tons of ore per day.

WHITE PINE COUNTY

Nevada Consolidated Copper Company—The annual meeting of the stockholders will be held Nov. 4 at Portland, Maine.

North Carolina

CATAWBA COUNTY

Catawba Gold Mine—This mine has changed management and is now in charge of C. L. Constant, of 61 Beekman street, New York. He is making important improvements whereby the cost of mining and milling will be reduced to a minimum.

FRANKLIN COUNTY

Portis Gold Mine—This old mine has been put under the management of Capt. A. J. Overton, of Salisbury, N. C., who is installing two Eardman washers and other machinery.

LINCOLN COUNTY

Piedmont Tin Mining Company—This company, of which Prof. J. H. Furman, of Lincolnton, N. C., formerly of South Africa Gold Fields, Ltd., is manager, has just shipped five tons of concentrates to Hamburg, which, according to sampling of Ledoux & Co., went 72.60 per cent. tin.

MONTGOMERY COUNTY

Sam Christian Gold Mine—A nugget weighing 1 $\frac{3}{4}$ lb. was found by a Mr. Morgan recently.

YADKIN COUNTY

Gross & Dixon Gold Mine—This mine, owned by Hooper, Neb., men, has erected a complete five-stamp mill with 18-ft. tube mill and cyanide plant, built by the Allis-Chalmers Company, under the direction of Capt. C. E. Warren, of Chicago.

Oklahoma

The production of petroleum from the Oklahoma fields in September is reported at 3,619,124 bbl. Shipments were 3,365,831 bbl., leaving 253,293 bbl. to be added to stocks. The total stocks on Sept.

30 are estimated at 50,997,000 bbl. The number of wells completed in September was 290, of which 271 were oil producers, 3 gas producers and 16 dry. On Oct. 1 there were 204 new wells drilling.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—This company's statement for August and the two months of its fiscal year from July 1 to Aug. 31 is as follows:

	August.	Two Mos.
Earnings.....	\$2,122,030	\$4,076,794
Expenses.....	2,182,816	4,047,758
Net or deficit.....	Def. \$30,797	\$ 29,036

For the two months, as compared with 1907, there were decreases of \$1,762,855 in earnings, and of \$1,454,067 in expenses; leaving a loss of \$308,788 in net earnings.

BITUMINOUS COAL

Dunlap-Connellsville Coke Company—This company now has the development of its mine well advanced, and the coke plant has been fired.

Echard Coal and Coke Company—This company has been obliged to close down its plant on account of short water supply. An artesian well is being bored.

New Connellsville Coal and Coke Company—This company has been organized, with \$1,500,000 capital stock, by R. P. Burgan, George M. Hosack, J. H. Sanford and J. T. M. Stoneroad, who recently bought 2800 acres of coal land. The company will begin at once the work of developing the property. Coke ovens will be erected and a railroad connection established. A town will be built and will be named New Connellsville. The coal tract lies in Washington township, Greene county. The coal is of excellent coking quality and adjoins the coal recently bought by Julian Kennedy and others. It is adjacent to Ruff's Creek village.

South Dakota

CUSTER COUNTY

Saginaw—At the annual meeting held in Custer, I. W. Herber, of Custer, Louis Hahn, George Thompson, of Columbus, O., Ben Eilber, H. B. Wagg and Charles Ewing, of Wisconsin, were made directors. I. W. Herber is president and general manager, and B. Eilber vice-president.

LAWRENCE COUNTY

Gilt-Edge-Maid—Under the closer screening system the property is producing monthly a little over 4500 tons.

Imperial—With the addition of ore from the lower contact on quartzite the output is now 3500 tons of ore per month.

Golden Placer—Over 1500 tons per month of ore from the Kicking Horse mine is being handled; the bedrock ore will be tapped in Deadwood gulch this fall.

Golden Reward—The monthly production has reached 5000 tons. Miners are being shifted from the Harmony and Golden Wedge claims to the Tornado, which is to be reopened. The Alpha has a new orebody which is producing 50 tons per day.

Homestake—The company is now producing regularly 120,000 tons per month and is increasing the capacity of its slime plant and foundry.

Mogul—With the mill running nearly full capacity the company is treating monthly 10,600 tons of ore and is rebuilding the Horseshoe shaft.

Minnesota Mines Company—The present monthly tonnage of 2500 is to be doubled by the addition of machinery in the mill, including more crushers.

North Homestake—Improvements in the mill and mine have been completed and the monthly production is now 4000 tons.

Reliance—A new Huntington mill has brought the monthly capacity to 4000 tons, which will be increased this winter with a larger force of miners.

Wasp No. 2—Regular dividends are being declared on ore running less than \$2 per ton gold and the output is 7000 tons per month.

PENNINGTON COUNTY

Balkan—The new five-stamp mill will go into commission this month and if satisfactory a larger plant will be erected.

Black Eagle—Joe Mitchell is working a new body of tripoli ore which he will prepare on the ground and then ship east. It is the only mine of this kind now being operated in the Hills.

North Star—Frank Coughran has put a 20-stamp mill on the property and is making a good extraction from the plates. He has an 8-ft. ledge of fair-grade gold ore.

Washington

CHELAN COUNTY

Holden Gold and Copper Company—A five-drill air compressor has been installed at the mine, near Lake Chelan. Two machine drills are now at work, one in each of the lower levels on the vein intersected several hundred feet from the portal. A lateral drift is to be driven in the footwall on both levels, and crosscuts will be driven at intervals of 100 ft. The vein is 40 ft. wide and carries ore assaying from 7 to 10 per cent. copper, \$5 to \$10 gold, and 2 oz. silver per ton. The stock is owned by J. P. Graves, of Spokane, and others from Spokane and Chelan men.

OKANOGAN COUNTY

The Favorite Gold and Copper Company—Two shifts are working in the adit, now 650 ft. long, on its property near Night-hawk. The adit will intersect the first lead-

silver vein at a depth of 1200 ft. and at a distance of about 500 ft. from its mouth. Beyond the small lead-silver vein there is a larger one of the same ore and a 7-ft. vein of copper. Several open cuts and tunnels have been driven on the copper vein near the surface.

STEVENS COUNTY

Beccher Gold Mining Company—Drifting from the different stations of the main shaft of the property, near Rock Cut, has begun; a small crew of men is working. A survey of the claims has been completed by L. W. James, of Spokane. R. M. McEntire is in charge of the work at the mine.

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of ore for the week ending Oct. 10 were as follows: Cobalt Central, 40,500 lb.; Kerr Lake, 80,000; La Rose, 120,000; Nipissing, 260,200; O'Brien, 191,260; Temiskaming, 60,000; Temiskaming & Hudson Bay, 180,000; total 931,960 pounds.

City of Cobalt—The annual report of the company showed assets to Oct. 1 as \$1,717,781 including estimated value of mine \$1,500,000, ore not shipped \$13,000 and ore shipped to smelters \$69,850, with liabilities of \$554,963.

Little Nipissing—At the annual meeting held Oct. 15 in Toronto, it was decided to increase the capitalization from \$650,000 to \$1,000,000, the stock being underwritten by the shareholders. Superintendent Madden reported that the recent valuable find on the J B 2 property of the company, was a vein 12 in. wide which when developed will be the means of proving the values of the other veins encountered. The additional capital secured will enable the company to prosecute active development work.

Trethewey—A calcite vein containing silver was encountered at a depth of 100 ft. at about 1300 ft. north of the main workings on the boundary between the Trethewey and Hudson Bay properties.

Mexico

FEDERAL DISTRICT

The announcement, officially given out on Oct. 14, that the cabinet had decided to reject Article 144, of the proposed mining law, has been received with great satisfaction in mining circles. The clause, if adopted by Congress, would have made it unlawful for foreign companies to acquire mines in Mexico. The chapter relating to the civil responsibilities of mining companies was also rejected.

CHIHUAHUA

Mexican-Standard Mining Company—This company has lately been organized with a capitalization of \$2,000,000 to

operate extensively in the Candelaria district. New York capital is largely interested.

Providencia—The working force at this property in the Parral camp has been increased since the return of Manager J. D. Barnes from an extended trip to the United States. J. Evans lately assumed the position of superintendent, succeeding Arthur Evans, who resigned to take charge of the mining operations of the Midland Mining Company in the Naica camp.

Guadalupe—In this gold district lying about 75 miles east of Chihuahua along the line of the Kansas City, Mexico & Orient road there are renewed activities resultant from the opening up of rich orebodies at a number of places within a radius of five miles of the famous Oaxaca mine. A number of new developments are recorded and the report is current that the Oaxaca, which has a production record of over 1,000,000 pesos, will be reopened.

San Francisco del Oro—It is reported that this company in the Parral section is to build a branch line from its properties to Malina station on the Parral & Durango railway to facilitate the readier marketing of its increasing shipments.

SONORA—NACOZARI

Moctezuma—The second unit of the new concentrator has gone into operation and about 1200 tons per day, of which 950 tons is handled in the first unit, is now treated in the new plant beside 800 tons daily in the old mill. The plant, which was designed for a capacity of 1500 tons per 24 hours, will handle at least 2000 tons when in complete working order.

Promontorio—R. P. Travers passed through Nacozari en route to the mine accompanied by W. M. Cummings, of the Southwestern Development Company, of the Eppes Randolph interests by whom it is rumored that the mine is being taken over.

Caridad—Following a visit by S. T. Godbe to the properties of the Harris Copper Company, work has been started on the ground which is being opened by three adits drifting for the granite-porphry contact. This work is under the supervision of W. P. Belding and about 30 men are now employed. Shipments of copper ore from this property will be commenced on completion of the trails to Calabazas.

Creston de Oro—Mill operations at these mines of the Dawson Mining Company have been suspended during the installation of agitation tanks and a complete cyanide plant for treating the tailings of the present amalgamation-concentration mill. It is expected that the treatment of ore will be resumed on or before the first of the year, until which time work is confined to development.

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, Oct. 21—Coal trade in the West shows a slight improvement, and there seems to be a more hopeful disposition among operators. Sales of steam coal increase slowly, and a cold snap has brought up the domestic demand. The Lake trade is still quiet and the season seems likely to end more peacefully than is usually the case—that is, with out any rush at the end.

The Seaboard bituminous trade is slightly more active. New England is taking more coal especially in the sections served by water. The anthracite trade is dull and without change. The Coastwise trade is improving.

Testimony is still being taken in the government case against the anthracite coal companies; but nothing new has been brought out thus far.

COAL TRAFFIC NOTES

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to Oct. 10, in short tons:

	1907.	1908.	Changes.
Anthracite.....	4,427,580	3,921,674	D. 505,906
Bituminous	30,429,198	25,553,697	D. 4,875,501
Coke.....	10,964,547	5,302,856	D. 5,661,691

Total..... 45,821,325 34,778,227 D. 11,043,098

Total decrease this year to date was 24.1 per cent.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, eight months ended Aug. 31, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio.....	14,282,068	1,823,861	16,105,929
Buff., Roch. & Pitts.	3,477,598	223,484	3,701,082
Penn. lines, N. Y. C.	4,149,592	44,907	4,194,499
Pitts. & L. Erie.....	5,012,458	1,808,997	6,821,455
Norfolk & Western.	7,042,055	1,216,778	8,258,833

Total..... 33,963,771 5,118,027 39,081,798

Total, 1907..... 42,909,847 9,622,931 52,532,778

Decrease in coal, 8,946,076 tons; in coke, 4,504,904; total, 13,450,980 tons, or 25.6 per cent. In addition to the above, the Baltimore & Ohio carried 643,638 tons anthracite in 1907, and 485,177 in 1908; decrease, 158,461 tons.

Coal tonnage of railroads in Ohio Coal Traffic Association, eight months ended Aug. 31, short tons:

	1907.	1908.	Changes.
Hocking Valley.....	2,569,057	1,853,956	D. 715,101
Toledo & Ohio Cent..	1,178,522	896,630	D. 281,892
Baltimore & Ohio....	1,486,006	903,357	D. 582,649
Wheeling & L. Erie..	2,290,975	1,732,632	D. 558,343
Cleve., Lorain & Wh.	1,914,996	1,568,090	D. 346,906
Zanesville & Western	1,074,431	742,411	D. 329,020
Toledo Div., Pen. Co.	1,563,345	981,681	D. 581,664
L. Erie, Alliance & Wh.	810,544	618,183	D. 192,361
Marietta, Col. & Cleve.	18,626	29,449	I. 10,823

Total..... 12,903,502 9,326,389 D. 3,577,113

The total decrease this year was 27.7 per cent. Only one small road showed an increase.

Coal and coke tonnage Chesapeake & Ohio railway, two months of fiscal year, July 1 to Aug. 31, short tons:

	Coal.	Coke.	Total.
New River.....	1,111,167	32,582	1,143,749
Kanawha.....	850,770	3,747	854,517
Kentucky.....	47,792	.....	47,792
Connecting lines....	28,338	10,997	39,335
Total.....	2,038,067	47,326	2,085,393
Total, 1907.....	1,985,805	81,502	2,067,307

Deliveries this year: Points west of mines, 1,072,367 tons coal and 27,782 coke; points east, 255,156 tons coal and 19,544 coke; tidewater, 708,741 tons coal; anthracite to line points, 1803 tons.

New York

ANTHRACITE

Oct. 21—Large operators report considerable activity in both prepared and small steam sizes. Wholesale dealers state that small sizes are not so active and that No. 1 buckwheat is especially dull. All-rail trade is not so brisk as that going to tidewater. Schedule prices are \$4.75 for broken, and \$5 for egg, stove and chestnut. Small steam prices are: Pea, \$3.25@3.50; buckwheat No. 1, \$2.35@2.50; buckwheat No. 2 or rice, \$1.60@2; barley, \$1.35@1.50. All prices are f.o.b. New York harbor points.

BITUMINOUS

The moderate activity which has existed for the last two weeks continues at all points except New York harbor. The demand from shoal-water ports is fair although not especially noticeable. Business along the Sound has picked up and consumers are taking more coal than heretofore. New York harbor continues dull and prices remain unchanged at \$2.50@2.65 for good grades of coal. Transportation is good.

In the Coastwise vessel trade rates continue firm and as a rule about 5c. higher than last week. The rates for large vessels from Philadelphia are: Boston, Salem and Portland, 55c.; Lynn, 65c.; Newburyport, 70c.; Portsmouth, 60c.; Saco, 90@95c.; Bath, 75c.; Gardiner, 80c.; Bangor, 70@75c.; Providence, New Bedford and the Sound, 50c. per ton.

Birmingham

Oct. 19—There is a steady increase still in the output at the coal mines in Alabama. The Tennessee company has removed the convict labor to the new shaft in the Pratt Mines division and has given Nos. 2 and 10 mines over to free labor. Coal washers are being added to this division and other preparations being made

to get the largest possible output. There are yet a number of miners to be given employment in the mines. The indications point to an inclination on the part of the various companies which were involved in the strike to do the best they can for the men.

Coke production is improving right along. A good demand exists for coke.

Chicago

Oct. 19—Though warm weather at the end of the week has somewhat lessened the demand for domestic coals, there is a fair sale of Eastern and Western, with the market firm. Retailers and consumers in city and country continue to lay in stocks. Shippers are keeping away from the market a good deal of the coal that has made prices weak; the consequence is little coal requiring to be sold to meet demurrage charges. Eastern coals are better in tone, except smokeless run-of-mine, which is too plentiful. Western lump is strong, run-of-mine is a little dull, and screenings are variable.

Lump and egg from Illinois and Indiana mines sell for \$1.85@2.50; run-of-mine for \$1.75@2.15, and screenings for \$1.20@1.50. Hocking Valley has no surplus, and is in good demand at \$3.15. Pittsburg No. 8 brings steadily \$2.75@2.85 for 3/4-in. Youghiogheny moves on contracts at \$3 for steam and \$3.15 for 3/4-in. gas. Smokeless is increasing in sales and brings \$4.20@4.30 for Pocahontas and New River lump, with other lump selling at \$4.05, and run-of-mine \$2.90@3.45; there is much low-grade smokeless on the market.

Anthracite finds a fair sale, the distribution being general over Chicago territory and all sizes in good supply.

Cleveland

Oct. 20—It is estimated that the Lake coal trade will show a decrease of at least 1,500,000 tons from last year. Thus far there have been no signs of the rush of shipments which usually comes in the last month of the navigation season. Notwithstanding the comparatively light shipments, heavy stocks are still reported on docks at the upper Lake ports.

Indianapolis

Oct. 20—Coal-mine operators throughout the State feel a measure of satisfaction because the output of their mines during the past week was equal to the corresponding week a year ago. Such a comparison is indicative of that progress necessary to bring about normal conditions.

There has been a greater demand for steam and foundry coal, and judged from the current orders from mills and manufacturers it is apparent that business is improving.

Pittsburg

Oct. 20—There is no material change in the coal situation; mine-run is on the basis of \$1.15 a ton at the mine. Only some large concerns, however, are holding to this price, others making sales at lower rates, the minimum this week being 90c. There is no regular price for slack, 40@50c. being nominal quotations. It is understood that M. A. Hanna & Co. have made additional contracts with independent interests for Lake coal.

Connellsville Coke—Production has fallen off, but shipments show a gain. Prices continue \$1.65@1.85 for furnace and \$2.10@2.25 for foundry. A number of sales have been reported under these prices, some foundry going as low as \$1.90 and furnace at \$1.40@1.50. The *Courier* gives production in both regions at 201,713 tons. Shipments 7707 cars as follows: To Pittsburg district, 3029; to points west of Pittsburg, 4236; to points east of Connellsville, 442 cars.

Foreign Coal Trade

British Coal Exports—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, nine months ended Sept. 30, long tons:

	1907.	1908.	Changes.
Coal	16,883,755	46,579,700	D. 304,055
Coke	656,198	817,082	I. 160,884
Briquets	1,107,737	1,136,691	I. 28,954
Total exports...	18,647,690	48,533,473	D. 114,217
Steamer coal.....	13,884,782	14,490,794	I. 606,012
Total.....	62,532,472	63,024,267	I. 491,795

The larger exports this year were to France, 7,786,683 tons; Germany, 7,268,507; Italy, 6,443,669; Sweden, 3,089,440 tons.

Welsh Coal Market—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of Welsh coal as follows, on Oct. 10: Best Welsh steam, \$3.72; seconds, \$3.48; thirds, \$3.30; dry coals, \$3.60; best Monmouthshire, \$3.18; seconds, \$3.06; best small steam, \$1.92; seconds, \$1.56. All per long ton, f.o.b. shipping port.

Iron Trade Review

New York, Oct. 21—The iron and steel markets are still in a waiting condition. No one seems to be disposed to buy far ahead, and sellers are not pressing contracts which cannot be placed except at a cut in prices.

In foundry iron business continues to be in small lots for deliveries this quarter. There are inquiries for next year, but they are regarded as only feelers to test the market. Some furnaces which are short of orders have been cutting prices.

In finished material there have been

some orders for railroad bridge work placed; otherwise the railroads are still out of the market. Some large building contracts are still hanging fire; quite a number of small ones have been placed, mostly at rather low figures.

There is a good deal of talk about export business. It is difficult to locate this business, as foreign contracts are generally kept quiet, for obvious reasons.

The board of directors chosen at the annual meeting of the Colorado Fuel and Iron Company this week shows that the control of the company has passed from the Gould to the Rockefeller interests. This confirms a belief that has been quite general. J. F. Welborn continues president, but L. M. Bowers, a Rockefeller representative, is now treasurer and D. C. Beaman secretary and general counsel.

Baltimore

Oct. 20—Imports of the week included 7250 tons manganese ore from India and 6000 tons from Brazil; 4950 tons iron ore from Cuba; 100 tons ferromanganese from Liverpool. Exports included 955,047 lb. tin scrap to Rotterdam; 1964 tons steel rails to Cuba.

Birmingham

Oct. 17—There has been but a little business booked lately by Alabama pig-iron manufacturers. The consumers are waiting until after the election. There is a steady inquiry, however, indicating that a large amount of iron is needed. There is also a good delivery of iron being made in this section, on orders placed some time ago. Very little business has been countermanded or ordered held for future instructions as to delivery. Quotations hold firm at \$12.50@13 per ton, No. 2 foundry. While some inquiry continues to come in as to iron to be delivered next year there are no orders being placed worthy of mention. The make in this section has been increased by the blowing in of two furnaces. The rolling mills of the Tennessee company at Bessemer are again in operation. The car and foundry plant at Anniston is doing well again and the cast-iron pipe plants have recently received additional orders.

Chicago

Oct. 19—The iron and steel market continues dull, but with no signs of weakening. All interests, indeed, are awaiting the developments of the election. Inquiries are numerous and for increasing amounts, showing that the needs of business are large. The great majority of buyers, or would-be buyers, are confining their orders to this year's deliveries, as for several weeks past. If they run into 1909 deliveries it is not for large amounts.

These conditions make quotations apply only to the small business that is being done now. On a large amount of iron, for speedy or delayed delivery, the price of either Northern or Southern iron

would undoubtedly be shaded materially from the \$12.50@13 Birmingham (\$16.85@17.35 Chicago) for Southern No. 2, and \$16.50@17 for Northern No. 2 now prevailing. At the standard quotations Northern iron obtains the preference of most buyers of quick-delivery lots. Lake Superior charcoal iron is steady at \$19.50@20.

In iron and steel products there is no marked change. Coke is in better demand and in good supply at \$4.90 for the best Connellsville; Southern cokes, 15@25c. lower.

Philadelphia

Oct. 21—The orders for pig iron which have been quietly booked at eastern Pennsylvania furnaces, especially during the past few days have allayed much anxiety as to business and prices for the first quarter of next year. A few large consumers were taken by surprise this week when they learned of the withdrawal of certain options on next quarters' delivery. Those who order for next quarter will pay 25c. per ton more than they would have had to pay two or three weeks ago. Foundry iron is the subject of more inquiry than for some months. Basic pig is stronger than it has been. Forge is the weakest on the list.

Pittsburg

Oct. 20—There has been no improvement in demand for finished steel products, and the market remains very quiet. There has been some improvement in sentiment. The trade finds encouragement in recent railroad reports. There is some uneasiness as regards prices, since there is a little shading in several finished steel products and it may possibly be found necessary to reduce prices of certain products. These reports have already noted shading of \$1 to \$2 a ton in plates of \$1 in black and \$2 in galvanized sheets; tinplates are shaded 5 or 10c. a box. It is believed that in some cases where low prices have been made on fabricated steel contracts the fabricators have secured a concession on the shapes from the mills on account of the large tonnage involved.

Pig Iron—The Pittsburg Steel Company, which has been negotiating at intervals for a long time for a regular supply of basic pig iron for its new plant of eight 60-ton basic open-hearth furnaces, which was put in partial operation Aug. 1 last, has closed a contract with the Penn Iron and Coal Company for 6000 tons of basic pig a month for five years, commencing Nov. 1 next. The price is to be 7 per cent. above the current cost of production, although details are not available as to the method by which the cost of production is to be computed. The Penn company operates one blast furnace at Canal Dover, O., and is controlled by M. A. Hanna & Co., who are large ore producers, so that the cost of ore is not

known. The contract disposes of more than half the output of the furnace. The Pittsburg Steel Company has just bought a block of 10,000 tons of basic pig from the Struthers Furnace Company, at \$14, furnace, for delivery 500 tons a day, which will carry it until shipments commence on the Dover contract. Corrigan, McKinney & Co., a large ore interest, and operating Josephine Furnace, have sold in the past few days 2000 tons of forge at \$13.75, furnace, and 3000 tons of No. 3 foundry at \$14, furnace, both for delivery this year. The Allegheny Steel Company gets 5000 tons of basic iron for delivery this year at about \$14, furnace. The iron for the United Steel Company, Canton, O., has not been closed. The market is quotable as follows, f.o.b. Valley furnaces: Bessemer, \$15; basic, \$14@14.25; malleable, \$14.50; No. 3 foundry, \$14.50; gray forge, \$13.50@13.75.

Steel—Extremely quiet. Billets remain \$25, Pittsburg. Tank plate is nominally 1.60c., but prices shaded \$1 to \$2 a ton. Merchant steel bars, 1.40c.

Steel—Unchanged. The regular figures are 2.50c. for black sheets and 3.55c. for galvanized, 28 gage, but black sheets are sometimes shaded \$1, and galvanized \$2 a ton.

Metal Market

Gold and Silver Exports and Imports

NEW YORK, Oct. 21.

At all U. S. Ports in September and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Sept. 1908..	\$ 3,974,391	\$ 4,695,894	Imp.\$ 721,503
" 1907..	1,503,836	2,759,019	" 1,255,183
Year 1908..	68,937,380	38,356,816	Exp. 30,580,564
" 1907..	49,879,813	30,862,220	" 19,017,593
Silver:			
Sept. 1908..	4,198,286	3,303,362	Exp. 894,924
" 1907..	6,048,457	3,822,766	" 2,225,691
Year 1908..	38,781,380	30,725,475	" 8,055,905
" 1907..	47,970,793	34,488,224	" 13,482,569

Exports of specie from New York week ended Oct. 17: Gold, none; silver, \$785,378, to Great Britain and France. Imports: Gold, \$128,194; silver, \$175,126, from Mexico and South America.

Foreign commerce of the United States, nine months ended Sept. 30, reported by Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1907.	1908.
Exports.....	\$1,331,588,696	\$1,230,837,439
Imports.....	1,108,072,299	798,168,922
Excess, exports.....	\$ 223,516,397	\$ 432,668,517
Add excess of exports, silver.....		8,055,905
Add excess of exports, gold.....		30,580,564
Total export balance.....		\$ 471,304,886

The gold and silver movement in detail is given in the table at the head of this column.

Gold and silver movement in Great Britain nine months ended Sept. 30:

	Imports.	Exports.	Excess.
Gold.....	£35,626,226	£34,813,302	Imp. £ 812,924
Gold, 1907..	33,762,192	24,989,296	Imp. 8,772,896
Silver.....	7,828,203	10,053,137	Exp. 2,224,934
Silver, 1907..	12,608,097	13,199,962	Exp. 591,865

Silver

SILVER AND STERLING EXCHANGE.							
Oct.	Sterling Exchange.	Silver.		Oct.	Sterling Exchange.	Silver.	
		New York, Cents.	London, Pence.			New York, Cents.	London, Pence.
15	4.8655	51 3/4	23 1/4	19	4.8655	52	24
16	4.8660	51 1/2	23 3/4	20	4.8650	51 1/2	23 3/4
17	4.8660	51 3/4	23 3/4	21	4.8655	51 3/4	23 1/4

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

Owing to bear operations in India in futures, spot silver shows no tendency to advance; any small improvement in price being soon met by a pressure to sell. The bear commitment for futures is large, according to the best information.

Messrs. Pixley & Abell report silver shipments from London to the East for the year to Oct. 8:

	1907.	1908.	Changes.
India.....	£9,702,354	£7,329,163	D. £2,373,191
China.....	.....	516,400	I. 516,400
Straits.....	625,950	112,385	D. 513,565
Total.....	£10,328,304	£7,957,948	D. £2,370,356

Copper, Tin, Lead and Zinc

Oct.	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.
15	13 3/4 @13 3/4	13 1/2 @13 1/2	59 1/2	29 1/2	4.32 @4.37	4.77 @4.82	4.62 @4.67
16	13 3/4 @13 3/4	13 1/2 @13 1/2	59 1/4	29 1/2	4.25 @4.30	4.77 @4.82	4.62 @4.67
17	13 3/4 @13 3/4	13 1/2 @13 1/2	59 1/2	29 1/2	4.25 @4.30	4.77 @4.82	4.62 @4.67
19	13 3/4 @13 3/4	13 1/2 @13 1/2	59 1/2	29 1/2	4.25 @4.30	4.77 @4.82	4.62 @4.67
20	13 3/4 @13 3/4	13 1/2 @13 1/2	59 1/2	29 1/2	4.22 @4.27	4.77 @4.82	4.62 @4.67
21	13 3/4 @13 3/4	13 1/2 @13 1/2	59 1/2	29 1/2	4.20 @4.25	4.77 @4.82	4.62 @4.67

London quotations are per long ton (2240 lb.) standard copper. 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 usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market is still dull, although the week Oct. 15-21, shows somewhat more business than the previous week, both for domestic and foreign account. A noteworthy feature has been an increase in the difference between the prices for Lake and electrolytic copper. The floating supply of Lake has apparently been absorbed, and consumers requiring this grade have had to pay the prices asked by producers. Calumet & Hecla is understood to be still asking 14c. and is reported to have made some small sales at that price, which, of course, can have

been only on orders for that particular brand of copper. The electrolytic situation is different, there being apparently plenty offered at previous prices. Offers at 13 3/4c. and lower, net cash, New York, have failed to secure orders, the bulk of which appear to have been taken at about 13 1/4c., while orders for export have been accepted at somewhat lower prices. The market closes at 13 1/2@13 3/4c. for Lake copper and 13 1/2@13 3/4 for electrolytic. The average for casting copper during the week has been 13@13 1/8 cents.

Copper sheets, cold-rolled, 19c.; hot-rolled, 18c.. Wire, 14 3/4c. base, carload lots at mill.

The London market for standard copper has also been very dull, and fluctuated around £59 10s. for spot, £60 5s. for three months. On Wednesday there was more activity and the market closes at £59 18s. 9d. for spot, £60 15s. for three months.

Statistics for the first half of the current month show an increase in the visible supplies of 2000 tons.

Refined and manufactured sorts we quote: English tough, £63 10s.; best selected, £62 10s.@£63 10s.; strong sheets, £74 10s.@£75 10s.

Tin—The London market, which had been barely steady throughout the larger part of the week, has developed a good deal of strength at the close, accompanied by large transactions. The close is cabled as firm at £134 5s. for spot, £135 17s. 6d. for three months.

The advance abroad has had an encouraging effect on home dealers and consumers, and especially among the latter more interest is shown in future deliveries. The domestic market at the close is quoted at about 29 5/8c. per pound.

Lead—The market has had a further decline, and considerable lead is offered at the lower figures. Consumers appear to be well covered and are holding off. At the close the metal is quoted at 4.20@4.25, New York, and 4.05@4.10, St. Louis, and the market appears to be rather demoralized.

There was a flurry in the London market for Spanish lead, due to rumors of a strike having broken out at the Broken Hill Proprietary mines in Australia. These, however, proved to be unfounded. At the close Spanish lead is quoted at £13 6s. 3d., English lead at £13 8s. 9d. per ton.

Spelter—Transactions have taken place right along during the week, and in some cases slightly lower figures have been accepted. However, the position of the metal remains strong, as reports from manufacturing districts show that consumption is slowly improving, and on the other hand supplies of ore are not abundant. The market closes at 4.62 1/2@4.67 1/2c., St. Louis, 4.77 1/2@4.82 1/2c., New York.

The London market is unchanged at £19 12s. 6d. for good ordinaries, £19 17s. 6d. for specials.

The Bartlesville Zinc Company, at Bartlesville, Oklahoma, has resumed operations.

Base price of sheet zinc is 7c. f.o.b. La Salle-Peru, Ill., less 8 per cent.

Other Metals

Antimony—The market is quiet, both in New York and abroad. Prices are higher for forward than for early delivery. Quotations are 8½@8¼c. for Cookson's, 7¾@8c. for Hallett's, and 7½@7¼c. for ordinary brands.

Aluminum—There has been a considerable reduction in prices. Base price of ingots is now 26c.; sheets, 35c. per pound.

Platinum—Business is reported to have been done recently at \$18@20 for refined and \$17.50 for scrap. This is considered low, and an advance is expected, as business has increased lately, especially with jewelers.

Cadmium—In 100-lb. lots, 75c. per lb., at Cleveland, Ohio.

Magesium—This metal is offered in New York at \$1.25 per lb. in 100-lb. lots. The price is \$1.40 per lb. for 5-lb. lots.

Nickel—Large lots, 40c., New York.

Quicksilver—New York price is \$46 per flask of 75 lb. for large lots. San Francisco, \$43@44 for domestic sales; \$41@42 for export. London price is £8 10s. per flask, with £8 7s. 6d. done by jobbers.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, nine months ended Sept. 30, figures in long tons, except quicksilver, which is in pounds:

	Imports.	Exports.	Excess.
Copper.....	129,674	50,092	Imp. 79,582
Copper, 1907...	85,151	51,489	Imp. 23,662
Tin.....	35,664	29,958	Imp. 5,706
Tin, 1907.....	33,046	28,455	Imp. 4,591
Lead.....	176,383	38,728	Imp. 137,655
Lead, 1907.....	145,181	34,320	Imp. 110,861
Spelter.....	79,135	6,173	Imp. 72,962
Spelter, 1907.....	80,099	4,305	Imp. 75,794
Quicksilver, lb. 3,130,466	1,295,071	Imp. 1,835,395	
Quicksilver, '07 2,917,596	1,773,239	Imp. 1,144,357	

Copper totals include metallic contents of ore and matte. Exports include re-exports of foreign material. Tin-ore imports, 15,761 tons in 1907, and 19,298 in 1908. Imports of iron and copper pyrites, 576,586 tons in 1907, and 598,015 in 1908. Of the imports this year the United States furnished 5045 tons copper matte, 48,652 tons fine copper and 27,998 tons lead.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 17—The highest price paid for zinc blende was \$39, the assay base ranging from \$34 to \$36.50 per ton of 60-per cent. zinc. The highest for zinc silicate was \$25.50, on a base of \$18 per ton of 40-per cent. zinc. The average price, all grades, was \$32.98. The highest

price paid for lead was \$54, on settlements of the previous week's purchase, the price declining at the week-end to \$51. Medium grades sold at \$52. The average price, all grades, was \$51.98 per ton.

Local papers reported that producers were holding both zinc and lead ore for better prices, but the increase in shipment does not bear out such an assertion. The stock of zinc in the bins which reached nearly 8000 tons at the close of last week, has been materially decreased by the heavy shipment this week, while the output is on the wane in the older camps.

SHIPMENTS, WEEK ENDED OCT 17

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,308,420	996,120	\$82,140
Joplin.....	2,768,170	441,990	60,932
Galena.....	758,860	148,400	16,758
Prosperity.....	220,800	245,960	10,147
Miami.....	555,400	145,160	9,313
Alba-Neck City.....	547,140	.....	9,301
Oronogo.....	387,960	.....	7,008
Aurora.....	385,570	43,590	6,716
Spurgeon.....	270,570	135,080	6,483
Granby.....	377,100	24,600	5,350
Duenweg.....	167,550	67,380	4,599
Carl Junction.....	199,590	15,220	4,067
Playter.....	64,630	31,650	1,928
Badger.....	104,760	.....	1,885
Zincite.....	84,840	5,280	1,556
Carthage.....	84,740	.....	1,524
Cave Springs.....	86,950	.....	1,478
Quapaw.....	64,410	.....	1,030
Sarcozie.....	52,620	.....	918
Wentworth.....	51,060	.....	594
Totals.....	10,541,140	2,300,430	\$233,727

42 weeks.....402,152,330 61,826,730 \$8,487,410
Zinc value, the week, \$173,921; 42 weeks, \$6,782,726
Lead value, the week, 59,806; 42 weeks, 1,704,684

MONTHLY AVERAGE PRICES

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1907.	1908.	1907.	1908.	1907.	1908.
January.....	\$46.90	\$37.60	\$45.84	\$35.56	\$83.58	\$46.88
February....	48.30	36.63	47.11	34.92	84.58	49.72
March.....	49.75	36.19	48.66	34.19	82.75	49.90
April.....	49.25	35.40	48.24	34.08	79.76	52.47
May.....	46.90	34.19	45.98	33.39	79.56	56.05
June.....	47.00	33.06	44.82	32.07	73.66	60.48
July.....	46.80	34.55	45.79	31.67	58.18	59.90
August.....	44.56	36.53	43.22	33.42	59.54	60.34
September..	41.00	37.63	40.11	34.44	53.52	54.59
October.....	41.75	.....	39.83	.....	51.40	.....
November...	38.60	.....	35.19	.....	43.40	.....
December...	31.50	.....	30.87	.....	37.71	.....
Year.....	\$44.36	.....	\$43.68	.....	\$68.90	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., Oct. 17—This week \$37 was the highest price paid for zinc ore on a basis of \$36 per ton of 60 per cent. zinc. The base price paid for 80 per cent. lead ore was \$52 per ton.

Shipments, week ended Oct. 17:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville....	911,030	.....	280,000
Benton.....	458,720	114,830	.....
Hazel Green....	406,240	81,160	.....
Galena.....	240,700	.....	.....
Cuba City.....	175,060	.....	66,100
Livingston.....	160,000	.....	.....
Rewey.....	105,300	.....	.....
Days Siding....	87,500	.....	.....
Total.....	2,544,550	195,990	346,100
Year to Oct. 17.....	79,743,369	8,571,565	2,394,604

In addition to the above there was shipped to the Electrostatic Separator, from Benton, 298,510 lb.; from Linden, 63,170 lb.; from Potosi, 52,505 lb. Shipped to the Joplin Separator Works, at Galena, 53,700 lb. Shipped to the Enterprise roaster, at Platteville, from Strawbridge, 282,800 lb. zinc concentrates.

Chemicals

New York, Oct. 21—The general market has been quiet and trading has been light and for immediate needs. Prices have not changed and business seems to be waiting on the political situation.

Copper Sulphate—The market is quiet and unchanged. Quotations remain at \$4.65 per 100 lb. for carloads and up to \$4.90 for smaller lots.

Nitrate of Soda—The market is firmer, but the demand is quiet. European dealers are buying heavily on the West Coast. Prices are 2.15c. for spot and for the remainder of 1908 and for 1909 the quotation is 2.17½c.

Sulphur—Messrs. Emil Fog & Sons report the exports of Sicilian sulphur as follows, seven months ended July 31, in tons of 1030 kg., as usual in the trade:

	1907.	1908.	Changes.
Exports, seven mos....	211,281	255,266	I. 43,985
Stocks, Aug. 1.....	533,022	542,641	I. 9,619

The Sicilian situation has been complicated by strikes among the miners, resulting in serious riots, which could only be subdued by a strong military force.

Mining Stocks

New York, Oct. 21—The general stock markets have shown some strength, as far as quotations are concerned. It is a traders' market, however, marked by moderate fluctuations, in which no definite tendency is apparent. There is an uncertainty which will probably continue until after election.

The Curb market has been fairly active, the copper stocks generally holding firm, or gaining slightly. The Nevada and Cobalt stocks were less firm, and less in demand.

One sale of Homestake, of South Dakota, was reported during the week, at \$88 per share.

The directors of the Amalgamated Copper Company have declared a quarterly dividend of 0.5 per cent., the same as for the previous quarter. This was generally expected.

Boston

Oct. 20—A few stocks have attracted attention in this market the past week, but as a rule a feeling of lethargy has been prevalent. The declaration of the regular quarterly dividend of 50c. by the Amal-

gamated Company gave a slight stimulus to the market.

The so-called Amster stocks have been well bought, while Old Dominion and Superior Copper have had good sized bulges. Arizona Commercial rose \$4.50 to \$36.25, reacting but a small portion of the advance. Boston & Corbin has also been active, selling up \$1.87 1/2 to \$19.37 1/2. A bull pool has been at work in Old Dominion and the result was a \$4.75 advance to \$50.25, reaching to below \$49. Superior Copper rose \$3.62 1/2 to \$29.87 1/2, reacting to \$28. This company is expected to begin shipments to the mill in a few weeks. The Old Dominion has wiped out a floating indebtedness of \$400,000 this year, and now has a working capital of over \$800,000.

Copper Range has been steady around \$72.50 and \$73.50 and North Butte at from \$81 to \$83.37 1/2. Amalgamated closed at its best tonight at \$76.50. Brokers report that they are carrying but small lines of this stock. The 2,000,000 shares of Superior & Pittsburg Copper stock, of which 1,472,790 shares have been issued, have been placed on the unlisted department of the Stock Exchange. The price is about the same as when taken from the Curb.

Osceola has been firm at \$116@119. The injunction against voting Calumet's holdings of this stock still holds and the adjourned annual meeting has been again adjourned.

Affairs have been quiet on the Curb. This institution has got to move its quarters and will take up its abode on Doane street a short distance from its present location on Exchange Place.

STOCK QUOTATIONS

Table with columns for NEW YORK Oct. 20 and BOSTON Oct. 20. Lists various stocks like Alaska Mine, Amalgamated, Anacnda, Balakiala, etc., with their respective prices and changes.

*Ex. Div. †Ex. Rights.

‡Last quotation.

N. Y. INDUSTRIAL

Table listing industrial stocks in New York such as Am. Agri. Chem., Am. Smelt. & Ref., Bethlehem Steel, etc., with prices and changes.

BOSTON CURB

Table listing stocks on the Boston Curb such as Ahmeek, Black Mt., East Butte, Hancock Con., etc.

NEVADA STOCKS. Oct. 21.

Furnished by Weir Bros. & Co., New York.

Table listing Nevada stocks with columns for Name of Comp., Clg., and prices. Includes Silver Pick, St. Ives, Triangle, Bullfrog Mining, etc.

ST. LOUIS Oct. 17

Table listing stocks in St. Louis such as N. of Com., Adams, Am. Nettie, Center Cr'k, etc.

LONDON Oct. 21

Table listing stocks in London such as Dolores, Stratton's Ind., Camp Bird, Esperanza, Tomboy, El Oro, Oroville.

Monthly Average Prices of Metals

SILVER

Table showing monthly average prices of silver in New York and London from January to December.

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

Table showing monthly average prices of copper in New York and London from January to December.

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Table showing monthly average prices of tin in New York from January to June.

Prices are in cents per pound.

LEAD

Table showing monthly average prices of lead in New York and London from January to December.

New York, cents per pound. London, pounds sterling per long ton.

SPELTER

Table showing monthly average prices of spelter in New York, St. Louis, and London from January to December.

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

Assessments

Table listing assessments for various companies, including American Fork, Birchville, Brookland, Brunswick, Bullion, Caledonia, California, Gould & Curry, Highland, Lady Washington, Massasoit, Mexican, New Mercer, N. Y. Bonanza, Pittsburg, Seg. Belcher, Sierra Nevada, Uintah Treas., and Utah United.