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Floor Construction.

BY J. H. GRANBERY.

There is perhaps no class of work which requires such heavy supporting members in the floor-system as lead refineries. Kettles, themselves weighing from 15,000 to 18,000 lb., are filled with 50 to 55 tons of desilverized lead, and the catastrophe that may occur when an insufficiently designed floor is loaded with a frozen kettle is apparent. Of course, for this class of work the floors are built heavily, but the fact is often lost sight of that it may be necessary to leave upon the floor for a space of many hours a kettle which has been removed from its hearth setting; perhaps overstraining the floor members.

Around the softening and refining furnaces bullion is apt to be piled up to such an extent that the floor will be loaded far beyond the figured carrying capacity. In these cases, it is always well to determine the floor loading, not by that load which it would ordinarily have to carry, but in conjunction with this load to use flange strains 50 per cent. in excess of the allowed limit, (say 24,000 lb.), and on that basis to provide sufficient strength to carry any load which it is at all probable may be placed upon it.

In boiler rooms, as well as in engine rooms, it is often possible for a single heavy piece to be placed upon the floor in such a position that the loads will be concentrated at one point and will far exceed the normal carrying capacity of the system. In this case also the weight of the single heaviest piece should be carefully determined, and the floor system proportioned to carry it without exceeding the normal flange strains in the beams and girders by more than 50 per cent.

An excellent illustration of the desirability of this procedure is given in C. C. Schneider's "Specifications for Mill Buildings." This paper received the award, by the American Society of Civil Engineers, of the Norman Medal, a high distinction, which is coveted by engineers throughout the world.

A Modern Colliery Stable.

BY F. W. PARSONS.*

Coal companies using large numbers of mules are now paying more attention to the proper and economical way of caring for these animals, and are sacrificing first cost to the after saving. A suitable size for an up-to-date stable capable of housing 44 mules is 116 ft. 4 in. long, by 27 ft. 4 in. wide. The stalls should be 5 ft. center to center and 9 ft. long. The water and feed boxes and hay chute take up 18 in. of this, leaving 7 ft. 6 in. in the clear for the mule. 2 x 12 in. lumber is used for the partitions between stalls, the back ends are enclosed between two 2 x 6 in.'s which run up to a 3 x 6 in. cap and help support the floor above. The stable walls are built of 6 x 6 studding placed about 3 ft. apart. The front end of every other stall partition is held between two 2 x 6 in.'s and where the partition ends another 2 x 6 is inserted so as to form a solid 6 x 6 all the way to the cap above.

The water box is 3 ft. long and is so placed that 17 in. protrudes into each stall. A pipe runs the entire length of each side of the stable, and one faucet answers for each water box or for the two stalls. The water box is divided by the stall partition into two boxes, but has a hole drilled in the side and near the bottom so that when the spigot is opened the water will rise to the same level in the box in both stalls. In case of one stall being unoccupied the box is but half filled. One hay chute also answers for two stalls, the chute extending down from the floor above and being slightly hoppered with the bottom at the larger end so that the hay will not clog. The side of the hay box at the bottom has wooden or iron bars spaced 6 in. apart like a manger; so that the mules can feed.

The feed box is adjacent to the hay chute so that any hay pulled out will drop into it instead of falling into the stall.

*Chief engineer, Victor Fuel Co., Denver, Colo.

In the center of the stable, on the ground floor, two stalls are thrown together, so as to form a small room for mixing feed. Above this room on the second floor is a large bin 20 ft. long and 9 ft. wide for storing feed; opposite this bin on the second floor is another similar bin for storing corn. There is a large opening in the second floor between the two bins, so that sacks of grain may be hoisted from the first floor to the top of these bins and dumped.

A chute leads from the bottom of each bin to the mixing box in the room on the first floor. The bottom of each chute is made of perforated tin or sheet iron in order that the dust will shake out on its way from the storage bin to the mixing box. An automatic lever in the mixing room regulates the flow of grain in the chutes.

The stable is lighted by small 1 ft. 4 in. by 2 ft. 10 in. 3-light windows. The windows are so placed that each one lights two stalls.

The driveway on the first floor between the stalls is 8 ft. wide with a hard clay floor. It is raised in the center with a small drain running along each side and graded to carry away the refuse from the stalls. There are double doors at each end of the stable, this allows the lower ones to be kept closed and the upper ones opened in summer for improving the ventilation. There are also doors on one side of the bar, opening into the loft or second floor to permit hay being hoisted from a wagon below.

An opening 4 ft. high runs the entire length of the building to provide suitable ventilation. No corrugated iron is used on the roof or sides of barn; it would be much too hot in summer.

A stable of this size and style with 2 x 12 in. second-floor joists, on 18 in. centers, two 2 x 10's for roof trusses, on 3 ft. 6 in. centers, and two 2 x 12's for tie beams at every truss, hung by ¾ in. rods would cost approximately as follows:

58,435 ft. lumber and 39,000 shingles @ $20 per 1,000 and including nails	$1,556.95
72 perches of stonework @ $1.80 per perch, including quarrying and hauling	129.60
Excavation	58.00
Carpenter's labor	603.00
Plumbing material and labor of install'g	48.60
Painting, two coats @ 15 cts. per sq. yd.	145.00
44 halter rings @ 30 cts	13.20
230 ft. of 2 in. strap iron for edge of manger	4.60
28 ft. of perforated sheet iron for bottom grain chutes, 12 in. wide	2.25
Total	$2,561.20

Tetrachloride of carbon will dissolve liquid fats, tar, resins, varnishes and dyes, and as a cleaning material has the advantage over benzine or naphtha, that it is incombustible. It will, however, volatilize at any ordinary temperature.

The Mannheim Contact Process.*

BY WM. WILKE.

The contact process for manufacturing sulphuric acid of the Verein Chemischer Fabriken in Mannheim is based on the following principles:

1. To use the heat of the ordinary roasting process for carrying on the catalytic action of the oxide of iron upon the sulphurous acid.

2. The purification of the burner gases is a dry process. In all other processes the gases are washed and have to be dried again.

3. The conversion or catalytic oxidation of that part of the sulphurous acid which passes through the iron contact but has not been converted, is brought about by means of platinum and reheated to the proper temperature by means of the waste heat of the burner gases.

4. The whole process is carried on by moving the gases by means of exhausters only.

The roast gases leave the kilns at a temperature of about 700 deg. C. This is the proper temperature necessary in the iron oxide to produce the conversion or catalytic action to transform the sulphurous acid into sulphuric anhydride. The iron oxide, at the above-mentioned temperature, forms iron arsenate, with the arsenious acid which is contained in the roast gases. If roast gases are taken at the temperature of the furnace through the oxide of iron, a large proportion of the sulphurous acid (50—60 per cent.) is converted into sulphuric anhydride, while the arsenic contained in these roast gases combines with the oxide of iron.

Water contained in the gases to be converted reduces the catalytic property of the iron oxide; it is, therefore, necessary to produce the roast gases with dried air. The drying of the air necessary for the process is accomplished with sulphuric acid which is produced in the process.

The roast gases are produced in a furnace which is protected with an air-tight iron shell against any entrance of moist atmospheric air. The air necessary for the roasting process passes through towers which are scrubbed with sulphuric acid and is then conducted through air-tight pipes entering the furnace or kilns below the grate bars. The dry and hot roast gases so obtained are conducted to a shaft which is attached to the furnace and filled with oxide of iron (pyrites cinders). In this shaft part of the conversion takes place—that is, part of the sulphurous acid is converted into sulphuric anhydride—while at the same time the arsenic obtained in the roast gases is retained.

The roast gases, therefore, are subjected to a dry purification, and are considerably reduced in their contents of sulphurous acid. After the sulphuric anhydride which is formed in this first part of the process has been absorbed, the rest of the sulphurous acid contained in the gases can be converted into sulphuric anhydride by means of a very small amount of platinum. To do this it is necessary to remove any small quantities of sulphuric acid (monohydrate) which have not been absorbed. This is accomplished by passing the gases through layers of porous material which is not affected by sulphuric acid. The main part of the sulphuric acid which is carried over mechanically is eliminated or retained in this way. The purified gases are now allowed to pass through layers of granulated basic blast-furnace slag.

The gases which have passed through the iron-contact mass contain sufficient heat to reheat the filtered gases to the temperature necessary for catalytic action in the platinum contact.

It would be possible to utilize this heat by giving it off to the filtered gases. But the sulphuric acid (monohydrate) must be carried along in the form of vapor. The heat, therefore, must not be reduced too much to keep the monohydrate in a gaseous state. The heat given off in the heater located over the iron contact is not sufficient to raise the filtered gases to the temperature necessary to carry on catalytic action in the platinum contact. It is, therefore, necessary to have a small coal fire to raise these gases to their proper temperature.

The platinum contact apparatus must be built in such a way that it does not offer much resistance to the passage of the gases, in order to move them with an ordinary exhauster. This is accomplished by using a number of platinized asbestos nets, the meshes of which are such that the resistance in the whole apparatus does not represent more than the pressure of a column of water about 30 mm. high. In constructing the platinum contact apparatus in this way, it is possible to exchange a single element during the process in the course of a few minutes without interruption. In this process it is possible to have a conversion of the roast gases up to 95 per cent.

The first plant in the United States was erected in 1903 in the works of the Schoellkopf, Hartford & Hanna Company, Buffalo, N. Y. This plant consisted then of one unit with a capacity of about 1600 tons of sulphuric acid or its equivalent. The original plant has since been enlarged to four times its original capacity. Besides this plant, four other firms have adopted this process, and there are now in use 22 units with a capacity of about 35,000 tons, and in course of construction 10 more units with a capacity of 16,000 tons. This is a total capacity of over 50,000 tons per year. This has been accomplished in a little over two years since the process was first introduced here.

This process does not require complicated or delicate pieces of apparatus, nor any special apparatus for the purification of the roast gases, as this is done in the furnace itself. The amount of fuel consumed and motive power required is smaller than in any other known process, and the plant can be built up gradually on account of the units being small and being easily arranged in groups. The cost of repairs is very low.

*A paper in *Journal* of the Society of Chemical Industry, Jan. 15, 1906.

Water in Arizona Mines.

BY D. E. WOODBRIDGE.

A pumping-plant is to be added to mines at Bisbee, Ariz. The Briggs shaft is to have a Prescott cross-compound condensing pump, with Corliss valve gear. This is to have a capacity of 1000 gal. per min. and will go on the 910-ft. level, reinforcing the pumps now located there, viz.: One 1500-gal. and one 1000-gal. Prescott pump. In the same shaft will be placed a Prescott direct acting, triple expansion condensing pump, with a capacity of 2000 gal. per min., which will be temporarily located on the 1330-ft. level; it is ultimately intended for the 1530-ft. level. In the meantime sinking pumps and the present equipment will be used. The shaft is down 1130 ft. In the Junction shaft the present 3000-gal. capacity will be increased by a Prescott cross-compound condensing pump with Corliss gear and a capacity of 1500 gal. per min. This will be placed at the 1500-ft. level, and will not lift direct to the surface, but to the 1000-ft. level to which the present installation will be removed.

The Dain Arizona Development Company, whose property joins Junction, has bought an equipment, including two triple expansion station pumps, each with a capacity of 1000 gal. per minute pumping against 1000-ft. head, and three 800-gal. sinking pumps. At present the equipment is small and temporary.

There is a flow of about 11,000 gal. per min. from the pumps in the Bisbee mines, and this addition of 6500 gal. in station pumps alone is notable. With the increased depth of workings Bisbee has become a phenomenally wet district, and the intention of the companies interested is an indication of what they expect in the way of mineral possibilities.

There is a pumping installation at the mines of the Tombstone Consolidated Mining Company, near Bisbee, of 8500 gal. per min. capacity; the station pumps throw from 600- and 800-ft. levels. No other mine plants in the southwest compare in magnitude with this and the Bisbee equipments.

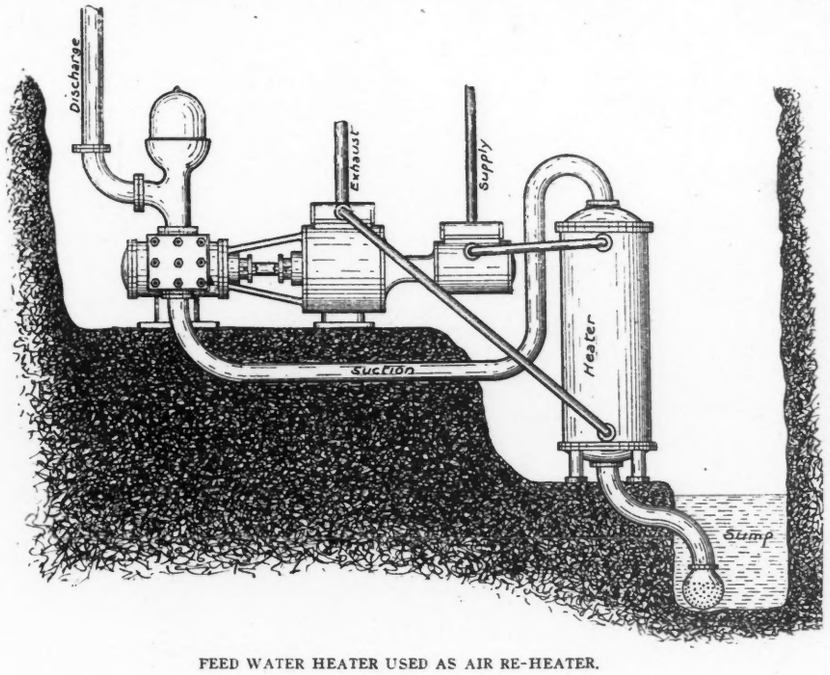
An oil that will not become stiff in cold weather is made by mixing sufficient cylinder oil and graphite to make a thick paste and then thinning with kerosene oil until the mixture flows freely. It is not affected by extremely cold weather.

Compressed-Air Pump with Water-Heated Reheater.*

BY L. C. BAYLES.

A simple and economical improvement was made at the Gwen mine, Calaveras county, California. It was necessary to lift 200 gal. of water per minute to a hight of 600 ft. At first this water was raised with a direct-acting sinking pump. The compressed air was furnished by a separate compressor which only supplied this pump and a hoist. It was found that when the pump was shut down the compressor was obliged to make 20 r.p.m. to operate the hoist and overcome pipe leakage.

With the pump in operation the speed of the compressor was 55 r.p.m., establishing the fact that the pump consumed the air compressed by 35 r.p.m. of the compressor. It was not considered advisable to install a re-heater of any of the standard types, but the engineer devised a simple method of obtaining practically as good results without the costs involved in firing a reheater.



FEED WATER HEATER USED AS AIR RE-HEATER.

The sinking pump was discarded and a direct-acting compound pump was installed in its place, along with a Wainwright feed-water heater. This feed-water heater was placed in the suction pipe of the pump, so that all the water passed through it before reaching the pump. The supply of compressed air was first led into the high-pressure cylinder, where it did a certain amount of work, and then passed into the shell of the heater at about 35 lb. pressure. Having been allowed to perform a certain amount of expansive work in the high-pressure cylinder, the temperature of the air entering the feed-water heater was reduced to a low point—in fact, the temperature of this air was below freezing point. As the air passed through the feed-water heater, its temperature was brought up to that of the water, which was about 70 deg. The air then entered the low-pressure cylinder, where it again performed some expansive work before escaping into the atmosphere. The slight fall in the temperature of the water being pumped was of no account. It was found that when this pump was put at work, the compressor was able to supply both the hoist and the pump when making only 35 r.p.m. In other words, the single-cylinder pump used 130 per cent. more air than the compound pump and feed-water heater.

The amount of compressed air required could have been still further reduced if a pump of the fly-wheel type had been especially designed for this case, with water-jacketed cylinders and discharge pipes, in which case the expansion could have been carried much further without danger of freezing. It goes without saying that the installation of a heater, which would have brought the temperature of the air up to 350 deg. before it entered either cylinder, would have reduced the amount of air the compressor had to supply for this pump to one-third of the quantity required for the single-cylinder pump using cold air. The cost of installing a pump and heater, such as just described, would not exceed the cost of a single-cylinder pump by more than about 50 per cent., which difference would be more than saved in the first two months.

I believe that, while not showing anything like as high efficiency in test runs as where reheaters are used, which bring the temperature up to between 300 and 400 deg., this method of using compressed air will be found the most satisfactory for general underground pumping, especially in cases where small pumps are required, and that it is efficient enough to make compressed air the most desirable motive power for the majority of underground pumps.

*Notes from a paper in *Journal* of Transvaal Institute of Mechanical Engineers, Feb., 1906. p. 99.

Tungsten Ore.

According to a communication in the London *Mining Journal*, March 31,1906, several large parcels of 65 to 70 per cent. tungsten ore were recently sold in Germany at prices varying from 22½ to 24½ marks per unit per ton c.i.f. Hamburg; 96 to 98 per cent. tungsten metal is selling at 5 marks 20 pfennigs to 5 marks 40 pfennigs per kg., packed in tinned boxes of 1 cwt.

A group of Hanoverian capitalists interested in the manufacture of tungsten salts has acquired the recently discovered tungsten ore deposits near Porte Alegre, South Brazil. These deposits are reported as of unusual extent and richness, one vein of clean, massive tungsten ore assaying over 70 per cent. WO_3, having been traced on the surface for over a mile, and averaging fully 1 ft. in width. There are a number of smaller parallel lodes also visible on the surface. A large output of cheaply mined ore is expected.

The Wolfram Lampen Company, Ltd., Augsburg, Bavaria, has been formed, with a nominal capital of £42,500, for the purpose of acquiring the Just-Hanamann patents for the manufacture of tungsten filaments for electric lamps. The price paid for the universal patent rights is £20,000 in cash and £20,000 in shares of the company; the managing director of the company is Dr. Otto Goll, Augsburg.

Tin-Bearing Pyrites.

The stanniferious pyritic ore of the North Dundas district, Tasmania, has been investigated by J. D. Millen, chief metallurgist to the Mount Bischoff Tin Mining Company, whose experiments promise commercial success. Some of the pyrite ore is rich in tin. The process decided upon consists first of calcination, followed by concentration, when, if it is found that the whole of the sulphur has not been removed, a second roasting will be resorted to. The product will then be smelted in the usual way.

Mining in the Transvaal was prohibited until 1868, when the Boer government threw open the goldfields to all comers, and offered a bonus for the discovery of profitable mines. In the early '70's quartz veins were located and mines opened in several parts of the northern Transvaal. In 1885 the conglomerate or "banket-beds" of the Witwatersrand were discovered.

High Grade Magnetite.

Witherbee, Sherman & Co., Inc., of Mineville, N. Y., have just made a second shipment of magnetic iron ore prepared for special purposes for the General Electric Company, Schenectady, N. Y. A consignment of the same ore was also made to the Monsanto Chemical Works, St. Louis, Mo.

The ore was prepared in car lots, and the analysis showed it to be of remarkable purity. Some of the regular product of Harmony cobbed ore was re-treated in the No. 1 mill; the only change made in the mill was to install a 16-mesh screen so that all the ore should be returned to the rolls until it would pass this size. It then passed over a belt type of Ball & Norton separator. The following analyses show the results:

Sample.	Iron.	Silica.	Phosphorus.
1 Enrique Touceda	71.02%	0.89%	.006%
2 Witherbee, Sherman & Co.	71.20	1.02	
3 Northern Iron C.	71.57	0.814	
4 Northern Iron Co. (washed)	71.75	0.688	

The Harmony cobbed ore which was retreated to get these special fine concentrates would analyze: Iron, 64.55; silica, 8.46; phosphorus, 0.088 per cent.

The followng screen test shows the ore before and after the second separation:

Screen.	Harmony Cobbed.	Special Fine Concentrates.
On ¼	16.9	
" ⅛	26.6	
" 10	4.7	
" 16	19.4	3.71
" 20		10.64
" 30	18.8	
" 40		44.23
" 60	8.7	13.08
" 80		8.91
" 100	1.6	7.69
Through 100	3.3	11.74

These results are interesting as showing the possibilities of magnetic concentration. The ore was prepared in car load lots and was withn 1 per cent. of chemically pure magnetic oxide of iron, besides makng it a special low phosphorus ore. The separation is practically perfect, as several analyses of the octohedral crystals of magnetite found in the mine showed that they contain about 1 per cent. of silica and the silicates of alumina, lime and magnesia.

On the other hand, the fine grinding required to get these results reduced the output of the mill to one-tenth of the usual run and proportionally increased the cost. Of course if the mill were designed for fine grinding and sufficient roll capacity provided, the cost need not be increased so much. But, nevertheless, it emphasizes the fact that where the magnetite in an ore is found in small crystals, disseminated through the gangue in such a manner as to require fine grinding to get the gangue free from the ore, the cost of mining and grinding the amount of ore necessary to get a ton of concentrates is apt to be more than the value of the ore, and may possibly leave the product so fine that further expense may be called for to briquet or nodulize the fines to prevent undue waste in the furnace. The screen test given shows that this special ore is not very fine as concentrates go. This is due to the coarse crystallization of the Mineville ore.

Notes on Gold Milling.*

BY W. BEAVER.

The question of the crusher plant as a factor in stamp duty has not been discussed so thoroughly as it deserves. Millmen have agreed that coarse ore sent to the mill is detrimental to good crushing, but we still have to prove by actual trial the size it should be. With that object in view, I made experiments with various sizes of rock with the following results:

Size of ore.	Duty per Stamp.	Size of ore.	Duty per Stamp.
2½ in.	4.04 tons.	2 in.	4.10 tons.
1½ in.	4.60 "	1 in.	4.74 "
⅝ in.	4.35 "	¼ in.	4.10 "

It is obvious that ore from 1 in. to 1½ in. is the correct size for that particular weight of stamp, viz., 1,050 lb., though I think the figures would be slightly modified with the heavier stamp.

Having arrived at the size for obtaining the maximum amount of work out of the mill, I proceeded with the experiments to ascertain what effect the fines had on the crushing. Taking three trucks of ore as supplied to the mill and mixing thoroughly, I weighed up a ton. I then weighed another ton after discarding all fines going through a 200 mesh; these were put through the same battery. Each test gave the identical duty per stamp., 4.6 tons.

Dividing the feed of ore into three portions by means of partitions bolted to the chute liner, causing one-third to fall under the center stamp, one-third under 1 and 2, and one-third under 4 and 5, which meant spreading the stuff fairly evenly under the five stamps, showed a duty of 4.65 tons, so that distributing the ore in the box failed to bring the crushing up to the present stamp duty, 4.8 tons. I tried concentrating the ore on the center stamp, making that stamp supply the others, which yielded a better result, viz., 4.74 tons, slightly below mill duty. Both experiments were with about 20 tons of ore. I also tried the distributor with several sizes of rock on a smaller scale, with and without the fines, but in every instance distributing the stuff in the box was a failure. Making the center stamp the distributor gave better results with all sizes of rock, but not quite so good as the ordinary method of feeding.

During all my crushing trials the regularity of the feed gave a poor idea of what was taking place, by which I mean, while putting the rough ore through, the feeder operated irregularly, working about three out of every five times the feed stamp dropped. With the fines the feed was most regular, but did not give the best crushing. It would seem, then, that regular feeding has little to do with good stamp duty.

A device for keeping the full mill running while scraping and dressing plates may be described. Our biggest stoppage is for that purpose, averaging about 30 min. every day.

The device, briefly, is a launder fixed against the lip and up the key ways of the box, wedged up tightly with wooden wedges; and a branch launder to carry the pulp to the next plate, on which a portable copper plate is fixed. This extra plate is very necessary, otherwise the double supply of pulp and water would quickly clear off that valuable product, black sand. The plate is a light affair, about a third of the ordinary length, and is used as much as anything for distributing and letting the pulp gently on to the under plate. A small launder with perforated bottom could be used as a distributor instead of the plate, but I do not think it advisable. The flow of pulp from 10 stamps on to one plate is too powerful for good amalgamation; therefore I think it best to carry it as far down the table as possible. The process of dressing, or, rather, fixing the launder and plate to each box, naturally takes up much more time, but that is of little consequence if the stamps are kept running.

I found it exceedingly difficult to get a suitable launder with sufficient gradient to keep itself clear of sand; there always remained from 3 in. to 4 in. in the launder, which immediately fell on the plate when the launder was removed, making the scheme imperfect. The success of the thing is due to our foreman carpenter, who made a launder with a glass bottom. Those who are troubled with insufficient fall in their launders should give the glass bottom a trial.

*Abstract of an article in *Journal* of the Chem., Met., and Min. Soc of S. A., Jan.,* 1906, pp. 215-217.

Mining in India.

The rapid development of manganese-ore mining is at present the most conspicuous feature in the mineral industry of the Central Provinces. There are now 15 mines and sundry shallow workings in operation. The yield of the mines in 1905 is officially stated at 85,034 tons, but these figures, it is said, do not include the output from shallow workings, which are sometimes of considerable importance.

There were three coal mines at work in the Central Provinces, situated at Warora, Ballarpur and Mohpani, in 1905; the total output was 138,026 tons, valued at rather more than 650,000 rupees. The total yield shows a decrease of about 22,000 tons on the previous year's returns.

Large galena deposits are said to have been discovered at the head of the Fish river, emptying into Golofin bay, Alaska.

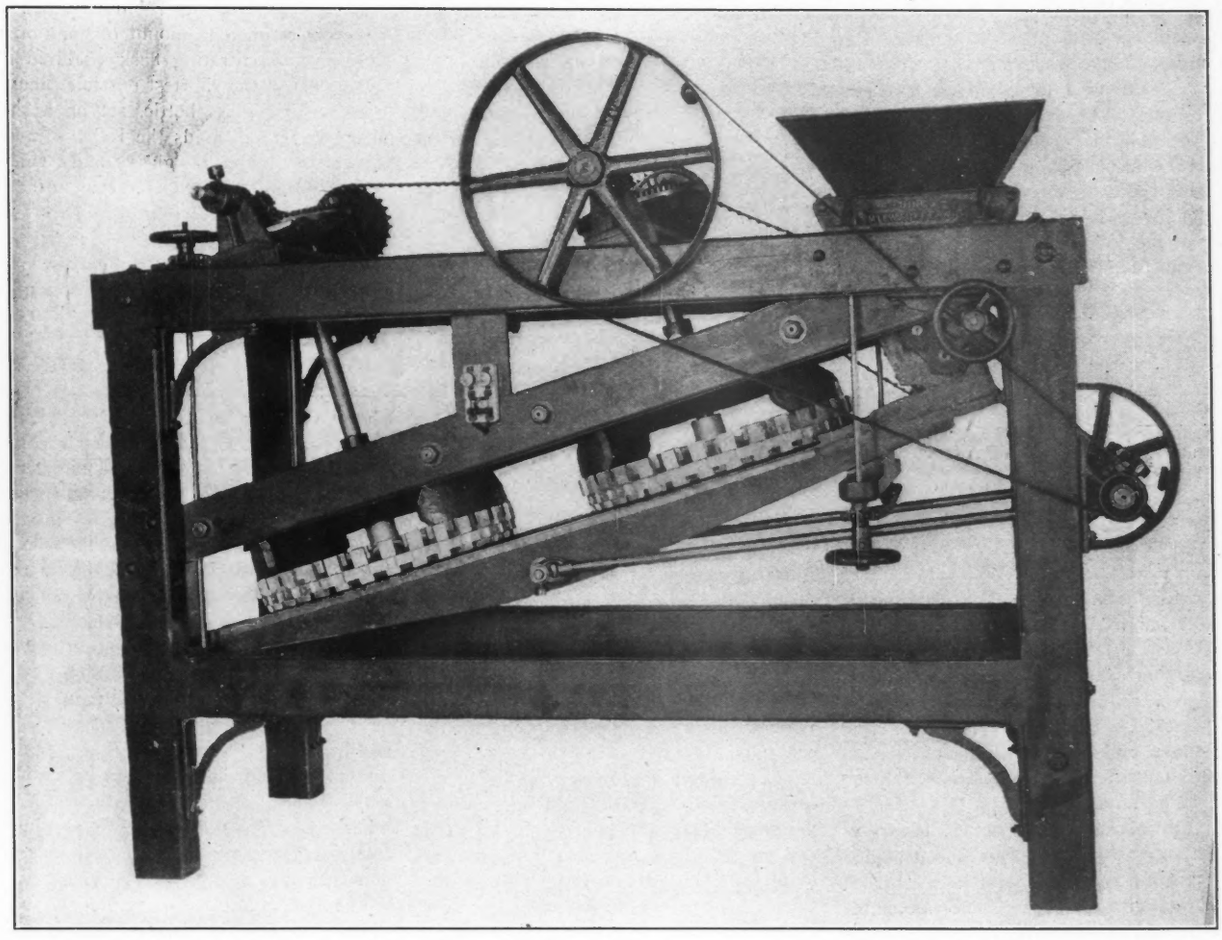
The Dings Magnetic Separator.

The Dings separator, made by the Dings Electromagnetic Separator Company, of Milwaukee, Wis., is a low intensity machine of the induction type. The ore is presented to the magnets by means of an inclined, shaking tray, which is fed mechanically from a hopper at the upper end. In the standard machine the tray is 16 in. wide. As in all magnetic separators the feed must vary according to the character of the ore. The feed to the tray is regulated by means of a hand wheel on the hopper, and means are also provided for adjustment of the inclination of the tray.

The primary magnet consists of a core and coil, fixed above the tray, with pole pieces projecting toward the tray, the two pole pieces having each a thin edge, shaped into arcs of a circle, the chords of which are about as long as the tray is wide. The secondary magnets form essentially a wheel, which is set to revolve in a plane parallel with that of the tray. The upper side of this wheel has a circle of U-shaped grooves, which embrace the curved edges of the pole pieces of the primary magnet, without touching them. In other words, the edges of the pole pieces of the primary magnet are encircled by the grooves of the secondary magnets. On the lower side of the wheel the secondary magnets have the form of a series of cylindrical studs, about 1 in. in diameter, projecting an inch or inch and a half from the wheel. The diameter of the wheel is greater than the width of the tray.

The primary magnet being energized by the current, the wheel of secondary magnets and the shaking tray being set in motion, the secondary magnets being energized by induction while their U-shape grooves embrace the pole pieces of the primary magnet, material that is permeable in the magnetic field is attracted by the secondary magnets, and by the revolution of the latter is carried beyond the edge of the tray, where it is dropped into a chute, the secondary magnets having then passed outside the magnetic field, and consequently being no longer magnetized. In the meanwhile the non-magnetic material passes down the shaking tray and is discharged over the lower end of the latter. It will be observed that material passing down the tray is twice exposed to magnetic attraction, but with very magnetic mineral by far the largest portion is removed at the first pass. The accompanying illustration shows a machine with two magnets in series, known as the double machine, which gives four magnetic zones. This machine has been installed at the works of the Mineral Point Zinc Company at Mineral Point, Wisconsin.

The tray is supported on a heavy steel plate, which acts as a magnetic armature with respect to the pole-pieces, so that the path of the magnetic lines of force is from pole to pole through the secondary magnets, then through the ore being treated, and then through the steel armature under the tray. The tray is supported by roller bearings resting upon the armature, or steel plate.



THE DINGS MAGNETIC SEPARATOR.

The wheel of the secondary magnets is made of heavy aluminum castings, and the secondary magnets themselves of laminated armature steel. Attention is given in the design to the reduction of the magnetic resistance between the primary and secondary magnets to the minimum.

Unslaked lime is used to prevent rust, through its property of absorbing moisture. This is why careful workmen sometimes keep a fresh lump in their tool-boxes.

Estimation of Copper by Titration with Potassium Cyanide.

BY H. M. KIMBALL.*

A description of this common copper titration, and of some of the working details of the method, will be of interest to all chemists and metallurgists connected with plants which handle ores carrying copper values.

The process and details described are those in use in the laboratory of one of the largest Montana copper smelters. In this laboratory some 60 copper assays are put through each day by the "daily" man, along with the rest of his work. "Special" chemists manage to easily run 60 more "coppers," using the same apparatus, making a total of 120 assays in eight hours. This number can be safely put through in a day without undue haste or slipshod manipulation.

Using the experience of two years spent in making cyanide titrations for copper. I make the following claim for the accuracy which can be maintained, using this method:

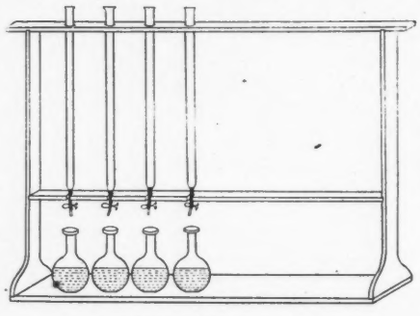
Material to be Assayed.	Per Cent. Cu Present.	Grams Taken for Assay.	Average Accuracy Obtained and Maintained.
Mattes	25–70 Cu	½	Within $\frac{3}{10}$ of 1 %
Concentrates and 1st-class ores.	8–25 Cu	1	" $\frac{3}{10}$ " "
2nd-class ores.	3–8 Cu	3	" $\frac{1}{10}$ " "
Slimes and Tailings.	0–3 Cu	5	" $\frac{5}{100}$ " "

I realize that this is not claiming a notably high degree of accuracy. I have seen a few claims to much closer accuracy in cyanide titrations for copper, and give credit to those who have used this method with such good results. But the above table expresses the checks attained day after day, and may safely be said to be reliable.

In the laboratory mentioned, electrolytic battery assays are made and reported on many of the same samples which are run by cyanide for copper. The battery results reach the office one day later than the titration results; and, being the more accurate of the two, are used for monthly averages. This gives each day an opportunity to compare the results of the previous day's titrations, with the actual percentage of copper present in the samples.

The great advantage of the cyanide assay is plainly seen when one considers the number of quick "daily" copper determinations required in the every day operation of a copper smelter. The concentrator requires daily copper assays on its feed, slime, concentrates, and tailings. The smelter calls for daily copper determinations on mattes, slags, briquettes, and calcines, etc., etc. Then there are frequently tests going on of various concentrating machinery, jigs, vanners, tables, etc., all of which rely on the "cyanide coppers" of the chemist for the copper assays of their various products. The only products not entrusted to the cyanide method, are the blister and the refined copper, both of which require the highest accuracy attained by the electrolytic method.

Method of Attacking the Ore—This is of marked simplicity. The common custom is to run 20 samples in the same "string." Each is weighed in the customary amount, one, two, or five grams (see table) into a No. 1 beaker, of which twenty fit on a rectangular wooden board with a handle at one end. Each assay is moistened and mixed by shaking with five c.c. of water. Fifteen c.c. of concentrated nitric acid are added to each; and,



BURETTE STAND.

when the first violence of the reaction is over, about a gram of granulated potassium chlorate is introduced to aid in oxidizing any sulphides into solution. A good stiff boil of about 10-15 min. generally takes all the copper into solution, after which the beakers are filled to half the capacity with hot water and boiled again to insure complete solution of copper salts.

The beakers are now washed into titrating flasks (16 oz.) and into each of the same beakers is poured 50 c.c. water and 50 c.c. dilute ammonia (one part ammonia and one part water). This is now transferred to the flasks and the flasks are well shaken. The settled solutions, if ammoniacal, show the blue copper tint. If green instead, add a little more dilute ammonia, shake and settle again. If still green, it shows incomplete oxidation, due to the presence of organic matter such as wood or coal; such assays are discarded, although the blue may sometimes be secured by adding small amounts of barium chloride solution. The flasks are cooled in a long trough filled with running cold water, while the burettes are being prepared.

The Burettes—The burette-stand in use here, is a simple wooden rack holding twenty 50 c.c. burettes. The accompanying sketch describes it better than words can do it. The whole affair is solid and not subject at all to vibrations. The best laboratory position is directly in front of a north window, or a double window, if such a position can be secured. Here the color of the solutions and of the end-point can be best recognized, and on this judging of color changes, wholly depends the accuracy attained.

Each burette is fitted with a flexible delivery-tube, namely a piece of light rubber tubing about three in. long, one end of which fits snugly over the lower end of the burette, the other end holding a small delivery-tip of glass. A common spring pinch-cock controls the flow of solution to a nicety. The whole arrangement is far superior for these titrations, to the glass stop-cock used on other burettes, and allows the estimated amount of solution to flow into the titrating flask (held in the left hand) in the shortest possible time.

A six-liter glass bottle, set on a shelf near the ceiling, holds the KCN solution. A simple siphon of glass and rubber tubing permits the rapid filling of the twenty burettes. The entire apparatus is made to get results, and to save time and may be said to well accomplish this purpose. All cyanide solutions are here made up of 200 grams of salt to six liters of water.

The Titration—The twenty flasks are brought from the cooling-trough and placed each before its respective burette. The operator then passes down the line, giving each flask its estimated number of c. c. of solution, and setting it down with a circular shake to thoroughly mix its contents. As is well known, the bleaching action of the KCN on the copper solution requires a few minutes to complete the reaction; hence about four or five minutes, at least, are allowed between subsequent additions of solution.

When the solutions show a light bluish-pink color above the settled hydroxides and insoluble residue, they are rapidly filtered through large filters in ribbed glass funnels, (4 in. in diameter) into other clean flasks made of an absolutely colorless glass, in which the titrations are finished.

The final addition of cyanide is made drop by drop. The color of the solution, as seen against a white paper background, becomes first faint blue or bluish pink; and finally, when the end-point is reached, a clear white or colorless. If overrun, a yellow or brown coloration appears. Herein lies the most delicate part of the whole assay; namely, the judging of the clear white end-point, and only experience can enable one to recognize it. The best of daylight is needed, and it is not customary in the laboratory here to risk titrating copper after 4 o'clock in summer, or 3 o'clock during the winter months.

The cyanide solution is standardized in each set of assays, by including a couple of half-gram charges of a "standard matte." Several pounds of this standard matte are kept on hand; it is frequently

*Chemist, Boston & Montana smelter, Great Falls, Mont.

well mixed by rolling for at least 10 min.; its copper contents have been closely determined by triplicate battery checks. It is much superior to a copper-foil standard. By titrating two of these standards along with the rest of the copper assays, the exact copper-value of the cyanide solution for that particular set of titrations is determined. Errors, due to the varying length of time of the titration, and to changing strength of solution are thus wholly eliminated. It is needless to state that the standards are treated with the greatest care all through the manipulation, and that the duplicates must agree very closely.

One modification of this method of running coppers should be mentioned here, namely the omission of the filtering before finishing the titration. The end-point can be approximately determined from the color of the supernatant solution, after the contents of the flasks are allowed to settle for a few minutes. By not filtering, 15 or 20 min. is thus saved; and where accuracy can be in a measure sacrificed to speed, this short cut may well be utilized. A number of the Butte laboratories (which run great numbers of daily mine-samples for copper) use the shortened method, and are thus enabled to put through many more determinations in a day. By taking five grams for the assay, any error in determining the end-point is of course divided by five.

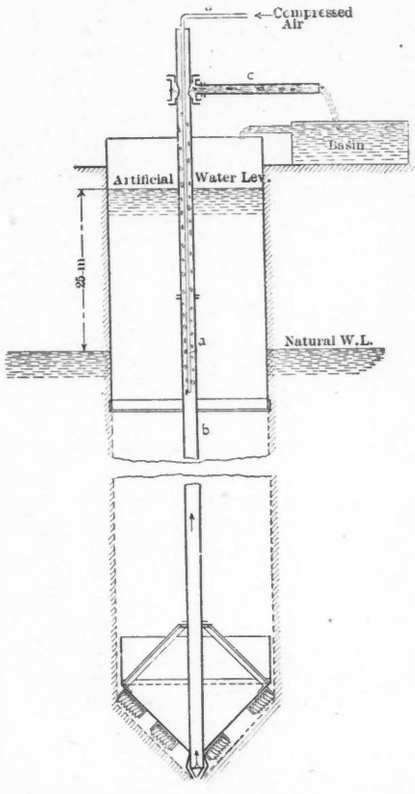
Nothing has yet been said about there being present, in ores or smelter products, elements which would interfere with the cyanide reacting with the copper contents. The two most important interfering elements are arsenic and zinc, neither of which, fortunately, occurs in the ores or products here in amounts sufficient to mask the end-point at all. Exception should be made to certain flue-dusts, which occasionally run as high as 7 or 8, or even 10, per cent, arsenic, but they are rare. My experience would indicate that 1 or 2 per cent of either arsenic or zinc would not interfere in this titration. Amounts above this percentage would call for a separation of the copper before titration, using either precipitation with zinc or aluminum, or some other of the common schemes for separating these metals. Fortunately these separations are usually unnecessary.

Investigations by a number of chemists have shown that certain factors affect the cyanide assay for copper. The most important of these are the presence of free ammonia, and the varying bulk of solution. Hence, in the process described, the ammonia is carefully measured, to insure a very slight excess; the assays are all kept close to the same bulk; and, what is of the most importance, the standards are treated in exactly the same manner as are the rest of the assays.

The Honigmann Method of Shaft Sinking.

BY ADOLF E. HARTMANN.*

Coal mining has been carried on in western Germany for several centuries, and as a result, all the coal deposits near the surface, when geological conditions were favorable, were soon worked out. Only deep-lying seams, or those which could not be opened on account of the thickness of the overlying quicksand, remained. The quicksand in this region varies from a few feet to 600 ft.; consequently the problem is to sink shafts through this unstable stratum. Three methods are now successfully employed. They are as follows: 1. The Sassenberg-Clermont method. 2. The Poetsch freezing method. 3. The Honigmann method.



HONIGMANN METHOD.

The first two methods are well known. The third has not been used much outside the German coalfields, although it has proved efficient.

The Honigmann method differs from other sinking methods, in the respect that no casing is built until the shaft has been completely sunk through the sand to the solid rock formation. To prevent caving in, Honigmann proceeds as follows:

1. The water-level in the shaft is raised to a certain hight above the natural water-level in the quicksand outside the shaft.

2. The specific gravity of the water column in the shaft is increased to about 1.2 by mixing clay with the water. By this means a pressure is obtained, which forces the clay contained in the water into the shaft walls, making a more solid mass of the quicksand. The increasing pressure of the quicksand toward the inside of the shaft is held in equilibrium.

The sludge loosened by the shaft percussion-drill is conveyed to the surface by means of a continuous water flow, rising through the hollow cylindrical drill-rod as shown in Fig. 1. A small gas pipe *a* extends into the drill-rod for a short distance, and through this pipe compressed air is forced, which bubbles into the drill-rod *b*, thereby making the water column in *b* lighter than that in the shaft. As a result the water rises into *b* from the bottom of the shaft, as indicated by arrows in the illustration.

The water and sludge flow through the pipe *c* into a basin, where the sludge is allowed to settle while the separated water flows back into shaft. The velocity of the rising water *b* can be increased by forcing more compressed air through the pipe *a*. Clay is mixed in the basin with the water returning to the shaft in order to keep the water in the shaft at the necessary specific gravity.

When the shaft has been sunk through the quicksand, and has reached solid ground, a casing is built in the usual way by means of iron tubbing. In passing through the quicksand, constant care has to be exercised to keep the artificial water-level and specific gravity of the water up to the pre-determined standards in order to prevent a caving in of the shaft.

Seven shafts varying from 12 ft. to 18 ft. in diameter have been sunk recently in western Germany by the Honigmann method, without any noteworthy accidents. Most of these shafts passed through quicksand up to 600 ft. in depth.

*Mining Engineer, Duluth, Minn.

The Clifton-Morenci District.

The population of the Clifton-Morenci district is almost wholly dependent on the copper-mining industry. There are three towns—Clifton, Morenci, and Metcalf. Clifton is picturesquely but inconveniently situated along the narrow bottom lands of San Francisco river and Chase creek, at an elevation of 3500 ft. The railroad terminus and the large smelting plants of the Arizona Copper Company and the Shannon Copper Company are located here, and the population numbers several thousand. The principal mines of the Detroit and Arizona companies, concentrating plants of both, and smelting works of the former, are found in the immediate vicinity of Morenci, which lies at an elevation of 4800 feet, and has a population of over 6000. Metcalf, situated on Chase creek at an elevation of 4400 feet, is a smaller settlement, where the mines of the Shannon company and some of those belonging to the Arizona Copper Company are located.

Selenium.

BY CHARLES S. PALMER.

This element has hitherto been regarded as of rare occurence; but its association with crude copper, and its incidental concentration in the "silver slime" obtained in electrolytic copper-refining, have made it possible to produce it in quantity which is worthy of consideration.

Selenium was discovered in 1817 by Berzelius, in flue-dust from certain pyrite burners and lead furnaces. It is chemically rated with the sulphur-selenium-tellurium group. Its atomic weight is 79.2, and its specific gravity 4.3 to 4.6. It has a dark purple or chocolate color, and has two allotropic forms, the amorphous and the crystalline, the latter being the heavier. It melts at 217 deg. C., and boils at 660 deg. On cooling melted selenium, it solidifies to the amorphous form; this can be changed to the crystalline by keeping it at a temperature slightly below the melting point for half an hour. When dissolved in appropriate solvents and evaporated down, selenium appears in dark-red transparent crystals. There are also other forms.

In chemical analysis, selenium is usually detected, either by its characteristic "horse-radish" odor in blow-piping; by a characteristic dark-red precipitate (often appearing spontaneously on standing); or by the peculiar reddish-blue flame, which is liable to be confused, by novices, with the potassium flame.

The physical properties of selenium are intermediate between the non-metallic character of sulphur (which it closely imitates in its chemistry), and the more metallic qualities of tellurium. Among the properties of crystalline selenium is a low electric conductivity; and the most remarkable feature of this slight conductivity is that it is increased several hundredfold by the action of light. Indeed, several years ago, a scientific toy was constructed on this principle, whereby a selenium union in a telephone circuit permitted the hearing of a tone by means of a beam of light thrown alternately on and off the selenium by a mirror attached to a tuning fork. This unique property is said to be the basis for much private experimentation, from which it is whispered that some new practical electrical devices are forthcoming.

Be this as it may, one American copper refinery is said to be recovering commercial selenium, (several hundredweight per month) from its "silver slime." This is absorbed by the large chemical houses, for purposes witheld at present. It is estimated that a certain refinery can produce six tons per year, and the total available American product may be five to six times this. The price, quoted anonymously and nominally, is $3 to $4.50 per lb. The selenium appears to be a slight but constant attendant on certain copper ores, as tellurium is of others. Up to this date it is not claimed that there is any important use or market for tellurium, but it would be strange if the large refineries should neglect to save both tellurium and selenium. The available supply of American selenium should be between 20 and 30 tons per annum.

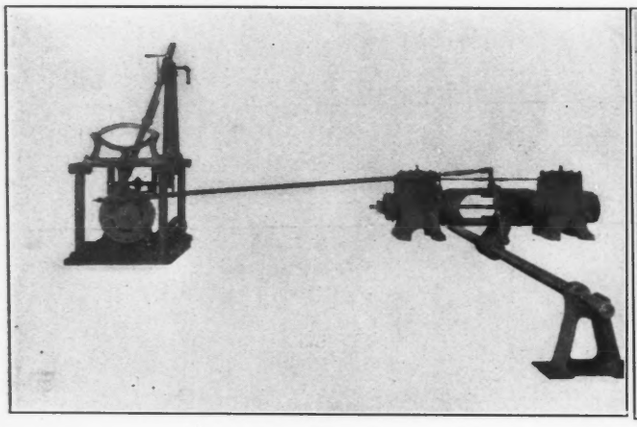


FIG. 1.

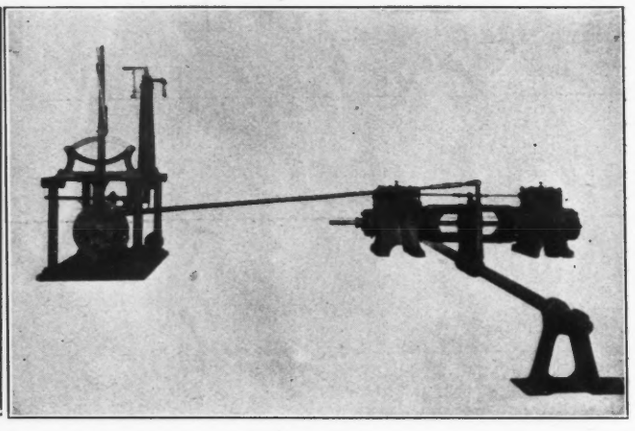


FIG. 2.

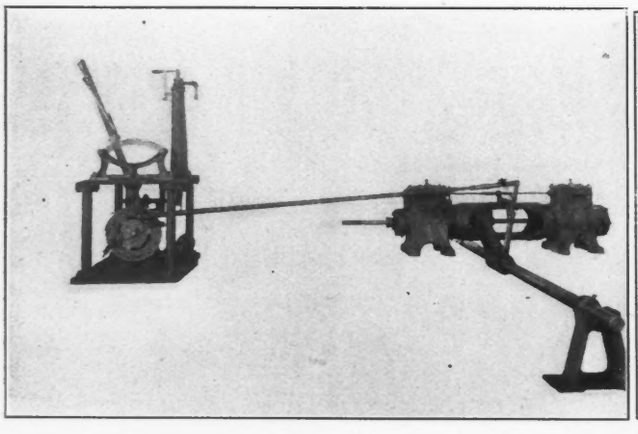


FIG. 3.

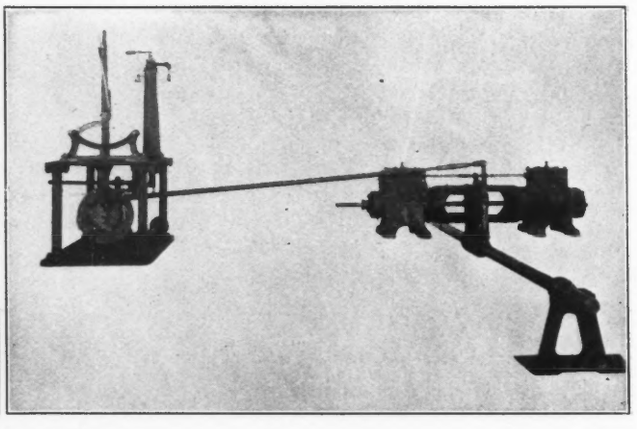


FIG. 4.

THE NICHOLSON ENGINE STOP.

Straits Tin.

In the Federated Malay States, the Chinese are the chief producers of tin. In the shallow workings, despite their wasteful methods, they can still make profits, but leading Chinese miners say that after tin falls below $70 a picul, a large number of mines must close down. According to F. D. Osborne, manager of the New Gopeng company, tin is daily becoming more difficult to get in the Straits, the richer deposits having been exhausted, forcing attention to the lower grade propositions, and these can only be dealt with by machinery, which will handle large quantities at a small cost.

The Nicholson Automatic Engine-Stop.

BY R. H. NICHOLSON.

This is a mechanical arrangement to prevent overwinding, by automatically hooking up the links, cutting off and gradually closing the main valve ports of the cylinders and applying, at the same time, the steam brake to engines which are operated by steam. Where it is necessary to land the cage or car at any fixed point, the device is of greatest service, and while it prevents the engineer from making an error at the end of the hoist, it does not interfere in any way with operating the reverse lever between the prearranged points.

As with other safety devices, the larger the measure of safety introduced in handling the machine, the greater the corresponding speed of hoisting and the more pronounced its effect upon the output. The essential principle of the automatic stop mechanism is to compel the middle position of a reversing lever at the ends of the wind, so that it cannot be moved from this position except by extreme exertion on the part of the engineer. This, of course, affects the main valves of the engine, and ignores the throttle valve entirely, and it is with this latter object in view that the mechanism is applied at this point instead of to the throttle. The fact that in long lines the expansion of the steam remaining in the feed line between the throttle and the cylinders may cause the engine to overrun to a point where a few inches more of wind would result in a disastrous catastrophe is seldom appreciated, and yet this is undoubtedly the cause of the statements appearing so often in reports of such accidents that "the throttle would not work." Duplicate throttles have been installed on some lines, but even this does not in every case, provide the desired safeguard.

In the accompanying illustrations Fig. 1 shows the lever forward and valves full open. The locking latch on lever at this time begins to lift by the incline on the edge of the revolving disc, and the tappet roller is ready to push the lever to its middle position or final cut off on the engine valves. This also operates on the steam valves for applying the brake, as is shown in Fig. 2. Fig. 3 shows the reverse lever set for the backward motion, and by reversing the engines, this also reverses the motion of the machine; it is operated, as explained above, with the lever brought into position as shown in Fig. 4. Fig. 5 shows the opposite side

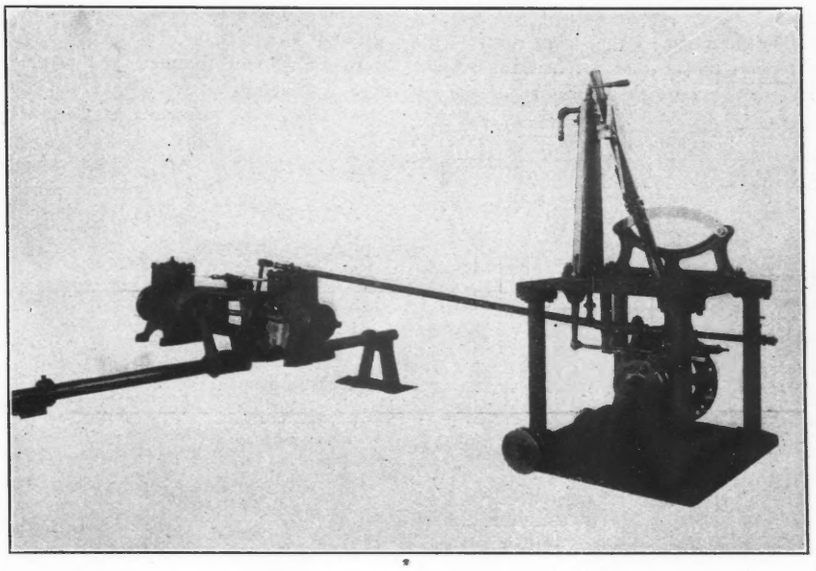


FIG. 5.

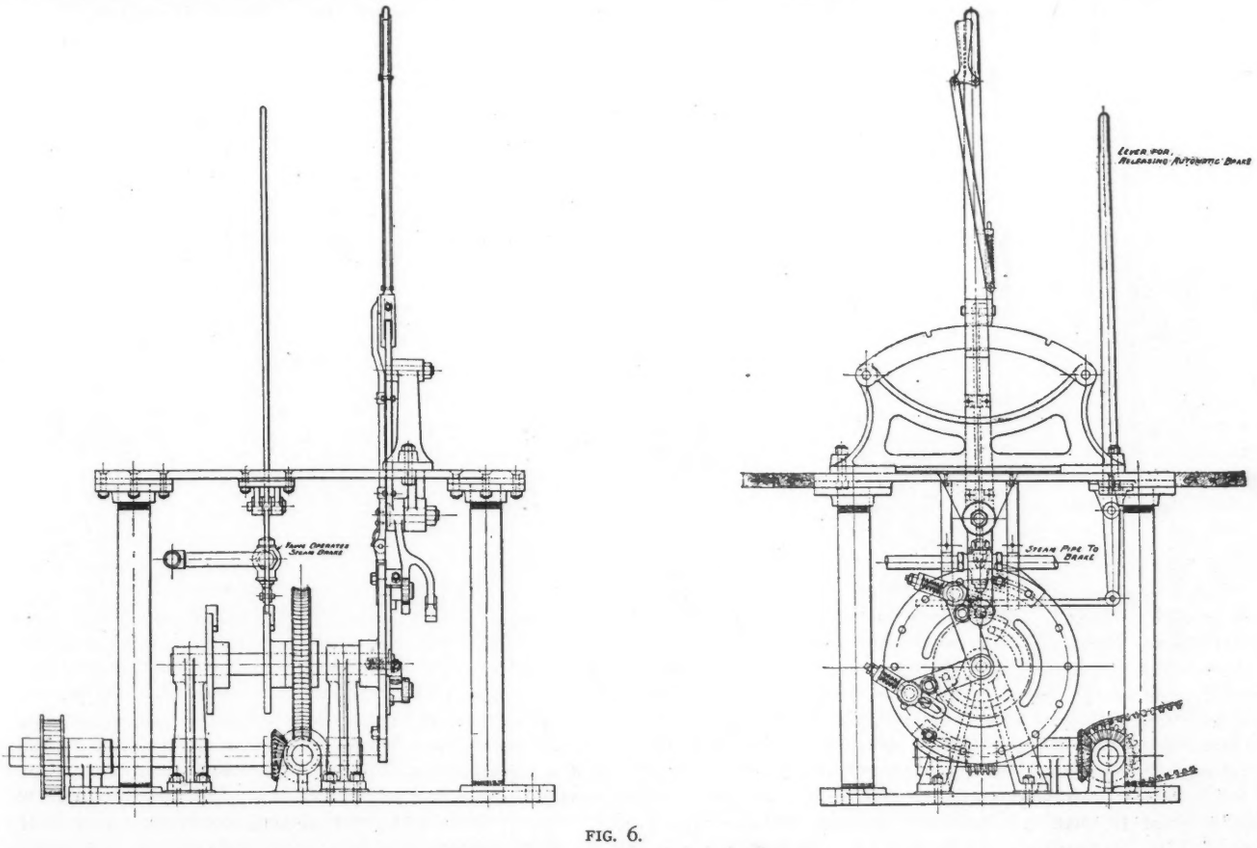


FIG. 6.

view of the machine, with the valves and mechanism for operating brake.

The diagram, Fig. 6, shows rear and side views of the machine, and Fig. 7 shows the engine stop connected to a pair of first motion engines equipped with steam brake and steam reverse. This also shows the method of driving by means of chain and sprockets from drum shaft.

The direction of the drum controls the direction of the disc. When the reverse lever is brought to the centre of the reverse quadrant and the engine valves centered, the lever can only be operated in the opposite direction; but if it is desired to go a little farther up, the lever is given a little extra pull or push, thus compressing the spring. This will cause a slight opening of the valves, and the expansion of the spring with the disc revolving in the same direction, will act on the lever again and bring the main valves central over the steam ports. It will also be noted, that when the stop begins to act, and the latch on the reverse lever is lifted from the notches in the quadrant, the lever begins to move forward or backward. As the engineer usually has his hand on the lever in regular hoisting, he has positive warning that the cage is approaching the end of the hoist. If the engineer fails to do so for any reason, the machine will do the work. If the hoisting is done from more than one level, one drum is usually made loose and driven by a clutch, and the other keyed fast. In this case it is necessary to adjust one arm on the face of the disc suitable to the travel of the cage.

At the Central Shaft of the coal department of the Delaware, Lackawanna and Western Railroad, at Scranton, Penn., tests were made on a pair of 18x30 in. geared engines, with an 8ft. drum, equipped with a hand brake, with the stop coupled to the tumbling or link lift-shaft. The rope speed was 850 ft. per min. A brake tension of 1500 lb. was put on the cages, corresponding to the weight of ten men (which is the number allowed on a cage by law). The engines were set in full motion, and with the cage coming up, after being stopped entirely by the control of the valves, it was found that there was only a variation of 18 in. in the distance traveled. This was considered satisfactory, as the engines were not equipped with a steam brake, and the machine only worked on the main valves, gradually hooking up the links and cutting off the steam supply to the pistons, thus bringing the engines to a gradual stop within a distance of 30 ft. from the beginning of cut-off. This distance can be increased or diminished according to the speed of the engine stop and the requirements. It would be preferable to increase it so as to land the cage without a sudden shock to the men or machinery and in this way to avoid damage.

There are numerous devices for stopping hoisting engines at all fixed distances above the top landing; consequently when the ascending cage passes the landing at the surface, the descending cage strikes the bottom with full velocity, and causes more damage at the bottom than at the top. This was the case at the Auchincloss Colliery accident which happened over a year ago; ten men were killed on account of the descending cage crashing through the landing fans set to receive the cage and the ascending cage was pulled over the sheaves.

There is at present being erected for the Struthers Coal and Coke Company at New Salem, Penn., a pair of 24x48 in. first motion engines with 8 ft. to 10 ft. conical drums on a 450 ft. lift. These engines are equipped with steam reverse, steam brake, and the Nicholson engine stop; they are being erected by the Vulcan Iron Works, Wilkes-Barre, Penn.

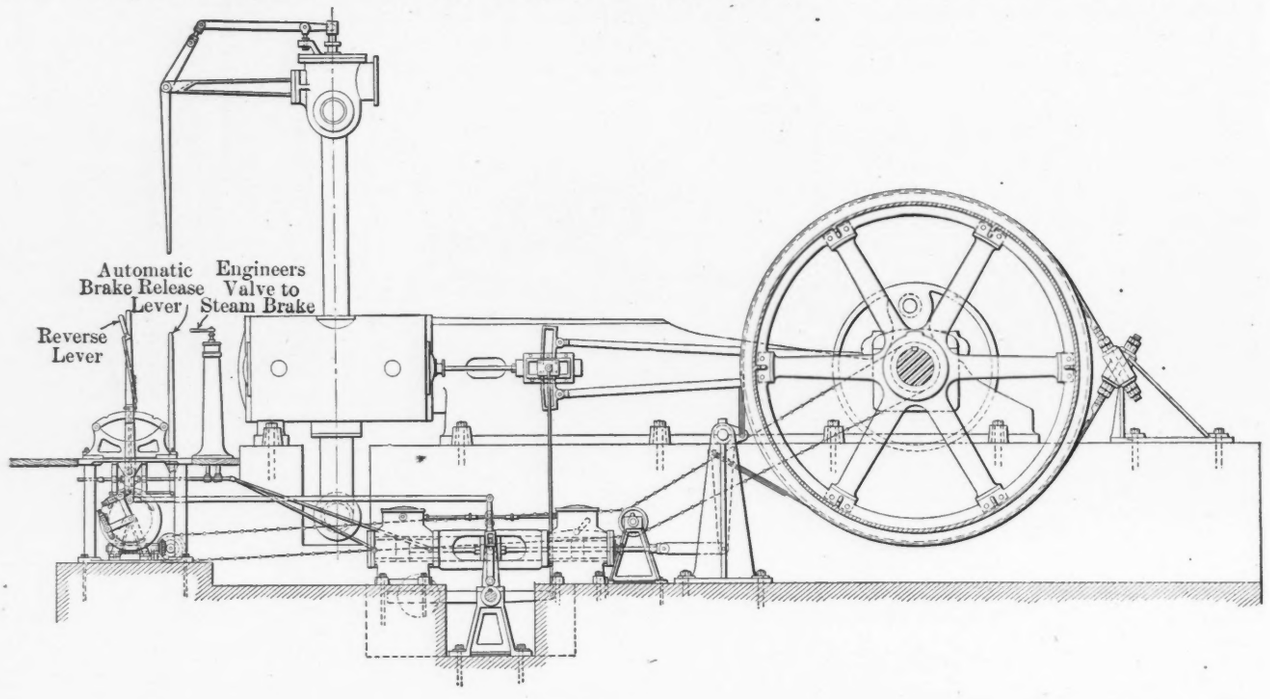


FIG 7.

Water Supply at Broken Hill.

The water supply is becoming an important question at Broken Hill, N.S.W., that at the command of the mines being insufficient. The Broken Hill Water Supply Company declines to increase its means of storage, as it is only a leaseholder, and at the expiration of its lease 12 years hence, the property will revert to the State Government. Under these circumstances, the Proprietary company has pegged out a water lease of 550 acres on the Umberumberka creek, near Broken Hill, an act that has for its parallel the application by the company for a lease over land for a tramway from the mine to the South Australian border, a result of the increasing insufficiency of the tracking arrangements on both sides of the border. The area applied for is 24 miles from Broken Hill, and includes the site abandoned by the New South Wales Government. In addition, a pipe line of 36 acres to Broken Hill has been applied for.

A deposit of high-grade copper ore is said to have been discovered at Gemine in the Bukowina, Austria.

The Alaska Central Railway.

BY M. S. DUFFIELD.

The Alaska Central Railway is building across Kenai peninsula (the land mass that forms the western boundary of the gulf of Alaska) to the coal fields of the Matanuska river, a tributary of Knik arm which is the northernmost fjord of Cook's Inlet. This railroad has been building about 1½ years and by Jan. 1, 1906 had expended nearly $2,000,000 on wharves, building and road-bed.

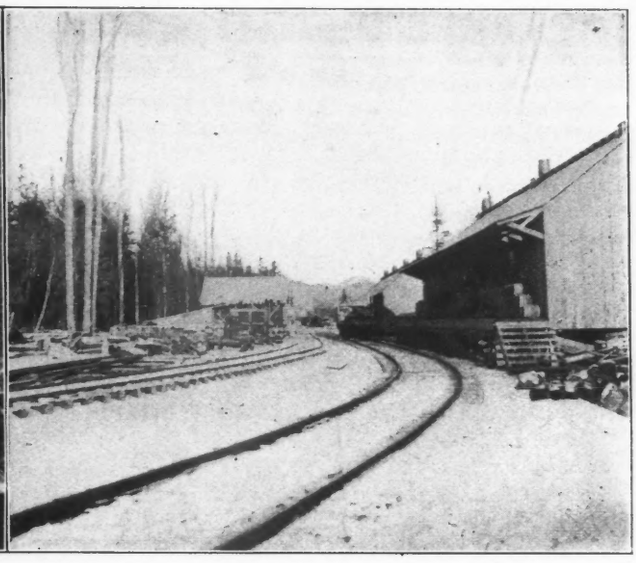
Up to date, 50 miles of track is in operation with work and commissary trains.

The town of Seward, at the head of Resurrection bay, has grown steadily during this time, and has earned a place on Alaskan maps. The Federal Government cable was extended to Seward from Valdez last summer; and on Dec. 15, Seward was made a sub-port of entry, thus permitting direct communication with Pacific coast ports and doing away with the necessity of having all freights go four or five days steaming time out of the way to enter at Valdez. Seward can be easily made by sailing ships; whereas to enter at Valdez, sailing vessels would have to be towed through the islands of Prince William sound.

It will seem strange to many that the Alaska Central, after building 142 miles inland to Knik, will only just have reached the point at which it leaves the same salt water that it left in Resurrection bay, its harbor terminus. This strange fact is to be accounted for by the fact that there are difficulties in Cook's Inlet in the way of tidal "bores" and ice floes that make harbor facilities doubtful. One studying the map would select Cook's Inlet as the proper starting point for a railroad. Resurrection bay is, however, so exceptionally perfect a harbor that crossing Kenai peninsula to reach it amply justifies the extra length of road.

It is the declared intention of the Alaska Central to extend its road from Knik northwesterly to the Sushitna river; thence up that broad valley, crossing the Alaskan range of Broad Pass; thence

SEWARD'S WATER-FRONT.



DEPOT AT SEWARD.

GOVERNMENT CABLE OFFICE, SEWARD.

ALASKA CENTRAL OFFICE BUILDINGS DURING CONSTRUCTION.

The Alaska Central's route runs from Seward, at the head of Resurrection bay, a perfect open harbor,—up Resurrection river east of Kenai lake, around the head of Turnagain arm, and thence to Knik, the head of salt water. The summit in crossing Kenai peninsula is only 1000 ft., and the grades are easy. From Knik up the Matanuska river to the Chickaloon creek coal field, about 46 miles, the grade is easy.

down the Cantwell river to Fairbanks or the head of navigation on the Tanana river—a total distance from Seward of about 450 miles. The proposed route is remarkably direct, not only to the Birch creek and Fairbanks mining districts, but also to the confluence of the two great navigable rivers of the interior, the Yukon and the Tanana, an important point in the growth of the interior.

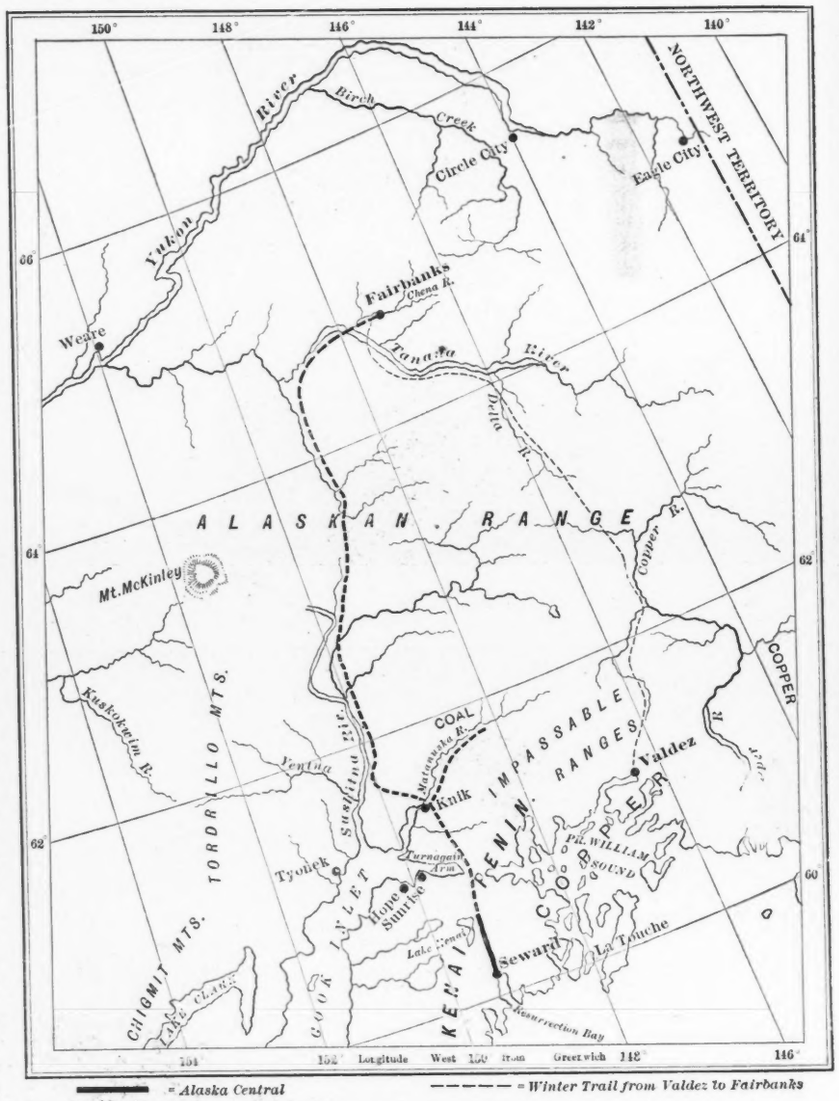
It is advertised that the road will reach the coal-fields of the Matanuska by next fall. Those engaged in the work and familiar with the conditions as thus far encountered, believe, however, that if the coal-fields are reached by the summer of 1907 exceptional headway will be made. Thus far great difficulty has been met, not only in inducing a sufficient number of laborers to go north, but also in keeping those who do go. The summer (the best, and in the interior practically the only time for grading) offers too many temptations to prospect; and in winter (when tunnel and rock work can be carried on) many are discouraged because of storms, consequent loss of time, and the high prices of supplies.

Contracts now under wyay call for expenditure of over $2,000,000 and the completion of the road-bed to Knik arm. About 1200 men are at present at work in the grading camps. The population of Seward is 1000.

The U. S. Geological Survey (which has been carrying on an energetic reconnaissance in Alaska since 1898) never exactly reconnoitered the route that the Alaska Central proposes to follow; but, nevertheless, the trips made have covered the general territory to be traversed pretty thoroughly. Especially in 1898 were investigations made in Alaska by the Survey for an All-American route to the Yukon; and, as the Cook's Inlet region seemed to promise the most direct line to the interior, efforts were concentrated there. In that year Mr. G. H. Eldridge, of the survey, ascended the Sushitna (and its tributary, the Chulitna) crossing a pass 3700 ft. in altitude and descending the Cantwell to the Tanana and Yukon. The same summer a detachment of the 14th Infantry ascended the west fork of the Chulitna, crossing into the Cantwell over a pass 2700 ft. in altitude. (The railroad has found a pass to the eastward of this—2300 ft. in altitude.)

In that same summer Mr. J. E. Spurr ascended the western branch of the Sushitna and crossed to the head-waters of the Kuskokwin, which he descended. Also Mr. W. C. Mendenhall ascended the Matanuska, and crossed the Copper river plateau to the Tanana watershed. In the same season, also, the work of Mr. A. H. Brooks and Mr. F. S. Schrader (in the Copper river basin and the head-waters of the Tanana and White rivers) contributed to our general knowledge of the Alaskan interior. Broad Pass between the head-waters of the Sushitna system and the Cantwell is declared easy of approach.

One of the factors in favor of the Sushitna valley as a route to the interior, is the fact that this valley is practically the only region in southern Alaska where there is any considerable agricultural promise. The Sushitna valley is a rolling sea of spruce-covered and open bottom lands, 150 miles long and 100 wide.



MAP OF ALASKA CENTRAL RAILROAD.

Native grasses are abundant, and among the forage plants the lupine is conspicuous. Grains (oats and rye) have been ripened successfully by the Indians and by the agents of the Alaska Commercial Company. All the hardy vegetables are grown, as can also be any quantity of feed for live stock. The marshes can be easily drained, and even some of the swamps. The bench lands are well timbered.

A recently organized industrial depart- of the Alaska Central Railway will undertake to induce the immigration of homesteaders, and an effort will be made to have Congress mark meridians to facilitate the survey of public lands. It seems doubtful whether many farmers can be attracted to Alaska solely to farm. The valleys of the interior will nevertheless prove attractive to a certain number of that adventurous type of homesteaders—a combination of trader, trapper and prospector,—such as were pioneers in similar valleys in Idaho, Montana and other western states.

The mountain ranges that enclose the Sushitna basin are intricate and of rugged topography, of an approximate height of 8,000 to 10,000 ft., sharply serrated and relieved by numerous peaks 12,000, 15,000 or 20,000 ft. in altitude. The loftiest and most rugged range is the Alaskan, constituting the Sushitna-Tanana divide. This carries the highest peak on the North American continent, Mt. McKinley, (Bolshaya, in Russian, Traleyka, in Sushitna Indian), 20,464 ft. high. West of Mt. McKinley (about 30 and 40 miles, respectively) in the same range are two other peaks, approximately

14,000 and 16,000 ft. in height. The face of this range is scarred with gorges 4,000 to 8,000 ft. deep, with precipitous walls and glacier-filled upper-courses.

The Chigmit and Tordrillo ranges, west of the Sushitna valley, are similar to the Alaskan range in their bold and rugged nature. Both carry lofty and unnamed peaks 10,000 to 15,000 ft. high. The Chigmit range bears, in its southern half, two well known volcanoes, Bedoubt (11,000 ft.) and Iliamna (12,000 ft.), the latter of which is still steaming.

Eastward of the Sushitna valley the mountains also have great ruggedness, many peaks being but little less than those in the Alaskan and Tordrillo ranges. The mountains that delimit the Matanuska watershed and extend southerly down the Kenai peninsula, are an extension of the divide between the Sushitna and Copper river systems. The higher peaks of the Alaskan and other ranges are snow-capped the entire summer; but the lower elevations are bare from June to September. Timber-line in the Alaskan range is about 3,000 ft. high..

The Sushitna river system drains a great country and the volume of water 80 miles from its mouth, at the junction of the Chulitna, is very great, the channel being 1½ miles across, more than twice the width of either stream above. The Sushitna and its tributaries, the Yentna and Chulitna, carry vast amounts of sediments derived from glaciers and from the banks that are constantly wearing away. Their currents run not over 5 miles an hour. The main channels are deep; the main channel of the Sushitna is well defined and of a depth sufficient at all times for the passage of light-draft stern-wheel steamers for 130 miles from its mouth.

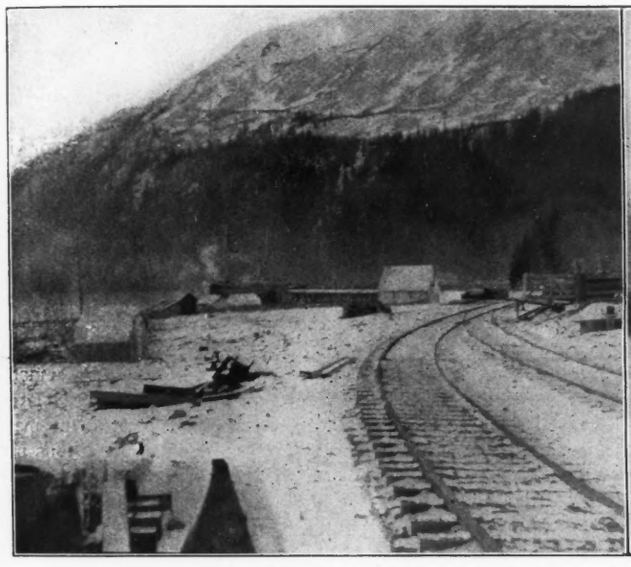
In the ranges east of the Sushitna valley, the formations are broadly simple, but complex in detail. They include granite, (probably Archean and believed to be the basal granite of the country); schist and slate, chloritic and sericitic; a series of conglomerates and coarse sandstones; sandstones and shales, in alternation with coal seams; and drift-sands, gravels, clays and muds. The granite which forms the core of the range and extends southerly into the Kenai peninsula has a gneissic structure generally strongly developed.

The Sushitna slates are one of the most important of Alaskan formations. The beds are essentially quartzitic and have been extensively crushed and sheared, the sand grains being flattened producing the schistose or slaty structure that generally prevails. These slates and schists may prove in the Sushitna country as economically important as they have already farther south in the Kenai peninsula; where, in the region between Turnagain arm and lake Kenai, they have been the area of the Cook's Inlet mining activity. Here they are of a remarkably uniform apearance and composition. They are of sedimentary origin and consist chiefly of fine-grained gray and bluish-black slates and gray arkoses, interstratified with which are quartzose beds and occasional thin conglomerates. Igneous dikes of aplitic or granitic character are frequent. In these schist and slate areas, have been conducted the mining operations on Six-Mile and Resurrection creeks and their tributaries. These creeks flow nothward into Turnagain Arm. Some seven or eight hydraulic properties on these creeks have been undergoing constant development. The greatest influx of miners to the dictrict was in 1896, ever since which time Cook's Inlet has attracted a small share of Alaskan immigration. In this same mineralized area, quartz claims have been taken up near Lake Kenai. Mr. C. D. Lane and others of San Francisco acquired a bond on some of them and are pushing development work. The vein occurs above timber-line in a contact region between the granite and the arkoses. The gold occurs free in a quartz gangue, and as tellurides. This discovery, made late last summer, will lead to a thorough prospecting this spring (when the snow is gone) of the entire region between Seward and Turnagain arm.

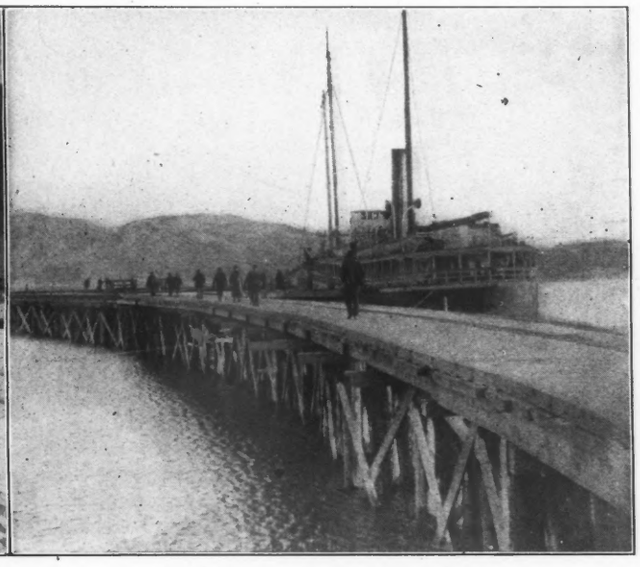
Other areas farther north in the Sushitna-Tanana divide where similar areas of metamorphic sediments are reported, may prove important. These Sushitna schists and the Sunrise Series (as the metamorphic areas of Kenai penninsula are named from the placers of the Sunrise creek) are tentatively correlated with the Tanana schists of the Fairbanks region and the Birch creek and 40 Mile Series.

Any extension of the metamorphic areas that are at present so popular among Alaskan prospectors (to the westward of the Sushitna valley in the Chigmit and Tordrillo mountains) seems improbable, unless it be to the northward near Mt. McKinley.

The Tordrillo mountains where visited by Mr. J. E. Spurr, present a considerable thickness of black shales that are frequently carbonaceous. Intercalated with these shales are numerous beds of sandstone, arkoses and impure limestones. All the rocks have been highly folded or cut through by great masses of intrusive material such as biotite granite, syenite, aplite, augite rhyolite, diorite and dacite. There is also much evidence of late Tertiary volcanic activity. According to Mr. Spurr, the mineralization in the Tordrillo mountains is quite distinct (in its age, although not in its nature) from that of the Yukon gold regions, being "dependent upon processes accompanying the Eocene dike rocks, whereas the Yukon deposits are dependent upon



SEWARD WHARVES.



UNLOADING RAILS FOR ALASKA CENTRAL RAILWAY AT SEWARD.

far more ancient intrusions. Evidences of gold are by no means so abundant as they are along the Yukon geanticline where the ancient schists, with their enclosed quartz stringers, are found."

The mineralization of the Alaskan peninsula south of the Tordrillo range is also of a later date, and in southwestern Alaska the Tordrillo mountains (being the chief seat of intrusion of igneous rocks) promises great mineralization west of the Sushitna valley. From the reports of prospectors from the head of the Yentna, the outlook for the region to the north towards Mt. McKinley and the great angle made in the Alaskan range, is much more promising than Mr. Spurr's report would lead one to expect south of the Yentna in the lower Tordrillo and Chigmit mountains. There is, in this at present entirely unknown region, a strong likelihood of areas of metamorphic sediments and of the recurrence of the copper bearing green stones of the Mt. Wrangle and the Copper river districts. The Alaskan range, from the Yentna to the Cantwell, is the main mountain mass in Alaska that has as yet not been reconnoitered by any observers, and is practically a *terra incognita*. Reports from this region in coming years will be watched with interest.

The main and intermediate interest of the Alaska Central Railway is undoubtedly centered in the coal-field which it intends to develop. The lignites of southwestern Alaska adjacent to the coast line have been rather thoroughly reported by members of the U. S. Geological Survey. Until a year or so ago the coals of the Matanuska river had been considered of doubtful economic importance. The Cook's Inlet coals are low-grade lignites and the seams are many times split by slate, clay and sand partings. They are often little more than carbonized wood, it being possible to pull from the back of a seam, slivers from a few inches to 3 ft. in length. Mr. Eldridge of the survey says: "It is doubtful if a younger example of coal can be found anywhere, peat itself excepted."

Such coal of course never encouraged railroad building, but prospectors discovered, some 50 miles up the Matanuska river, coals of a much higher grade. On Moose Creek an exposure of 5 ft. was found. On Kuig a 10-ft. and a 6-ft. seam are exposed. The largest seams of coal so far discovered are on Chickaloon Creek, where five beds from 5 to 35 ft. in thickness, have been proved. The coal is bright black in color, has a conchoidal fracture, but is friable and will not stand severe handling. An analysis of Chickaloon coal by C. C. Bogardus of Seattle, gave moisture 1.15 per cent.; volatile, 22.50; fixed carbon, 69.34; ash, 6.42; sulphur, 0.89; fuel ratio, 3.08. It is reported that the quality of the coal has somewhat improved with development work, some of it showing as high as 72 per cent. fixed carbon.

The Chickaloon coal of the Matanusko is far and away the highest grade of coal thus far known in southwestern Alaska. It will hardly compete as a steamer coal in outside markets with the semi-anthracite and bituminous coals which have been found at Controller bay — southeast of the delta of the Copper river; but it may find special markets if adaptable for smelter use in Port William sound. Its exploitation and development (by the Alaska Central Railway) promises, however, to put it first on the market; and, as Seward will undoubtedly in time attract the main travel to the Yukon and the interior, it will find its way into the channels of commerce as ballast or back freight. Its development by the Alaska Central will be a great boon to Alaskan shipping, making possible larger cargoes when return coal need not be brought from Puget sound ports.

The future of both the Matanuska and Controller bay coal fields of Alaska is considered by many particularly significant because of their situation within a few hours steaming distance of the Great Circle route from Puget sound to the Orient. The Matanuska field is at present less known than the Controller bay field, and it is not beyond the range of possibilities that coal fully as high grade as that of Behring river may yet be proven in the Matanuska region. Indeed the two fields may yet be correlated geologically. At any rate these two fields will afford a high grade of coal.

Of the mineral possibilities of the upper Sushitna and the Cantwell river, from Broad Pass to the Tanana, but little is known. The miners of the Fairbanks region are giving attention to the Kantishna and Novakakit rivers that flow northward from the Alaskan range in the Mt. McKinley region. The Kantishna field is reported good. Fairbanks (whose output for 1905 is variously given at from 6½ to 8 million) is attracting attention. The limit of discovery of rich placers may not have been reached. As Fairbanks lies in that broad belt of metamorphosed sediments that stretches westward from the international boundary near Dawson to the Yukon at the Ramparts, in which belt are many productive localities, it is hoped that other districts may be opened up in tracing that belt in its westward extensions into the Mount McKinley region. Prospectors are alive to the importance of inspecting within such areas the localities where the igneous intrusives are plentiful, such as granite, diorite and gabbro with their intermediate types and altered derivatives. (The extrusives in the gold regions so far as known are diabases and basalts).

The Tanana schists are sedimentary rocks, varying from a comparatively massive quartzite to a quartzite-schist and mica-schist, probably a simple extension of the Birch Creek series towards the Tanana. Hornblende-schists, gneisses and intrusive granites occur locally.

East of Seward in western Prince William sound is a mineralized section that is in no way dependent on the Alaska Central Railway for its successful development; but that nevertheless is of interest as suggesting possible similar areas in territory that the new railroad will open up. In the western islands of Prince William Sound are copper deposits that are proving of considerable importance. The principal one is on La Touche islands, east and north of the entrance to Resurrection bay. The Bonanza mine, as it is known, is located on the western side of La Touche island at an elevation of about 200 ft. The ore occurs in a sloping face of bare iron-stained sandstone and shale, about 300 ft. in length and 100 ft. in height, and has been stripped for a width of 180 ft. The staining has resulted from the weathering of iron pyrite, chalcopyrites and bornite that are quite general over the entire exposure. Shipments above 9 per cent. copper (no gold or silver values) are made with but little sorting.

The Gladhaugh mine at Ellamor in Prince William sound is a deposit somewhat similar to that of La Touche, though here the direct contact of an igneous dike of olivine diabase with the country rock seems to have had something to do with the mineralization. The country rock is a gray arkose. The ore consists largely of chalcopyrite and gray copper with some bornite and epidote. There is present also an apparently large amount of white iron pyrites or marcasite. Shipments of about 2,000 tons per month are made from each of these mines to the Tacoma smelters, the ore being in great demand as ballast by the returning Valdez and Seward steamers. The rate to Tacoma is $2 in 300-ton lots, and $2.50 for less.

These occurences, as also the others of Knight island, etc., are genetically connected with the flows of greenstone that are interbedded with the arkose sandstones and shales. Mr. Schrader of the survey says: "The mode of occurence may be compared in a very general way to that of a portion of the deposits of the Lake Superior region, though in the present instance sulphides are found in place of metallic copper."

The formation in which the La Touche and Gladhaugh deposits occur, is known locally as the Orca series, a sedimentary succession of thick-bedded brown and gray sandstones, black limestones, and arkoses, interlarded with dark shale and slate, and occasionally some conglomerate. Occuring with these sediments are great masses of diabase or interbedded basalt. These basaltic greenstones are generally uniform in appearance. They were originally basalts and on La Touche island the rock has an amygdaloidal char-

acter and otherwise greatly resembles the greenstones of the interior district of the Copper river. They have been so sheared and crushed by dynamic mountain building that they are now amphibolite-schists. They trend east and west and have been recognized on Kenai peninsula and reported yet farther north. The building of the Alaska Central will stimulate a careful prospecting of the known greenstone localities; as this formation, so readily recognizable, is a favorite with prospectors as a guide in copper searching. Already new copper fields are reported on Kenai peninsula, and still farther north of Knik on the Kashwhitney river.

A water-proof cement that has been patented in Germany consists of vegetable wax and caustic lime in boiling water, which is added to unground portland cement clinker; the whole being then ground together. The inventor makes the claim that a ½ in. coating of this cement placed on a brick wall will render it absolutely water-proof.

Hydraulic Dredging.

BY F. DANVERS POWER.*

This method of working alluvial ground is also known as "centrifugal hydraulic sluicing" or "pump dredging," the latter expression being liable to confusion with suction dredges. Hydraulic dredging is much used for reworking old alluvial diggings; and on account of the efficient way in which one can quickly handle large quantities of material, low-grade wash may be made to pay. With a natural head of water for sluicing, this method of mining costs 4.6 to 5.6c. per cu.yd.; but if one has to pump water through the nozzle, the cost rises to 6 or 9c. per cu.yd. When wash is clayey, a large amount of water is necessary to break it down and sluice it; but when working over old heaps from which most of the gold has been won, if the clay has been previously washed out, the old heaps may still pay to work, and any pillars of virgin ground that are met with serve to enrich the yield. This method of extraction is much used in Victoria, especially in the Beechworth and Castlemaine districts. In the latter district, on the abandoned diggings of Forest, Fryers, Barkers and Campbell creeks, there are over 20 plants, all paying dividends. The average yield for the Castlemaine district, where the ground is about 14 ft. deep, is nearly 230 oz. per acre; while 125 oz. per acre will pay a profit. The Castlemaine Junction Sluicing Company, after 18 months' sluicing, returned the subscribed capital to the shareholders, plus 50c. per share.

The advantages of this system of working are: The construction of a lengthy race is saved, for one can work where there is no natural head of water; wash can be raised from below the surface drainage level; work can be carried out with a small amount of water by using most of it over again; as the plant is on a barge capable of floating, this method can be used in places liable to become flooded, the plant is easily moved from one part of the lease

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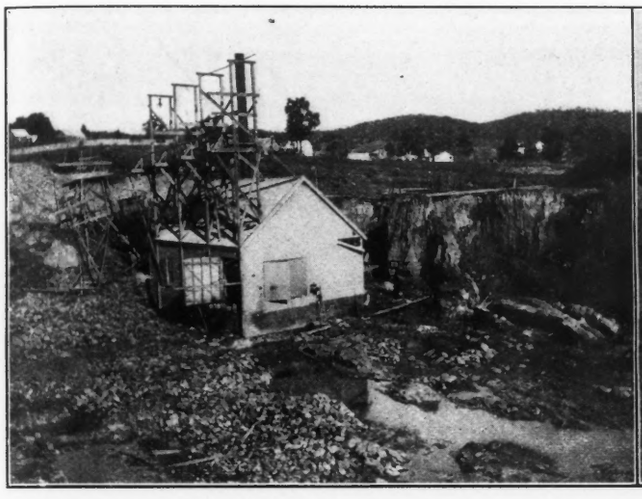


FIG. 4. BARGE READY TO BE FLOATED TO ANOTHER POSITION.

FIG. 2. SLUICING WITH ARTIFICIAL HEAD.

FIG. 3. TAILING DAM, FILLING OLD PADDOCK.

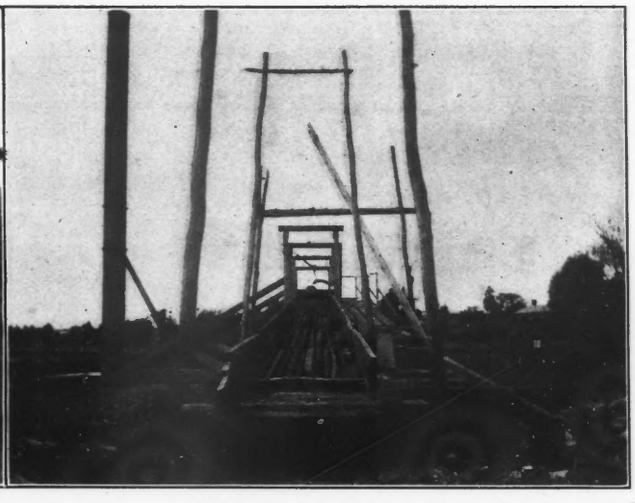


FIG. 6. VIEW UP SLUICE BOX.

to another and thus can be brought up to the face; being simple and comparatively inexpensive, the plant can be used for working small isolated deposits in places where it would not pay to bring in water along races which would be useless afterward; the gravel, which is simply turned over, does not pollute the rivers, and this method of working levels down the old heaps left by earlier diggers, thus improving the surface of the ground (Fig. 8); the necessary outlay can be approximately determined beforehand; the capital required to purchase and start the plant is not great, and if the ground is worth working the venture should pay from the start; the bed rock can be thoroughly cleaned up by this method, which accounts for the yield from this class of mining being greater than from bucket dredges, and which more than compensates for the greater cost of mining by hydraulic dredging, the weekly expense of a bucket dredge being from $200 to $300, that of a hydraulic dredge being $375 to $500.

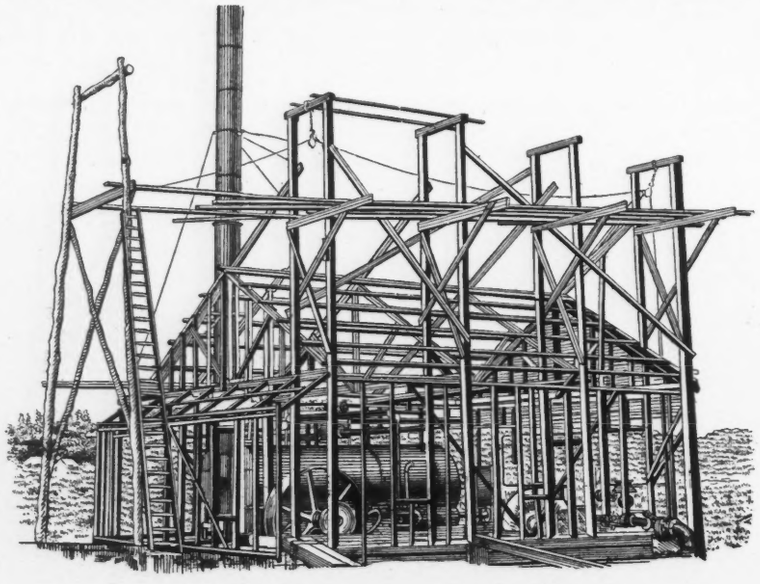


FIG. 1. HOUSING OF BARGE.

Work is commenced by making an excavation about 50 ft. square and 6 ft. deep. This is filled with water, and the barge, which is built on the bank, is launched in. The machinery is then placed on board and the whole housed in with galvanized iron. The barge is from 35 to 45 ft. long (not counting the 4-ft. tailboard sometimes added), 30 ft. wide and 4 ft. deep; when loaded it draws 3 ft. of water. The capacity of the engine and boiler naturally depends on the depth of wash to be worked, generally from 130 to 170 i.h.p. A typical plant has a cross-compound engine having a 10-in. high-pressure and a 20-in. low-pressure cylinder, the stroke being 24 in. The boiler, which is of the marine type (Fig. 1), is 20 ft. long and 7 ft. diameter, fitted with 38 to 60 tubes of 4-in. diameter; it burns about 80 cords of firewood per month. The working pressure is from 120 to 125 lb. There are a duplex feed-pump, 4½x2¾x4 in., a steam bilge pump, heater, air-pump and condenser. Where there is no natural head of water to sluice with, an artificial head is obtained by a 12-in. centrifugal pump, known as a "pressure," "sluice" or "nozzle pump." Water is conveyed from this along a spiral-riveted pipe (of 14 gage, in lengths of 18 ft.) to the nozzle at the face, which is generally 4 in. in diameter. Only one jet of water is used, and the pressure at which it is delivered is from 60 to 70 lb. per sq.in. The water and gravel are elevated from the sump to the sluice boxes by a 10-in. centrifugal pump known as a "gravel pump." In addition there is a washing-down pump, which is a direct-acting plunger of the Blake or Worthington make. The sluice boxes have a total length of 80 to 120 ft., are 4 ft. to 4 ft. 6 in. wide and 12 in. deep, except at the head, where they are 18 in. deep; they are made of sheet iron ⅛ to 1/16 in. thick, and are in 10- to 12-ft. lengths, so that they can be readily taken apart and re-erected. The head of these boxes rests on trestles built on the barge, which pass through the roof of the housing (Fig. 1); the other trestles (which are placed 10 to 12 ft. apart) are erected temporarily on the ground and are shifted as the barge changes its position. There is a crane at the end of the barge for lifting heavy weights. Most plants have an electric-light installation, the dynamo being wound for 35 amp. and 65 v.; this, of course, is driven by a separate engine. Incandescent lamps are used on the barge and arc lights at the workings.

By the time the machinery is placed on board the barge another excavation has been made alongside the first, down to the bed rock, and a level bed is prepared for the barge to rest on, for the barge is stationary when working, not floating. The barge does not rest directly on the ground; if that were the case the woodwork would tend to rot, so bed logs are laid to keep the structure off the moist ground and allow air to circulate beneath it. When ready this excavation is flooded and the barge floated in. The pump is then set to work to empty the excavation, the barge eventually settling in position. A sump is sunk in the bed rock near the barge; this should not be deeper than 20 ft., as that is the effective suction limit of the pump in practice. Races are cut in the bed rock from the face to the sump as the work progresses; this is given a grade of 1 in 24. The main race is cut up the center of the paddock, and any branch races meet it at a suitable angle. The actual sluicing is carried out in the usual manner (Fig. 2). The larger stones are forked out of the race and stacked on either side. An iron grating near the sump prevents any stray boulders too large for the gravel pump from passing into it.

At first the tailings are stacked on the surface, but later on they serve to fill the worked-out paddocks. A low brush-and-tailings dam is erected behind the barge, so as to impound the tailings; this dam is gradually raised so the old paddock becomes filled up (Fig. 3). The water is drained off through a large wrought-iron pipe into the lowest portion of the worked-out ground, and can be worked over and over again for sluicing purposes, thereby saving about two-thirds of the total water used. The drain pipe is left in position and eventually becomes buried. The water thus obtained has to be strained before being returned to the pump.

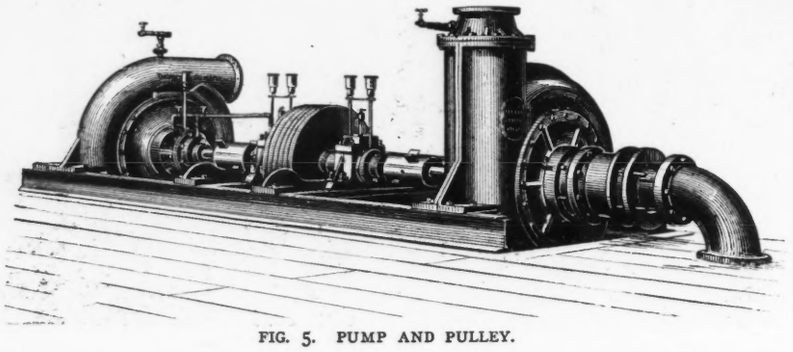


FIG. 5. PUMP AND PULLEY.

The ground is worked out in paddocks, which occupy an area of one to two and

a half acres, and under ordinary conditions it takes a month to work out three-quarters of an acre. When the working face gets so far away from the barge as to necessitate the cutting of a deeper race to keep a suitable grade (which in hard ground is an important item of expense), the pipes connected with the sluicing pump and the suction pump of the gravel pump are disconnected, as are also the sluice boxes on the barge from those on the bank (Fig. 4). In the meanwhile the bed rock is thoroughly cleaned up and a new bed laid and leveled in a suitable position; a new sump is sunk alongside of it. The paddock is then flooded sufficiently to float the barge to its new site, the connections are remade, and the water pumped out. One week in sixteen is the time generally allowed for moving a barge to a new site, and the expenses come to about $350 before another start can be made.

grit. The pumps are primed at starting with a steam injector. These pumps are driven by rope gear, the driving pulley being 8 ft. in diameter and the pump pulley 2ft. 7½ in. (Fig. 5). When running at about 350 r.p.m. the pump will lift 1 cu.yd. of gravel and 400 cu.ft. of water per minute. Since it costs nearly as much to pump water as it does to pump sand and gravel with it, one should try to pump the maximum quantity of wash with the minimum quantity of water. This is best done by increasing the grade of the race, which necessitates moving the barge more frequently. The minimum quantity of water required per cu.yd. of gravel raised by such a pump is about 2500 gal.; but the proper mixture suitable for pumping requires fifteen times the amount of water by bulk to one of gravel. These pumps, besides elevating the gravel and sluice-water. also act as drainage pumps by raising the water that may drain into the excavation. The suction pipe of the gravel pump is of smaller diameter than the delivery pipe, so as to avoid any chance of a small boulder that has passed the suction jambing in the delivery pipe.

ner is shrouded at the sides, but open at the periphery, so no wear can take place at the sides of the blades, and therefore there is no necessity to take up the sides: but the space between the shrouding and the casing becomes worn by grit that gets between them. The lining is all in one piece, and is consequently heavy to handle. Most of the gravel pumps employed in Australia are of this type.

Sometimes sluice boxes provided with ripples are placed in the main race so as to save as much gold as possible before raising the gravel to the upper sluice boxes; this, however, is not advisable in those places liable to floods as one may not have sufficient warning to allow for a clean up before becoming drowned out. The upper sluice boxes are set with a grade of ¾ to 1 in. to the ft. The sides are lined with planks while coarse fiber-matting is laid on the bottom; on the top

FIG. 8. VIEW OF GROUND TURNED OVER BY HYDRAULIC DREDGES.

FIG. 7. CLEANING UP BED-ROCK.

It always costs more, and takes more time, to work the opening-up paddock than those worked subsequently.

The power required to work a plant depends largely on the hight the gravel has to be lifted, the hight being measured from the bottom of the sump to the head of the sluice box. This hight may be from a few feet to say 90 ft. For any hight over 60 ft. (which is the limit of one gravel pump for good work) it is better to use two lifts, working the pumps in series. If the ground is shallow, 20 ft. or less, the pump may be placed on piles and driven by a portable engine from the banks.

The wear and tear of the gravel pumps through which so much gravel and sand passes is naturally very great, for they are capable of passing boulders up to 50 lb. in weight. The wearing parts of the pumps are renewable and the bearings made sand-proof by means of clean water conveyed to them under greater pressure than that at which the pumps are working; the leakage of the clean water into the pump thus keeps back any sand and

There are two types of centrifugal gravel pumps employed in Australia, known as "beater" and "port runner" pumps; the former is represented by the Jennings pump, and the latter by Kershaws. In the Jennings pump the runner is made of wrought iron with renewable steel blades, so that wear and tear can be made good quickly and at least expense. The liners of the casing are not only renewable but also adjustable. As the sides of the blades become worn down, causing leakage, the side liners can be pushed forward by set screws, and are held in position by stud bolts. The lining, being in sections, is easily handled and replaced. At the Woolshed plant (Beechworth, Victoria) the average cost of liners and other connections with the pump came to $50 per month. In the Kershaw pump the runner is shrouded at the sides, but open at the periphery, so no wear can take place at the sides of the blades, and therefore there is no necessity to take up the sides: but the space between the shrouding and the casing becomes worn by grit that gets between them. The lining is all in one piece, and is consequently heavy to handle. Most of the gravel pumps employed in Australia are of this type.

Sometimes sluice boxes provided with ripples are placed in the main race so as to save as much gold as possible before raising the gravel to the upper sluice boxes; this, however, is not advisable in those places liable to floods as one may not have sufficient warning to allow for a clean up before becoming drowned out. The upper sluice boxes are set with a grade of ¾ to 1 in. to the ft. The sides are lined with planks while coarse fiber-matting is laid on the bottom; on the top of this are arranged different kinds of riffles. The "curly riffles" are made of bar iron, 2 to 3 in. deep by ¼ in. thick, and crimped in such a manner that when two or more bars are placed together, diamond-shaped spaces 2 in. by 2 in. are formed. Fifteen such bars are bolted together in a set for easy handling, and each set is 5 ft. long. Quicksilver is generally used with these riffles. Venetian riffles consist of iron castings on either side of the sluice box containing slots every 3 in. into which bars 3½ in. deep and ⅜ in. thick are slipped, having an inclination with the stream. Up-and-down riffles made of wood 2x2in.x12-ft. lengths are also used, the spaces between the bars being 2 in. and the cross pieces to tie them together being 2 by 3 in. A common arrangement is to have three lengths of curly riffles; then 25 ft. of Venetian riffles, and finally three lengths of up-and-down riffles (Fig. 6).

After the bulk of the gravel has been sluiced away, the bed rock is carefully gone over with picks, hoes, three-cornered scrapers and hand brushes

(Fig. 7). When the ground is soft, several inches may have to be taken up in order to obtain the gold that has worked down into the crevices. The heaviest gold is naturally found on the bottom. Many curiosities are obtained by reworking the old diggings, together with much mine timber; but the wood cannot be used as fuel in the boilers, as it is found to destroy the firebars, probably on account of pyrites deposited on it.

The number of men employed in connection with a hydraulic dredging plant varies from 25 to 30 for the three shifts, some of them being required only during the day shift. These include nozzle men and shift bosses, pump men, race or stone men, engine drivers, stokers, man on tailings dam, laborers, and wood carters.

The Shoshone Indian Reservation.

The proposed opening of a large portion of the Shoshone Indian reservation for prospecting operations in the coming summer is attracting a large amount of attention in mining circles throughout Wyoming and the adjoining States. It is probable there will be a large rush when the ground is thrown open. Congress at the last session passed the necessary legislation to throw open more than a million acres of this reservation to settlement and exploration.

The ceded portion of the Shoshone Indian reservation is the area lying north of Wind river and east of Popo Agie and Bighorn rivers. It lies in the northern-central portion of Fremont county, and includes also a small corner of Bighorn county, adjoining Bighorn cañon south of Thermopolis. The total area is about 2000 square miles. The northern third of this area lies in the Owl creek and Shoshone mountains and the southern portion comprises a wide area of rolling plains in the Wind river basin. The area is bordered on the south by the Wind river, and its eastern margin is crossed by the Bighorn river. These streams carry a large volume of water and flow in narrow but flat-bottomed valleys.

In portions of the Owl creek mountains granite and associated schists are exposed, and are reported to contain gold and other ores, which may possibly occur in sufficient amount to be of economic importance, while in the southern end of the Shoshone range, which constitutes the northwestern corner of the ceded area, there may possibly be found a southern extension of the mineral veins of the Kirwin region. Coal deposits occur in the center of ceded area, and although they may not merit extensive working, they will afford a useful local supply.

The only settlers, now in the area are a few Indians, and white men who have married squaws, and the ranches of these persons are widely scattered along the rivers and on the creeks near the foot of the mountains.

The Courrieres Disaster.

SPECIAL CORRESPONDENCE.

Although the last word cannot be said regarding the recent Courières mine disaster, yet it would seem that the responsibility will devolve on the company operating the mine. The miners themselves are positive in their statements that to save a slight decrease in dividends the company did not adopt the means prudence suggested. For instance, four years ago there was a similar fire in the Liévin coal mine, close at hand, and similar means were employed to close in the fire with this difference however, that a large tube furnished with a valve and manometer was supplied at each barrier to indicate the interior pressure. This tube was connected directly to the return air way, and watch was made and the valve was opened whenever the pressure attained a certain maximum. To avoid the expense of uniting valves at the barriers with the return current of air—2 kilometers distant—and, the necessary cessation of work in the mine for two or three days, the Courrières Company preferred to hermetically seal the burning seam, hoping that the thickness of the barriers would resist the accumulating pressure. It is difficult to see in all this anything but a huge blunder on the part of the engineers in charge of the mine, and the matter cannot fail to be brought home to those responsible.

It may here be mentioned that the Courrières mine started operations in 1852 with a capital of 600,000 francs represented by 2000 shares of 300 francs each. After 5 years a 50 per cent. dividend was paid, after 13 years it attained 100 per cent., in 1890 it was 200, in 1891 it increased to 766. For 1905 the dividend was estimated at 1040 per cent. In view of these results, it is certain that the antiquated methods of the company will receive severe handling at the official investigation.

Heusler's Magnetic Alloy.

Andrew Gray, in *Proc.* Royal Soc., Mar. 6, 1906 makes some curious observations in the case of a Heusler alloy containing about 16 per cent. manganese, 8 per cent. aluminum, with a little lead and the remainder copper. It was originally almost non-magnetic. It was heated to 400 deg. C. in a furnace, and then allowed to cool slowly. After having been placed in a magnetic field it was found to have considerable residual magnetism. It was next heated to 340 deg. C. for about 20 min. and allowed to cool, when it was found that the magnetic properties were much more pronounced. The magnetic properties were destroyed by quenching from a temperature of 400 deg. C. When tested at the temperature of liquid air the specimen was more susceptible to magnetism than in its previous best condition, while it exhibited much less hysteresis and retentiveness.

Oil Shale Deposits in New South Wales.

SPECIAL CORRESPONDENCE.

A company designated the Commonwealth Oil Corporation, Ltd., with a capital of £800,000, has been formed to work the oil-shale deposits in the Capertee and Wolgan valleys in New South Wales, and which cover an area of some 20 square miles. The oil-shale deposits in this State have been worked for a period of over 40 years, and shale to the value of over £2,100,000 has been won. The deposits from which the supplies had in the past been drawn were being rapidly depleted, and the opening up of this new field will mean a renewal of former activity. The quality and extent of the deposits now to be operated on have been fully described by J. E. Carne in his memoir on the "Known Shale Deposits of New South Wales," published by the Department of Mines. It is stated that D. A. Sutherland, the expert deputed by the British investors to report on the merits of the proposal, stated that the resources of the property had been understated, if anything, and he had no hesitation in recommending the investment of such a large capital. It may be mentioned that Mr. Sutherland is now on his way to Australia to give effect to the scheme. One of the most important details involved in the plan of operations is the driving of a tunnel 3¼ miles in length from the Wolgan to the Capertee valley, and work is being proceeded with simultaneously from both sides of the mountain. The tunnel is being driven on the line of shale, and the most modern appliances are in use to expedite the work. At each end of the tunnel an electric installation has been provided to furnish motive power for Jeffrey electric heading machines, drills, and ventilating fans. During the preliminary work of driving and sinking the extent and quality of the shale opened up proved quite up to expectations. There will undoubtedly be a large quantity of shale of sufficiently high grade for export to Continental markets for use in connection with the manufacture of gas. Owing to the thickness of the seam and the facility with which it can be handled, it is estimated that 600 tons of shale can be wrought per diem. The manufacture of oil and other products will be carried out on the field, and works for this purpose are to be erected immediately. The construction of a railway to connect with the State railways has also to be undertaken; this line will have a length of some 27 miles. During the progress of prospecting operations a seam of coal 10 ft. thick and of excellent quality was discovered on the property.

The materials of which crucibles are made must be of the highest quality, and practically all the graphite used comes from Ceylon.

THE ENGINEERING AND MINING JOURNAL

Contents.

IF ANY RELIANCE can be placed on recent despatches from the Pacific Coast, the Guggenheim and allied interests are preparing to enter extensively into Alaskan mining. It is already understood that the exploitation of the Copper river country was one of the plans of these interests. Now, however, they are credited with securing gold-mining property in Alaska and the Yukon, with a view to operations on a large scale.

THE RAIN-MAKING experiments which the Yukon Government is going to undertake under contract with a famous fakir, are so absurd that the criticisms, which our Dawson correspondent mentions, are no cause for wonder. The wonder is that any Government officials should be so foolish as to make a contract, even for only transportation and subsistence. The Yukon certainly needs water, but it will not obtain it by any such ridiculous "medicine."

San Francisco.

As we go to press, Wednesday, April 18, we learn of the destruction, by earthquakes and subsequent fire, of a large portion of the business center of San Francisco, together with a lamentable loss of life. San Francisco is an important mining and smelting center, the headquarters of the mining industry of the Pacific coast, which is the abode of a large number of mining men, and is visited frequently by mining engineers and others who are engaged in the mining business from all parts of the world. All will learn with sorrow of the disaster which has overtaken this important city, and will feel sympathy for its inhabitants in their loss. We extend our own sympathy to our friends of San Francisco at this time of great disaster.

Rolls. vs. Stamps.

According to our Salt Lake correspondent, the engineers in charge of the construction of the large mill of the Boston Consolidated Mining Company, at Garfield, near Salt Lake City, have finally decided to employ stamps for crushing. The Utah Copper Company, which is erecting a mill of similar capacity in the same vicinity, intends to employ rolls and edge-runners (Chilean mills). The ore that is to be concentrated in the two mills is of identical character. It is a soft, light-colored porphyry, containing pyrites finely disseminated through it. Fine crushing is necessary in order to liberate the mineral. If the plans of the two companies are carried out on the present lines, we shall have a comparative test, on a huge scale, of the efficiency in crushing by two radically different methods.

However, we shall have little doubt as to the outcome. As a crushing machine and amalgamator, the stamp mill holds its place unquestioned in the metallurgy of gold. Merely as a device for fine crushing, especially as a preliminary to concentration, stamps are out of date, being surpassed in mechanical efficiency by other machines, especially by rolls for moderately fine grinding, and by ball-mills, edge-runners, and tube-mills for finer work. That highest representative of power in crushing, the steam stamp, did not prove successful at Butte, and although it still holds it own at Lake Superior, where it originated, experiments are now being made even there with rolls as a substitute. It appears that the Boston Consolidated Mining Company is making a step backward.

State Ownership of Mines.

The Ontario Government has, apparently, decided to try practically state ownership and operation of mines. An announcement was made in the Ontario Legislature on April 3, by Premier Whitney, as to the policy to be pursued in regard to the Gillies timber limit, the mineral bearing tract immediately south of the Cobalt mining area, the opening of which has been anxiously anticipated by prospectors. After briefly recapitulating the circumstances in connection with the limit, Premier Whitney said that "the Government has considered this matter carefully with all the circumstances and conditions before them and has arrived at this conclusion that they will not dispose of that silver-bearing land. It being ours, we are prepared to keep it, to use it, develop it and mine it for the benefit of the people of the Province of Ontario."

This is an entirely new departure and a concession to the strong feeling existing in this province in favor of public ownership, which has influenced the course of the Government in dealing with other questions. It is understood that as soon as the limit holders give up posses-

sion, which will be on Oct. 1, the Government will place the tract in the hands of a commission to operate it on the public account.

The extent of the Gillies limit is about 100 square miles. Its northern apex, projecting into the Cobalt mining area to within about half-a-mile of the town of Cobalt, and comprising about 3½ square miles, is known to contain veins as rich as any of the finds now being exploited. The mineral value of the remainder of the limit is an unknown quantity, though it is believed that the ore-bearing formation extends some distance toward Sudbury. Prof. Willet G. Miller, provincial geologist, has been instructed to conduct a thorough investigation of the portion of the limit known to be rich in minerals, ascertaining the geological formation and tracing the valuable ore-veins, so as to have information in readiness for the commission. He will afterward begin the exploration of other portions of the limit.

The Government has further decided to offer for sale, or rather lease, by tender, mining concessions on the right of way of the Timiskaming & Northern Ontario Railway, the mileage between the 101st and 105th mile lying in the Cobalt area being rich in minerals. The following are the lowest terms which will be considered: A rental of $500 a year for a site outside the right of way for buildings; a cash payment of $50,000 for the concession itself, a 10 per cent. royalty on all ore valued at $400 per ton or less; a 25 per cent. royalty on ore between $400 and $1000 per ton, and a 50 per cent. royalty on ore over $1000 per ton.. This, also, is a new departure for Ontario.

The purpose of the Government is certainly commendable; the question is as to its execution. The national lands belong to the people at large. When they are known to be of exceptional value, it is unjust to give them away for a song to the few "boomers" and speculators who can manage to be on the ground. The case is quite different, when the prospector has to find the veins by arduous search over a great area of country; no one will grudge the treasures that have been found by a comparatively few of our American prospectors, nor belittle the part they played in the development of the West, nor deny the benefit of the system under which our mineral lands were thrown open; but no one wants a repetition of the scandals of the opening of the agricultural lands of Oklahoma.

The leasing of Government lands which are known to be rich in minerals is an equitable proposition, and should be satisfactorily workable if the leases are properly drawn and adjusted, and the right kind of organization for supervision is developed. The working of mines on Government account is a different matter. It is done in Germany and elsewhere, but in some of the European mining districts there are conditions which do not exist in North America, and there is an elaborate mining organization, which it has required many years to create. The true function of government, however, is to govern, and in general it is unwise for a government to engage in industrial undertakings, or try to do what the people can best do for themselves. The trusts and the magnates may grab more than their share when they are not restrained, but generally they can do things cheaper than a government if necessity constrains them.

Hydraulic Dredging.

In this issue there is an interesting article on hydraulic dredging in Australia. Its conclusions indicate that, in Mr. Power's opinion, particularly where firm bedrock is found, it is a method superior to that of working with a bucket dredge. There are numerous deposits of auriferous alluvion in the United States, having characteristics in common with those which have been worked so successfully in Australia and New Zealand, and it is likely that its introduction into this country would result well.

One of the advantages claimed for it is the circumstance that worked-out ground is left in better condition than when handled by stacker dredges. In view of the opposition to gold dredging in California, it will be suggested that this method—because of its ability to restore and even improve ground, originally rough, or left in an uneven condition by previous mining—is particularly applicable where the underlying gravels, of fertile agricultural and horticultural districts, possess dredging value. Because of this and other advantages claimed for it, we suggest that attention be given this process by those contemplating the exploitation of alluvion possessing the peculiar characteristics which seem to make its adoption expedient.

That a much higher gold extraction is possible than is accomplished by bucket dredging is surprising. (David K. Blair in the JOURNAL of Oct. 28, 1905, page 774, says it is 100 per cent. greater.) As similar gold-saving devices are used in both operations, it would appear that the fault is either in incomplete excavation of bottom (because of lack of power, strength and careful manipulation), in spilling and waste of material from badly designed buckets and by overloading at the lower tumbler; or by faulty discharge of buckets (caused by the occurrence of adhesive material and the use of narrow, deep buckets). But it is difficult to account for a 50 per cent. smaller extraction in this way.

It is true that hydraulic dredging has many advantages, but it is not likely to displace bucket dredging where there is an excess of water, or where the bottom (as is found in most of the California dredging fields) is a false bedrock, easy to excavate and in which "races", cuts, or ground-sluices would be difficult to maintain. A plant requiring (in addition to cost of superintendence, amortization, etc.) about 30 men, and 80 cords of wood per month, with a capacity of about 500 cu.yd. per day (according to Mr. Power's description) would cost, to operate in the United States, two or three times as much per cubic yard as does bucket dredging in California. Experience with gravel, rock and sand pumps in placer mining on this Continent has, except in few instances, been unsatisfactory. They have been tried in the Western States, Canada, Klondike and Alaska. Only where pumps of design and construction similar to that of the Australian pump were installed, has satisfaction been given. However, they have been used with great success in harbor and reclamation work, but principally for filling in tide lands under the Bowers patent.

If bucket dredging on the Western Continent is losing as much gold as it is in Australia, it is truly a serious condition. It is probable that it is not, but the fact remains that there is a woeful lack of exact knowledge as to the percentage of loss in tailing. We suggest that dredge operators investigate the percentage of extraction, not by contrasting prospecting and dredging values, but by comparing dredging and tailing values. The result may be startling.

Metallics.

Brass with an excess of zinc, tin or lead will not cast smoothly enough for fine art metal work.

The bright dip usually used for brass work consists of nitric acid one part and sulphuric acid two parts.

Ordinary steam pumps do not, on the average, utilize more than 50 per cent. of the indicated power of the steam cylinder.

It is not claimed even by air-compressor builders that compressed air is a cheap medium for developing power underground; but in almost every mine there is to be found one or more places where a compressed-air pump is the simplest, most convenient and most desirable way of handling the water at that point.

Art metal workers, who desire to obtain smooth castings for various purposes, use charcoal dust, and more especially the dust from burned cork, for producing smooth cast surfaces on certain alloys. An alloy with a high percentage of copper, say from 80 to 85 per cent., will produce a fine smooth casting by this method.

The punch and saw sampling of base bullion have been used for a good many years and undoubtedly will continue to be used to some extent for a good many years to come but it is certain that of the methods employed in good practice the kettle is by far the more accurate and, wherever the circumstances will permit, it should be used.

It is unsafe to jab hard with a wooden tamping bar, in case a piece of powder fitchers or sticks half way in a hole, when loading, and it can not be pushed home gently. Robert N. Bell says: "Never mind your reputation as a loader. Let the hole spoil. If it should result in your losing your job you will have yourself left, anyway."

Base bullion in bars, or in molten condition direct from the furnaces, is put in a 30-ton kettle, heated, thoroughly mixed by a jet of dry steam, cooled, skimmed of impurities, siphoned off into the ordinary molds, and as every tenth mold is filled, a dipper of the molten lead at the end of the siphon is taken. This dip weighs an ounce or two, and furnishes for a 30-ton lot, a sample of about 5 lb.

In alloying gold with silver and copper the alloy is generally composed of two-thirds copper and one-third silver. It usually requires several meltings and additions of the precious metal to obtain the right proportion, as the gold is apt to sink to the bottom of the crucible or melting pot. Fine brass has been used in late years instead of part of the copper content.

In Victoria, for the ten years ending 1903, the average value of the gold ore was 29s. 4½d., whereas on the Rand in 1904 the value for the ore milled was 38s. 6d. per ton, and individual mines in Bendigo have working costs as low as 4s. ½d. and 6s. 7d. per ton; so that, in spite of the high-priced labor of Australia, the mines there handle lower-grade ore than can be mined with the cheap labor of the Rand.

Tin mining has not yet become a profitable industry in Alaska. Specimens of tin, both lode and alluvial, have been found in several parts of the Seward peninsula. At Tin City a company has sunk a shaft 100 ft. in depth on a tin-bearing formation, and erected a 20-stamp mill, but the returns have not yet been gratifying. There are, however, many miners who have investigated the tin areas who express the opinion that Alaska will in time produce a little tin.

Tin melted for tinning must be constantly stirred and skimmed to remove the oxide, which forms and floats upon the surface of the metal; some of it partially mixes with the metal. This does no harm at first, but the amount increases until finally the metal becomes so thick that it cannot longer be satisfactorily used. In this case it is usual to add a quantity of new tin. This dilutes the oxide, but eventually must be removed and new material used.

Quite an interesting drilling competition was recently held on the Lancaster West mine. On this mine kaffir labor is employed, while Chinese are used on the next mine, the Lancaster. The white miners of the Lancaster West boasted they had a Kafir who could drill better than any Chinaman. A competition was arranged and the Chinaman beat the Kafir easily. drilling 156 in. in about 7 hours, while the Kafir drilled 140 in. It is found that the Chinaman is an excellent driller provided the conditions are favorable. Otherwise he loses heart.

A 14-in machine-banded redwood water main under a pressure of 250 ft., or 108 lb., has been built by the Detroit Copper Mining Company, of Morenci, Ariz., to convey water to the concentrator. It was banded, before shipment, with 0.307-in. galvanized rod, spaced 1¾ in. Before the banding was wound around the pipe and pressed into the wood by the tension applied on the banding machine, it was dipped in hot asphaltum. The staves of the pipe were cut from 1½x4-in. well-seasoned clear redwood. The end joints are made with cast-iron collars, driven upon the pipe.

The excavation of iron ore by electric and compressed-air shovels instead of steam shovels is to be experimented with on the Mesabi range in Minnesota; an electric shovel for this purpose is now being built by the Bucyrus Company. It is hoped to economize by generating power at one large central plant instead of by a boiler and engine on each of the numerous machines. The electric power will be generated at the new Duluth water-power plant. Experiments are also being made with a cableway of about 1000 ft. span, handling grab buckets, the cableway traveling over the ore bed as the work progresses.

A centrifugal pump, to operate at a high efficiency, is necessarily limited to special purposes. With refined machines, 80 per cent. of useful effect is attainable, but one that will utilize 60 per cent. of the power applied is likely to be the best machine to buy. The efficiency attainable in various uses is from 40 to 80 per cent., being lowest in dredging machines, but the strange feature of the matter is the constant inquiry respecting efficiency. A customer will go to a maker or dealer in displacement pumps and purchase one to operate at an efficiency of 25 to 35 per cent. and never make an inquiry or ask a guaranty of effect.

The present standard type of air reheater consists of two concentric cylinders having about ¾-in. space between them. A coal fire is maintained within the inner cylinder, which is provided with a gate at the bottom end, and a smoke pipe at the top. The compressed air is conducted through the space between the cylinders where it takes up about 50 per cent. of the heat units developed by the combustion of the coal, the remaining 50 per cent. escaping up the stack and by radiation. In tests made with reheaters of this type, in which the air was raised from 52 deg. F. to 350 deg., an increase of 54 per cent. was found in the work performed by a given amount of compressed air.

Topaz occurs in many different shades of white, blue, and rarely pink and pale red. Some of the dark yellow and brown specimens can also be altered to a delicate pink by careful application of heat. This is a somewhat difficult operation to perform, as it is necessary to guard against any sudden alteration in temperature, or the stone will be found to be flawed, or if the heat be too great it will be found to be colorless. The power of changing the color of the topaz by application of heat was first discovered by accident in 1775 by an old French jeweller, named Dumelle. His method of effecting the change was to heat the yellow topaz in a sand bath.

An English variable-speed steam turbine is provided with two sets of steam-admission ports, into which the steam is directed. The one takes steam through expanding nozzles to the rotating blades, which are made in two sets and give the high speed, the steam then being exhausted. Steam is taken through the same blades to operate at a lower speed; but instead of being exhausted at the same point, it is taken through another channel to another set of rotating blades before exhaustion, giving about one-half the speed with the same efficiency as when operating at the higher speed. The turbine has been patented, but is not yet, we understand, on the market.

Colliery Notes.

Under present conditions it takes from two to three years time and from $1,000,000 to $2,000,000 to open a colliery in the anthracite region, and to equip it with the latest mining, haulage and breaker plant.

One of the oldest breakers in the anthracite region is about to be taken down. It is at No. 4 colliery of the Lehigh Coal and Navigation Company. It was built in 1859 and has been in continuous operation 46 years. Last year it handled 206,348 tons of coal.

An air current passing through underground mine workings meets with a large amount of friction, which varies with the condition of the entry walls, their areas and sectional shapes. The pressure required to overcome this friction varies in proportion to the square of the velocity of the current.

Mixtures of marsh gas and air begin to be sharply explosive with 7 per cent. of marsh gas (CH_4), the maximum force being reached with a mixture of 10.8 per cent. The mixture ceases to be explosive with 14.5 per cent. of marsh gas. A mixture of 5.8 per cent. of marsh gas and air is the lowest inflammable combination, while one of 16 or 17 per cent. of marsh gas is the highest.

The prevention of accumulations of thin layers of fine coal dust on the supporting timber and sides of the entries is almost impossible, and its inflammability increases in deep mines with the high temperature of the circulating air. Many recent explosions have shown that the explosive zone has been extended by the finest dust in the workings, the coarse dust generally remains unburnt. The most dangrous dust is that which is carried about by the circulating air current and deposited on timber and entries.

The proper size of shaft pillars is an important problem when planning new coal workings when the seam is deep. A common practice is to allow 150 ft. square for a depth of 300 ft., and to increase the square by 20 ft. for every increase of 60 ft. in the depth of the shaft. Usually a safe system is to make the shaft pillar have an area equal in length in yards to the depth of the shaft in fathoms. Local conditions, however, require modifications. The inclination of the seam, nature of coal and rock, the nature of the buildings on the surface, and proximity of the sea will sometimes require the pillars to be of exceptionally large dimensions.

Pneumatic locomotives are employed in some of the large German collieries. The engine is constructed like an ordinary steam locomotive. An air-storage tank takes the place of the boiler. The air is stored under pressure varying from 700 to 1000 lb. per sq.in. In some of the engines the air passes into an auxiliary reservoir before entering the cylinders. The air pressure is reduced to about 150 lb. per sq. in. before entering the engine cylinder. The air is used expansively by means of the Stephenson link-motion gear. This system of underground haulage is cheaper and handier than rope haulage, and it is thoroughly safe and reliable.

There are two methods in general use for dealing with colliery fires. The commonest is by sealing off the district in which the fire occurs with masonry or brick walls with the view of cutting off the supply of oxygen. These walls are generally of double thickness, the space between the two courses being filled with clay, well tamped down. These walls must, of course, be air-tight. If the isolated area is extensive, the walls must be furnished at intervals with tubes and pipes for inserting pressure- and temperature-recording instruments, for conveying water and carrying any dangerous gases generated by the fire to the return air ways. The second method is to flood the fire area with water and choke the smouldering area with sand, or mud filling, which must be packed as hard as possible.

Underground mine ventilating fans have been successfully employed in English collieries to furnish the entire air-currents. The fans are placed at the bottom of the shafts, and are arranged so as not to interfere with the haulage and loading arrangements. This method allows coal to be hauled from both up-cast and down-cast shafts. The motive power is electricity. The conditions favorable to the use of underground fans may be summarized as follows: (a) Abundant and absolutely reliable, well duplicated, electric power. (b) A thin coal seam and long and irregular airways. In such circumstances the advantages gained by using underground fans are: (1) The use of both shafts for hoisting coal. (2) Greater elasticity in regulating air-currents. (3) Less loss of air through leakages.

In some coal-mining districts much trouble is experienced through the liability of the coal seam to spontaneous combustion. Underground fires thus started often destroy large areas of the coal and burn for years. To overcome the danger arising from this property of the coal, various modified methods of mining are adopted. Where the longwall system has been employed it is sometimes the custom to build solid continuous clay walls in order to prevent fresh air from entering the worked out areas. Where clay is not obtainable hand-packed sand banks are used. These precautions are chiefly successful when the retreating system of working is followed, that is to say, when the entries have been driven to the mine boundary and the coal is worked back to the shaft. Where this is not done, the panel system is usually adopted.

Correspondence and Discussion.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.

Readers are invited to use this department for the discussion of questions arising in technical practice or suggested by articles appearing in the columns of this JOURNAL.

Letters shoud be addressed to the Editor.

We do not hold ourselves responsible for the opinions expressed by correspondents.

Copper Smelting in the Reverberatory Furnace.

Sir—You may be interested in the results of our method of smelting copper at Nijni-Tagilsk (Ural, Possession of Demidoff, San Donato), now producing the largest amoumt of copper of any plant in Russia. During 1905 and 1906 we made experiments on smelting copper ores, with a view to elaborating the best method for the extraction of copper. The experiments were made in a 50-ton reverberatory regenerative furnace, and gave the following results:

By smelting ore without preliminary roasting, and without any fluxes (the ore was self-fluxing), we obtained a matte containing 70 to 75 per cent. copper. The slag carried 0.70 to 0.80 per cent. copper: but after the application of our process for the extraction of copper from silicate (and lasting three hours), it retained only 0.25 per cent. copper. The consumption of fuel for smelting ore varied from 15.6 to 29.0 per cent. of the charge.

N. LIBIDOFF and B. POMERANZOFF.

Oranienbaum, Russia, March 30, 1906.

Gold Mining in the Philippines.

Sir—May I offer an addition to the notes on the Philippines recently appearing in the JOURNAL (Oct. 28, 1905; p. 769)?

The superintendent of the Cogran Mining and Development Association is Geo. Lander. This company commenced the erection of a modern 10-stamp mill in October, 1905. The machinery for this has been purchased and is now due in Manila.

The association has a wagon road from its mines to tidewater, a distance of 4½ miles. Development work has been pushed, with the result that when the mill is ready 50,000 tons of ore (now fully developed) can be delivered to the mill at a cost not exceeding 25c. per ton. A shaft has been sunk that cuts the vein 102 ft. below the main tunnel. The ore at this point carries $28 gold per ton.

Firewood at Camp Luia costs $1.50 per cord. Water is plenty, 600 ft. from the mill; it has to be elevated 100 ft. Labor is plenty at 30c. per day, with board. From the mill to tidewater it is only 4½ miles over an almost level road. The climate at Camp Luia is good the year round.

GEORGE LANDER, General Manager.

Camp Luia, Philippines, Jan. 29, 1906.

The Cyanide Patents in Mexico.

Sir—I find in the JOURNAL (March 17 and 24), recent correspondence from Mexico City and Guanajuato, respecting a fight between the Guanajuato Reduction and Mines Company, and the MacArthur-Forrest Cyanide Company, which I represent.

These articles convey the idea that our property in the patents and legal rights in Mexico are fictitious and unsubstantial; that we extort royalties, and are generally oppressive and detrimental to the mining industry in this country; and that, consequently, all the mining companies in this Republic are our enemies. As this is erroneous, I desire, in justice to my company, to state the facts as they are, and beg that with your accustomed impartiality you will give publication to this letter.

About 12 years ago the Mexican Gold and Silver Recovery Company, Ltd., was formed in London to purchase the MacArthur-Forrest rights for Mexico, paying a large sum for them. Various other patents for improvements on the process were acquired afterward.

The company established itself in Mexico; brought over from Europe a large number of chemists; organized its offices and a central laboratory and test-plant in this capital, and in many different points in Sonora, Sinaloa, Zacatecas, Guanajuato, Chihuahua and other states. The process was then unknown in this country; and while no one doubted its novelty, its utility was only recognized to a limited extent. For the first nine years it spent over $500,000 and all its revenues from royalties, to introduce and foster this important metallurgical process, notwithstanding the strong prejudices against it then existing in many mining camps. More chemists, as time went on, were brought over and trained in the best use of the process, so as to be available and serviceable to the users of the cyanide process as plants were erected.

Within the last few years several suits were brought to annul one of our main patents. In every case the tribunals, with the whole litigation history of the patents in South Africa and elsewhere before them, have sustained the patents in their judgments. The validity of the patents is well established, although no case has ever reached the Supreme Court. In a case against the decision, or opinion of the Patent Office, which declared one of the patents "lacking in novelty", the court reversed the opinion; the general attorney accepted the judgment as well founded and declined to appeal.

All the large companies, represented by the best attorneys here, have had the legal status of our patents thoroughly investigated before paying us royalties, and we invite every new company or individual interested to do so, through reliable lawyers.

A certain combination of powerful and wealthy mining companies in Guanajuato united to resist and test the patents. It was naturally necessary to refuse the payment of royalty to bring the matter to a test; and they plainly stated their intention of using the process without authorization from us. On our side, we advised them that we should proceed criminally against them, and were at last compelled to do so. Hence our complaint to Judge Arizmandi of the First Criminal Court of Guanajuato. The statement that we made a descent upon the Guanajuato Reduction and Mines Company, without notice, and that the high-handed proceeding caused great indignation is therefore erroneous. They had every reason to expect, and must have been expecting this, sooner or later. We simply denounced the fact of the infringement and the judge did the rest. The representatives of the companies involved came to Mexico and consulted attorney Don Pablo Martinez del Rio, one of the ablest and most influential attorneys of the capital, who, after investigating and discussing the matter with our legal adviser and President Don José Luis Requena, advised the representatives to come to terms; the matter was amicably adjusted by their paying a substantial royalty, but moderate considering their vast properties and the great importance of their operations.

Our relations with all users of the cyanide process, with few exceptions, are most amicable and cordial. While the necessity for maintaining test plants all over the country has passed, now that the the process is better known, the central laboratory and test plant in this city is still maintained, and experiments are constantly going on tending to improve and make the process more efficacious; our offices are headquarters for the great majority of the cyanide chemists, and requests for information to remedy difficulties in the use of the process are constantly addressed to us and attended to; chemists make applications for positions, etc.; in fact our officers are general headquarters for the cyanide industry. I will venture to say that, apart from our rights under the patents, the services we render in the application of the cyanide process, far more than compensate the moderate royalties we collect. We are therefore no detriment to the industry, but, on the contrary, a great help and assistance. The Government recognizes this, and the president by special decree prorogued our three main patents for five years after their legal expiration, basing his decree upon these facts.

That the same patents have never been fully enforced in the United States may be a fact; but the cyanide company there paid dividends, and there has never been a judgment rendered against it.

In this country I believe the patent laws are more effective (in carrying out the purpose and intent of the Government and the legislators, to protect inventions that are new and useful) than in most other countries; the penal part of the law is very severe.

We are fully prepared and able to protect and sustain our rights. While we wish to avoid all litigation as far as possible, we are determined to prosecute criminally every infringer, whether in a combination or out of it.

ERNEST DUBOIS.

Mexico, D. F., March 31, 1906.

New Publications.

"Map of the Cahaba Coal Field." Sheets 1, 21x27 in.; in 6x9 in. paper case, 75c. University, Ala., 1905: Geological Survey of Alabama.

"Notes on Alloys." By L. Parry. Pp. 59. 5½x8½ in.; cloth, 7s. 6d. London, $2.65 New York. London, 1906: The Mining Journal.

"Poor's Directory." Pp. 244. 6x9 in.; paper. Supplementary to Poor's Manual. New York, Feb., 1906: Poor's Railroad Manual Company.

"Electric Railway Accounting." By W. B. Brockway. Pp. 84; illustrated. 5½x8 in.; cloth, $1.25. New York, 1906: McGraw Publishing Company.

"Ventilation of Buildings." By William G. Snow and Thomas Nolan. Pp. 83-40. 4 by 6 in.; paper, 50c. New York, 1906: D. Van Nostrand Company.

"The Wiring Handbook." By Cecil P. Poole. Pp. 85 + XIX; illustrated. 4½x8 in.; limp leather, $1. New York, 1905: McGraw Publishing Company.

"Standard Telephone Wiring." By James F. Fairman. Pp. 91; illustrated. 4½x7 in.; limp leather, $1. New York, 1905: McGraw Publishing Company.

"The Science Year Book." Edited by B. F. S. Baden-Powell. Pp. 365; illustrated. 6x9 in.; cloth, 5s. London, $1.75 New York. London, 1906: King, Sell & Olding.

"Report of the Reclamation Service, 1903-04." F. H. Newell, chief engineer. Pp. 653; illustrated. 6x9 in.; cloth. With a separate case for accompanying plans. Washington, D. C., 1905: U. S. Geological Survey.

"The Geology and Water Resources of the Western Portion of the Panhandle of Texas." Water Supply and Irrigation Paper No. 154, U. S. Geological Survey. By Chas. N. Gould. Pp. 64 + V; illustrated. 6x9 in.; paper. Washington, D. C., 1906: U. S. Geological Survey.

"Practical Electric Railway Handbook." By Albert B. Herrick. Pp. 460; illustrated. 4½x7 in.; limp leather, $3. New York, 1906: McGraw Publishing Company.

Contents: General tables. Testing. Track. The power station. The line. The car-house. The repair shop. Equipment. Operation.

Guide-Posts in the Desert.

SPECIAL CORRESPONDENCE.

At the last session of the Legislature of California the sum of $5000 was appropriated for the purpose of supplying metallic guide-posts to indicate the distance, direction and location of wells, springs, tanks or other sources of water fit for drinking purposes in the desert sections of California, particularly in the counties of Kern, Ventura, Los Angeles, Inyo, Riverside, San Bernardino and San Diego. It was provided that each county bear the expense of placing the guide-posts, as well as the inscriptions upon them. The purchase and distribution of the guide-posts was placed under the management and control of the State Department of Highways. The guide-posts designed by State Highway Commissioner Ellery, are entirely of metal, each consisting of an upright of galvanized-iron pipe, having an external diameter of 2⅜ in., 10 ft. high. The base of this upright or post consists also of galvanized pipe in the form of a cross with widespread arms, designed to be buried under the sand, and to maintain the post in an upright position even when the sand is blown away. The inscriptions on the sign boards are formed of perforated letters 2 in. high, each perforation being ¼ in. in diameter. The "hand" indexes are also stamped through the metal, and a brass collar bearing, in raised letters 1 in. high, the words "Destruction or injury of post a State prison offense," the whole combination making a very substantial guide-post. People can not utilize such a post as this for camp-fire purposes, nor is it apt to get much injury from the frequent sandstorms in the desert regions. The ordinary painted or enameled signs lasted scarcely one season, and were found to be practically useless. The sign-posts not only have the "hand" indexes pointing to the direction of water, but the distance in miles is also given on each post. The name of the road or trail is also designated, with the distance to fixed points from each road.

There has been for years much suffering, and occasionally death, from lack of guide-posts in these desert regions, which were frequented mainly by prospectors. It is not an easy thing for even old hands to find their way at times, and newcomers are apt to get into danger when without knowledge of points where water may be obtained. Most of this region is practically unsettled, and distances between inhabited parts are great. Every season some deaths occur of people who wander off the trails and fail to obtain water. The guide-posts have been made and are now ready for distribution. The idea is a good one, and will be of material benefit to the mining people in the southern and southeastern sections of California.

The New Ontario Mining Law.

SPECIAL CORRESPONDENCE.

The mining bill, which has been promised for some time, has been introduced in the Ontario Legislature by Hon. Frank Cochrane, Minister of Lands and Mines. Its provisions substitute a uniform system of taking up mining lands for the many and confusing methods obtaining at present. Under existing regulations there are four methods of securing public lands for mining: (1) by purchase; (2) by lease; (3) by staking out in a mining division: (4) by staking out outside a mining division. The purchase price of lands varies according to distance from a railway and situation in surveyed or unsurveyed territory. The amount of work to be done is different on purchased or leased lands, from that required on land staked out inside or outside of mining divisions, so that the variations in prices and conditions are hopelessly bewildering to many prospectors. Under the uniform system introduced by the new bill every prospector or person desirous of holding mining lands must procure a miner's license, good throughout Ontario, which will cost $10 per annum. The province will be divided into mining divisions, extending the system already adopted as regards the Michipicoten and Timiskaming regions. In each division where there is sufficient business to warrant it, a mining recorder's office will be opened. On making a mineral discovery the prospector must make his claim by planting posts at the corners and a discovery post on the outcrop. A claim will be a square of 20 chains (440 yards) to a side, with boundaries north, south, east and west. The prospector must then record his claim in the office of the mining division, and his discovery will be subject to inspection. If the inspector's report is to the effect that valuable mineral has been discovered, the prospector is required to do 30 days' work within 90 days; 60 days' work in each of the next two years and 90 days' work the third year—or he can complete the amount of work required within a shorter term. He is then at liberty to buy the land at $3 per acre, if in surveyed territory, or $2.50 in unsurveyed territoy. This will give an indefeasible title without further working conditions. The valuable discovery necessary to obtain title is defined as follows: "A vein, lode or other deposit of minerals in place, containing such quantities of mineral or minerals, other than limestone, marble, clay, marl, peat or any building stone, as to make it probable that the said vein, lode or other deposit is capable of being developed into a working mine."

In cases where, owing to the depth of soil or superimposed barren rock, minerals do not outcrop and discoveries consequently cannot be made without trenching, sinking a shaft or using a diamond drill, the bill permits the issue of what is known as a working permit, to be issued 60 days after application; provided that in the meantime no *bona fide* discovery of valuable mineral has been made. The working permit gives the holder exclusive possession for six months, on condition of his working on it five days per week. If at the end of the term, no discovery has been made, the permit may be renewed for another six months, and when discovery is made the land may be bought and patented in the ordinary way.

For the regions north of the Hight of Land, where there is reason to believe that such valuable substances as petroleum, natural gas and salt may be found as well as lignite and other minerals which do not come to the surface, "prospecting permits" may be granted for one year, covering 640 acres, for $100. The holder must spend in actual work a sum equal to $2 per acre and on discovering minerals the lands may be leased subject to a rental of $1 per acre and the expenditure of $2 per acre in work.

The bill also regulates mining partnerships, requiring particulars to be filed at the recorder's office, and naming an agent who will have authority to deal with the claim. Miners and mine laborers are placed by the bill in the same position as workers in other industries as regards enforcing claims for wages, which are constituted a lien on the property. Improved regulations are provided for securing the health and safety of working miners. The question of the taxation of mines so as to provide a revenue sufficient, not only to meet the expenses of the mining department, but also to give bonuses or other financial aid to metal refineries, is not dealt with in the present bill, but will be covered in a separate measure.

Graphite in Virginia.

Virginia has not heretofore been a producer of graphite; recent development in Albemarle and Orange counties, at the base of the Blue Ridge, has opened up promising deposits, which are to be worked by the Naylor-Bruce Graphite Company, of Charlottesville, Va.

In the Naylor and the Bruce mine, the graphite occurs among gneisses and syenites, in veins dipping at 45 deg. to the east. They range from 13 in. to 8 ft. wide, and are clearly defined from the foot and hanging walls by clay selvages. The graphite is dense and massive, permitting the extraction of single blocks weighing several hundred pounds. The crude ore, analyzed by Froehling & Robertson, of Richmond, showed 76.28 per cent. graphitic carbon.

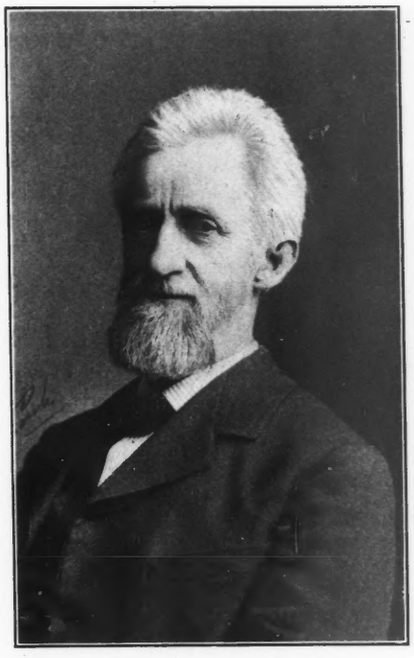
The operating company owns 624 acres of land on which graphite appears and is planning at once to build a factory for refining the product.

Nathaniel S. Shaler.

Nathaniel Southgate Shaler died at his home in Cambridge, Mass., April 10, of pneumonia. He had been operated on for appendicitis on March 25, but was recovering rapidly, when pneumonia set in. Professor Shaler was born in Newport, Ky., Feb. 20, 1841. He travelled extensively at home and abroad, and in 1859 he entered the Lawrence Scientific School, from which he graduated in 1862. He then served two years in the Union army as captain of a Kentucky volunteer battery, opposed to many of his old friends and neighbors. In 1864, ending his military service, he was appointed assistant in paleontology in Harvard, and in the year following became an instructor in geology in the Lawrence Scientific School. In 1868 he was appointed professor of paleontology and geology, and also took up some teaching in zoölogy. He continued teaching in this general field until 1887, when he became professor of geology, giving up the teaching of other subjects. He had followed this work continuously ever since. In 1873 he was appointed director of the Kentucky Geological Survey, and held that position until 1880, continuing his teaching meanwhile and devoting a part of each year to the work. In 1884 he was appointed geologist in charge of the Atlantic Division, United States Geological Survey. In 1891 he became dean of the Lawrence Scientific School, and had held that position continuously since, with distinguished success.

Dr. Shaler was a member of the American Association for the Advancement of Science, member and curator of the Boston Society of Natural History, and a member of the American Academy. He published reports on the geology of Kentucky, and reports to the United States Coast Survey. His papers on various subjects have been leading contributions in the proceedings of many learned societies and periodicals. He also published a number of books. He was author of "A First Book in Geology"; "Kentucky, a Pioneer Commonwealth"; "The Nature of Intellectual Property"; "The Story of Our Continent"; "Illustrations of the Earth's Surface"; "Sea and Land"; "Fossil Brachiopods of the Ohio Valley"; "American Highways"; "Features of Coasts and Oceans"; "Domesticated Animals: Their Relation to Man"; "The Individual: A Study of Life and Death," 1902; "The Citizen," a study of the relation of the individual to the State; "The Neighbor," a study of racial types; "Elizabeth of England," a drama in Shakspearean form; "The Interpretation of Nature"; "Aspects of the Earth"; "Man and the Earth," and a large number of minor works on geological subjects. He was also the editor of the compilation, "The United States of America, a Study of the American Commonwealth."

This list shows the remarkable extent and variety of Professor Shaler's activities. He was considered by many the most versatile man connected with Harvard University at any time in the last generation, and his intellectual power and energy were the wonder and admiration of his colleagues. He was known primarily as a geologist, but he had investigated as well practically every other branch of science, and perhaps the crowning feature of his work is to be found in his comparative studies of the sciences and of the philosophical bearings of all scientific knowledge. His work along this line is best illustrated by his work on "The Individual; a Study of Life and Death," a work in which he undertook to explain to the non-scientific reader the relations of the individual to his physical,



NATHANIEL SOUTHGATE SHALER.

social and intellectual environment. All of his work was performed with the enthusiasm and thoroughness of the born investigator. He was never known to leave a logical process half-developed, but carried all his reasoning to its final conclusions. In his scientific work Professor Shaler was essentially an explorer and investigator. While a keen student of the work of other men, he relied mainly for his own results upon his own observations at first hand, and this fact explains much of the freshness and vigor of his scientific writings.

He never appeared to care much for the closet study of exact sciences. He constantly applied mathematical computations in interpreting and generalizing from natural phenomena, but regarded mathematical processes as a useful instrument of research rather than an end worth while in themselves. Tangible, physical facts were his chief interest. Professor Shaler's technical scientific researches will probably be best remembered for his work on the shores of continents, a most difficult subject, which engrossed much of his attention during the last years of his life, and for his highly independent and original theorizing as to the causes of volcanic action and earthquakes. His work was so widely varied, however, that any prediction of this sort is difficult. He was a most enthusiastic student of every possible variety of geological and geographical material. As an administrator, he was successful in bringing up the Lawrence Scientific school, which had been rather neglected, to a high standard. Just before his last illness, he had completed plans for enlarging its scope and increasing its usefulness, with the aid of the large fund provided by the McKay bequest. To him also was due the successful development of the Harvard summer school. As a teacher and educator, he combined the exacting standards of the old-fashioned schoolmaster with a breadth of view and a progressive spirit which led him to welcome and vigorously promote all improvements in educational methods. But while approving all advances in method he held rigidly to old-time ideas of hard study and concentrated application to the subject in hand. While a strong believer in bodily exercise and systematically following that doctrine in his own life, he had little use for modern college athletics.

An appreciation of the man, written by a friendly hand, in the Boston *Transcript* says: "In his personal relations Professor Shaler was a most unusual man. To strangers he gave the impression of a certain abruptness of manner, but those who knew him learned that this was in appearance only, and that his habit of blunt, direct speech was really the expression of a simple, earnest, democratic nature, scorning all pretence of super-refinement and anxious to meet all upon terms of perfect equality. No human interest, however remote, was foreign to him. He combined the instinct of the true scholar with a wonderful breadth of sympathies and a fellow feeling for all. He had an unfailing sense of humor, which was often in full play when least expected.

"Among his many other activities, Professor Shaler was successful in business. He was interested, through his scientific researches, in a number of mining enterprises, and might undoubtedly have been a very wealthy man had he chosen to devote his time to business rather than to science and education. The wonderful versatility of his nature allowed him to devote some attention to business matters, chiefly as an expert adviser. But his great work in life was that of a scientist, thinker, teacher and organizer."

The trustees of the Edward Wilson estate, Victoria, Australia, have endowed a fund for an inquiry into the cause of "miners' phthisis."

Transvaal, Nevada.

SPECIAL CORRESPONDENCE.

The acme of "boom" is that of Transvaal. The strike there was made about March 24; the boom started March 30. By the end of the first week of April, 200 town lots had been sold at an average price of $175, some of the lots changing hands at $1000.

The ore is apparently a nearly unaltered rhyolite, showing minute quadrangular specks of gold under a strong glass. The country is already located for miles in all directions, the original disoverers having located 60 full claims. There is much excitement over this new strike.

The camp lies 18 miles northeasterly from Beatty and is reached by a long cañon walled in by basalt and rhyolite cliffs for much of the distance. There are a few prospecting tunnels along the route, made during the last few years. The camp, now consisting of 50 tents, lies in an open gulch among low hills a mile above the narrow part of the cañon.

So far the only showing of note is on the Transvaal claim where a trench 100 ft. long by 4 ft. wide and 2 ft. deep has been cut across the supposed strike of the ledge. This cut is near the summit of a rounded hill and is in decomposed rhyolite near the contact with a hill of tuff, or volcanic ash; this contact can be followed by the eye for a mile to the east. The ledge strikes north. It is too soon to say if there is a real ledge as the whole trench is in decomposed ground. Samples assayed in 10-ft. sections showed but little in the ends of this trench, but 35 ft. in the middle averaged perhaps $10 and a small portion will probably go $150 or more. Ore has just been struck 600 ft. to the north on the strike of the ledge. T. L. Oddie has secured an option on 300,000 shares in this property, at $1 per share, until April 21.

The town of Transvaal now has 150 inhabitants, but the rush is just starting. Town lots 30x140 ft. are selling at $400 each. Although the camp is one week old, there are already two saloons.

The southern extension of the Transvaal has been floated and treasury shares are selling at $0.15.

The discoverers of the Transvaal are Probasco and Chaffey. Both have been prospecting for the last 15 years and this is the first find they have ever made.

Hardening an ordinary twist drill in sulphuric acid makes an edge that will cut tempered steel. The acid should be poured into a flat-bottomed vessel to a depth of about ⅛ in. The point of the drill is heated and dipped in the acid to that depth. This makes the point extremely hard, while the remainder remains soft. If the point breaks reharden but with a little less acid in the vessel.

Protection Against Lightning.

The recommendations of the British Lightning Research Committee of 1905, are as follows: (1) Two main lightning rods, one on each side, should be provided, extending from the top of each tower, spire, or high chimney stack by the most direct course to the earth; (2) horizontal conductors should connect all the vertical rods (a) along the ridge, or any other suitable position on the roof, (b) at or near the ground; (3) The upper horizontal conductor should be fitted with aigrettes or points at intervals of twenty or thirty feet; (4) Short vertical rods should be erected along minor pinnacles and connected with the upper horizontal conductor; (5) all roof metals, such as finials, ridging, rain-water and ventilating pipes, metal cowls, lead flashing, gutters, etc., should be connected to the horizontal conductors; (6) all large masses of metal in the building should be connected to earth either directly or by means of the lower horizontal conductor; (7) where roofs are partially or wholly metal lined, they should be connected to earth by means of vertical rods at several points; (8) gas pipes should be kept as far away as possible from the positions occupied by lightning conductors, and as an additional protection the service mains to the gas meter should be metallically connected with house services leading from the meter.

Patent Office Skepticism.

The following anecdote which is related by the *Scientific American,* will appeal especially to inventors who have had personal transactions with the examiners of the Patent Office. A New York attorney filed an application for improvements in a centrifugal pump. The Patent Office declared the invention inoperative and demanded a working model. The Patent Office was requested to send an examiner to Trenton to inspect the machine in actual operation. This the Patent Office refused to do. The attorney, therefore, politely sent a seven-ton pump to the Patent Office to satisfy the skeptical examiner. Twenty-one men were required to get it into the examiner's office.

Patents Relating to Mining and Metallurgy.

UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications correspondents are requested to name the issue of the JOURNAL in which notice of the patent appeared.

Week Ended April 10, 1906.

817,158. TREATMENT OF BLAST-FURNACE SLAG FOR PRODUCTION OF MATERIAL SIMILAR TO TRASS, ETC.—Heinrich Collosseus, Berlin, Germany. Filed Aug. 14, 1905.

817,278. GRAVITY-CONVEYER.—Martin C. Schwab, Baltimore, Md., assignor to Gravity Conveyor Company. Filed May 29, 1905.

817,298. ROCK-CRUSHER.—John Y. Byers and James W. Myer, San Diego, Cal. Filed Apr. 19, 1905.

817,399. PROCESS OF MAGNETIC SEPARATION.—Frederick T. Snyder, Oak Park, Ill., assignor to International Separator Company, Chicago, Ill. Filed Dec. 20, 1902.

817,411. PROCESS OF TREATING ORES OF THE PRECIOUS METALS.—Ada C. Atwater, Manchester, Iowa. Filed Aug. 6, 1904.

817,412. CUPOLA.—Alphonse Baillot, Haybes, France. Filed June 6, 1905.

817,414. PROCESS OF REDUCING ORES.—Horace F. Brown, Chicago, Ill. Filed Oct. 24, 1905.

817,415. ORE-REDUCING FURNACE.—Horace F. Brown, Chicago, Ill. Filed Oct. 24, 1905.

817,438. REGULATION OF FURNACES.—Embury McLean, New York, N. Y. Filed May 23, 1904

817,609. CHUCK FOR ROCK-DRILLS.—Thomas E. Adams, Cleveland, Ohio, assignor to The Adams Drill Company, Cleveland, Ohio. Filed June 29, 1903.

817,623. SAFETY-GEAR FOR SKIPS, CAGES, AND THE LIKE.—James W. Campbell, Salem, Va. Filed Oct. 27, 1905.

817,643. DRIER.—John R. Hussey, Indianapolis, Ind. Filed May 17, 1905.

817,655. ORE-SEPARATOR.—George Moore, London, England. Filed Feb. 16, 1906.

817,672. ROCK AND ORE BREAKING MACHINE.—Edward H. Sansom, Goodwick, England. Filed May 14, 1904.

817,714. APPARATUS FOR CASTING CRUCIBLE STEEL.—Leslie E. Howard, La Grange, Ill., assignor to Simonds Manufacturing Company, Fitchburg, Mass. Filed Dec. 3, 1904.

817,736. APPARATUS FOR DETECTING AND LOCALIZING MINERAL DEPOSITS. Leo Daft, Ealing, and Alfred Williams, Wimbledon, England, assignors to The Electrical Ore Finding Company Limited, London, England. Filed Oct. 14, 1902.

GREAT BRITAIN.

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Week ended March 24, 1906.

25,116 of 1904. CONCENTRATOR — G. Moore, London. A concentrator of the traveling-belt type.

27,397 of 1904. ARTIFICIAL FUEL.—Central Turfkohlen Gesellschaft, Berlin. In making a fuel out of peat, first expelling moisture and light gases from the divided peat in a retort and subsequently pressing into briquettes without intermediate cooling.

3619 of 1905. SLAG CEMENT.—H. Collosens, Berlin. Adding nitrates or sulphates of lime, alumina and magnesia to molten blast-furnace slag, so as to produce a cement that sets more rapidly than the usual slag cement.

13,141 of 1905. HARDENING STEEL—G. L. Hoffman, Berlin. A hardening and toughening composition for improving poor qualities of steel, consisting of 600 parts of rosin, 80 parts of linseed oil, 200 parts of potassium ferrocyanide, 40 parts of charcoal and 80 parts of copper sulphate.

14,329 of 1905. PULVERIZING APPARATUS.—H. Collosens, Berlin. An apparatus for pulverizing liquid slag, consisting of a perforated and ribbed drum revolving in the stream of slag, the perforations serving to introduce the liquid which does the pulverizing.

21,398 of 1905. CONCENTRATOR.—R. E Saunders, London. A pneumatic apparatus for separating gangue from mineral, consisting of a series of baffle plates, against which the ore is drawn by suction.

23,690 of 1905. CRUSHERS. — S. Mason, Leicester. Improvements in the toggles of jaw crushers.

26,263 of 1905. BLAST FURNACE.—The Frodingham Iron and Steel Company, Lincoln. In blast furnaces where high pressure and fine ores are used there is a tendency for the building up on the bosh-walls of accretions of fine ores and coke dust. This invention arranges for the placing of tuyeres at suitable places and at proper angles in order to remove or prevent the formation of such accretions.

Personal.

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

F. J. H. Merrill, of New York, is visiting Sonora, Mexico, on professional business.

A. B. Carpenter, a prominent mining engineer of Mexico City, is in San Francisco, Cal., on business and pleasure.

F. P. Jones, general manager of the Dominion Iron and Steel Company, Sydney, N. S., was in Toronto recently.

F. H. Symonds, of Providence, R. I., has been in Gilpin county during the past month, looking after his mining interests.

A. H. S. Bird, of Salt Lake, spent several days in Montana recently. He controls a group of copper claims near Butte.

George W. Kessler, formerly superintendent of the Britannia mine, Howe Sound, B. C., is now in Los Angeles, California.

William R. Todd, of New York, president of the Quincy Mining Company, is at the mine at Hancock, Mich., for a brief visit.

Thos. Kiddie has resigned as general manager for the Britannia Smelting Company, and is taking a much needed rest at Victoria, B. C.

Frank L. Wolfer, of Empire, Colo., manager of the Empire Smelting Company has gone East for business and personal purposes.

James W. Neill, consulting engineer for the East Butte Copper Company, spent several days in Butte recently in the interest of the property.

F. H. Begole, of Marquette, Mich., president of the Begole Mines Syndicate, has left for Goldfield, Nev., to look after the interests of his company.

Juan Felix Brandes returned to Denver from Mexico and California a few days ago and will leave for Europe on professional business at once.

Fred Smith, superintendent of the Wolverine and Mohawk mines in the Michigan copper district, was at West Baden, Ind., last week for his health.

James Breen, who with others built the Crofton, B. C., smelter, spent several days in Butte recently and left for Chicago April 8 on mining business.

A. J. McMillan, managing director of the Le Roi Mining Company, has returned to Rossland, B. C., after an absence in England of about eight months.

Karl Eilers, of the American Smelting and Refining Company, has gone to Salt Lake City for a long stay, in connection with the interests of his company.

Harry L. Kaufman, vice-president of the Mary Charlotte Mining Company has returned to his home in Marquette, Mich., from a two months' trip in Eupore.

C. F. Eckman, of Empire, Colo., has returned from Guaymas, Mexico, where he went to look after a contract for a railway extension to the Gulf of California.

H. F. Mercer, chief engineer at the Baltic mine of the Copper Range Consolidated Company, succeeds R. R. Seeber as chief engineer at the Champion mine.

Clarence B. Wisner, manager of the property of the Montana Zinc Company near Butte, has returned to Butte from New York, where he spent several months.

Dr. O. H. Lau, Dr. A. N. Collins and C. E. Kanter, of Detroit, Mich., have been visiting Gilpin county, Colo., during the past week as stockholders in the Pleasant Valley Mining Company.

W. P. Clough, of Empire, Colo., has returned after an absence of several weeks in eastern cities, interesting capital in an electric and power plant to be installed near Empire.

I. H. Meserve, president of the Adventure Consolidated Copper Company, and a director of the Quincy and Rhode Island, is inspecting these properties in the Lake Superior copper district.

R. R. Seeber, of Houghton, Mich., has resigned his position as chief engineer of the Champion copper mine, to become superintendent of the King Philip, Challenge and Winona mines.

Dr. Robert Bell, of the Dominion Geological Survey, has gone to Cobalt to make a thorough survey of the mining district. He is accompanied by Professor Hidden, of New York.

Ernest Waterman, of Princeton, Similkameen, B. C., manager of the Vermilion Forks Mining and Development Company, Ltd., has returned from a winter vacation spent in California.

W. G. Trethewey, owner of the New Ontario mine, Cobalt, was in Toronto April 12. He stated that the report that he had sold the mine were incorrect, and that it was not in the market.

R. B. Lamb, of Hedley, Similkameen, B. C., manager of the Daly Reduction Company operating a 40-stamp mill at Hedley, left last month for Denver, Colo., *en route* to New York, on a business trip.

Lucien S. Robe, for several years mining engineer with the North American Trading and Transportation Company, in the Canadian Yukon, has left Dawson for Tanana, where he will practise his profession.

Geo. H. Robinson, of Salt Lake City, Utah, who is president of the Britannia Copper Syndicate, Ltd., and the Britannia Smelting Company, Ltd., both operating in British Columbia, recently visited the Britannia mine, at Howe Sound, B. C., and the smelting works at Crofton, Vancouver Island.

R. Chester Turner, of San Francisco, has gone to Tonopah, Nev. He has been appointed superintendent of the Tonopah Mining Company, and of the Tonopah Belmont and the Tonopah Jim Butler companies.

We regret to hear that Edwin S. Holden met with an accident recently while making some professional examinations in New Mexico, and is now laid up at St. Luke's Hospital, Denver, Colo., with a broken leg.

J. W. Mercer, general manager of the South American Development Company of New York, recently returned from a business trip to Ecuador and Peru. He left New York again last week on a professional trip to the Lake Superior country and Denver.

Joseph A. Coram, organizer of the American Consolidated Copper Company. arrived in Butte April 8 to look after the affairs of the company. He expects to visit Bingham camp in Utah and the Balakalala mine in California before returning to Boston.

Knowles Croskey, chief engineer of the Southwestern Development Company, left Philadelphia this week for Martinez, Arizona. Thence he will go to Sinaloa, Mexico, by way of San Francisco, returning by way of Idaho, where he will look over the Thunder Mountain Gold Company's property.

A. C. Garde, formerly resident manager of the Payne Consolidated Mining Company, operating the Payne mine and concentrator in the Slocan, B. C., has taken charge of development work at the mine of the Argenta Mines, Ltd., of Boston. Mass., which is situated near the head of Kootenay Lake in British Columbia.,

W. E Zwicky, of Kaslo, B. C., manager of the Rambler-Cariboo Mnes, Ltd., which company is nearing the completion of a deep-level tunnel about 4500 ft. in length at its mine near Kaslo, lately paid a visit to the Sullivan Group smelter at Marysville, East Kootenay, where the Huntington-Heberlein process has been in use for months.

J. H. Kennedy, assistant general superintendent, and H. M. Adams, vice-president, of the Great Northern Railway. R. C. Morgan, superintendent of the Washington & Great Northern, and D. F. Anderson, president of the Belcher Mining Company, visited the Belcher mine, near Republic, Wash., April 2, for inspection and to confer regarding ore shipments.

D. B. Brown, of New York, president of the Brown-Alaska Mining Company and the Alaska Smelting and Refining Company, recently met J. L. Parker, his mine manager, and Paul Johnson, smelter manager, in Seattle, Washington, and afterward spent a few days at Victoria. Messrs Johnson and Parker came down from Prince of Wales Island, Southeast Alaska, to meet Mr. Brown.

L. R. Lemoine has been elected general manager of the New Jersey Zinc Company, with office at 71 Broadway, New York. R. M. Catlin has been appointed superintendent of mines, with headquarters at Franklin Furnace, N. J. Mr. Catlin was formerly general manager of the Consolidated Gold Fields of South Africa, Johannesburg, Transvaal.

W. B. Stewart, for the past five years superintendent of the Big Five properties in Boulder county, Colo., has been appointed superintendent of the Consolidated Gem Mines Company at Idaho Springs. His successor is J. J. Willis, of Boulder, Colo. D. W. Carr who resigned the superintendency of the Consolidated Company at Idaho Spings, has gone to San Diego, Cal., to take charge of a large group of mines about forty miles from that city.

Obituary.

José Ramon de Ibarrola y Vertiz, a young engineer of Mexico City, died at Salina Cruz, Mexico, March 27, of yellow fever. He was a young man of much promise.

Societies and Technical Schools.

University of Idaho—Plans have been completed for the construction of the new buildings for the mining department of the University of Idaho at Moscow. It is estimated that the two buildings will cost $40,000 exclusive of apparatus. The appropriation was made by the last Idaho legislature for this purpose. The metallurgical building, 96x68 ft., will contain ten ore bins, giving a total capacity of 50 tons. The ore will be conveyed by automatic apparatus to the crushing and sampling departments.

Montana Society of Engineers—At the March meeting, in Butte, this society voted to retain its connection with the Association of Engineering Societies. Dr. F. W. Traphagen, of the Colorado School of Mines, for many years connected with Montana's educational institutions, gave an account of an ingenious method for locating the source of some stolen gold bullion by chemical analysis. He also gave an outline of a prospective trip of the Senior Class of the Colorado School of Mines as follows: The class, consisting of more than thirty members, will leave Golden, Colorado, April 29, visit numerous mines and reduction works in Colorado, thence go to Utah for similar investigations. They expect to arrive in Butte May 5, and remain 12 days, then go to the Black Hills and reach home the day before graduation.

Harvard Mining Club—At the regular meeting in Cambridge, Mass., on March 29, Dr. E. D. Peters addressed the club, in the Harvard Union, on "First Principles of Optioning Mines and Organizing. Mining Companies." Dr. Peters gave a very practical lecture on the way in which mines are optioned, how they are subsequently secured or lost, depending on whether they were simply bonded or secured by a deed in escrow, and finally how companies are formed to develop them. He also explained the part the promoter played in such companies when the resources at hand were sufficient to build the mill and open the mine on a paying basis. On the other hand, when the capital secured at the time the company was organized, proved to be insufficient, the part of the capitalist in the reorganizing of the company was shown.

Trade Catalogs.

Receipt is acknowledged of the following trade catalogs and circulars:

Backus Water Motor Company, Newark, N. J. Catalog, The Backus Engines—Gas and Gasolene. Pp. 31, illustrated. Paper, 6x10 in.

Wallach Bros., 57 Gracechurch St., London, E. C. Catalog, Blue List of Safety Appliances. Pp. 32, illustrated. Paper, 6x9 in.

American Locomotive Company, 111 Broadway, New York City. Catalog, Four-Cylinder Balanced Compounds. Pp. 32, illustrated Paper, 6x9 in.

American Water Softener Co., 1011 Chestnut St., Philadelphia, Pa. The American Water Softener. Pp. 8; illustrated; paper, 4 by 8½ in.

C. T. Carnahan Manufacturing Company, 1724 Lawrence St., Denver, Colo. Pamphlet, Dust Allayer for the Murphy Drill. Pp. 8, illustrated. Paper, 5x8 in. Pamphlet, Automatic Feeder for the Murphy Drill. Pp. 2, illustrated. Paper, 6x8 in.

Parke & Lacy Co., 21 and 23 Fremont St., San Francisco, Cal., Hoisting, Pumping and Crushing Machinery and Supplies. Pp. 38, illustrated; paper, 6 by 9 in. Jan. 1, 1899. Catalog No. 1. Gold Mills. Pp. 78; illustrated; paper, 6 by 9 in. February, 1901.

The Risdon Iron Works, San Francisco, Cal. Catalog No. 1., Engines and Boilers. Pp. 48, illustrated; indexed; paper, 7 by 10½ in. 1900. Catalog No. 3. Hoisting Machinery. Pp. 76, illustrated; indexed; paper, 7 by 10½ in. 1901. Catalog No. 4. Risdon Patent Tangential Water Wheels. Pp. 48; illustrated; indexed; paper, 7 by 10½ in. 1900. Catalog No. 5. Evans' Hydraulic Elevators. Pp. 48; illustrated; paper, 7 by 10½ in. 1904. Catalog No. 6. Hydraulic Machinery. Pp. 62; illustrated; indexed; paper, 7 by 10 in. Catalog No. 7. Air Compressing Machinery. Pp. 76, illustrated; indexed; paper, 7 by 10 in. Catalog No. 8. Bryan Roller Quratz Mill. Pp. 48; illustrated; indexed; paper, 7 by 10 in. 1897. Catalog No. 12. Gold Milling Machinery. Pp. 90, illustrated; indexed; paper, 7 by 10 in. 1903. Catalog No. 14. Johnston Concentrator. Pp. 36; illustrated; paper, 7 by 10 in 1905. Catalog No. 17. Gold Dredging Machinery. Pp. 50, illustrated; paper, 7 by 10 in. 1903. Catalog No. 18. Electric Hoisting Machinery. Pp. 20; illustrated; paper, 7 by 10 in. 1901.

Industrials.

The J. Geo. Leyner Engineering Company, of Denver, is installing an air-compressor plant and drills at the Joe Reynolds mine at Larson, Colorado.

The new factory of the Electric Cable Company, which is now in course of construction at Bridgeport Conn., will be completed the latter part of Apil. The plant will be devoted to the manufacture of Voltax, the new insulating compound, for magnet wire, rail bonds and field and armature coils.

At a meeting of the directors of the Westinghouse Electric and Manufacturing Company, held Tuesday, April 10, L. A. Osborne, formerly third vice-president of that company, was elected second vice-president to succeed Frank. H. Taylor, resigned. Mr. Taylor remains a director of the company.

The Lake Superior Corporation has purchased from the Canadian Government the Heroult experimental plant lately in use at Sault Ste. Marie, for the electrical smelting of iron and nickel ore, and will utilize it for treating some 10,000 tons of nickel matte which it has long had in stock. If the new process proves as commercially valuable as is claimed, it will be enlarged. The plant is located in one of the buildings of the Lake Superior Corporation at the Sault.

At the second annual meeting and banquet of the Technical Publicity Association, held April 5, at the Aldine Association, New York, the following officers were elected: President, F. H. Gale (General Electric); first vice-president, H. M. Cleaver (Niles-Bement-Pond); second vice-president, C. B. Morse (Ingersoll-Rand); secretary, Rodman Gilder (Crocker-Wheeler); treasurer, H. M. Davis (Sprague Electric); Executive Committee, Robt. L. Winkley, and G. M. Basford.

Work has been started at Redondo, California, on the erection of the largest steam-power plant for generating electricity west of the Rockies. The plant will be built and operated by Henry E. Huntington, the Pacific Light and Power Company and C. C. Moore & Co. The plant principally is to supply power for the Los Angeles Railway. It is to be completed in a year. Complete, it will generate 25,000 h.p. The machinery will be supplied by Chas. C. Moore & Co., San Francisco.

The Pelton Company has received an order from the East for a complete Pelton

equipment to operate under two heads, conditions being such that two independent streams afford heads of 630 and 420 ft. respectively, with varying water quantities. This involves two wheels of different diameters mounted on the same shaft, which is direct-connected to an electric generator by means of Pelton flexible leather link couplings. A single governor controls both wheels by means of stream-deflecting hoods on the nozzles.

Construction News.

Jamestown, Colorado—Arrangements are being made to install machinery on the Thunderbolt group at Jamestown. Sealey, Davis & Phillips are owners.

Georgetown, Colorado—Machinery for hoisting and drilling is to be put in at the Early Sun group. D. W. Shepard, Georgetown, is manager.

Georgetown, Colorado—The Comet Mining and Leasing Company is arranging to build a tramway at the mine. H. Colburn, Idaho Springs, Colo., is manager.

Gilson Gulch, Colorado—The Fostoria Mining Company is preparing to install machinery. W. E. Campbell, Idaho Springs, Colo., is manager.

Black Hawk, Colorado—The Banzai Mining Company is arranging to put in new machinery at its mine. A. Watters, Bald Mountain, Colo., is superintendent.

Chicago Mountain, Colorado—The Bismarck mine has been leased to Philip Mixsell, of Idaho Springs, Colo., who will put in an air-drill plant at the mine.

Guanajuato, Mexico—The Guanajuato Development Company is having plans prepared for a new mill at the Negociacion del Cedro. The address is at Guanajuato.

Amador City, California—The Bunker Hill Mining Company proposes to add 20 stamps to its present mill. The address is at Amador City, Amador county, California.

East Argentine, Colorado—The Waldorf Mining Company intends to enlarge its concentrating plant at the Paymaster mine. M. Wilcox, Silver Plume, Colo., is manager.

Spring City, Missouri—A 100-ton concentrating plant is to be built by the lessees on the McCown land. J. E. Vright, Spring City, Mo., and Detroit, Mich., is in charge.

Empire, Colorado—The Covode Mountain Mining Company is making arrangements to put in a power plant. B. J. Hatmaker, of Empire, Colo., and Rochester, N. Y., is in charge.

Butte, Montana—The Butte Copper and Zinc Company will equip the Emma mine with electrical machinery and will build a 500-ton zinc smelting plant in Butte or close to it. Clarence B. Wisner, manager of the Montana Zinc Company, has charge.

Special Correspondence.

San Francisco. April 14.

The Selby Smelting and Lead Company has lost its first suit in the matter of damages caused by smelter fumes. This was in the case of C. B. Deming, who claimed $6500 damages for loss of stock, pasturage, etc., the verdict of the jury being in his favor for $200. The company has filed a notice of appeal, and until the matter is decided by the higher court nothing will be done with the twenty-two similar cases filed against the Smelter Company. Meantime the county of Solano, has commenced suit against the Selby Company, on similar grounds. The salt water arm of the bay known as Carquinez straits, connecting San Pablo and Suisun bays, lies between the smelting plant and the Solano county shore, the works being in Contra Costa county, opposite. In this latter suit the Selby Company denies all the material allegations in the complaint. Moreover, the county is alleged to have been guilty of laches in permitting and acquiescing in the expenditures by defendant in the erection and improvement of the works.

The California Oil Producers' Association has decided to begin an aggressive campaign in its own interest among the producing oil companies which are not under obligation to deliver oil on long time contracts. The president of the association has submitted figures to show that the consumption of petroleum on the Pacific Coast has caught up to the California production. The directors of the association have determined to recommend still further curtailment of output and to sell oil on daily runs only.

Brokers at Pittsburg, Penn., are reported here to be heading a movement to protect the public of that vicinity from the fake mining companies which have been advertising stock for sale and with good success. Large numbers of people have been victimized. Inquiry has been made in this city by these Pittsburg men as to whether Nevada has a law providing punishment for men engaged in such. While California has such a law, there is as yet none of like character in Nevada. The Pittsburg Stock Exchange proposes to bring action against a number of the fake mine promoters in California. A movement is now on foot to have a law similar to the California measure passed by the next Legislature of Pennsylvania.

The entire senior class of the Department of Mining of the University of California, numbering 45 in all, will go to Grass Valley and Nevada City, and visit all the prominent mines. Professor Lawson, the geologist, will accompany the party. The students will remain about a week examining the practical features of both underground and surface work.

At the annual meeting of the Selby Smelting and Lead Company this week, A. J. Ralston, who has been president for many years retired from the corporation and will now take a well earned rest. Henry B. Underhill, Jr., for over a quarter of a century the secretary and afterward first-vice-president, has been elected president in Mr. Ralston's place. Charles J. Durbrow has been chosen secretary in place of Geo. L. Underhill, who has gone into other business. E. B. Braden, representative in San Francisco of the American Smelters' Securities Company, was chosen first vice-president; and Edward Brush, second vice-president. These compose the directors with the addition of Alfred von der Ropp, general manager of the Selby smelter, and W. R. Rust, who has charge of the Tacoma smelter. This new set of officers represents the Guggenheim control of the company.

Goldfield, Nev. April 14.

The tube-mill which was recently installed in the Combination plant is now in operation. The pulp from the 20 stamps is reground in a Bryan mill and led to a cone classifier, the discharge from which passes into the tube-mill and is ground to 100 mesh or finer. The product from the tube-mill is passed over a Wilfley slimer, which has also been recently installed, before going on to the tanks for cyanide treatment. The entire slime output of the Combination plant is now treated very satisfactorily by the Butters process, which gives a good extraction at a small expense per ton for labor.

At the Red Top mill a filter-press for slimes treatment is now being installed. The press is of the Stilwell-Bierce & Smith-Vaile make, and has a capacity of 2½ tons of dry slime per charge. The building for the press in now completed and the press will soon be in operation.

The Kinkead mill is idle at present awaiting the installation of a cyanide plant. The plant will be of sufficient capacity to treat the tailings produced by the three Kinkead mills.

The Nevada Water Company is now laying a pipe line from Lida to Goldfield, about 28 miles. The line will commence with 9-in. pipe, and will deliver an ample supply of water to the camp for milling and domestic purposes at a reasonable figure.

A valuable shipment of ore went from the Florence mine to the Globe smelter at Denver on March 30. While ore is being hoisted to the surface regularly, systematic development work is being carried on in the lower levels.

It is reported that cinnabar has been struck on the Brooklyn property, which lies in the extreme northeastern end of the Goldfield district.

A strike was recently made on the Blue Bull property which is south of the town of Goldfield.

Bradbury and partners have sunk a shaft to a depth of 65 ft. on their block of Mohawk ground. It is their inten-

tion to sink 75 ft. and then crosscut to explore a ledge which passes through the ground.

Miles & Lutz have gained a depth of 80 ft. on the Daisy claim in Diamondfield. Their block of ground lies between the Gold Coin and Great Bend, and from all indications the veins of these properties will be cut when the necessary depth is attained.

Samuel Newhouse recently purchased a controlling interest in the Montgomery Mountain property at Bullfrog. Work has been commenced to develop the property systematically. As the claims lie on the side of a mountain the ground will be exploited by means of tunnels.

A hoisting plant has been ordered by the Bullfrog Gold Mountain Company, and is now on its way from San Francisco. The shaft is now down 100 ft. about.

A large force of men is now at work on the Montgomery-Shoshone property. The main shaft is being lowered as fast as possible. At 300 ft. a station will be cut and a drift run to connect with the Polaris shaft about 400 ft. south. The object of connecting the shafts is to get better ventilation in both properties.

Salt Lake City. April 14.

The final payment having been made on its property, the Consolidated Flagstaff Mining Company is ready to commence a development. The company's holdings consist of 235 acres, which adjoin the Columbus Consolidated at Alta, and include the Flagstaff, once a noted Utah producer. The company is capitalized for 400,000 shares of the par value of $5 and the officers are: Thomas J. Pringle, of Milwaukee, president; John A. Kirby, Tonopah, Nev., vice-president and manager; Kenneth W. Jacobs, Milwaukee, treasurer; Phil D. Durant, Milwaukee, secretary; these, with G. S. Holbert, St. Claire, Michigan and E. A. Duval, of Milwaukee, are directors. William M. Wantland, of Salt Lake, is assistant manager. It is the intention to run a tunnel for 2400 ft. and raise to connect with the workings of the old Flagstaff mine.

The annual meeting of the stockholders of the Century Gold Mining Company, operating in Park Valley district, resulted in the re-election of the old board. P. W. Madsen, president and manager, of Salt Lake, reported that conditions are better at the mine than they were a year ago; that the mill would be started up as soon as the condition of the roads improves, probably about May 1.

The special meeting of shareholders of the Mammoth Mining Company, called for March 31 to consider the matter of re-incorporating under Nevada laws for 400,000 shares of $2.50 each, has been indefinitely postponed.

The Beck Tunnel Mining Company, operating in the Tintic district, has declared a dividend for April of 2½c. a share, $25,000, payable April 20. This is an increase of 1c. a share over the last. The company paid $80,000 during the past five months. Jesse Knight, Provo is manager.

A new mining suit has been filed. The St. Louis-Magnolia Mining Company, is plaintiff, and the Silver King Mining Company, David Keith and Thomas Kearns, president and manager, respectively, are defendants. Trespass and unlawful extraction of ore are alleged and $900,000 damages are sued for. The plaintiff owns two patented lode mining claims which are entirely surrounded by lands of the defendants. The plaintiff is now sinking a shaft on the ground involved, which will intersect, it is said, the workings run by the Silver King. The latter will set up the defense that it had a right to mine the ore taken out, claiming the apex to the vein.

The annual meeting of the South Swansea Mining Company, resulted in the election of J. M. Wheeler, C. V. Wheeler, J. T. Croxall, L. E. Riter and W. H. Farnsworth, all of Salt Lake, directors. The report, covering three years' operations, shows ore sales aggregating $63,667; received from assessments, $6000; other sources, $1549, or a total of $71,216. The disbursements amounted to $68,839, leaving a balance of $2377. The ore mined amounted to 4675 tons and contained 224,325 lb. lead, 78,880 oz. silver, 18,842 oz. gold. The ore carries an excess of iron and has been sought by the smelters during the past year. The mine is located at Silver City, Tintic district.

Breaking of ground for the new 3000-ton concentrating mill of the Boston Consolidated Mining Company, near Garfield, Salt Lake county, will begin in a few days and letting of contracts for the buildings and equipment will immediately follow. The plant is to be constructed under the supervision of L. H. Wheeler, of Denver, with Metallurgical Engineer A. J. Bettles. Stamps are to be used for crushing. The building of this plant and that now being erected by the Utah Copper Company, a few miles away, will furnish some interesting demonstrations for those interested in ore dressing. In other words, it will be in the nature of a competition between stamps in the case of the Boston and rolls and Chilean mills at the Utah Copper. The ores to be treated will come from the copper-bearing porphyries of Bingham, and are identical in character.

The renewed activity in the camp of Stateline has stirred the owners of the Ophir property, which is equipped with a large mill, into action. It is stated that steps will be taken to re-open the mine to further development.

Denver mining men are making investigations in the unexplored region in southeastern Utah, including La Sal mining district.

Utah camps were recently visited by the worst snow-storm of the year. The production, as a consequence of bad roads, will be lighter than usual for a week or so.

Socorro, N. M. April 14.

In Santa Fé county the demand for zinc has brought fortune to several old-time claim owners at Cerrillos and Bonanza, where the veins are lead and zinc sulphides with a little copper, silver and gold. It is expected that the Keystone concentrator will soon resume, but the Cerrillos smelter shows no signs of life. The San Pedro Copper mine still remains closed, in spite of its modern smelter and the high price of copper. It is claimed that the smelting process will not permit the profitable treatment of the large reserves of 4 to 6 per cent. copper ore still existing in the mine.

The placers near Golden are extensive and fairly rich, but lack water. J. A. Wood, manager of the Golden Bullion Mining Company, is putting in a large dredge of special design. Other companies operating are the Racine and the Ora Quay.

In Otero county the pipe-line from the Sacramento mountains, to supply water for the smelter of the Southwest Company at Jarilla and for the placers of the Electric Mining Company at the south end of the Jarilla range, is well advanced. A spur of the El Paso & Southwestern railroad is completed from Jarilla to the Southwest Company's mines. On the Nancy Baird a hoist and compressor has been installed, and grading is in progress for a tramway from the Lucky to the adjoining mines and dumps. The By Chance reports the uncovering, by trenching, of a new orebody with considerable chrysocolla. O. P. Kreuger, of San Antonio, Texas, has the contract for the Jarilla smelter, and has nearly completed the foundations.

Leadville. April 14.

The Mammoth ore-shoot, Big Evans gulch, is now considered independent of any so far found in this section, and mining men now believe that the orebodies of Carbonate and Fryer hills trend to the north, despite the Iron mine fault. If development work on the Mammoth proves this theory to be correct, then Canterbury hill to the north will become one of the most active sections in this district. So far the trend of the Mammoth shoot is northeast and southwest like all of the large bodies in the camp, and it is certainly an orebody and not a pocket. The shaft is now down 12 ft., and still in solid ore. Samples taken daily from all over the bottom of the shaft show that the values are holding up, as the lowest average shows 130 oz. silver per ton, and 30 per cent. lead. The work of sinking is slow on account of the flow of dolomite sand which plugs the valves of the pumps. The strike has been the

means of bringing a number of capitalists to the camp with the view of securing ground in the neighborhood, and several deals are now pending to work territory that has been idle for many years.

A good body of ore was opened during the week in the west drift of the Brattleboro, 300 ft. from the shaft, and the values in gold, silver and lead run $30 per ton. The vein is 4 ft. wide and is dipping under the drift; this will probably necessitate the sinking of a new shaft. The ore was found at a depth of 160 ft. from the surface, so it will not be a difficult or expensive undertaking to send down a new shaft. This is supposed to be an extension of the Katy shoot of the New Monarch Mining Company. The initial shipment goes out this week.

Returns from the first car of rich ore shipped from the Bessie Wilgus give $1,000 per ton net; this is better than the car samples by several hundred ounces. As the work proceeds on the vein it widens, and is now fully 5 ft. with top and bottom still to be found. The trend holds steadily to the southwest, and the work will be carried to the side-lines. It is the richest silver ore found in the camp for many years. The strike, however, is not of so much importance as that of the Mammoth, as the latter opens up a territory that has been considered barren from the beginning.

The Sequin, to the north of the Bessie Wilgus, has opened in one of the lower levels, a body of gray sand that runs from 50 to 70 per cent. lead. Work is being rushed on it to determine the extent of the find.

There is quite a demand on the part of the smelters for fluxing ores, and this has stimulated mining in different sections of the camp, and Fryer hill in particular. During the week a number of leases have started on the Dunkin, Matchless, Little Pittsburg, Chrysolite, etc., and they will be able to ship in the neighborhood of 150 tons daily of the stuff desired by the smelters.

Considerable activity is noticeable in the Poverty Flats section, and, in addition to the Northern shipping 125 tons of iron daily, ore is going out from the Sam Small, Jensen, etc. The Sam Small shaft will be sunk to the lower zone to catch the sulphide supposed to exist all over this district.

The drift from the bottom of the Cleveland shaft of the New Monarch Mining Company, to cut the body of low-grade gold quartz, is within 100 ft. of its destination, and should be completed by the end of the month. It is stated that the company has perfected arrangements to erect a mill this summer to treat this ore; the whole body of ore averages $6 gold per ton.

The Jennie June, East Tennessee Park, has been working a small force of men all winter, and taken out considerable gold ore, which will be shipped as soon as the roads will permit. The property is located close to the line that divides Lake from Eagle county at Tennessee pass.

Breckenridge, Colo. April 14.

The Pennsylvania mine, of Argentine, shipped several cars of silver-lead ore last week through the local branch of The Chamberlain & Dillingham Ore Company.

The management of the Old Union mine has now a force of men raising on ore recently struck in the main tunnel in the Old Union vein. This work, when carried up for 125 ft., will make connections between the old upper workings and the lower workings of the new tunnel, giving free access of air without the necessity of the present furnace ventilation.

The Abundance Mining and Milling Company is making good headway with the main tunnel into the base of Mineral hill. It is now in 460 ft. and has passed through a small vein of good lead-zinc ore.

The Reliance gold dredge in French gulch has started its season's work and is excavating about 2500 yards per day.

C. C. Acton, owner and operator of the Chester mine in Summit gulch, is taking out and piling a quantity of free-milling gold ore. This he will start to treat in his little mill early next month. The richer streaks of his 6-ft. vein run high in gold, and this grade is shipped direct to smelters.

The Gold Dust Mines Company, operating on Nigger hill, has just received a car-load of pipe and machinery to put the tunnel in shape for sinking below that level. The tunnel is 3500 ft. long and the vein now worked is from 12 to 18 ft. wide; 3 ft. of this is high-grade silver-lead ore, the remainder being a good concentrating ore. Sinking will be started at once and a pump installed.

The Laurium mine, on Nigger hill, has been purchased from Niles & Walker, by a company which intends to increase the capacity of the mill to 40 tons and put on a force of men getting out ore.

Butte. April 13.

The Pittsburg & Montana Copper Company has decided to close its smelter for the present, the order effective on April 14, instructions having been received from Pittsburg yesterday. No reason has been assigned for the move, but in view of the fact that the capacity of the plant is not sufficient to enable the company to make much more than expenses in the production of copper, silver and gold, it is supposed that additions and new equipment are contemplated. At present the copper-making part consists of one blast furnace and one converter. The former is not a patent of Ralph Baggaley; it is a made-over Garretson furnace with a forehearth that has given the company considerable trouble recently. Two weeks ago the plant was idle five days on account of this furnace, and a short time prior to that several more days were lost. As the company was making only seven tons of copper a day the loss cut into the total output. It is the intention to continue the development in the mines, for the workings on the 1200-ft. level and below that point are showing up remarkably fine bodies of copper ore. Oscar Rohn, manager of the property, will remain in charge of the mine work, but W. A. Heywood, in charge of the smelter, will leave.

The reduction works of W. A. Clark have not turned out a pound of copper since the first of the month, and it is not known when the operations will be resumed. The company had planned to start last week, having resumed the transportation of ore from its mines to the concentrator and was operating the latter, but the carpenters and bricklayers employed in the plant quit work on account of trouble between the latter and the Building Trades Council of Butte, with the result that unless the difficulty is adjusted soon the company may have to resume shipments of ore to the Washoe smelter. The high stack, flue connections and new furnaces in the plant are finished and ready for use, but there is much other work for the bricklayers and carpenters.

North Butte has received its headframe, and will begin its erection at once. The frame will be 127 ft. high. Its new hoisting engine is going up. It will not be in running order until June. When finished, the output of the property will be increased from 850 tons a day to between 1400 and 1600 tons.

The Butte Commercial Copper Mining and Development Company was organized in Butte April 10, with a capitalization of $5,000,000 in 1,000,000 shares. The officers are: President, J. R. Wharton; E. Siegel, vice-president; J. H. Maloney, secretary; P. J. Brophy, treasurer. The property of the company adjoins the Berlin group, owned by the North Butte Company.

The Butte & Summit Valley Copper Mining Company is capitalized at $3,000,000 in 600,000 shares. T. W. Buzzo is president; C. D. Joslyn, vice-president; J. W. Thomas, secretary; James A. Talbot, treasurer. The company will work ground near the property of the Lewisohn General Development Company, having five claims.

Joplin, Mo. April 14.

It is reported that the Hayseed mine and lease of 40 acres, north of Carthage, has been sold to L. Anderson and N. Wagner, the consideration not being given.

The Eleven O'clock mine on the General Zinc and Lead Company's land at Prosperity, is developing into one of the best lead producers in the district. For the past two weeks the daily output has been about five tons.

The Chapel Mining Company, operating on the Putnam lease at Porto Rico, has practically all of the lumber on the ground, and the work of building the new mill has been commenced. This company has encounterd ore in a drill hole on the Wood land on which it recently secured a lease.

A company, composed of Frank D. Jones and others, has taken a lease on 20 acres of the Murphy & Connor land, north of Turkey creek, and will thoroughly prospect it for ore.

J. E. Wright, and others of Detroit, Mich., who recently took a lease on a portion of the McCown land at Spring City, now have a 16-ft. face of zinc ore, and expect in the near future to commence the erection of a 100-ton concentrating plant.

T. J. Jones, of Webb City, who owns a large tract of land about a mile south of Granby, intends to prospect it by drill, having let a contract for 1000 ft. He has had three holes drilled on the land, and ore was encountered in each of them.

Chapman & Lennon, of Webb City, have purchased a lease of 8 acres of the Davey land lying north of Carterville, and joining their Dinger mine on the east. The consideration was $10,000.

The Two Mayors mine on the Davey land in North Carterville, has been sold to Kansas City parties for $25,000. Mayor Moore, of Webb City; Mayor Janes, of Carterville, and others, were the owners.

Indianapolis. April 16.

The situation in Indiana remains practically unchanged. With the exception of six coal mines in the Evansville district, one in Park county, two in Gibson and two in Clay county, no company has signed the 1903 scale. The largest of the companies to sign and resume operation works 350 men. On April 6, the Indiana Operators' Association held a meeting in Terre Haute and adopted resolutions to stand by the action of its representatives in the Indianapolis conference. The several companies that have signed the 1903 scale with the miners were expelled from the association. The association held another meeting April 11, and unanimously re-affirmed the stand taken in the previous meeting. The excutive committee was given full power to act for the association in order to do away with the necessity of holding weekly meetings. A committee headed by Phil. Penna was appointed to collect, prepare and publish all facts relating to the stand taken by the association.

April 10 was pay day at the Indiana mines and was the biggest pay in the history of the industry in the State. The pay was for the last two weeks in March, and upward of three-quarters of a million dollars was distributed. Every miner got full time. Operators are showing pay rolls to back up their assertion that miners make big wages at the price for mining under the contract which expired April 1. At some mines, they say, men received as high as $100, for the two weeks' work. The "stand-pat" operators say that the gross output of the 19 mines signed is insignificant compared with the total of the State, and that there are several mines in the association, each of which has a larger output than all of which have signed the 1903 scale.

President O'Connor, of the Miners' Association, says the figures furnished by the operators are misleading; that while the men did draw big pay for the last two weeks, taking the year through, the average wage in Indiana was $1.68 per day, and from this must be deducted the cost of powder, oil and blacksmithing, which the miner pays to his employer, and on which the employer make a profit.

The mine owners in Gibson county are increasing their land holdings. Contracts for $62,000 worth of land were made this week. The real-estate owners retain nothing as their own, except the land at the surface, the mine owners purchasing outright everything below, including minerals, coal, oil, gas or what not. A number of big deals are likely to be made during the next few weeks.

The Knox Coal Company, of Bicknell, has increased its capital stock from $32,000 to $100,000. This company has secured additional coal lands, paying $60 an acre.

A petition asking that a receiver be appointed for the Hecla Consolidated Mining Company has been filed in the Federal Court by F. A. Autenheimer and others of Kentucky. John C. McCutcheon, of Indianapolis, is secretary and is made a defendant. The company's mine is near Hecla, Montana, and the petition alleges that the company is insolvent, and the business in a tangled condition.

The first issue of the official paper of the Mine Workers since the conference says editorially: "The silver cord has been broken and the joint conferences for which so many sacrifices have been made and which was a boon to all concerned, which uplifted the miner; which strengthened the operator; which assured the public industrial peace and the sure supply of coal, are at an end." The organ justifies the position of the miners on the ground that the miner is entitled to an advance in keeping with the great prosperity of the country. It says that the operators deliberately planned for months to bring about a suspension and urges all members of the organization to stand pat for the demands of the recent convention. The paper states that from advices received operators representing 70 per cent. of the tonnage of the bituminous fields have signed the scale.

Calumet Mich. April 14.

Lake Superior copper mines produced approximately 18,800,000 lb. of metal last month, an increase of 1,500,000 lb. over February.

The Wolverine mine made a remarkable record last month. Notwithstanding the recent destruction by fire of the shaft-house at No. 3, which confined the production to No. 4 shaft, the March product showed a gain of 14,000 lb. fine copper over that of the preceding month. It is expected that No. 3 shaft will be in commission once more in two months, but there will be no falling off in production in the interim, as No. 4 is shipping the mine's normal rock suppiy. It should not be inferred from this, however, that a large increase in production will be possible when No. 3 shaft is in service, as the stamp mill is now handling all the rock that its capacity permits.

The output of the Atlantic mine for the first quarter of 1906 shows a material gain over that for the same period of 1905. Owing to the demands incident to the introduction of the new system of mining operations at the Atlantic, the production has suffered, but henceforth there should be gradual gains as the work is nearing completion. Once the new system of mining is fully in service, the production will be larger than ever before and the operating costs much less.

Interest in the Quincy Mining Company's No. 8 shaft, on the Mesnard tract, grows as that portion of the mine increases in importance. A largely increased production from that shaft will be possible in a short time. The output of No. 8 shaft has grown steadily in the last few years and is now at the rate of 425 tons of rock daily. The surface plant which is being provided is designed to handle an ultimate production of 1000 tons a day. But as the Mesnard shaft increases its output, the older shafts will show a slight falling off.

The Quincy's output for the first quarter of the current year is larger than that for the first three months of 1905, which would seem to indicate that the damage caused by the recent air-blasts underground in the deeper workings had been overestimated. On the basis of its March output the Quincy is making 18,600,000 lb. of copper annually.

A feature which continues an important factor in the Quincy's production is the yield from the West vein, which parallels the Pewabic, or main lode, at variable distances, averaging 100 ft. The greater portion of the rock supply from the West vein is taken out through crosscuts and hoisted in No. 4 shaft, but there is a small tonnage which comes to surface through No. 2 shaft. William R. Todd, of New York, president of the Quincy, is inspecting the property this week.

Fire has again broken out underground in the Tamarack mine and all openings connected with the burning of the property have been sealed airtight. Nos. 1, 2 and 5 shafts are idle. As soon as the fire exhausts the oxygen in the air in the

openings underground the gases will smother the flames. It is now three months since fire first broke out in the Tamarack starting in an abandoned stope in No. 2 shaft, and the loss in production and earnings has been heavy. While it was possible to work to some extent in No. 5 shaft, which is a downcast shaft, men were employed there only a short time. A feature which may cause annoyance, once the fire is smothered, is the larger inflow of water at the present season of the year. Owing to the spring breakup the seepage is increased and it may take a number of weeks to empty the shafts of the water which is accumulating now. No. 3 shaft, at the north branch of the Tamarack mine, continues operations on a normal scale, not being connected with the remainder of the property. As many men have been transferred to No. 3 from the idle shafts as the facilities there will permit.

Champion rock shipments average 2000 tons a day, but improvements at the stamp mill render probable an increased production soon.

Scranton. April 16.

Whether there will be a strike or not, or whether it will be a long continued struggle, the events of the past few days have demonstrated that the operators are determined to make strenuous efforts to operate their mines. The change in the sentiment has been remarkable. The miners have been out for two weeks, and are more than puzzled at the manner in which the controversy has developed. There is a sentiment that, having been out of work so long, it would be foolish to resume work without getting some concession; while on the other hand there are many who are urging that they should avail themselves of the opportunity to accept the offer of the operators for a continuance of the existing agreement. Three years ago the men were solid to a unit for a fight. The division of opinion as to the merits of the present fight is manifest.

Realizing this, the operators have done what they did not attempt to do in 1902, and are working to secure men to operate the mines and breakers. Their success is demonstrated by the fact that the Lackawanna Company has five breakers out of 24 in operation at this time, and is putting scores of men at work daily. The company has adopted the policy of sending the men to a mine at some distance from their homes, so that they are free from recognition. Work trains are used to take them to and from the mines, while no one is permitted to do any picket duty on the property of the company. A large number of men have also been imported into the region, and these have been placed at work. The fight is shaping itself into one for the existence of the union, and the miners realize this more than the outside world would give them credit for.

President John Fahy, of the Hazleton district, takes a very philosophical view of the situation. Upon his return from New York he was asked for his opinion as to the status of the controversy and said: "All the miners are remaining away from the mines and awaiting the adjustment of wages and conditions of employment between the operators and the mine workers. And while all are good natured, all are just as determined to secure a square deal, which means fair conditions of employment between themselves and their employers. This spell of idleness is just like a vacation to the miners, and they are enjoying the fresh, pure air, which is doing them good."

Mr. Fahy's cheerfulness is not contagious however, and it is no secret that some of the mine leaders are worrying over the prospect of a fight made by the operators with the avowed intention of breaking up the union. There are now many Huns and Polanders who hold certificates of competency as miners, and once they gain the impression that the union is gone it will be imposisble to restrain them from going to work. Many of them are already at work, being convinced that the union cannot secure any concessions, therefore, its days of usefulness are over. They are very susceptible to an argument of this kind, especially when accompanied by a hint that they may get better places by returning to work early. The English speaking people are already chagrined at the number of foreigners who have been secured.

The Erie Company has been among the most determined in the Northern basin to maintain work in some of its mines, and has succeeded in operating three of its breakers, largely with foreign labor.

So far as can be ascertained, not one business organization throughout the anthracite region has formally discussed the matter of a strike. Three years ago, one body after another passed resolutions demanding that prompt action be taken to avoid a strike, and then to bring the strike to an end. The lack of any such action at this time is significant.

The State constables are being massed in the anthracite field in order to be ready for an emergency. Those with headquarters in Reading have been moved to Tamaqua for the purpose of being in close touch with the Schuylkill and Lehigh districts. The troop which has been stationed in Wilkes-Barre has been in active service already.

District President Dettery is making a tour of the Seventh district for the purpose of acquainting the miners with the present status of the controversy, and advising them to keep united in the cessation. He is not sanguine of a settlement without a strike.

New York. April 18.

As the spring opens, and the active season is beginning everywhere, the indications are that the year will be a good one for mining. In all the mining States there are signs that much work will be done on old and new properties; while in the East more interest is being taken in mining developments than for years past.

The greatest attention just now in gold and silver mining is being paid to the new districts in Nevada. Tonopah, Goldfield and some of the adjoining districts are now established facts, and the new districts from which discoveries are reported almost daily are being accepted much more readily than was the case with Tonopah at first. The adjoining desert region of California is full of prospectors, and rushes there may be looked for also.

Throughout California mining is prospering; many old workings are being reopened and old mines extended. The State has had a better share of rainfall and snowfall than for two or three years past, and is sure of a good supply of water this season for mining and power purposes.

In Colorado the old camp of Leadville again shows great activity. The discovery of new orebodies has brought increased prosperity to the district and a year of large output seems sure. At Cripple Creek the drainage of the lower levels is now the main question, and interest has revived in the new tunnel project. The other Colorado camps—Telluride, Breckenridge, Clear Creek and Gilpin counties—are all active.

Copper is the most attractive metal just now owing to the strong demand and the prospect of continued high prices. The Butte district is a center of activity, and now companies are being formed; while the old mines are being worked on a larger scale than ever. The same conditions exist in the growing districts of Arizona. In California, also, the copper industry is gaining. In Nevada beginnings are being made on the great low-grade deposits, which have been opened by the Nevada Consolidated and other companies. In Utah the copper interests promise to exceed all other mines in importance. In the three States, a process of consolidation has been going on, which promises to bring their copper mines under the control of two or three strong groups of operators, as has already been the case in Montana and Arizona. In the Lake Superior region there has never been a time when so much new exploration and development work was in hand; while the working of the producing mines is being pushed. All the larger mines are making heavy outputs, with the exception of the Tamarack, where a fire in the lower workings has seriously impeded mining.

Iron mining will be prosperous throughout the year, without doubt. The mines of the Lake Superior district are prepared for a large production, which will certainly be required. In the South preparations are being made for enlarged out-

put. In the East, some old mines have been reopened, and the working mines in New York, New Jersey and Pennsylvania are all busy.

The coal situation is uncertain, and may affect business seriously. In the Central West the bituminous operators and the mines have either reached a settlement, or are approaching it, in spite of the opposition of the operators in Ohio and Illinois. A general strike has been averted, and the partial suspensions now existing will hardly last long. The anthracite situation is less promising. The operators are not inclined to recede from their position. and it looks as if a prolonged suspension might follow before any agreement can be made.

In Canada, interest continues to center in the Cobalt and Timiskaming districts in Ontario. Other mining districts are active, and there will be a great deal of exploration this season in the new Chibogamoo district in Quebec, and all through the region which will be opened by the building of the new Grand Trunk Pacific road. British Columbia also, is quietly working its way toward better conditions and renewed prosperity.

Toronto, Ont. April 16.

Charles Hurd, a surveyor engaged on survey work in Playfair township, about 70 miles north of New Liskeard, Timiskaming district, reports important mineral discoveries there. The southeastern portion of the township is rocky and in the northwestern section there are many rock exposures. A vein of gold-bearing quartz was discovered by Mr. Hurd near the center of the township, samples of which assayed high. Veins of quartz occur frequently and it is thought that many of them carry gold. The news, confirmed by the samples shown by Hurd, has created great excitement in the Timiskaming mining district and parties of prospectors are preparing to leave for the new field. Cobalt bloom has also been found in considerable quantities in the northwestern portion of Playfair township, leading to the belief that silver, cobalt and nickel may be discovered. Other finds of silver-bearing ore are reported at Iroquois Falls, some 80 miles north of New Liskeard, and a rush northward of prospectors is anticipated.

The Ontario Government advertises for sale by tender, a 999-year mining lease of two portions of the Timiskaming & Northern Ontario Railway right-of-way, east of the 99-ft. regular right-of-way required for operating the road. The two sections are divided by an arm of Cobalt lake. The tender is to be for not less than $50,000 cash and the lessees must pay a rental of $500 per annum, plus a percentage of the gross value at the mouth of the mine on a sliding scale from 10 to 50 per cent., according to the amount assayed per ton. Tenders must be made before May 10, and keen competition is expected, as the attention of British capitalists has been attracted. A cablegram has been received from Lord Strathcona, Canadian High Commissioner in England, asking for full particulars on behalf of a number of British firms.

The report of the Commission on Toronto University, in which many important changes in the system are recommended, deals strongly with the need which exists for training in engineering and applied science. They urge that in a country like Canada, with so much undeveloped wealth and an era of constructive undertakings in prospect, the practical part of the university course is of great importance. They point out that the principal and professors of the School of Practical Science have been underpaid and overworked, and call for greater support for this class of training, so that the Science faculty of the University, may not only perform its university functions, but minister to the popular demand for special technical instruction.

In the Dominion Parliament on April 10, James Conmee gave notice of a resolution declaring that in future all bonuses paid in connection with the iron and steel manufacture should be confined to Canadian ore and iron and steel produced therefrom, or from the ores of any British colony and that the bonuses hitherto granted should be renewed for a further period, subject to the provisions of this resolution; and that duty be remitted upon coal coked in Canada and used for smelting purposes.

An oil gusher recently struck on the farm of J. W. Smith, near Merlin, Ont., is flowing 100 bbl. per day. The locality is regarded as a promising one and 12 wells will soon be put down in an area of about 60 acres.

Victoria, B. C. April 12.

Trail—An interim report of the Consolidated Mining & Smelting Company, owning the St. Eugene silver-lead mine at Moyie, East Kootenay; the Centre Star and War Eagle gold-copper mines at Rossland, West Kootenay; and the Canadian Smelting Works at Trail, gives the following information relative to the operations of the last mentioned: There were 249,000 tons of ore treated. The quantity and value of metals produced were as under:

	Gross Value.
Silver, 1,359,911.068 oz.	$ 806,658.81
Gold, 82,644.311 oz.	1,708,257.91
Copper, 4,571,764 lb.	563,249.87
Lead, 13,382,050 lb.	397,580.70
	$3,475,747.29
Refinery production from bullion from other smelters	320,000.00
Total production in 1905	$3,795,747.29

The company's establishment at Trail comprises complete lead and copper reduction works and an electrolytic lead refinery. As an indication of the increasing volume of the company's smelting and refining business it is stated that during the month of January of the current year 28,000 tons of ore, chiefly from the company's own mines, were treated and the metal production was approximately as follows: Silver, 182,000 oz., value $119,000; gold, 9787 oz., value $202,000; copper, 384,000 lb., value $69,000; lead, 2,820,000 lb., value $113,000; total value, $503,000, or $17.96 per ton.

Dawson, Yukon. March 16.

Information received from Eastern Canada is to the effect that Yukon Government officials have been freely and unfavorably criticized for having entered into a contract with Charles M. Hatfield, of Los Angeles, California, described as "the famous rainmaker," to make rain in the Klondike during the ensuing mining season. The Territorial comptroller—now acting commissioner in the temporary absence of W. W. B. McInnes, commissioner of Yukon Territory—who had learned of Hatfield's rainmaking work in California, has been prominent in bringing about the arrangement for similar work to be done in the Klondike where, last season, the production of gold was comparatively small owing to the shortage of water, the rainfall having been unusually light. The contract requires Hatfield to work for four months, virtually all the open season, beginning May 1, by which date he must be on the ground with an assistant and the rainmaking apparatus. Hatfield undertakes to keep up a sufficient supply of water to admit of the operation all summer of the hydraulic and other gold placer mines. Should he do this to the satisfaction of a board of seven men, three of whom are to be chosen by the Government, three by Hatfield, and the seventh by the other six, he is to receive $10,000. Half of this sum is to paid by the Government and the other half by 10 of the largest mining operators in the Yukon. Should he fail to satisfy this board he will receive only his cost of transportation to and from the Klondike and maintenance for himself and assistant, together with cost of shipping his apparatus. No specific quantity of water in inches is stipulated for, the contract simply providing that he "shall increase the rainfall and renew it from time to time for four months, as may be named by the board, and sufficient to insure, so far as ample rain can do, a successful and prosperous summer for the placer-mining industry of the Dawson district."

A pumping system is to be installed on Duncan creek, where there is known to be rich gravel, but pumps are necessary to control the water. The Government mining engineer has selected two Cameron pumps, one a No. 10 vertical plunger sinking pump and the other a horizontal, light-service pump 12x10x18 in. The pumps will reach Dawson shortly af-

ter the opening of navigation and will be hurried thence to Duncan creek as quickly as possible.

There are large dumps of gravel on Hunker creek, taken out through the winter. The coming summer will, it is expected, be a busy one on this creek.

The result of the visit of the commissioner of Yukon Territory to Ottawa, for the purpose of urging the Dominion Government to adopt recommendations made to it in several matters of great importance to the Yukon, is being awaited with confident expectation that these will have favorable consideration. The chief subjects submitted are the following: The purchase of gold in the Yukon by the Government; the establishment of a government assay office for the Yukon; the adoption of the mining code drawn up by the Yukon Council and local officials; and government action to secure for the district cheaper transportation. These matters are of concern to all residents in the Territory, so that interest in them is practically universal. It is reported that the commissioner's recommendations are likely to be approved at Ottawa.

Mexico. April 12.

The decision of the United States to impose the 20-per cent. ad valorem duty on all zinc ores entering the States has made necessary the establishment of assay offices at El Paso, Eagle Pass, and Laredo, for the assaying and valuation of the Mexican zinc ores. As a majority of the zinc smelters are located in southeastern Kansas, an effort is being made by Congressman P. P. Campbell, of Kansas, to have the United States Government establish a sampling plant and assay office for the zinc ores at Cherryvale, Kan., so that the smelters may be present during the sampling without great expense. At the same time the smelters are making a strong endeavor to have Congress remove the duty on zinc ores. If this is not done, it will practically force Mexican interests to build zinc-reduction works in this Republic. This has already been seriously considered, particularly in Monterey, because of its proximity to a large and productive zinc field, and to the Coahuila coal mines, which give it a cheap fuel. Stanley C. C. Currie, of Los Angeles, Cal., is at present in Mexico perfecting his patents on an electrolytic process for the separation of lead and zinc from their ores.

A number of Monterey capitalists propose to establish a plant in that city. Among them is Vicente Ferrera, who has for some time been figuring on a zinc smelter for Monterey, and is now, with Avelino Z. Garza, opening up a large zinc property on Cerro de la Ventana in the Santa Catarina district. Smelter No. 2, in Monterey, of which Mr. Ferrera holds controlling interests would use a large part of the product in its lead-refining plant. St. Louis people have bought, and will develop on a large scale, some promising zinc properties on Mitre mountain, near Monterey, and the Cantos Mining Company has been organized with $1,000,000 gold by J. S. Rodgers and B. F. Hobart, of the Lanyon Zinc Company, Gas, Kan., and the Cherokee-Lanyon Zinc Company, St. Louis, to develop the immense zinc fields of Pablo de los Santos, near Sabinas Hidalgo, about 40 miles northeast of Monterey. These were brought to the attention of Messrs. Rodgers and Hobart by their representative, Louis Lyon, during his investigation of the district in the summer of 1905.

Guanajuato, Mexico. April 8.

Rumor has it that the old Negociacion del Cubo has lately changed hands again, this time to Ernest B. Wiltsee of New York. This property was owned and worked for a long period by the United Mexican Mining Association, Ltd., of London, and under its ownership yielded a considerable amount of ore, the greater part of which was brought to Guanajuato for treatment, a distance of 5 miles. Later, however, the company erected a plant for pan-amalgamation, and treated its own ores. This was the first pan-amalgamation mill in the district and worked successfully for several years. Two principal veins run through the property, the Villalpando-Doctora and the Loca-Dolores veins; the latter having produced over a million dollars from one shoot of ore. The property was sold four years ago to Walter M. Brodie and H. L. Hollis, who built a 40-ton cyanide plant and worked the mine until early in 1905, when they turned it over to T. H. Leggett (of South African fame) and associates, who formed a company called the Cubo Venture. Mr. Leggett, however, has found it impossible to give the mine the time which it requires, his attention being claimed by interests in other parts of the world, and finds it convenient, therefore, to turn the property over to Mr. Wiltsee.

The Guanajuato Development Company, which lately took over the Negociacion del Cedro, has by crosscutting and extending some of the levels, succeeded in opening up a large amount of medium-grade ore, for the treatment of which it is having plans drawn for a new mill, to be erected close to the property. In order to carry on rapid development, a compressor and air-drills have been ordered and will be installed with all possible despatch. The mine is at present equipped with three electric hoists, and as the water has been kept out of the mine by bailing, the condition is quite favorable for economical development.

Five cyanide mills are now operating in the camp, representing 210 stamps at work. The large 80-stamp mill of the Guanajuato Reduction and Mines Company has just begun to crush and cyanide, although it is not yet running up to full capacity, through the non-completion of the slimes plant. This latter, however, is being finished up as fast as possible, so that it is probable that the entire plant will be in full commision in 30 days from date.

London. April 7.

Some months ago I referred to the issue of shares in the Cerro Muriano Copper Mines Ltd., a company owning properties near Cordoba, Spain. This week another company in the same district has been floated, called the North Cerro Muriano Copper Mines Ltd., with the object of acquiring part of the property of the former company, as yet undeveloped, together with other adjoining claims. The properties of the Cerro Muriano were examined by Wm. Frecheville, and are now being managed by H. F. Collins, acting for John Taylor & Sons. The North Cerro Muriano was reported on by Alexander Hill and John Taylor & Sons are to be managers of these properties also. The claihs to be acquired contain a number of copper lodes which have been worked in almost prehistoric times, but have been entirely neglected in recent years. To explore these lodes thoroughly will cost more money and thought than is at the disposal of the Cerro Muriano. Hence this separate flotation.

The report of the Rio Tinto Company for 1905 has just been issued. This company has never made a practice of publishing in its accounts the details of the gross income and expenditure; the profit and loss account starts out with the item of "profit on sale of produce during 1905" which was £1,845,000. Other sources of revenue brought the total gross profit to £1,900,000. After paying debenture interest, income and other taxes, cost of administration and allowing for depreciation, the net divisible balance was £1,504,000. Out of this dividends at the rate of 5 per cent. have been paid on £1,625,000 preference shares, and at the rate of 80 per cent. on £1,875,000 of ordinary shares. In November last, as already recorded, negotiations were commenced for the redemption of the debenture debt which amounted to just under £3,000,000. The issue of 50,000 new ordinary shares of the nominal value of £5 each was entirely successful, yielding £3,150,000. The redemption of the debentures out of this fund did not begin until Jan. 1 of this year but is now practically complete. The production of copper during the year was interfered with by the drought. It amounted to 19,530 tons produced locally and 12,750 tons contained in pyrites shipped, making a total of 32,280 tons.

General Mining News.

United States Steel Corporation—At the annual meeting in Hoboken, N. J., April 16, the stockholders voted to approve the report and the recommendations made by the various committees. The following directors, whose terms had expired, were re-elected: William Edenborn, Henry C. Frick, William H. Moore, Norman B. Ream, James H. Reed, Charles Steel, Peter A. B. Widener and Robert Winsor.

Petroleum Exports—Exports of mineral oils from the United States for the three months ending March 31 are reported as in gallons:

	1905.	1906.
Crude petroleum	18,483,652	32,311,550
Naphthas	7,132,214	11,017,727
Illuminating	189,109,119	188,941,649
Lubricating oils	26,108,071	45,443,116
Residuum	12,616,128	17,814,420
Total	253,449,184	295,528,462

Paraffin is included in lubricating oils. The total increase was 42,079,278 gal., or 16.6 per cent. this year.

ARIZONA.

GRAHAM COUNTY.

Arizona Copper Company, Ltd.—This company reports that the production of its mines at Clifton in March was equivalent to 1427 short tons of copper.

CALIFORNIA.

AMADOR COUNTY.

Bunker Hill—This mine is producing well, and the 20-stamp mill will be doubled in size, for which purpose a reserve fund is being accumulated.

Jose Gulch—The 10-stamp mill of this mine was started up, but at once closed down in order to put in concentrators, as there was much loss of sulphurets in the method pursued.

BUTTE COUNTY.

Cherokee Mining Company—F. B. Finley, of Boise, Idaho, has bought the right to work the claims of this old company. The old diggings were very rich, and have been worked over two or three times in recent years.

CALAVERAS COUNTY.

Utica Mining Company—The 100-stamp mill of this mine at Angels is running steadily and crushing six tons daily per stamp.

Angels Mining Company—At this property, Angels, 20 of the 40 stamps are in motion, and the rest will shortly start up on a better grade of ore.

Etna King—At this mine near Angels, sinking with three shifts is progressing. A good shoot of ore has been found.

EL DORADO COUNTY.

Summit Hill Consolidated Mining Company—This is a new corporation formed by Oakland men to work the Summit Hill mine at Spanish Dry Diggings.

HUMBOLDT COUNTY.

War Eagle Mining Company—This county is at last to have a stamp mill, the first in its history. It will be of 20 stamps and erected for the company named as soon as the weather conditions permit.

INYO COUNTY.

Sacramento Mining Company—In this mine an incline is being run below the old workings by Supt. W. W. Godsmark in which a vein of $40 rock has been found. Two Wilfley concentrators are being installed.

LOS ANGELES COUNTY.

Amalgamated Oil Company—Another great oil gusher has been tapped on the property of this company in Salt Lake district, nine miles from Los Angeles, at 2350 ft. depth. The well has been flowing about 5000 bbl. of oil daily, and is still flowing 500 barrels.

NEVADA COUNTY.

Conlin Mining Company—The Lafayette and Comet claims adjoining have been purchased by this company. H. G. A. Brunnier is superintendent.

Pennsylvania Mining Company—A new 150-h.p. compressor, with motor has been ordered for this mine to operate the pumps, etc. The W. Y. O. D. mine of this company has had an unusual flow of water of late, but the new machinery is expected to overcome the difficulties.

SHASTA CFUNTY.

Kingsbury—The owners of this mine near Sonora, Tuolumne county, have applied to the California Debris Commission for a legal permit to work it by hydraulic process, the drainage to be into Sullivan's creek, where a dam is to be built.

SIERRA COUNTY.

Alaska—Manager St. John is sinking the new shaft some distance from the old and will run it down to 700 ft., when the old works will be tapped by cross-cut and upraise, and the water removed. Electric power is to be put in.

Forest City Mining Company—At this mine, Forest City, formerly the Mabel Mertz, H. B. McCormick, superintendent, the main working tunnel is being rapidly pushed ahead, and it is expected that the pay channel will shortly be reached. The necessary plant for washing the gravel has been put in readiness.

Herkimer—Work in the tunnel at this mine has been resumed. The men were forced to close down some time since, there being 16 ft. of snow at the mine.

TRINITY COUNTY.

Union Hill—Preliminary work has commenced on this mine near Douglas City, and a large force of men will shortly be employed.

YUBA COUNTY.

Rackerby District—F. E. Wright has re-bonded the Santa Rosa mine in this district to R. W. Correll, of San Francisco, and the old works are being reopened. He has also re-bonded the Abbott mine to the same person, and work upon it will commence at once.

COLORADO.

BOULDER COUNTY.

Daily Group—Theo. Olson and J. H. Harte, of Omaha, Neb., have purchased the Daily group of tungsten mines at Nederland and will operate as the Omaha Tungsten Mining and Milling Company. Machinery is to be installed.

Monarch Consolidated—The roasting and cyanide plant of this company at Jamestown, which will have a capacity of 50 tons daily, is nearing completion. It will treat the product of the Wano mine and will cost about $75,000. The mill is expected to be in operation about May 15.

CLEAR CREEK COUNTY.

Cass Mining Company—S. K. Behrend, Dumont, Colo., representing Cassopolis, Mich., capital, has taken under option the Dumont-Boston mill, which is to be remodeled and a cyanide plant added.

Waldorf Mining Company—A strike is reported on the Paymaster in the Wilcox tunnel, the orebody being 2 ft. wide and running well in silver, copper and gold. Property is located at East Argentine.

Manager Wilcox, of Silver Plume, announces that early in the coming summer machinery will be installed to increase the capacity of the concentrator.

Griffith Group—Three claims in the Georgetown district have been sold to the Independent Mining Company by Messrs. Hood & Maxwell, of Georgetown; consideration, $40,000. It is reported that Idaho Springs people are figuring on the purchase of the group, and many improvements are to be made.

Newhouse Tunnel—Silas A. Knowles, of Idaho Springs, has succeeded Jesse J. May as manager. The main bore is in 14,480 ft. and a contract for 1000 ft. has been given. Indications point to the tunnel being continued to the Eureka mine in Gilpin county, a further distance of about 5000 ft. Manager John Owen, of the Saratoga property, has decided to run a diamond drill 400 ft. from the lateral in the Newhouse tunnel to the 900 level, a distance of 400 ft., for the purpose of draining the property.

Clear Creek & Gilpin Mining, Drainage and Transportation Company—Articles of incorporation show capital stock of $7,000,000, intention being to run a tunnel from Dumont in Clear Creek county toward Russel Gulch and Quartz hill in Gilpin county. Office is at Dumont, Colo., and heavy machinery is to be installed.

Ray Gold Mining Company—This company has acquired the Magnet group of 14 claims on Griffiths mountain at Georgetown, Idaho Springs and Denver people

being interested. The group is to be opened by a tunnel. John Larson, Georgetown is manager.

Chamberlain-Dillingham Ore Sampling Works—This plant at Idaho Springs is being remodeled and enlarged to greater capacity, owing to increasing production in that section.

Independent Mining Company—President J. W. Martin, of Joliet, Ill., is at Georgetown, Colo., superintending the preliminary work on the West Griffith mine, on which the last payment of $17,000 has been made.

GILPIN COUNTY.

State Mines Commissioner E. L. White, credits this county in 1905 with a production valued at $1,841,598, of which $1,497,872 was gold, balance being silver, copper, lead and zinc.

Maine—Denver and local people have taken a lease on this property, on German hill. They have placed T. Noonan of Central City in charge and figure on liberal developments.

Eagle Ore Company—Denver people are interested, having taken a lease on the Engelburg mine and the Eagle 35-stamp mill at Black Hawk. They are installing machinery at the mine. J. Cundy, Black Hawk, Colo., is in charge.

Boston-Occidental Mining Company—A new Wild mill is being installed in the concentrator mill at American City, and increased operations are outlined. C. S. Ripley, Apex, Colo., is manager.

Santa Loreta—Providence, R. I., people who recently purchased this property are asking for bids for carrying on extensive operations. They will also start up the Randolph mill on North Clear creek. W. H. Hook, Central City, is manager.

North Star—The Ann Rutledge Mining Company has given contracts for a large amount of work, and is preparing, as soon as the snow is gone, to start up the new 25-ton amalgamating and concentrating plant. Youngstown, O., people are interested with A. B. Sanford, 1717 Champa street, Denver, as manager.

MICHIGAN.

HOUGHTON COUNTY—COPPER.

Baltic—Daily rock shipments now average 2000 tons. No. 2 shaft's surface plant is rapidly nearing completion and that opening will be a source of a considerable gain in the output within a short time.

Calumet & Hecla—While stamp-mill facilities have been largely increased and rock shipments are larger than ever before, this mine is not producing 100,000,000 lb. of refined copper per annum, as has been stated in the East. Rock shipments average probably more than 6500 tons daily, but much of this is coming from the workings on the Osceola and Kearsarge amygdaloid beds, which are not as rich as the Calumet conglomerate lode. In former years the mine's rock averaged 3 per cent. copper, but the average is nearer 2 per cent. now.

Copper Range Consolidated Company—This concern's production is now at the rate of 34,000,000 lb. of refined copper per annum and the St. Mary's Mineral Land Company, by virtue of its half-interest in the Champion mine, is entitled to a production of 8,000,000 lb. yearly.

Oneco—Arrangements have been completed for the resumption of exploratory work at this property. As soon as the snow disappears it will be started. Captain Joseph Hocking, who was in charge during the property's activity a few years ago, will again superintend the work. One of the principal objects is to locate the mysterious Tomahawk lode, which is supposed to have been discovered by Edwin J. Hulbert, who also discovered the Calumet & Hecla. Mr. Hulbert has resided in Rome, Italy, for many years. The Shelden tract, southeast of the Laurium, was probably purchased because it is supposed to carry the Tomahawk lode. James D. Hague, of New York, who was a close friend of Mr. Hulbert in the early days recently purchased the Shelden tract from the Shelden estate, and undoubtedly acted upon the strength of information furnished him by Mr. Hulbert.

Osceola Consolidated—Steps have been taken for the introduction of the filling system on a limited scale in the North Kearsarge branch. Since the system of underground storage for waste rock was first extensively practiced by Superintendent F. W. Denton at the Baltic, it has come into quite general use. In the North Kearsarge the system will not be carried beyond the filling of stopes with the rock that otherwise would be hoisted to surface and discarded. No underground selection other than that already practiced will be attempted, nor is it planned to break down any barren rock which is ordinarily left standing, for use in filling the empty spaces.

South Kearsarge—A small fire was discovered at the 10 level of No. 2 shaft at the branch of the mine this week, but beyond delaying operations for that day it did no damage.

Trimountain—The improvement underground is reflected in the production, which is returning to normal proportions. A number of drills ran into lean ground at the same time, but the lode is becoming better.

Winona—As soon as the necessary preparations can be made the mine will resume production. Rock will probably be shipped to the Adventure mill, where there are unemployed facilities. Negotiations for an exchange of land with the King Philip are expected to be consummated in a short time. The deal should benefit both. The new boundary line between the two will be at right angles to the strike of the lode. This will provide more room on surface for the Winona, and a new shaft, to be known as No. 4, will be opened. As the third and fourth-level drifts south from No. 3 have penetrated the line the new shaft will follow, it will be possible to begin sinking in three places at the same time.

KEWEENAW COUNTY—COPPER.

Ahmeek—Work on the new hoisting engines is advancing steadily. Rock shipments average between 400 and 500 tons daily, which is all that can be handled economically with the present equipment. Fourteen drills are in use under ground, mostly opening new ground and expanding the territory available for stoping. The filling system will be introduced substantially along the same lines as mentioned at the North Kearsarge mine.

ONTONAGON COUNTY—COPPER.

Adventure Consolidated—It is likely that the surplus capacity at the stamp mill will soon be turned into a source of income, as the Winona will soon want the services of one head. The Michigan also may want a head next fall, after its contract with the Mass mill expires.

NEW MEXICO.

GRANT COUNTY.

Granite Gap—Manager Whiteman has gone east, and James Squire, formerly of the Dos Cabezas mines, of Sonora, is now manager of the affairs of the United States & Mexico Development Company, the owner of the Granite Gap mines. The company has an entirely new force of men, having discharged all the men who made trouble. Jas. Fulton is superintendent. A find of high-grade ore has been made on the 600-ft. level.

SOUTH DAKOTA.

CUSTER COUNTY.

Ivanhoe—An open cut has been run 64 ft. on the Detroit claim, showing a face 18 ft. high on the 3-ft. vein. This runs directly toward the Chilkoot, the richest orebody on the property, and by continuing the present workings 700 ft. of stoping ground will be developed. A trestle and an ore shoot from this opening to the mill are being built.

LAWRENCE COUNTY.

Rex—The management of this company has decided to commence work again this summer and to put down a diamond drill to prospect the lower orebody. Frederick P. Julian is the manager.

Branch Mint—The mine will soon be comparatively free from water. The work of unwatering has been going on for some time. The railroad from the mill to the mine, 3½ miles in length, is practically completed.

Eleventh Hour—The new mill is prov-

ing a success. About 140 tons of ore are going through a day, and the mining and milling costs $1.20 a ton. There are six Ingersoll drills in the mine and two more have been ordered.

Parsons—The annual meeting of the Parsons Gold and Silver Mining Company has just been held. This company owns a number of silver claims near the Golden Crest, this side of Galena. It is now thought that the property will be reopened, and the first work will be that of pumping out the water in the main shaft, which is 125 ft. deep.

Homestake South Extension—Under the direction of Superintendent A. H. Olson, the shaft is 130 ft. deep, and has just passed through a quartz vein carrying copper values in small quantities. The shaft is well timbered, and all the work done is of a permanent character.

Globe—This company has decided to put in the Ogden process in their mill. The Ogden Company will also install in this mill building a complete testing and experimental plant, to be operated by electric power.

PENNINGTON COUNTY.

Yellow Jacket—This is the first property to be opened up on the line of the new railroad between Rapid City and Mystic. It is an old property which lies only three miles from the road, and a spur will be built to furnish connections.

UTAH.

JUAB COUNTY.

May Day—Some encouraging developments have been made recently on the 300 and 400 levels of this property.

Beck Tunnel—This property is in a better physical condition than ever before. Stoping is in progress in a shoot of ore that has been followed for 159 feet.

Yankee Consolidated—The bad condition of the roads will delay starting work on the mill to be built by this company.

PIUTE COUNTY.

Providence—This company is preparing to drive a long tunnel to tap the ledges at depth. John Meyerhoffer, of Salt Lake, is president.

SALT LAKE COUNTY.

Bingham Group—A vein of lead carbonate has been opened in this property which is 29 ft. across. A shipment is about to be made. Albert Booth. Bingham Junction, Utah, is manager.

SUMMIT COUNTY.

Park City Shipments—Last week aggregated 4,360,000 lb., the shippers and amounts being: Daly, 1,714,800; Daly West, 1,150,000; Little Bell, 105,000; Daly Judge, 1,057,000; ditto, (zinc middlings) 38,000; Jupiter, 16,000.

Ontario Drain Tunnel—Work is still progressing in the tunnel which is being run in solid formation around the caved section. It may be months, however, before the big avenue is cleared.

TOOELE COUNTY.

Overland—Ore has been encountered in the new shaft at 860 ft. depth, and the gold-bearing orebody has been crosscut for 50 ft. showing values as good as on the levels above. The mill will be started in about 60 days. The plant has bin capacity for 150 tons, and tank room for 2000 tons. E. W. Clark, manager of the Ophir Hill mine at Ophir, Utah, is manager of the Overland.

Cyclone—A body of galena ore, several feet in thickness, has been encountered in a winze 25 ft. below the 700 level. The ore is high-grade shipping stuff.

WASHINGTON.

FERRY COUNTY.

Meteor—The tunnel is going ahead. with two shifts, and may cut the vein within the next 50 ft., 85 ft. from the portal.

New York—A drift, running on the vein, is in 150 ft. and all in ore.

Horse Shoe—Work has been resumed.

Nonpareil—The tunnel is in 760 ft. and expected to cut the main vein about 40 ft. further in. It has crossed two blind ledges, the ore from which assayed well.

Orion—A tunnel, to run 1000 ft., is in 580 ft. The Orion Mining Company has located 1180 acres of land on Columbia river, as placer, and will lay out a townsite. It has also started the construction of a wagon road from Stray Dog cañon to the river, and will establish a ferry across the river for a connection with the Spokane Falls & Northern Railway.

The Meteor, New York, Horse Shoe and Orion mines are situated in Meteor camp, in the southeastern part of Ferry county, on the east side of the Sherman range of mountains and west of the Columbia river, above or north of the big bend of that stream.

Raspberry—A tunnel, from Stray Dog cañon, Meteor camp, is in 16 ft. and has opened a vein, bearing gold and silver.

Blue Bell-Belcher Mining Company—Articles of incorporation were filed in Spokane county, Wash., March 28. Capital 1,500,000 shares, at a par value of $1 each. Incorporators, Chas. S. Voorhies, R. A. Hutchinson, E. C. Gove, George Foster and C. E. Mitchell, all of Spokane, Wash. The object of the company is to acquire and operate the Blue Bell group of claims on Belcher mountain, said to cover 3000 ft. of the Belcher vein, northwest of the Belcher mine, beginning within a few feet of where the Belcher people are working.

Belcher—Two sizes of electric drills are in commission and reported to be giving satisfaction. An upraise is in progress from No. 3 to No. 2 level, and some surface work is being done.

Washington & Great Northern Railway—Fifty steel 50-ton ore cars have been ordered for the transportation of ore from the mines of Republic camp and the Lambert creek division of the Eureka district.

STEVENS COUNTY.

First Thought Gold Mines, Ltd.—A survey is being made for an aërial tramway from the First Thought mine to the Washington & Great Northern Railway, to facilitate the shipment of ore. The working force at the mine, at Orient, now 25 in number, will be largely increased. The ore is dry, but in demand at the smelters, on account of good value in gold.

Pomeroy—Some machinery has been installed to aid development.

WISCONSIN.

GRANT COUNTY.

Kodatz Mining Company—This company, operating a new proposition near Kodatz, between Mineral Point and Belmont camps, reports strong ore at the 100-ft. level. A 4-in. sheet has been opened up clear across the main working breast, which is some 30 ft. in width. The operators are now installing a compressor and pumping outfit.

Vinegar Hill Zinc Mining Company—This new company is operating on the Stacy property, near Galena camp.

Jupiter Mining Company—This company has been organized to work on the Ingram farm, not far from Cuba City camp.

Hoskins Mining Company—This company, of Buncombe camp, held its annual meeting recently. There was some talk previous to the meeting of a change in management by the Joplin contingent, which holds a controlling interest, represented by Frank Nicholson, but no change was made.

Standard Lead and Zinc Company—The troubles of this company will soon be righted, if reports can be relied upon. Henry Anchester, of Milwaukee, is authority for the following: At the annual meeting of the company a committee to investigate the actions of the general manager was chosen, consisting of H. A Blatchley and Frank Boden, attorneys; F. J. Wilson and J. Brien, stockholders, and Henry Anchester, representing the stockholders in a body. The object of appointing this committee is to have them examine the books and transactions of the general manager. A report will undoubtedly be rendered later. It is the general belief that this property is a good one, but it means that several members of the company will have to be dropped before anything can be accomplished.

WYOMING.

L. W. Trumbull, of the School of Mines, University of Wyoming, is preparing to make an extended search through the

middle and western part of the State for the various non-metallic minerals, giving special attention to reported finds of sulphur, borax and elaterite. A search will also be made for coking coal, which, it is thought must be present in the volcanic region south of Yellowstone Park. The School of Mines expects to publish a bulletin upon the non-metallic resources of the State some time during next winter.

Foreign Mining News.

CANADA.

NOVA SCOTIA.

Canadian Mining and Development Company—This new company has completed the purchase of several iron-ore properties at Whycocomagh in the island of Cape Breton, and will undertake extensive development work. Neil Ferguson, of Sydney, Cape Breton, is at the head of the enterprise.

Intercolonial Copper Company—At a recent meeting at Providence, R. I., the capitalization was changed from $2,500,000, divided into $10 shares, to $2,000,000, divided into $5 shares, preferred and common stock, with restricted voting privileges attached to the latter. It is understood that the reorganization includes plans to cancel a $50,000 bond issue, discharge mortgage and other forms of indebtedness, and to arrange for an early resumption of mining operations. It is at Dorchester and the property has been idle two years.

Micmac Gold Mining Company—At a recent meeting the following officers were chosen: President, Thomas W. Moore; vice-president and secretary, Wm. B. Arnold; treasurer, Frederick W. Moore. The other members of the board are Winthrop A. Harvey, Henry W. W. Cain and Arthur P. Milliken. This company, which was recently sold to a party of New York capitalists, is incorporated under the laws of Maine, with a capital stock of $1,500,000. The mines of the company are in the Leipsigate gold-mining district, Lunenburg county. The new interests in the property are about to install new machinery.

MEXICO.

COAHUILA.

La Fronteriza Gold and Silver Mining Company—This company, which was recently organized and has headquarters at Shawnee, Oklahoma, has bought La Fronteriza mine, and is pushing development work on the property.

ASIA.

INDIA—MYSORE.

Kolar Goldfield—The production of gold in March was 49,040 oz., the smallest reported for over a year. For the three months ending March 31 the total was 155,055 oz. bullion in 1905, and 150,592 oz. in 1906; a decrease of 4463 oz. The bullion reported this year was equal to 135,533 oz. fine gold, or $2,801,467 in value.

JAPAN.

An explosion occurred on March 27 in the Takashima colliery, near Nagasaki, causing the loss of 250 lives. This is one of the most disastrous colliery accidents that has occurred in Japan. The cause of the explosion is not known, but will be fully investigated by the Government mining inspectors.

AUSTRALIA.

NEW SOUTH WALES.

The gold yield in March is reported at 16,539 oz., a decrease of 7053 oz. from March, 1905. For the three months ending March 31 the total was 84,376 oz. in 1905, and 95,493 oz. in 1906; an increase of 11,117 oz. this year.

QUEENSLAND.

The gold production of the State in March is reported at 41,300 oz. fine. Dividends paid during the month by Queensland mines amounted to £71,400. Calls, or assessments reported were £21,000 in all.

Coal Trade Review.

NEW YORK, April 18.

The coal situation is not cleared, by any means. The long discussion between the anthracite operators and miners has resulted in a refusal of the former to consent to arbitration, except on the grounds they have already stated. Negotiations are not finally broken off, and the stoppage of work in the mines is still only a "suspension;" but a settlement seems further away. Meantime there are some manifestations in the region, which show that an ugly feeling is growing among the miners, especially those of foreign birth. On the other hand, there are signs of preparation for working the mines—or attempting to work them—in case of necessity, which do not tend to allay feeling. Upon the whole the situation is disquieting.

In the West, the Pennsylvania mine operators and a majority of those in the Hocking Valley in Ohio, have signed the scale and their mines are working. In the rest of Ohio the operators still hold out, and the Illinois Operators' Association seems determined not to yield, though this may change when the situation comes down to the individual companies. A number may then give in, as many have done in Indiana, notwithstanding the action of their association—arbitration is talked about.

A violent outbreak occurred this week at the Windber mines of the Berwind-White Company. These mines are non-union, and attempts made to bring the miners into the union, or force them to stop work, resulted in a violent collision, in which five men were killed and 20 injured.

A significant feature is the shipment of Kentucky coal to Chicago and elsewhere. These mines have their own agreement, and have increased in number during the past year, so that they are ready to take advantage of any scarcity of coal in the markets; and to open markets for themselves, wherever an opportunity is offered.

The final refusal of the anthracite operators to arbitrate is published as we go to press. It takes the ground that practically no new questions have arisen since the award of the Anthracite Strike Commission, and that there is really nothing on which to arbitrate, except possibly the rate of wages. This, with the reports from the region itself, point to a determination to fight the union and break it up, if possible.

A Washington despatch says that the Department of Justice has decided to investigate the "coal trust," and see if there have been any violations of Federal law in the coal trade. Charles E. Hughes, of New York, and Alexander Simpson, Jr., of Philadelphia, have been retained as counsel to assist in the investigation.

COAL TRAFFIC NOTES.

The total coal and coke traffic originating on all lines of the Pennsylvania Railroad east of Pittsburg and Erie for the year to April 7, was as follows, in short tons:

	1905.	1906.	Changes.
Anthracite	1,099,569	1,333,299	I. 233,730
Bituminous	7,317,525	9,727,838	I. 2,410,313
Coke	2,923,608	3,397,757	I. 474,149
Total	11,340,702	14,458,894	I. 3,118,192

Shipments of Broad Top coal for the week ending April 14 were 123 tons; for the year to April 14 they were 287,807 tons.

The anthracite coal shipments for the three months ending March 31 were as follows, in long tons:

	1905. Tons.	1905. Per Ct.	1906. Tons.	1906. Per Ct.
Reading	2,682,905	19.8	3,301,673	20.7
Lehigh Vy	2,242,460	16.5	2,353,336	14.8
N. J. Central	1,815,064	13.4	2,061,700	13.0
Lackawanna	2,161,061	15.9	2,613,741	16.4
Del. & Hudson	1,365,428	10.0	1,601,867	10.1
Pennsylvania	1,101,288	8.1	1,385,630	8.7
Erie	1,211,333	8.9	1,494,920	9.4
N. Y., Ont. & W.	642,143	4.7	679,830	4.3
Del., Sus. & Schu'l	368,064	2.7	423,354	2.6
Total	13,589,746	100.0	15,916,051	100.0

All the companies show gains this year; the total increase was 2,326,305 tons, or 17.1 per cent. The monthly average for this year was 5,305,350 tons, against 4,529,915 tons last year.

The Chesapeake & Ohio Railway reports coal and coke tonnage for the eight months of its fiscal year from July 1 to Feb. 28 as follows, in short tons:

	Coal.	Coke.	Total.
New River	3,603,190	217,645	3,820,835
Kanawha	1,883,746	77,730	1,961,476
Kentucky	70,436	.....	70,436
Connecting lines	303,489	27,707	331,196
Total	5,860,861	323,082	6 183 943

The totals show increases of 753,061 tons of coal and 132,231 tons of coke over last year. The disposition of the tonnage originating on the line was: Points west of mines, 2,327,013 tons coal and .170,865 tons coke. Points east, 1,020,739 tons coal and 124,510 tons coke; tidewater, 2,209,620 tons coal.

New York. April 18

ANTHRACITE.

A peaceable solution of the labor difficulty appears to be farther removed than ever. The joint conference of miners and operators last week, at which the proposal to arbitrate the points at issue was considered, adjourned finally without having reached any conclusion. Negotiations, however, may still be carried forward, but the operators are firm in their refusal to concede the demands of the workmen. In the meantime, the mines stand idle partly because the owners feel no necessity for operating them and partly because, judging from the present attitude of the strikers, it would not be safe to work them. A few washeries are running and the companies are generally shipping from stock-piles. There is very little demand for coal, however, and by the time stocks are depleted, a settlement will probably be reached. The usual summer discount will not occur this year. Prices therefore remain at the old level; $4.75 for broken and $5 for domestic sizes. Steam sizes: $3 for pea; $2.25@2.50 for buckwheat; $1.45@1.50 for rice and $1.30@1.35 for barley f.o.b. New York harbor shipping points.

BITUMINOUS.

The Atlantic seaboard soft-coal trade is uneasy under the prevailing strike conditions, although the preparations made before April 1 have put the consumers into a state of preparedness, so that the coal is not now in great demand. A few Eastern ports, however, are blockaded with boats waiting to discharge, and demurrage is accruing.

The labor trouble seems to have localized in central Pennsylvania where the questions at issue appear to be of vital importance to the producers; the demands of the men were such as to have closed down mines in that region, if they had been conceded.

Trade in the far East is not active. Producers are taking on some business on new contracts, and are filling in their storage as soon as consumption has used up a cargo. The Sound shows a very ordinary demand and consumers are not calling for more than their monthly allotments on contracts. New York Harbor has seen a recession on prices for transient business. Coal has been bought for less than $3.25 f.o.b. New York harbor shipping points.

Transportation is excellent and car supply is equal to all demands. Vessels in the coastwise market are in good supply and are looking for cargoes. Current rates from Philadelphia are: To Boston, Salem and Portland, 75c.; to the Sound, 60c.; to Lynn, Newburyport, Saco and Gardner, 90c.; to Portsmouth and Bath, 85c. per ton.

Birmingham. April 16.

Coal production in Alabama shows no decrease, and in various collieries record daily outputs are being made. Coal prices are steady. Coke is still in demand, despite the reduction in pig-iron production.

The Sayre Mining and Manufacturing Company during the past week filed official notice of the increase in capital stock from $200,000 to $300,000. The additional capital will be used in making improvements at the mines and constructing more coke ovens.

Paul J. Stith, president of the Stith Coal and Iron Company, shot himself through the heart Friday; the cause of the rash deed is believed to have been despondency over business troubles. For a number of years Mr. Stith was superintendent of the Brookside coal mines for the Sloss-Sheffield Steel and Iron Company.

Chicago. April 16.

The wholesale coal market is quiet; little business is being done, because of the general tendency of the public to await developments in the strike situation before ordering in excess of immediate needs. These needs are fairly well provided for, in general, by the stocks laid in by retailers and consumers, which will be good for two or three weeks yet. Nearly all the coal now moving is on short orders for consumers who did not lay in stores before the strike began. This applies to both anthracite and bituminous, though the popular feeling about anthracite supplies seems to be that it is undesirable to buy now, and consequently anthracite sales are unusually slow.

Hocking and smokeless coal are largely taking the place of Illinois and Indiana coal in the city. For Eastern coals generally, however, the demand is not large, owing to the same causes that affect Western coal. Smokeless brings $3.50 with plenty coming forward to supply the demand; Hocking is quoted at $3.25@3.50, with similar light demand and a fair supply. Illinois and Indiana, what there is to be had, brings $2.50@2.75 for run-of-mine and $2.30@2.50 for screenings. Some coal from Kentucky is coming forward, at about $3 for run-of-mine and $3.50@4 for lump.

Cleveland. April 17.

The coal situation on the lakes and in this territory has eased materially during the last week. The cause for the change is the fact that the Pittsburg Coal Company has signed the scale and started operating its mines. This caused all of the independent mines in the Pittsburg district to do the same thing, with the result that coal has been coming into the Cleveland territory at a lively pace during the past week. Since most of the consumers had stocked up a supply sufficient for 45 to 60 days, this new coal eases the market materially, leaving an overflow for the lake trade. In addition to that the shipment of three-quarter coal by lake is increasing the supply of slack, which is also easing that situation. The Ohio mine operators have been holding meetings during the past week and will hold others this week. They will probably not begin operations until the middle of May or later. The result of the abundant supply of coal has been easier prices all the way through and mine-run steam coal has been selling down to $2, delivered, during the past week, with a further recession in sight, and slack has sold at $1.80 delivered. Both prices are $1 a ton below the high-water mark. No prices have been fixed for the lake trade, and the information is that they will not be made by agreement this year, the old arrangement having been abandoned as inoperative. Some more coal has been taken on contract by lake vessels, and the movement will soon be heavy. The new rates are 40c. to Lake Michigan, and 30c. to the head of the lakes.

Coke prices have also eased as to furnace coke, which is selling at $2.50@2.75 at the oven, while 72-hour foundry coke is still firm at $3.25@3.50 at the even.

Pittsburg. April 17.

Coal—With the exception of the five mines of the National Mining Company, a subsidiary interest of the United States Steel Corporation, the mines in the Pittsburg district are in full operation today. There was a suspension at a number of mines yesterday, as the foreign element among the miners insisted on observing the day as a holiday. The only strike is at the mines of the Great Lakes Coal Company in the northern part of the district and 1200 men are involved. These mines are not in the district proper and have been operating under a special scale. The management has refused to concede the demands of the miners' organization. While a strike has not been declared against the company the miners are not permitted to return to work until a settlement is reached. The Pittsburg member of the National executive board of the United Mine Workers left last night for Indianapolis, where a meeting of the board is in session today. Commissioner P. H. Penna, of the Indiana Coal Operators' Association, is in Pittsburg. He says about 85 per cent. of the tonnage is idle in Indiana and probably 90 per cent. in Illinois. The operators have agreed to submit the mining rate dispute to arbitration and to start the mines at once pending the result. President John Mitchell was not willing to take the re-

sponsibility of accepting or rejecting the proposition and has submitted it to the national executive board. The Pittsburg Coal Company is making heavy shipments to lake ports for the northwestern markets and although the regular lake season did not open until yesterday, a number of vessels were started early last week. Prices are about normal and quotations this week are based on mine-run coal at $1.10 a ton at the mine. Some operators are said to be getting a higher price.

About 50 coal operators, representing 95 per cent. of the independent interests in the Pittsburg district, not including the National Mining Company and the Vesta Coal Company, the fuel concerns of the United States Steel Corporation and the Jones & Laughlin Steel Company, met last night and formed a temporary organization. It is proposed to form an association of coal operators and a committee was appointed to prepare a constitution and by-laws to be submitted for approval at another meeting to be held later in the week. The object of the association is to protect the interests of the members but not to antagonize the Pittsburg Coal Company and its allied companies. The operators who attended the meeting represent an annual tonnage of 13,000,000 tons and employ nearly 20,000 miners. It is intimated that when the proposed association is perfected it will lead to the consolidation of the independent interests in this district into a company that will be almost as strong as the Pittsburg Coal Company. John H. Jones, president of the Pittsburg-Buffalo Company, is one of the principal promoters of this plan to get the independent operators together.

Connellsville Coke—Quotations of fancy prices have stopped and $2.35@2.50 is named for furnace and $2.90@3 for foundry. The production for the week is given at 268,579 tons, a decrease of 1075 tons compared with the previous week. The shipments aggregated 12,320 cars, an increase of 202 cars, distributed as follows: To Pittsburg and river points, 4466 cars; to points west of Pittsburg, 6509 cars; to points east of Everson, 1345 cars. The combined shipments from the Connellsville and Masontown fields aggregated 355,567 tons.

San Francisco. April 12.

The coal market continues without change in conditions or prices. Stocks are fair, except of Eastern coals.

For coast coals, in large lots to dealers, prices are: New Wellington and Richmond, $7.50; Roslyn, $7; Wellington, Seattle and Bryant, $6.50; Beaver Hill and Coos Bay, $5.50; White Ash, $5.25. For Rocky Mountain coals, in car-lots, prices are: Colorado anthracite, $14; Castle Gate, Clear Creek, Rock Springs and Sunnyside, $8.50. Eastern coals are largely nominal at $14 for both anthracite and Cumberland. Foreign coals, ex-ship, in large lots are: Cannel, $8.50; Brymbo and Walsend, $7.50. No Welsh anthracite on the market.

Foreign Coal Trade.

April 18.

Exports of fuel from Germany for the two months ending Feb. 28 were as follows, in metric tons:

	1905.	1906.	Changes.
Coal	2,443,179	3,767,028	I. 1,323,849
Brown coal	3,171	3,340	I. 169
Lignite	366,103	568,113	I. 202,010
Total	2,812,453	4,338,481	I. 1,526,028

The increase in exports this year was chiefly to France, Belgium and Austria. included in the exports this year is 3420 tons of coke to the United States.

Imports of fuel into Germany for the two months ending Feb. 28 were, in metric tons:

	1905.	1906.	Changes.
Coal	1,806,831	1,271,092	D. 535,739
Brown coal	1,283,622	1,262,440	D. 21,182
Coke	138,838	116,832	D. 22,006
Total	3,229,291	2,650,364	D. 578,927

The larger imports last year were due to the strike of the coal miners.

The production of coal in Germany for the two months ending Feb. 28 was, in metric tons:

	1905.	1906.	Changes.
Coal	15,385,993	22,800,826	I. 7,414,833
Brown coal	8,742,621	9,601,927	I. 859,306
Total mined	24,128,614	32,402,753	I. 8,274,139
Coke made	1,436,009	3,141,593	I. 1,705,584
Briquets made	1,938,350	2,441,817	I. 503,467

The effect of the strike last year is plainly shown. The briquets are largely made from brown coal, or lignite.

Iron Trade Review.

New York, April 18.

A revival in buying of pig iron has marked the week. Pipe makers especially, have bought large quantities, and other foundries are coming in. The big steel-makers have also been buyers, and it looks as if the temporary slackening in business was over.

The activity in finished material also shows an increase. Structural material and plates have not shown at any time the easing which was apparent in other lines. Now inquiries and actual buying are increasing in all lines, and the mills are beginning to hesitate about deliveries, fearing a rush in the summer. Rail orders have been large again, and the mills are almost filled up for the year. The Tennessee Coal, Iron and Railroad Company is now asking $29 per ton for basic open-hearth rails from its Ensley mill, the capacity of which is being enlarged. This has given rise to a good deal of loose talk about the superior quality of open-hearth rails, much of which shows a lack of knowledge upon the subject.

The settlement in the Pittsburg district removes apprehension of delay at the mills on account of coal shortage. The mines in the district are in operation, and the supply of coal will be abundant.

Pig-Iron Production—The reports for April 1 show that the total weekly capacity of the coke and anthracite furnaces in blast on April 1 was 484,300 tons; an increase of 4500 tons over March 1. Taking the estimate made by the *Iron Age*, with an allowance for the output of the charcoal furnaces, the total production of pig iron in the United States in March was 2,196,000 tons; for the three months ending March 31, it was 6,239,000 tons.

Birmingham. April 16.

Conditions are bright and there is a healthy inquiry. Sales are being made right along for delivery during the third quarter of the year and some of the larger consumers have made an inquiry or two into the possibilities of the fourth quarter. There has been no improvement lately in the way of production and sales during the past week exceeded the make. Shipments are steady, while home consumption is as large as it has been in months. The cast-iron pipe makers have been doing the most buying of late though machinery manufacturers are also laying in supplies. The larger furnace companies are maintaining $14 per ton for No. 2 foundry, though there is a little shading in the lower grades. No charcoal iron is being manufactured in this State at present. The Shelby Iron Company has one furnace in blast but it is turning out coke iron instead of charcoal. Quinn furnace at Attalla may be started at any time now. There appears to be no indication that the quotations are going to advance in the near future except that Northern furnaces are unable to supply their demand. Inquiries received in this district come from all directions. A number of small orders have been placed recently with the understanding that there is to be an early delivery. J. A. Durfee, general superintendent of the Ensley division of the Tennessee properties, has been called for a conference with the officials of the company in New York in relation to the extensive improvements planned for the iron and steel plants in this district.

Chicago. April 16.

The iron market continues to be unmarked by any striking features, but the tone is still strong, as regards pig iron. Sales are still confined chiefly to quick-delivery lots, small in individual tonnage but aggregating a fair business, with a growing percentage of contract business for the last half of the year.

Nearly all the furnaces in Chicago territory have disposed of their iron up to autumn, and business is being done chiefly in Southern. An occasional lot of

Northern iron is to be had, however, on quick delivery. Southern No. 2 brings $14@14.50 Birmingham, or $17.90@18.40 Chicago. Northern No. 2 is quoted at $18.75@19.25, with the tendency in favor of the higher price.

Coke is not in large demand, but prices are still high—$5.90@6.15 on 72-hour Connellsville, and Southern cokes 25@65c lower.

Cleveland. April 17.

Iron Ore—The season of navigation opened April 15 by the success of boats in getting through the St. Mary's river and opening the channel between the upper and the lower lakes. The labor situation and the failure of the ore producers to get started early in the year, has placed an artificial embargo on the movement of freight and the shipment for the first few weeks is expected to be light. The labor situation has not been cleared. The movement has been heavy from the lake docks to the furnace stock-piles, and the result is that the stocks on Lake Erie ports have been depleted. The possibility is that the Steel Corporation fleet will be in operation from now on, while the merchant fleets will not be started until the war is over. Their advantage lies in shortening the season of navigation that the wild rates may be advanced.

Pig Iron—Buying for the second half has started, and in addition inquiries are heavy for delivery after July 1. The market has run off again, and No. 2 is quoted at $16.50 in the Valleys. This price is an incentive to buy before an advance comes. Material for spot shipment is selling on the same basis. Southern furnaces are not doing much in this territory, since they are holding for $14, Birmingham, to which is added $3.85 to make up the price in Cleveland.

Finished Material—The market is unsteady. The supply of billets is short, and while some forging qualities are being sold at $35 at the mill, some consumers have to use bars. Now, structural capacity is easing that situation, but not enough has been shipped from the new mills to supply demand, and premiums are being paid jobbers and eastern mills. Bars are easy, bar iron being down to 1.60c. Youngstown. Plates are active.

New York. April 18.

Pig Iron—Business has been more active, and there have been larger sales. The pipe makers have been taking some heavy lots, and it is reported that on some of these there has been shading of 25 or 50c. a ton; but this cannot be verified. Northern furnaces are pretty firm in their views, while Southern makers are stiffer, holding at $14, Birmingham.

For Northern iron in large lots we quote: No. 1 X foundry, $18.50@19.25; No. 2 X, $18@18.75; No. 2 plain, $17.50@18; forge, $16.25@16.75. Southern iron is held firmly by the larger companies on the basis of $14 Birmingham for No. 2. For large lots on dock, New York, prices are: No. 1 foundry, $18.25@18.50; No. 2, $17.75@18.25; No. 3, $17@17.50; No. 4, $16.25@17; No. 1 soft, $18.25@18.50; No. 2 soft, $17.75@18; gray forge, $16.25@16.50. Basic is held at $19 for Virginia, $18.50 for Alabama and $18 for Northern.

Cast-Iron Pipe—Prices are steady, the present basis being $30.50 per net ton for 6-in. pipe in carload lots at tidewater points. Business is active, and higher prices are expected.

Bars—Business is better, but prices are unchanged. Sales are at 1.645@1.695c. for common iron bars, and 1.745c. for refined iron. Steel bars are also 1.645c., tidewater. Store trade is a little more active at 2c., delivered.

Plates—Steel plates are in steady demand. Tank plates are nominally 1.745@1.825c.; flange and boiler, 1.845@1.945c.; universal and sheared plates, 1.745@1.845c.; according to width. Sales have been chiefly in small lots.

Structural Material—Prices are nominally unchanged. Beams under 15 in. are 1.845c. for large lots; over 15 in., 1.895c.; angle and channels, 1.845c., tidewater delivery. Jobbers ask a considerable advance on small orders. New business continues to come out, though there is difficulty in securing the deliveries wanted.

Steel Rails—No change in standard sections. Light rails are in steady demand, prices ranging from $26 for 25-lb. up to $33 for 12-lb. rails. The demand for trolley rails is good. Orders have been large, but few are negotiated in this market.

Old Material—Business is better and dealers hold for the same prices. No. 1 railroad wrought is $18@19; No. 1 yard wrought can be had for $17@18; machinery cast, $14@14.50; heavy steel melting scrap, $15@16.50. These prices are on cars, Jersey City or other terminal delivery.

Philadelphia. April 18.

Pig Iron—The greatest activity this week has been in basic and pipe irons in which quite a good volume of business has been done very quietly. Other kinds of crude-iron have remained quiet. The most remarkable feature of the week has been an apparent drop of 50c. per ton, but this does not affect actual quotations as yet. No. 2 iron is the weakest on the list, but will regain strength as soon as some stocks on hand are disposed of. The better grades of iron are scarce and hard to get. The quotations given last week hold good today.

Steel Billets—A big business has been done in billets. Quotations are given at $29 for ordinary steel with prices ranging from $4 to $6 higher for the different kinds of forging steel.

Bar—There is renewed rumor today of a weakening tendency in merchant bar iron, but the office people deny it. Some business has been done at less that 1.73½ for refined bar, but the volume of business warranted the quotation.

Sheets—The numerous small spring requirements for sheet iron are now dropping in and light sheets are meeting with more attention than any other kind.

Pipes and Tubes—The pipe market is strong and prices are unchanged. The tube situation is just what it has been for months past, especially, with reference to boiler tubes.

Merchant Steel—A good deal of merchant steel is being hurried forward this week and but little business is going to the mills.

Plates—The plate situation is fully as satisfactory as a month ago but the mills of this State have not been booking quite as much business as recently. Tank iron is quoted at 1.73½; boiler steel 1.83½; marine and fire-box steel 1.93½.

Structural Material—There has been another rush of orders this week to the structural mills of this State and there appears to be no end to the requirements.

Steel Rails—A large volume of business has been transacted the amount of which is not given out. The railroad builders are anxious to crowd in their orders and they have been doing so.

Scrap—The scrap market has moved up a notch since last week. Steel scrap now commands $17@17.25. A good deal has been taken at these figures. Low-phosphorus scrap is wanted at $21; machinery scrap is held at $16; No. 1 yard scrap is quoted at $18, with sales at $17.50 per ton.

Pittsburg. April 17.

The heavy buying movement in pig iron continues, sales for the week aggregating nearly 50,000 tons, exclusive of the purchase of the United States Steel Corporation and the Cambria Steel Company. As indicated in last week's report the Corporation bought 15,000 tons of bessemer iron from the Bessemer Pig Iron Association for April delivery, and will take 3000 tons additional if the Association can spare it. The price paid was $17.25, Valley furnaces and the iron bought by the Corporation in January for second-quarter delivery at $17.75, guaranteed against a decline, will be adjusted to about this basis. The Corporation also bought 2000 tons of basic iron paying $17, Valley. The reported purchase of 10,000 tons of bessemer iron by the Cambria Steel Company for April delivery from W. P. Snyder & Co., has been confirmed. The largest pig iron transaction of the week was the sale of 13,000 tons of gray forge to the United States Cast Iron Pipe and Foundry Company for its Scottdale plant. The sale was made by a near-by furnace, and the price was $16, which is equal to $16.80 de-

livered at Pittsburg. Two sales of gray forge of 2000 tons each are reported this week, the price given on one being $17, Pittsburg, and on the other $16.50 is named. The forge market seems to be a trifle better this week and $16.75, Pittsburg, appears to be the minimum price for second quarter. Foundry iron also has strengthened a little, and the sales for the week exceed 20,000 tons, some of which was Southern iron. The price paid for Northern No. 2 ranges from $16.75 to $17, Valley. The reported purchase of ful if less than $16.75 can be done even on an attractive order for second-half delivery. The Southern iron market is firmer. A number of sales of bessemer iron in small lots of from 200 to 500 tons have been made within the past few days at $17.50, Valley, for delivery this month. The aggregate tonnage exceeds 4000 tons. According to reports the general pig-iron market is stronger today than it has been for several weeks. No stocks of bessemer iron have accumulated, and it is understood the United States Steel Corporation will take at least 15,000 tons a month for delivery this quarter. The ferro-manganese market continues strong, and it is now generally believed the scarcity during the past few months has been due more to the increased demand than to the shortage of supply. The anticipation of lower prices for second half may not be realized.

Business in finished steel lines is remarkably good, especially in structural material, a number of orders having been booked during the week. The mills are sold up to the end of the third quarter. New business in plates also is coming in, and some of the small mills that were short of orders a few weeks ago cannot guarantee deliveries inside of 60 days. On steel car plates the mills are filled for the rest of the year. Agricultural implement makers are inquiring for merchant-steel bars on contracts for the season beginning July 1. Bar mills do not seem inclined to make concessions, and there may be some delay in closing the contracts. Common iron bars are quoted this week at 1.60c., a decline of about $1 a ton, but this rate is $2 a ton above that of steel bars. Rail orders continue to come in, and there is now no doubt but that this year's contracts will amount to over 3,500,000 tons. The Ohio works of the Carnegie Steel Company which recently changed from sheet-bars to steel rails will likely remain on the rails for the rest of the year, despite the fact that some of the mills of the American Sheet and Tin Plate Company may be forced to close for lack of steel. The starting of the new Sabraton works at Morgantown will result in the closing of some tin-plate mills, the supply of steel being inadequate to keep all in full operation. Several independent sheet and tin-plate mills were forced to close during the week, and prices in these lines are very firm.

Pig Iron—Prices are quoted today as follows: Bessemer, $17.25@17.50; basic, $17; foundry No. 2, $16.75@17, all at Valley furnaces; gray forge, $16.60@16.75, Pittsburg.

Steel—Billets are scarce and prices are about 50c. higher this week, bessemer billets being quoted at $27.50 and open-hearth at $28. Plates are firm at 1.60c., and merchant-steel bars at 1.50c.

Sheets—A number of orders in 200-and 300-ton lots were booked at the full price of 2.40c. for No. 28 gage. Galvanized sheets are firm at 3.45c.

Cartagena, Spain. March 24.

Iron and Manganiferous Ores—Messrs. Barrington & Holt report that shipments for the week were one cargo, 1750 tons dry ore, and six cargoes, 13,550 tons manganiferous ore, to Great Britain; one cargo, 4800 tons magnetic ore, to Rotterdam. The trade is steady, and most firms have little or no ore to sell. Freight rates were low.

Quotations are 8s. 5d. for ordinary 50 per cent. ore; 9s.@9s. 4d. for special low phosphorus; 11s. 9d. for specular ore, 58 per cent. iron; 10s. 2d. for S. P. Campanil. Manganiferous ores range from 11s. 8d. for 35 per cent. iron and 12 manganese, up to 18s. 2d. for 20 per cent. iron and 20 manganese. All prices are f.o.b. shipping port.

Heavy Chemicals and Minerals.

NEW YORK, April 18.

The quotations for heavy chemicals are shown in the table given herewith; and in particular:

Blue Stone (copper sulphate)—This has shown variable activity lately, not entirely dependent upon the price of the metal, but also in connection with the demand for insecticides.

Nitrate of Soda—We announced in a recent issue the probable re-adjustment of the combination on the West Coast. This was confirmed by telegraph, but only a few details have been learned. However, in view of this, the market has stiffened, and prices are advancing, as quoted herewith. The indications do not favor the interest of the consumer; as compared with a year ago, there is no surplus.

Phosphate—The market is stiff on account of an apparent shortage for 1906; in accord with which quotations hold their own.

Potash Salts—New quotations were recently announced by the American agents of the German Kali Syndicate.

Sulphur—Emil Fog & Son, of Messina, under date of Mar. 31, 1906, report that at the meeting in Rome between the Anglo-Sicilian Company and the representative of Louisiana interests, no understanding was effected. The Italian Government decided to send two engineers to America to report on the Louisiana mines, and may await their return before presenting to Parliament the new bill on the compulsory trust. So far nothing has transpired as to what will become of the stock belonging to the Anglo-Sicilian; had the company not raised prices so inconsiderately, its stock would probably never have reached such proportions. The Louisiana mines, in 1895, had almost been abandoned in despair; moreover the Italian Government, abolishing the export duty of 8s. a ton, had given all facilities in order that the Sicilian product might compete successfully against the invading pyrites. The Anglo-Sicilian Company, by unfortunately raising values considerably, caused the Louisiana people to renew their efforts to pierce that troublesome quicksand. Even the manufacture of recovered sulphur had been given up, but was resumed in competition against Sicily. The Anglo-Sicilian ought to have tried to reduce the production, but the large profits induced it instead to offer advances to mine-farmers, thereby increasing the production and aggravating the position. The new "Consorzio Obbligatorio" may find a solution to these disconcerting questions without a crisis.

PRICES.

"Alkali," per lb., future	0.75@.87½c
" " " prompt	.85@.95c.
Soda ash, 48%, per lb	1.2@1.3c.
Bicarb. soda, per lb	1.3@1.5c.
Bleaching powder, per lb	1.3c.
Soda, caustic, per lb., future	1¾@1.8c.
" " " April, May	2¼@3c.
Salt cake, per lb	.65c
Sal soda, per lb	.6@1.4c.
Soda, monohydrate, per lb	1¼@1¾c.
Potash, caustic, per lb	4½@6¼c.
" carbonate, 82-85%	3¾@4¼
Alum, per lb	1.75@1 85c.
Ammonia, aqua, 26 deg., per lb	4¾@5¾c.
Nitrate of soda, 100 lb. 96% for 1906	$2.35
95% for 1906	2.30
Saltpeter (pot. nitrate) per lb	4¼@5¼c.
Potash, muriate, per cwt	$1.90@$1.98
Potash, kainite, per long ton	$8.50@9.50
Potash, sulphate, 90%, 100 lb	$2.18@2.21½
Sulphate of ammonia, per 100 lb	$3.06@3.07½
Hydrochloric acid, nominal, per lb	1.1c.
Nitric acid, per lb.	3¾@5¾c.
Sulphuric acid, 50°, bulk, per ton	$12 up.
60°, 100 lb. in carboys	1.00
60°, bulk, ton.	18.00@20.00
66°, 100 lb. in carboys	1 00@1.25
66°, bulk, ton	21.00@23.02
Alcohol (ethyl) per gal	$2.45@$2.47
" (methyl or wood) 95%	$0.70
Arsenic, white, per lb., nominal	5½@6½c.
" red, per lb	6½@7c.
Blue stone (copper sulphate), carload, per lb	6c.
Sulphur.	
Louisiana (prime) to New York, Boston or Portland, ton	$22.12½
To Philadelphia or Baltimore "	22.62½
Tin.	
Crystals, per lb., varies with metal	23c., up.
Pyrite.	
Domestic, furnace size, per unit	10½@11c.
Fines "	8@10c.
Imported, lump, non-arsenical, per unit	11½c.
Imported, lump, arsenical, per unit	10½@11c.
" fines, non-arsenical, per unit	10½@11c.
Imported, fines, arsenical, per unit	8½@9c.

Pyrite prices are per unit of sulphur. On lump deliveries, a charge of 25c. per ton is made for breaking to furnace size.

Phosphates.	F. O. B.
*Fla., hard rock	$8.00@8.50
land pebble	4.50@5.00
†Tenn., 78@80%	4.60@4.65
78%	4.00@4.25
75%	3.75@4.00
68@72½%	3.25@3.50
‡So. Car. land rock	4.00@4.25
" " river rock	3.75@4.00

Prices for 1906 are merely nominal, as there is practically none to be had.

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

Metal Market.

New York, April 18.

Gold and Silver Exports and Imports.

At all United States Ports in March and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Mar. 1906..	$4,618,627	$5,625,529	Imp. $1,006,902
" 1905.	2,392,784	5,133 592	" 2,740,808
Year 1906..	18,846,622	10,310,921	Exp. 8,535,701
" 1905..	34,015,264	9,222,202	" 24,793,062
Silver:			
Mar. 1906..	5,213,811	3,507,532	Exp. 1,706,279
" 1905..	4,191,632	2,531,796	" 1,659,836
Year 1906..	19,165,608	12,674,692	" 6,490,916
" 1905..	12,592,452	6,515,356	" 6,077,096

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

Gold and Silver Exports and Imports, N.Y.

For the week ending April 14, and for years from January 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	$482,101	$1,013,265	$1,040,196	$ 44,053
1906.....	3,674,526	4,315,183	20,278,173	579,740
1905.....	31,950,770	4,184,040	10,037,998	1,114,675
1904.....	6,745,095	1,581,354	13,496,640	210,742

Imports of gold for the week were chiefly from Germany and France; of silver from Mexico. The gold exported for the week went to Cuba and the West Indies; the silver to London.

The following table shows the specie holdings of the leading banks of the world. The amounts are reduced to dollars:

	Gold.	Silver.	Total.
New York.....	.....	.....	$172,704,700
England.	$175,058,275	.....	175,058,275
France....	591,716,500	$210,024,365	801,740,865
Germany	171,710,000	57,240,000	228,950,000
Spain.....	75,465,000	118,990,000	194,455,000
Netherlands...	30,266,000	29,726,000	59,992,000
Belgium.	17,630,000	8,815,000	26,445,000
Italy.....	141,800,000	19,433,500	161,233,500
Russia..... .. .	460,995,000	24,015,000	485,010,000
Austria.	230,010,000	63,940,000	293,950,000

The returns of the associated banks of New York are of date April 14, and the others April 13. The foreign bank statements are from the *Commercial and Financial Chronicle*, of New York. The New York banks do not separate gold and silver in their reports.

The statement of the New York banks —including all the banks represented in the clearing house—for the week ending April 14, gives the following totals, comparison being made with the corresponding week of 1905:

	1905.	1906.
Loans and discounts..	$1,099,611,100	$1,009,275,200
Deposits.....	1,139,702,000	981,861,600
Circulation.....	44,407,900	51,452,300
Specie.....	210,954,800	172,704,700
Legal tenders.....	83,323,100	77,533,200
Total Reserve.....	$294,277,900	$250,237,900
Legal requirements....	284,825,500	245,465,400
Surplus reserve.....	$9,352,400	$4,772,500

Changes for the week this year were increases of $946,700 in special and $991,-500 in legal tenders; decreases of $23,434,-200 in loans, $21,579,500 in deposits and $265,100 in circulation. The surplus in reserve was $4,772,500, against a deficit of $2,500,625 for the previous week.

Shipments of silver in London to the East are reported by Messrs. Pixley & Abell as follows for the year to April 5:

	1905.	1906.	Changes.
India.....	£ 2,279,890	£ 5,371,960	1. £ 3,092,070
China.....	8,070	.....	D. 8,070
Straits..	2,800	.....	D. 2,800
Total.....	£ 2,290,760	£ 5,371,960	1. £ 3,081,200

Receipts for the week were £24,000 from the West Indies; £298,000 bars and £47,000 Mexican dollars from New York; £50,000 in Mexican dollars from Hongkong; a total of £419,000. Exports were £251,250 in bars and £105,100 in Mexican dollars; £356,350, all to India.

The foreign merchandise trade of the United States for the three months ending March 31 is valued by the Bureau of Statistics of the Department of Commerce and Labor as follows:

	1905.	1906.
Exports.....	$367,446,594	$457,891,953
Imports	311,858,477	324,381,470
Excess, exports....	$ 55,588,117	$133,510,483
Add ex. of exp., silver.....		6,490.016
" " " gold.....		8,535,701
Total export balance.....		$148,536 200

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

Prices of Foreign Coins.

	Bid.	Asked.
Mexican dollars.....	$0.50	$0.53
Peruvian soles and Chilean.....	0.46	0.49
Victoria sovereigns....	4.85⅓	4.87⅓
Twenty francs.	3.86	3.89
Spanish 25 pesetas..... ...	4.78	4 80

SILVER AND STERLING EXCHANGE.

Apr.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	Apr.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
12	4.84¼	64¾	29⅞	16	4.85½	64⅝	....
13	4.85	64½	....	17	4.85½	64⅞	29 11/16
14	4.85	64⅝	29⅞	18	4.85¼	64⅞	29 11/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, .925 fine.

Other Metals

Daily Prices of Metals in New York.

April.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
12	18⅝ @18¾	18¼ @18⅝	84 13/16	38⅛	5.35	6.05	5.90
13	18⅝ @18¾	18¼ @18⅝	.....	38¾	5.35	6.05	5.90
14	18⅝ @18¾	18¼ @18⅝	....	38¾	5.35	6.05	5.90
16	18⅝ @18¾	18¼ @18⅝	.....	38¾	5.35	6.05 @6.10	5.90 @5.95
17	18⅝ @18¾	18¼ @18⅝	85¼	38⅞	5.35	6.05 @6.10	5.90 @5.95
18	18⅝ @18¾	18¼ @18⅝	85 1/16	38⅞	5.35	6.05 @6.10	5.90 @5.95

London quotations are per long ton (2,240 lb). standard copper, which is now the equivalent of the former g. m. b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars. The price of cathodes is usually 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting & Refining Co. for near-by shipments of desilverized lead in 50-ton lots, or larger orders. The quotations in spelter are for ordinary western brands; special brands command a premium.

Copper—The market remains firm. Some transactions have taken place in copper for delivery during July and buyers commence to show interest in August deliveries. All orders are being booked at unchanged prices, and the market closes at 18⅝@18¾c. for Lake copper; 18¼@18½ for electrolytic in cakes, wirebars or ingots, and 18@18¼c. for casting copper.

In London, where business was only transacted during four days of the past week, the bulls are still holding their own and are in a position to dictate to the bear contingent the prices which they will have to pay in covering their commitments. The market there closed very firm at £85 1s. 3d. for spot, £82 1s. 3d. for three months.

Statistics for the first half of the current month show an increase in the visible supplies of 500 tons.

Refined and manufactured sorts we quote: English tough £85@86; best selected £89; strong sheets £96@97.

Exports of copper from New York for the week were 1319 long tons. Our special correspondent reports the exports from Baltimore for the week at 1310 long tons of fine copper.

Tin—The scarcity of spot material here, as well as in London, is still very pronounced. Inquiries from consumers in this market were quite large, and an active business has been done with prices closing at 38⅞@39c. for spot metal.

The London market was manipulated more or less, fluctuations there amounting to £1 between morning and afternoon calls. It closed firm at £177 5s. for spot, £174 for three months.

Exports of tin from the Straits for the first half of April are reported as follows: United States direct, 268; London, 1875; European continent, 243; total 2386 long tons. This is a decrease of 106 tons from the corresponding period last year.

Lead—As is usual at this time of the year, when building operations are commencing on a larger scale, the demand for this metal has become brisker, and a good-sized business was done at unchanged quotations, 5.35c., New York, and 5.27½c. St. Louis.

In Europe the demand has also become better, and as the supplies on hand are hardly adequate to the former, prices are hardening perceptibly. The market closed at £15 18s. 9d. for Spanish lead, £16 1s. 3d. for English lead.

The movement of foreign lead in the United States for the two months ending Feb. 28 is reported by the Bureau of Statistics as follows, the figures being in short tons:

In bond, Jan. 1	8,148
Imports, two months	16,728
Total supplies	24,876
Re-exports, two months	8,055
In bond, Feb. 28	11,026
Total deductions	19,181
Balance	5,695

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

St. Louis Lead Market—The John Wahl Commission Company telegraphs us on April 18, as follows: Lead is strong and in demand. Ordinary Missouri brands are selling on a basis of 5.35c.; corroding brands, 5.45c.; East St. Louis.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of March 31, that silver has been 13.75 reales per ounce. Exchange is 28.70 pesetas to £1. Lead has been 76.50 reales per quintal; equal, on current exchange, to £14 16s. 5d. per long ton, f.o.b. Cartagena. Shipments were 177 tons argentiferous lead to Marseilles.

Spelter—The lower prices ruling for this metal have not helped to stimulate a buying movement, and business is almost nil. On the other hand, not much pressure to sell is noticeable, and for this reason the market closed steady at 6.05@6.10c. New York, 5.90@5.95c., St. Louis.

London reports a better market in consequence of a shortage of stocks in the hands of the producers. Quotations are cabled at £25 15s. for good ordinaries, £26 for specials.

St. Louis Spelter Market—The John Wahl Commission Company telegraphs us on April 11, as follows: Spelter is firm and fairly active on a basis of 5.97½@6c., East St. Louis.

Silesian Spelter Market—Paul Speier reports from Breslau that the market shows unusual fluctuations. Although dealers are buying large quantities from the smelters, it is difficult to establish an average quotation. The downward course of the first three months became more stable toward their close. Good ordinary grades can now be bought for 25@25.5 marks per 50 kg. (4.8@5c. per lb.) f.o.b. Breslau. The demand for zinc sheets is becoming more active, although prices are low on account of the fall in spelter. Present quotations are 54.50@55 marks per 100 kg. (5.9@6c. per lb.). Imports of zinc ore are heavy. Zinc dust is in strong demand from foreign countries; the quotations on lots of 10 tons is 46.50 marks per 100 kg. (5c. per lb.) f.o.b. Stettin.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of March 31, that prices are a little firmer. Shipments for the week were 1000 tons blende to Swansea; 550 tons blende and 100 tons calamine to Antwerp.

Zinc Sheets—The price of zinc sheets is $7.75 per 100 lb. (less discount of 8 per cent.) f.o.b. cars for Lasalle and Peru, in 600-lb. cases for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive, and lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 lb. The fluctuations in the base price for sheet zinc since Jan. 1, 1906, have been as follows: Jan. 6, 1906, $8; Feb. 5, $7.75.

Antimony is exceedingly firm and the market still continues to advance. Ordinary brands are ruling at from 20½c.@21c., Cookson's from 21@22c. per pound.

Nickel—Quotations for large lots, New York, or other parallel delivery, are 40@47c. per lb., according to size and condition of order. For small quantities, prices range from 48c. up to 60c., also according to size of order and deliveries.

Platinum—Prices are still unsettled, the supply being irregular and the demand large. The current price is $25 per ounce.

Manganese Alloys—Prices for these alloys in Germany are given by Paul Speier as below. The prices are for orders of not less than 50 kg. delivered in Bremen, and are as follows, per 100 kilograms:

	Marks.
Manganese copper, No. 1, 30% Mn	275
No. 2, 28% Mn	180
No. 3, 20 to 25%, with 2 to 4% iron	165
Manganese tin, No. 1, 55% Mn., no iron	480
No. 2, 56% Mn., some iron	280
Manganese nickel, No. 1, free from iron	450
No. 2, traces of iron	270

Manganese metal is quoted at 3 marks per kg.—38.8c. per lb.—delivered in Bremen.

Minor Metals—For minor metals and their alloys, wholesale prices are f.o.b. works.

Aluminum.	Per lb.
No. 1, 99% ingots	35@38c.
No. 2, 90% ingots	33@35c.
Rolled sheets	44c. up.
Aluminum casting all 98	30@38c.
Aluminum-bronze powder	90@$1.00
Bismuth	$2.10
Cadmium, 99.5% f. o. b. Hamburg	92c.
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Molybdenum (50%)	95c.
Ferro-Titanium (20@25% N. Y.)	75c.
Ferro-Chrom. (75%)	12½c.
Ferro-Tungsten (37%)	29c.
Magnesium, pure (N. Y.)	$1.60
Manganese (98@98% N. Y.)	75c.
Manganese Cu. (30@70% N. Y.)	40c.
Molybdenum (98@99% N. Y.)	$1.75
Tantalic acid (N. Y.) (oz.)	49c.
Phosphorus, foreign red	75c.
Phosphorus, American yellow	50c.
Tungsten (best), pound lots	90c.

Variations in price are chiefly due to size and conditions of order and deliveries.

Quicksilver—The metal is firm and New York prices are still $41 per flask of 75 lb. for lots of 100 flasks or over, and $42 for small lots down to 10 flasks. For retail quantities, under 10 flasks, pound prices are charged, which work out to $43.50@44 per flask. San Francisco prices are firm at $39.50 for domestic orders and $38 for export. The London price is £7 7s. 6d. per flask, but jobbers ask £7 10s. for moderate lots.

Missouri Ore Market.

JOPLIN, April 14.

The highest price paid for zinc was $49 per ton, the assay basis price $43 to $46 per ton of 60 per cent. zinc, the average price $42.74.

The highest price paid for lead was $77, ranging down according to grade to $73 per ton. The average price was $73.70 per ton.

With a decline of $1 per ton in the price of zinc ore the purchasing agents entered into more spirited competition and some of the large bins of ore were purchased, part loaded this week and part for future delivery. While shipments are being made from the large bins of reserve ore some of the smaller mines find no sale for their ore and the stock on hand is merely being transferred to other bins by this process. The smaller producers cannot hold their ore long and they will be ready in two weeks to accept any reduction offered. The past two weeks have demonstrated that the mines using natural-gas fuel are capable of outputting as much ore as the average output of all the mines during last year, consequently the few outlying mines that are idle from lack of coal have less bearing upon the situation than was expected two weeks ago. Some coal has been brought into the district, and this, with natural gas, is keeping the output up to the purchases.

The lead-purchasing situation is kaleidescopic in its changes. While last week closed approximately $3 lower than was paid early in the week, the lowest price this week in $1 higher than a week ago and the highest price is $1 less than the high price of last week. The four smelting companies taking the ore are making a spirited competition for a division of the output.

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

	Zinc, lb.	Lead, lb.	Value.
Joplin	2,326,070	229,050	$60,810
Carterville-Webb City	1,809,700	426,420	55 590
Duenweg	1,016,040	138,230	27,465
Galena-Empire	993,480	137,290	25,450
Badger	826,500	.....	18 596
Oronogo	493,640	1,170	11,407
Granby	570,000	42,000	10,560
Neck City	255,950	23,160	6,742
Prosperity	222,180	37,800	5,952
Aurora	352,170	.....	5 837
Spurgeon	175,910	33,950	3,980
Carthage	150,540	.....	3,462
Baxter Springs	26,130	60,490	2,700
Alba	83,980	.....	1,931
Totals	9,302,290	1,129,560	$240,482
Fifteen weeks	146,519,600	20,652,660	$4,015,072

Zinc value, the week, $198,829; 15 weeks, $3,249,571.
Lead value, the week, 41,653; 15 weeks, 765,501.

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1905.	1906.	Month.	1905.	1906.
January...	52.00	47.38	January....	61 50	75.20
February...	52.77	47.37	February...	57.62	72.83
March.....	47.40	42.68	March.....	57.20	73.73
April.....	42.88	....	April.....	58.00	....
May.	43.31	....	May.....	58.27	....
June.....	40.75	....	June.....	57.80	....
July.	43.00	....	July.....	58.00	..
August.....	48.83	....	August.....	58.00	....
September.	46.75	....	September.	63.50	....
October....	47.60	....	October.....	63.86	....
November..	49.55	....	November..	68.67	....
December..	49.00	....	December..	76.25	....

Wisconsin Ore Market.

PLATTEVILLE, April 14.

The continued bad conditions of the roads prevented loading of ore from the outlying mills. Some of the producers complained of the cut of last week and refused to sell on a $45 basis. One lot sold at $46 per ton of 60 per cent. zinc. The Empire has shut down for a complete overhauling. This will cut off shipments quite materially from the Platteville camp. Buyers are not exerting themselves.

Lead is steady and selling at the same price as last week. Well cleaned sulphur is bringing $6 per ton f.o.b. cars, nearest shipping point. For dry-bone $20 is top price.

The camps of the district loaded ore as follows:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville.....	237,850	52,000	... .
Linden.....	207,100	.....	.....
Buncombe-Hazel Green.	115,560	49,500	.....
Highland.....	60,000	60,000	.....
Livingston.....	50,000	.....	.....
Benton.....	40,050	.....	.....
Total...	710,560	161,500	.....
Year to Apr. 14.....	18,636,150	1,121,120	2,086,400

In addition to the promised shut down of the Empire, two other large producers will be compelled to suspend operation unless they get some relief on the way of coal shipments. At the Gritty Six there is piled up some 600 tons of 40 per cent. ore awaiting treatment on the new roaster. One buyer of low-grade ore offered a good price but the operators intend to hold for treatment on roaster, which will be started as soon as the roads are in shape to haul coal.

Mining Stocks.

New York. April 18.

The stock market has turned largely on money conditions. It has recovered somewhat from the depression under the influence of gold imports, a better bank position and cheaper money.

In some stocks, however, there was a little recession. Amalgamated Copper lost a little from its high point of the week, closing at $114. American Smelting common sold at $161 today. In the industrials, Sloss-Sheffield sold at $83, while United States Steel closed at $109 for the preferred and $44 for the common.

On the curb market, trading was light, generally; much of the business was in mining stocks, especially in coppers. Prices were firm for the most part, but some losses were shown. Greene Consolidated Copper closed a little lower than its top point, at $31½. Nevada Consolidated, on the other hand, was higher, at 19½. Mitchell Mining was steady around $21, Guanajuato Consolidated at $5¾. Several new mining stocks are being brought out, and there is more interest in this class of stocks than for some time past.

On the Consolidated Exchange Alice was dealt in at $2.75, and Standard Consolidated, of California, brought $3.50 for a small lot. Of the Cripple Creek stocks, Isabella sold at 26c., and Anaconda gold at 16c. More interest is being taken in the Tonopahs; Jim Butler brought $1.40; Sandstorm, $1.25; Bullfrog National Bank, 52c; Indiana Tonopah, 5c. In the Comstocks, $5.50 was paid for Ophir, and $1.30 for Consolidated California & Virginia.

Boston. April 17.

There has been a better market for mining shares, yet continued disappointment is felt as there never was a time when conditions were legitimately so favorable as at present. The only out is money and the attitude the banks display toward accepting copper shares as collateral. As in the recent past it is expected that New York will make the market here if there is one.

An improvement is to be noted in the demand for the better class of Lake mining shares. Osceola, Quincy, Wolverine and Calumet & Hecla have been particularly favored. Franklin has been freely offered and is off $2, to $17, Parrot spurted $4.50 to $42, on the better showing at the mine from month to month, but reacted to $39.25 on profit-taking. Shannon rose $1.12½ to $8.12½ on a large buying order. Adventure has also been in better request, closing tonight at $7.75. The recent talk of a contest for control has tended to loosen the present management a bit and it is understood that it will make a statement before the annual meeting. For the first quarter of the current year, the product of 544,360 lb. was sold for 18.25c. or $99,344, which resulted in surplus earnings of $11,731.

Calumet & Arizona mining shares have been listed on the local stock exchange. There are 250,000 shares authorized, and 200,000 shares issued. The stock rose to $120 per share today. Isle Royale rose $2.25 to $24.75 on active trading one day, but has since lost it. North Butte easily rose over $9 to $92.75 on concentrated buying, but reacted to $90.25. The 1905 output was 30,954,788 lb. of copper, from which $5,002,788 was received, the copper bringing 16.47 cents per pound. The profit above expenses and betterments was $2,720,670.

Butte Coalition rose $2 on the curb to $37.50. The Boston Stock Exchange rules that temporary receipts are a good delivery for stock purchased "when issued." Raven continues to be the curb feature, but is apparently made to sell at $5@6 each day.

Colorado Springs. April 13.

The local mining market has been fairly active during the past week, but with no special features, and prices not much varied. El Paso, which took such a sudden drop on account of the flooding of the mine, has been traded in considerably and the price declined from 57 to as low as 52c., but it was stronger today, selling up to 55c. Findley has made a fractional decline, selling today at 77⅞c. Elkton has gained and closed at 43c. Portland sold yesterday at $1.82. Vindicator was traded in today at 98c. Isabella has been quite active at 26c. United Gold Mines has declined to 9c. on quite heavy trading. C. K. & N. is quoted at 10@10½, and Golden Cycle at 75@85c. Independence sold today for 19c. Mary McKinney has declared a dividend of 3c. per share.

San Francisco. April 11.

A fair business was done in the Comstocks and buying orders were more in evidence. This resulted in a moderate degree of strength. The stories about New York buying, which have been industriously circulated, do not find much credit.

The Tonopah market got to be rather topheavy early in the week, and there was something of an upset. While the better stocks were quite firm, there was a tumble in a number of the lower-priced ones. Some excitement followed, and there was a good deal of buying at the fall, which helped to rally prices a bit at the close.

Oil stocks were rather dull, and trading was confined mainly to Home, Independence, Monte Cristo and a few specialties.

The sworn returns of the mining companies, as filed in their offices this week, show cash on hand April 1 as follows, with all expenses paid, unless otherwise noted: Alta, $271, with liabilities of $6118; Alpha Consolidated, $1560; Andes, $6337; Belcher, $6300, with March expenses partly unpaid; Best & Belcher, $6340; Bullion, $468; Caledonia, $80, with March expenses unpaid; Chollar, $2184; Consolidated California & Virginia, $9422; Consolidated Imperial, $1430; Consolidated New York, $421, with liabilities of $1288; Confidence, $440, with March expenses unpaid; Challenge Consolidated, $369; Crown Point, $73; Exchequer, $1935; Gould & Curry, $7454; Hale & Norcross, $2516; Justice, $297; Julia Consolidated, $245; Mexican, $4719; Overman, $2459, with March expenses unpaid; Ophir, $37,443, with concentrates valued at $14,000 unsold; Potosi, $3001; Savage, $6846; Scorpion, $269, with liabilities of $500;

Segregated Belcher, $3134; Sierra Nevada, $677; Silver Hill, $15,293; Standard Consolidated, $32,876, with March expenses and March clean-up to be accounted for; Union Consolidated, $783; Utah, $150, with $3000 due bank.

Dividends.

Company.	Payable.	Rate.	Amt.
Beck Tunnel Mg., Utah	Apr. 20	$0.02½	$25,000
Champion, Mich	Apr. 12	1.00	100,000
Granby Con	May 15	0.30	400,890
Homestake, S. D	Apr. 26	0.60	109,200
International Nickel, pfd	May 1	1.50	133,689
Mary McKinney	Apr. 25	0.03	30,000
Montana Ore Pur	Apr. 30	10.00	810,000
N. Y. & Honduras Rosario	Apr. 21	0.10	15,000
North Star Mines Co	Apr. 21	0.10	50,000
Pennsylvania Steel, pfd	May 1	3.50	588,749
Philadelphia Co	May 1	0.75	434,296
Tenn. C., I. & R. R. pfd	May 1	2.00	4,960
Tenn. C., I. & R. R.	May 1	1.00	225,536
United Copper	Apr. 30	1.75	767,500
United Copper, pfd	May 15	3.00	150,000

Assessments.

Company.	Delinq.	Sale.	Amt.
Blue Tent, Cal	Apr. 25		$0.10
Bullion	Apr. 30	May 21	0.05
Brown Stone, Utah	Apr. 22	Apr. 30	0.01½
Caledonia	Apr. 20	May 11	0.10
Challenge Con	Apr. 17	May 8	0.10
Confidence	Apr. 11	May 2	0.20
Christmas, Utah	Apr. 16	May 5	0.00½
Crown Point, Nev	Apr. 25	May 16	0.10
Gould & Curry	Apr. 3	Apr. 23	0.10
Idaho-Tonopah, Idaho	Apr. 26	May 14	0.001
Kismet, Cal	Apr. 20	May 21	0.01½
Julia Con	Apr. 9	Apr. 27	0.03
Kentuck Con	Apr. 11	May 4	0.05
San Juan Grande	May 12		0.02½
Scorpion	May 3	May 21	0.02
Sierra Nevada	May 7	May 28	0.10
Segregated Belcher	Apr. 5	Apr. 26	0.05
Union Con., Nev	Apr. 10	Apr. 30	0.10
Utah, Nev	Apr. 18	May 9	0.05
Victoria, Utah	Apr. 24	May 15	0.00½
Yellow Jacket	Apr. 20	May 15	0.10

Tonopah Stocks. Apr. 16.

(Revised by Weir Bros. & Co., New York.)

	High.	Low.	Last.
Tonopah Mine of Nevada	18.50	18.00	18.00
Tonopah Montana	2.95	2.90	2.93
Tonopah Extension	10.62½	10.50	10.62½
Tonopah Midway	2.20	2.17	2.19
Tonopah West End	3.50	3.45	3.50
Goldfield Mining Co	.53	.52	.53
Jumbo Mining	1.70	1.68	1.69
Red Top	1.95	1.90	1.90
Sandstorm	1.25	1.22	1.23
Montgomery Shoshone Cons	16.50	16.25	16.37½
Eclipse-Bullfrog	1.17	1.14	1.15
Denver-Bullfrog	1.84	1.83	1.83

St. Louis. Apr. 14.

Adams, $0.40—$0.25; American Nettie, $0.15—$0.10; Center Creek, $2.75—$2.50; Central Coal and Coke, $62 00—$61.00; Central Coal and Coke, pfd., $80.00—$78.00; Central Oil, $60.00—$58.00; Columbia, $1.00—$0.50; Con. Coal, $25.00—$22.00; Doe Run (old stock), $350.00—$300.00; Granite Bimetalic, $0.27—$0.20; St. Joe (old stock), $31.50—$30.00.

LONDON. (*By Cable.*) Apr 18.

Dolores, £1 17s. 6d.; Stratton's Independence, £0 7s. 6d.; Camp Bird, £1 6s. 0d.; Esperanza, £4 5s. 0d.; Tomboy, £1 8s. 9d.; El Oro, £1 8s. 1½d.; Oroville, £0 18s. 3d.; Arizona Copper, pf., £3 13s. 6d.; Arizona Copper, def., £3 11s. 6d.

*Furnished by C. Schumacher & Co., New York.

PHILADELPHIA.

Cambria Steel	35¾	36⅝	35⅛	36¾
Philadelphia Co	50	50	49½	49¾
Tonopah	18⅜	18⅝	18⅜	18⅝

PITTSBURG.

Crucible Steel	14¾	16	14⅛	14½
Crucible Steel, Pref	79¾	81⅛	79⅜	80½
Tonopah Ext	10¼	10¼	10¼	10½

STOCK QUOTATIONS.

NEW YORK. Week Apr. 17.

Name of Company.	High	Low	Clg.	Sales
Amalgamated	115⅜	107⅛	112⅞	737,515
Anaconda	286	262½	277⅛	235,600
Boston Copper	25⅜	23	23⅛	5,225
British Col. Copper	8½	7⅛	7⅜	2,025
Federal, Pf	105¼	102⅞	104⅛	3,500
Greene Copper	31⅞	30⅛	31¾	24,335
Greene Gold	3¼	2⅞	3	6,150
Mitchell	12⅛	11⅛	11⅛	3,926
Tennessee Copper	47	46⅜	47	400
Union Copper	2¾	1⅜	2¾	24,700
United Copper	68⅞	64½	66⅞	21,200
United Copper, Pref	99	99	99	50
Utah Apex	6⅝	6⅝	6⅝	100
Utah Copper	29¼	28	28¾	2,550

NEW YORK INDUSTRIALS.

Am. Smelting & Ref	162⅞	155⅛	160⅜	98,300
Am. Smelting & Ref., Pf	121¾	119¾	121	2,400
Col. Fuel & Iron	63¾	59¾	62⅛	28,350
Pittsburg Coal	15⅛	14⅛	14⅝	1,000
" " pfd	59	56	56	300
National Lead	86¼	81⅜	83¾	22,100
Republic I. & S	32	29⅜	31¾	3,000
Republic I. & S., Pf	103½	102¼	102¾	1,780
Tenn. C. & I	149¾	149	149	350
U. S. Red. & Ref	35⅜	25	34	5,600
U. S. Red. & Ref., Pf	71⅜	63	70⅛	4,500
U. S. Steel	44⅛	41	43¼	361,000
U. S. Steel, Pf	109¾	106¼	108½	85,310
Standard Oil	658	650	654	
Bethlehem Steel	30	28	29	

These stocks, not elsewhere quoted, had the following range of prices during the week: (New York) Bamb. Delamar, 6½—7; Butte Coalition, 35¾—37¾; Cumb. Ely Min., 6—6⅞; Greene Gold-Silver, 2¾—3; Mont. Shoshone, new, 16—16; Nevada Con. Copper, 17⅛—19⅜. (Boston) Adventure, 7½—8; Montana C. & C., 3⅝—3⅞; Nevada, 17½—19⅞; Trinity, 11—12¾; U. S. Oil, 12½—12½; Wolverine, 137—140; Wyandotte, 1¾—1¾.

BOSTON.

Allouez	40¾	39	40	1,795
Amalgamated	115½	107½	112⅞	69,657
Atlantic	21⅜	20½	20¾	1,245
Bingham	41	38	39	6,945
Boston Consolidated	24	23	23¼	2,420
*Calumet & Hecla	714	700	710	335
Centennial	27¼	26	27	1,110
Mercur	65	60	60	366
Copper Range	82⅞	80	81⅞	8,768
Daly-West	15½	14¾	15	632
Franklin	19	17	17	6,065
Granby	13¾	12¾	12⅞	2,093
Green Con. Copper	32	30½	31¼	9,885
Isle Royale	24¾	22½	23	2,440
Mass	9	8½	9	997
Michigan	15½	13	14¼	1,227
Mohawk	62¾	60½	62	2,678
*North Butte	92¾	83¼	90½	19,955
Old Dominion	45¾	44¼	44¾	1,937
Osceola	109¼	104	107	3,378
Parrot	42	37¼	39¼	5,179
Quincy	108	99	106	1,323
Rhode Island	5⅞	5¼	5¼	470
Shannon	8¾	7	8	6,846
Tamarack	110	107	109	116
Tecumseh	12¼	12	12	350
*United Copper, com	69	64½	66¾	15,750
U. S. Smg. & Ref	62¾	58½	61	6,561
" " pfd	47⅞	45⅝	46½	3,586
Utah	65¼	62½	63⅝	8,931
Victoria	8¾	8¼	8¾	506
‡Winona	8	7½	8	280

COLORADO SPRINGS.

Name of Company.	First	High	Low	Clg
Elkton	42	45	42	45
El Paso	53	55	52¾	53
Isabella	26½	27	25¾	26¼
Portland	185	190	180	180
Vindicator	98	100	94	94

SAN FRANCISCO.

Best & Belcher	1.25	1.25	1.15	1.15
Bullion	.31	.31	.25	.29
Caledonia	.37	.44	.35	.44
Confidence	.90	.94	.90	.90
Con. Cal. & Va	1.35	1.35	1.30	1.30
Gould & Curry	.28	28	.27	.27
Hale & Norcross	1.20	1.20	1.05	1.10
Mexican	1.15	1.15	1.15	1.15
Occidental Con	.96	.96	85	.95
Ophir	5.37½	5.50	5 25	5.25
Savage	1.00	1.00	1.00	1.00

*Ex-dividend. †1st Installment Paid.
‡Assessment Paid. §2d Installment Paid.

Monthly Average Prices of Metals.

SILVER.

Month.	New York.		London.	
	1905.	1906.	1905.	1906.
January	60.690	65.288	27.930	30.118
February	61.023	66.108	28.047	30.464
March	58.046	64.597	26.794	29.854
April	56.600	.....	26.108	.....
May	67.832	.....	26.664	.....
June	58.428	.....	26.910	.....
July	58.915	.....	27.163	.....
August	60.259	.....	27.822	.....
September	61.695	.....	28.528	.....
October	62.034	.....	28.637	.....
November	63.849	.....	29.493	.....
December	64.850	.....	29.977	.....
Year	60.352	.....	27.839	.....

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, .925 fine.

COPPER.

	NEW YORK.				LONDON.	
	Electrolytic.		Lake.			
	1905.	1906.	1905.	1906.	1906.	1906.
Jan	15.008	18.310	16.128	18.416	68.262	78.896
Feb	15.011	17.869	15.136	18.116	67.963	78.147
March	15.125	18.361	15.250	18.641	68.174	81.111
April	14.920	.....	15.045	.....	67.017	.....
May	14.627	..	14.820	.....	64.875	.....
June	14.673	.....	14.813	.....	65.881	.....
July	14.888	.....	15.005	.....	66.887	.....
Aug	15.664	.....	15.725	.....	69.830	.....
Sept	15.965	.....	15.978	.....	69.667	.....
Oct	16.279	.....	16.332	.....	71.406	.....
Nov	16.599	.....	16.758	.....	74.727	.....
Dec	18.328	.....	18.398	.....	78.993	.....
Year	16.590	.....	15.699	.....	69.465	.....

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2,240 lb., standard copper.

TIN IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan	29.325	36.390	July	31.760	....
Feb	29.262	36.403	August	32.866	.....
March	29.523	36.662	Sept	32.096	.....
April	30.625	.....	Oct	32.481	.....
May	30.049	.....	Nov	33.443	.....
June	30.329	.....	Dec	35.835	.....
			Av. year.	31.358	.....

Prices are in cents per pound.

LEAD IN NEW YORK.

Month.	1905.	1906.	Month.	1905.	1906.
Jan	4.552	5.600	July	4.524	.....
Feb	4.450	5.464	Aug	4.665	.....
March	4.470	6.350	Sept	4.850	.....
April	4.500	.....	Oct	4.850	.....
May	4.500	.....	Nov	6.200	.....
June	4.500	.....	Dec	5.422	.....
			Av., year.	4.707	.....

Prices are in cents per pound. The London average for January, 1906, was £ 16.850 per long ton; February, £ 16.031; March, £ 16.922.

SPELTER.

Month	New York.		St. Louis.		London.	
	1905.	1906.	1906.	1906.	1906.	1906.
Jan	6.190	6.487	6.032	6.337	25.062	28.225
Feb	6.139	6.075	5.989	5.924	24.594	25.844
Mar	6.067	6.209	5.917	6.056	23.825	24.563
April	6.817	.....	5.667	.....	23.813	.....
May	5.434	.....	5.284	.....	23.694	.....
June	5.190	.....	5.040	.....	23.876	.....
July	5.396	.....	5.247	.....	23.938	.....
Aug	5.706	.....	5.556	.....	24.675	.....
Sept	5.887	.....	5.737	.....	26.376	.....
Oct	6.087	.....	5.934	.....	28.225	.....
Nov	6.145	.....	5.984	.....	28.500	.....
Dec	6.522	.....	6.374	.....	28.719	.....
Year	6.882	.....	5.730	.....	26.433	.....

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2,240 lb.) good ordinary brands.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES.

(See also Market Reviews.)

ABRASIVES—		
Bort as to size	carat	$10.00@$18.00
Carborundum, f.o.b. Niagara Falls, powd	lb.	.08
Grains	"	.10
Corundum, N. C	"	.07@.10
Chester, Mass.	"	.04½@.05
Craigmont, Ont.	"	.05½@.06½
Mont. f.o.b. Chicago	"	.07@.07½
Crushed Steel, f.o.b. Pittsburg	"	.05½
Emery, in kegs: Turkish flour	"	.03½
Grains	"	.05@.05½
Naxos flour	"	.03½
Grains	"	.05@.05½
Chester flour	"	.03½
Grains	"	.05@.05½
Peekskill, f.o.b. Easton, Pa., flour	"	.01½
Grains, in kegs	"	.02½
Garnet, per quality	sh ton	25.00@35.00
Pumice Stone, Am. Powd.	lb.	.01 3-5@.02
Italian, powdered	"	.01½@.01⅝
Lump, per quality	"	.04
Rottenstone, ground	"	.02½@.04½
Lump, per quality	"	.06@.20
Rouge, per quality	"	.10@.30
Steel Emery, f.o.b. Pittsburg	"	.07
ACIDS—		
Acetic	lb.	.02¼ and up
Boric	"	.10@.11
Hydrofluoric, 30%	"	.03
" 48%	"	.05
" 60%	"	.11
Oxalic	"	.05¼@.05½
ALCOHOL—Grain	gal.	2.45@2.47
Refined wood, 95@97%	"	.70@.75
ALUM—Lump	100 lb.	1.75
Ground	"	1.85
Chrome Alum	lb.	0.05
ALUMINUM—Sulphate, com'l.	"	1.75@1.80
AMMONIUM—		
Bromide	lb.	.23
Carbonate	"	.08
Muriate grain	"	.05⅞@.06½
Lump	"	.09½
Sulphocyanide com.	"	.25
" " chem. pure	"	.35
ARSENIC—White (nominal)	"	.03½@.08
Red	"	.06½@.07
ASPHALTUM—		
Barbadoes	per ton	20.00@100.00
West Indies	"	40.00@80.00
Egyptian	lb.	.10
Gilsonite, Utah ordinary	per ton.	40.00@60.00
Trinidad	"	26.00
California	"	20.00@25.00
BARIUM—		
Carb. Lump, 80@90%	sh. ton.	25.00@27.00
92@98%	"	28.00@29.00
Powdered 80@90%	lb.	.01½@.02
Chloride com'l	ton.	$33 up.
Nitrate, powdered, in casks	lb.	.06
Sulphate (Blanc Fixe)	"	.02
BARYTES—		
Am. Crude	sh. ton.	11.00@13.00
Crude No. 2	"	13.00@15.00
Floated	"	17.00@19.00
Foreign floated	"	19.00@21.00
White	"	17.25@19.00
BISMUTH—Sub-nitrate	lb.	1.50
BLEACHING POWDER—35%.	100 lb.	$1.25@1.30
BONE ASH	lb.	.02½@.02¾
BORAX	"	.07½@.08
CALCIUM—Acetate, gray	"	2.35
Acetate, brown	"	1.60@1.65
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J.	sh. ton.	65.00
Chloride, f.o.b. works	"	9.00@10.00
CEMENT—		
Portland, Am. 500 lb.	bbl.	1.55@1.60
Foreign	"	1.25@1.75
"Rosendale," 300 lb.	"	.85
(in sacks)		.65
Slag cement	"	.75@1.25
CHROME ORE—		
(50%) ex-ship N. Y.	lg. ton.	18.50@19.00
Bricks, f.o.b. Pittsburg, M.	"	175.00
CLAY, CHINA—Am. common ex-dock, N. Y.	"	7.50
Foreign	"	11.00
COBALT—Oxide	lb.	2.60
COPPERAS—Bulk	100 lb.	$0.47½
In bbls	"	.57½
In bags	"	.62½
CRYOLITE	lb.	.06½
EXPLOSIVES—		
Blasting powder, A	25-lb. keg	$2.65
Blasting powder, B	"	1.40
"Rackarock," A	lb.	.25
"Rackarock," B	"	.18
Judson R.R. powder	"	.10
Dynamite (20% nitro-glycerine)	"	.13
(30% nitro-glycerine)	"	.14
(40% nitro-glycerine)	"	.15
(50% nitro-glycerine)	"	.16½
(60% nitro-glycerine)	"	.18
(75% nitro-glycerine)	"	.21
Glycerine for nitro.	"	.11@.11½
FELDSPAR—Ground	sh. ton.	10.00@12.00
FIRE BRICK.		
American	per M.	20 00@30.00
Imported	"	30.00@45.00
St. Louis No. 1	"	16.00
" No. 2	"	14.00
Extra	"	20.00@23.00
FIRE CLAY.		
St. Louis mill	per ton	2.50
FLUORSPAR—		
Domestic f.o.b. shipping port:		
Lump	sh. ton.	8.00@10.00
Ground	"	11.50@13.50
Gravel	"	4.25@4.50
FULLER'S EARTH—Lump.	100 lb.	.80
Powdered	"	.85
GRAPHITE—		
American, ore, common	lb.	.01@.10
Artificial	"	.06
Ceylon, common pulv	"	.02½@.03½
Best, pulverized	"	.04@.08
German, com. pulv	"	.01½@.01½
Best, pulverized	"	.01½@.02
Italian. pulverized	"	.01@.02
GYPSUM—Ground	sh. ton.	8.00@8.50
Fertilizer	"	7.00
Rock	g. ton.	4.00
English and French	"	14.00@16.00
INFUSORIAL EARTH—		
Ground Am. best	"	20.00
French	"	37.50
German	"	40.00
LEAD—Acetate (sugar of)	lb.	.07½@.09½
Nitrate, com'l	"	.07½@.08
MAGNESITE—Greece.		
Crude (95%)	lg. ton.	7.00@8.00
Calcined	sh. ton.	16.50@17.00
Bricks, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	lb.	.01½
Sulphate (Glaubers salt)	100 lb.	.40@.50
MANGANESE—		
Crude powdered:		
70@75% binoxide	lb.	.01½@.01½
75@85% binoxide	"	.01½@.02½
85@90% binoxide	"	.02½@.03½
90@95% binoxide	"	.03½@.05½
Ore	ton.	21.00@60.00
MARBLE—Flour	sh. ton.	6.00@7.00
MINERAL WOOL—		
Slag, ordinary	"	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
Selected	"	40.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, nominal	lb.	.14@.15 and up.
NICKEL—		
Oxide, crude, 100 lb. (at .55 for fine metal contained.		.35@.40
Sulphate, single	100 lb.	.22@.25
" double	"	.13@.15
OZOKERITE	lb.	11½
PAINTS AND COLORS—		
Litharge, Am. powdered	"	.05½@.06½
English glassmakers'	"	.08½@.08¾
Lithopone	"	.03½@.07
Metallic, brown	sh. ton.	19.00
Red	"	16.00
Ocher, Am. common	"	8.50@9.00
Best	"	16.00
Dutch, washed	lb.	.02½@.03
French, washed	"	.01½@.02½
Paris green, pure, bulk	"	(.12) nominal
Red lead, American	"	.06½@.06½
Foreign	"	.07@.08½
Turpentine, spirits	gal.	.65½@.70
White lead, Am., dry	lb.	.05½@.05½
American, in oil	"	.06½@.06½
Foreign, in oil	"	.09@.09½
Zinc white, Am. extra dry	"	.04½@.04½
Foreign, red seal, dry	"	.06@.06½
Green seal, dry	"	.06½@.09½
POTASSIUM—		
Bicarbonate crystal	lb.	$0 08½
Powdered or granulated	"	.14
Bichromate, Am.	"	.08½@.08¾
Scotch	"	.08½@.08¾
Bromide	"	.16
Carbonate (80@85%)	"	.03½@.04½
Caustic, ordinary	"	.04½
Elect. (90%)	"	.05½@.06½
Chlorate, powdered	"	.09½ and up
Crystals	"	.08½@.09½
Cyanide (98@99%)	"	.18@.19
Permanganate	lb.	.09½@.10
Prussiate, yellow	"	.13½@.13½
Red	"	.35
Sulphate	100 lb.	2.18½@2.21½
SALT—N. Y. com. fine 280 lb. bbl.		.72@1.18
N. Y. agricultural	sh. ton.	4.40
SALTPETER—Crude	100 lb.	4.25@4.50
Refined	"	4.50@5.50
SILICA—		
Ground quartz, ord'ry	sh. ton	9.00@10.00
Best	"	12.00@13.00
Lump Quartz	"	2.50@4.00
Glass sand	"	2.75
Infusorial earth, crude		25.00
Calcined and floated		32.00
SILVER—Nitrate, crystals	oz.	.40½@.44
SODIUM—		
Acetate	lb.	0.04¼
Bichromate	lb.	.07
Bromide	"	.21
Chlorate, com'l	"	.09½@.10
Cyanide, ("100% KCN")	"	.18@.19
Hyposulphite, Am.	"	1.50@1.60
German	"	1.75@2.00
Phosphate	lb.	.02½@.02½
Prussiate	"	.09½@.09½
Sal soda, f.o.b. works	100 lb.	.60
Foreign, f.o.b. N. Y.	"	.85
Silicate, concentrated	lb.	.05
Com'l	"	.01
Sulphate, com'l	100 lb.	.40
STRONTIUM—Nitrate	lb.	.07½@.08
SULPHUR—	per ton.	22.12½
Roll	100 lb.	1.85
Flour	" "	1.90
Flowers, sublimed	" "	2.20
TERRA ALBA—	100 lb.	.70@.80
TALC—Domestic	sh. ton.	15.00 and up
French, best	"	15.00@20.00
Italian, best	"	20.00 and up
TIN—Bi-chloride, 45%	lb.	.11
Crystals	"	.23
URANIUM—Oxide	"	2.25@3.00
ZINC—Metallic ch. pure	"	.07@.09½
Chloride solution, com'l	"	.02½
Chloride, granular	"	.04½@.04½
Dust	"	.05½@.06
Sulphate	"	.02@.02½

The Rare Earths.

(Nominal).

BORON—Nitrate	lb.	$1.50
CERIUM—Oxalate	oz.	.35
LITHIUM—Carbonate	"	1.50
LITHIUM—Nitrate	oz.	.60
TANTALUM—Acid	oz.	.40
Ore, 20% acid	lb.	.20
" 70% "	"	3.50
THORIUM—Nit. 49@50%	"	7.00@10.00
URANIUM—Nitrate	oz.	.25
ZIRCONIUM—Nitrate	lb.	10.00

Note—These quotations are for wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. Readers of THE ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.