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Conditions in Prominent Rand Mines

By E. M. Weston*

SYNOPSIS—New Modderfontein will be large producer. Two shafts of Modder Deep close together. Modder B follows coal-mining practice, which has been found unsuitable for City Deep. Large reserves in Crown Mines. This company will probably take in the Robinson. Van Ryn Deep mill about ready to start. Water shortage in district feared for the winter. Important iron discovery reported from Prieska district.

The yearly reports of a large number of companies have now been published. The New Modderfontein Gold Mining Co. promises to be one of the largest gold producers in the world. There are about 1120 intact claims 150x400 ft. The mill is equipped with 180 stamps and six tube mills and can crush 600,000 tons per year. When development is advanced at the deep circular shaft, it is proposed to raise the rate of crushing to a million tons per year. The mine is estimated to contain 20,000,000 tons of ore of a value of from 30s. to 35s. per ton; 3,355,000 tons have been crushed to January, 1913. The capital is £1,400,000 in £4 shares, valued at about £13 per share. The Modderfontein Deep lies to the south of this company. It is developing a triangular area from two shafts sunk 100 ft. apart. The shafts struck the reef at 2990 ft. To date, 3587 ft. of development shows 6.74 dwt. over 55.2 in.

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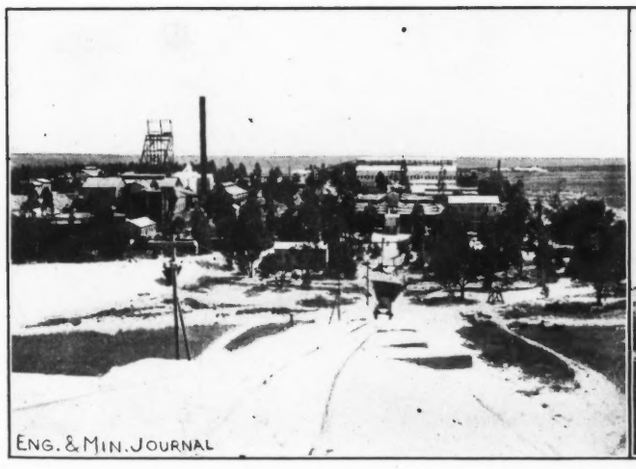
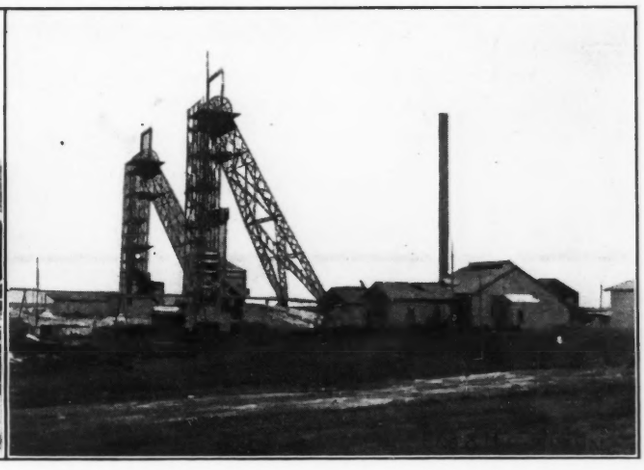
The Modderfontein B Gold Mines Co. lies to the east of New Modderfontein Gold Mining Co. On this mine the outcrop of the main-reef series passes under the younger Dwyka coal measures and sandstones. The reef lies at between 600 and 1500 ft. from the surface. The mine has developed 2,600,000 tons valued at 30s. 3d. and 361,000 tons valued at 15s. 11d. The mill is handling ore above this grade; costs are 15s. 11d. per ton. The conditions in this mine allow mining on lines following coal-mining practice; the reef lies at a dip of 10% to 15% and is not badly faulted. The ground is easy to work and the efficiency of rock drills and hammer boys is high. The ore is cut in blocks 800x1000 ft., the drives are dry-walled and stopes packed with waste rock. One-ton trucks are hauled into the stopes, and parallel slope roads put in every 80 ft. on the dip.



Modder B Shaft and Mill



Shafts of the Modder Deep

The City Deep is slowly recovering from the mistake of endeavoring to apply to a reef dipping 40°, methods that were most suitable in a mine like Modder B. Costs are, however, still far too high and the 200-stamp mill cannot yet be fully supplied with ore. This has been partly due to shortage of native labor, but chiefly to mistakes in planning development. During 1912, 479,630 tons were crushed, yielding 35s. 6d. at a cost of 23s. 9d. and a working profit of £292,654. The ore reserves are 2,123,650 tons, valued at 8.7 dwt. Development cost 3s. 9d. per ton; 93.8% of the ore developed on the Main

Reef leader has been payable; over 10,470 ft. of development, it averaged 24.3 dwt. across 21 in. The ore reserves at the Crown Mines are now 10,607,671 tons, valued at 29s. 10d. per ton. Profits during 1912 were £1,314,247, with a yield of 32s. per ton and costs were 18s. 4d.; £238,000 went into capital expenditures.

The Robinson mine has now nearly finished development. The ore reserves are 1,373,100 tons of main-reef leader and south-reef, valued at 11 dwt. and 1,160,800 tons of main reef valued at 4.3 dwt. Costs were 15s. 8d.; 231,000 tons of sand were sent below. This mine will probably now be amalgamated with the Crown Mines. The Van Ryn Deep Gold Mines is developing rich ore. The mill is expected to start work in July.

The rainfall this season has again been low and most of the mine dams and reservoirs along the reef are not nearly full. There is some fear of a water shortage during the coming winter, unless additional supplies are developed. Important discoveries of rich iron ore are reported from the Prieska district of Cape Colony. The ore is reported to average nearly 70% iron and to run for 40 miles toward Bechuanaland.

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The Hall Desulphurizing Process

By Donald M. Liddell

The general outline of the Hall sulphur-recovery process was given in the Journal of July 5, 1913. A visit to the experimental plant in Brooklyn resulted in an interesting exhibition of how sulphur gases could be eliminated, and how easily the reduced sulphur can be absorbed.

The testing roasting plant consists of one small round furnace, hand-rabbled through a small hole in the top, and one a little larger, a miniature single-hearth mechanical roaster of the McDougall type. The small furnace has a hearth about 16 in. in diameter; the large one is probably 32 in. Both furnaces are fitted with hydrocarbon-gas burners, and air and steam connections. In both furnaces the burners, air and steam connections all enter radially, pointing slightly downward, near the bottom of the furnace, and the regulation of each one is entirely independent. The Hall process primarily consists in the nice regulation of these factors so that neither H_2S, SO_2, SO_3 nor COS is produced.

The furnace fumes can discharge directly into the atmosphere, or can be led to a condensing system. For the smaller furnace, this consists of two glass chambers in tandem, partly filled with water, through which the exhaust gases are allowed to bubble. For the large furnace, big wooden tanks are used. It should be noted that these scrubbing devices are of the crudest description. There are no sprays, agitators, centrifugal devices, or any of the other aids to scrubbing usually thought necessary, and the manner in which the scrubbers do their work is eloquent testimony to the ready absorbability of the fumes, of which Mr. Hall speaks.

With the furnaces working as ordinary roasters, there is the customary odor of SO_2 in the room, which, however, disappears as soon as the correct mixture of steam, air and reducing flame is turned on. If the flame is not made strongly enough reducing, the gases keep their SO_2 odor, although a portion of the sulphur oxides will be reduced. If too strongly reducing, the odor is that of H_2S.

If all conditions are right, when working under the Hall system, the fumes simply form a yellow cloud in the air. Some of these fumes were caught in a large tubulated retort and shaken with water for a few seconds, upon which they completely disappeared.

The demonstration, on the day I visited the plant, consisted in starting the roasters discharging into the air, without any attempt at distillation of the sulphur. There could be no question that SO_2 was present in large quantities. Regulation was then begun of the gas flame, steam and water, and the odor of SO_2 disappeared. Reduction was carried too far and H_2S was formed, which manifested itself both by its odor, and by blackening strips of lead acetate paper. Soon the correct regulation was obtained, and a stream of gas carrying entrained particles of yellow sulphur escaped into the air. This stream had at times a barely perceptible odor of SO_2, but the gas would certainly have no effect on vegetation. This was quickly turned into the scrubbers after its lack of odor has been noted, as the neighbors, all of whom seem to be doing a large laundry business, object as vigorously to having their clothes covered with yellow sulphur, as did ever a western smoke farmer object to furnace fume.

The sulphur was completely absorbed in the first of the glass scrubber towers, the other simply acting as reserve unit, and showing that there was nothing left to absorb.

A fundamental principle of the process is the heretofore unrecognized fact that nascent O (from the decomposition of water) will, under proper conditions, combine with iron, to form Fe_2O_3 before it will combine with sulphur, to SO_2, while the oxygen of the air behaves in the reverse manner.

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Trolley Wire Renewals

The accompanying diagram, showing the practice of one of the large city-railway companies of the country on the classification of trolley wires in place, as to their wear and renewal, is printed in the "O. B. Bulletin"

(house organ of the Ohio Brass Co., Mansfield, Ohio), May, 1913. It is this company's practice to keep a record of the wire breaks and every fall and spring an engineer takes micrometer measurements of the trolley wires in sections where the worst breaks occur. These measurements are taken 300 or 400 ft. apart, the results plotted and compared with the accompanying diagram.

Where wire is found in condition No. 3, it is found that the expected life is six months under heavy service. Wire which comes into the class of No. 4 is considered dangerous and is renewed as soon as possible. If found in condition No. 5 anywhere, it is renewed without delay. These diagrams show that trolley wires are by no means a permanent installation, and that the copper producer may expect to make replacements of this material without any compensating amount of scrap coming back on the market.

Principles and Methods of Ore Testing

By I. F. Laucks*

SYNOPSIS—The object of ore testing is to determine whether a given ore can be treated at a profit, which process is most profitable, and the details of the chosen process. Such basic processes as amalgamation, concentration, cyanidation and smelting may be used in a variety of combinations. The factors to be determined in each combination and the methods of procedure are outlined.

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Thorough testing of ore in large amounts before building a plant nowadays is recognized as good practice and a wise precaution. There are large establishments devoted to this work. However, but little concerning this important phase of metallurgical work is to be found in literature. The workers in this field have developed their own ideas and practice, and perhaps a discussion of the principles and methods of ore testing may be of value to the profession.

Several Basic Processes

At present in the treatment of ores, we have the following basic processes: Amalgamation, cyanidation, concentration (including specific gravity, flotation, magnetic and electrostatic concentration), smelting, and special processes, such as leaching of copper ores, chlorination, etc. The treatment of any one ore may consist of only one of the above, or the first four may all be used on the same ore.

An ore is tested to determine: (1) Whether it can be treated at a profit; (2) what process or combination of processes is the most profitable by which to treat it; (3) the details of the chosen process which are necessary for intelligent design of the treatment plant.

The first determination is required, for example, when a new mining property is to be taken over, and ordinarily does not need to be made as elaborately as the other two. The grade of the ore along with some preliminary tests generally will determine this point with sufficient accuracy, except in the case of ores where the margin of profit is extremely small. In such a case the test should be as detailed as the tests made before building a mill, and should be carried on until it is decided accurately that one process at least will return a profit on the ore in question.

The second and third determinations are required before building a mill to treat an ore. Most ores are capable of being treated by several different methods. For example, a certain gold ore may be cyanided direct, amalgamated and cyanided, or amalgamated, concentrated and cyanided. It will yield a different percentage of gold by each combination, the working cost will be different, hence a different profit will result from each combination. Again, a copper ore may be concentrated by ordinary gravity methods, or by flotation. It is, therefore, necessary to determine the method which will yield the greatest profit. It will be noted that this involves not only determining the percentage of saving, but also costs of operation.

The objection may be raised that the cost of operation of a mill cannot be accurately determined from a test run. It is true that the cost cannot be determined accurately to the last cent, but it can be determined near enough for correct comparison of several different processes. A careful study of the details of the processes under comparison, knowing the approximate costs of power, labor, transportation, etc., at the camp where the mill is to be built, will give a close comparison of the cost of several different methods of ore treatment.

Costs of somewhat similar ores may be used to advantage in making comparisons, if the factors making up such costs are known and corrected for the district and ore in question. Neglect of the latter precaution is often a source of error. The cost of a process in one district cannot be assumed as the cost of the same process in another district, unless the factors making up that cost are identical for the two districts and also for the two ores.

It will not be attempted to go further with the question of determination or prediction of costs, as that subject is worthy of a separate discussion. This article will deal mainly with the determination of the percentage of saving, taking up the following combinations: (1) Amalgamation alone; (2) amalgamation and concentration; (3) amalgamation and cyanidation; (4) cyanidation alone; (5) amalgamation, concentration and cyanidation; (6) concentration alone.

Few ores give a sufficient saving by amalgamation only. The percentage of saving depends mainly on the size to which the ore is crushed, to a lesser extent on its treatment after crushing, such as the dressing and slope of plates, amount and temperature of water used.

Amalgamation and Concentration

This combination is applied to an ore containing free gold and gold in combination with sulphides or other valuable metals. In general the saving by amalgamation increases with finer crushing, while the saving by concentration decreases. It is required, therefore, to determine the size at which the sum of the two savings will be at a maximum. The size of the crushing is limited to from about 10 to 50 mesh.

The method of determining the maximum saving is as follows: Choose a size for the first run by inspection of the ore, depending on character of free gold, size and condition of sulphides. Suppose this to be 30 mesh: Crush one lot through 30 mesh, amalgamate (after adjusting plates, water, concentrators, etc., by small preliminary run), classify pulp from plates into sand and slime, treat each on a separate concentrator. The pulp is sampled on issuing from battery and again after passing amalgamating plates. The difference between these two samples gives the extraction by amalgamation. The saving by concentration is determined by drying, weighing and sampling the concentrates made.

Next crush a lot through 40 mesh, determining saving as before. If the total saving is higher, next try 50 mesh; if lower, try 20 mesh. Proceed in this manner until the maximum total saving is determined. Rate of crushing and capacity of concentrating machines, and amount of sand and slime are determined, affording a basis for cost calculations.

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Amalgamation and Cyanidation

There are three variations of this combination: Amalgamation and leaching by cyanide solution; amalgamation, classifying, leaching sand and agitating slime; amalgamation, regrinding and agitation in cyanide solution.

Amalgamation and Leaching by Cyanide Solution—The total saving will generally be greater the finer the crushing. The fineness of crushing is limited, however, by the amount and character of the slime made in crushing, thus limiting the ability of the solution to percolate through the ore.

Determine first the finest-size screen which will still allow percolation, by crushing small representative lots of the ore. Determine also on these small lots, after amalgamating, the time of leaching required, the best strength of solution, amount of alkali, best ratio of solution to ore, etc. (see under cyaniding). Now crush a large lot to the finest leachable size as above determined, amalgamate, and leach with cyanide solution according to the details determined in the preliminary tests. Determine saving by amalgamation and cyaniding. Crush another lot through the next coarser screen, amalgamating and leaching according to the details determined in the preliminary test on this size. Proceed in this way until certain that the maximum profit in this direction has been reached.

As a check, crush a lot through the screen next finer to the size which was found to be the practical limit of percolation. Determine the consumption of cyanide and alkali, rates of crushing, etc., in the large tests. We can now determine the maximum saving by amalgamation and leaching, and the approximate cost.

Amalgamation, Classifying, Leaching Sand and Agitating Slime—Crush a lot through the screen determined above as being the limit of percolation, amalgamate and classify into sand and slime, after first determining the adjustment of classifier that will deliver an easily leachable sand product. Leach sand and agitate slime (the details should first be determined on preliminary tests as above). Repeat on finer size and so on until the maximum profit by this combination has been found.

The consumption of cyanide and alkali is determined in both the sand and slime treatments. The amounts of sand and slime and rates of crushing are also determined. The latter determinations are used in calculating the cost of the process.

It must not be lost sight of in all the different tests enumerated that the purpose is to determine the maximum profit by the specific combination described. All of these tests are part of a complete scheme of determining the most profitable process to use on any given ore, as will be seen later.

In the third variation as described below, it is easy to lose sight of amalgamation altogether, as the question of cost of crushing enters so largely into this test. The relation between the first crusher and the regrinder, influences the cost of milling to a large degree; and the tendency in working out this combination is generally to determine the most economical relation between the two as far as cost of crushing is concerned, and to lose sight of amalgamation.

For instance, the cheapest size for the first crusher to deliver, considering cost of crushing only, may not give any extraction by amalgamation. There are certain advantages in getting out a good percentage of gold by amalgamation, rather than throwing the burden of the saving on cyaniding. The advantage in getting quicker returns for the output by amalgamation may be great with a company which is short of working capital. There is also a technical advantage in getting a good part out of the process quickly instead of subjecting it to the more complicated cyaniding.

On the other hand, there is the extra cost of the attention to the plates and the greater liability of amalgam to theft. Also, if the most economical combination of first crusher and regrinder is departed from to secure a higher amalgamation, then amalgamation must be debited with the increased crushing cost. The cost of converting amalgam to bullion is cheaper than the reduction of cyanide precipitate. One of the main advantages in amalgamation before cyaniding, is to keep coarse gold out of the solution tanks.

Amalgamation, Regrinding and Agitating in Cyanide Solution—The fineness of regrinding, necessarily, should be determined by grinding portions of amalgamated pulp, say to 100, 150 and 200 mesh, and determining cyanide extraction. After deciding on the requisite fineness of regrinding, lots of ore are then crushed to different sizes, in the stamp mill, amalgamated, reground to the size determined and agitated in cyanide solution, having previously determined the necessary details.

These trials are continued, each lot being crushed coarser until the extraction by amalgamation becomes negligible. The capacities of stamps and regrinder are carefully noted, to be used in estimating costs. The cyanide treatment may vary somewhat, depending on the proportion of saving which is thrown upon it. It may, therefore, be necessary to make separate preliminary tests on each lot to determine the details of treatment.

The cost of regrinding is an important item in this scheme of treatment, and this cost will vary with the type of regrinder used. Comparative costs may be determined fairly close, so that the most economical combination of this one process, i.e., amalgamation, regrinding and cyaniding, can be determined, but it is more difficult to determine absolute cost, in order that this process may be compared with others, which may not use any regrinding.

To decide upon the most economical regrinder, it is necessary actually to test all that are worthy of consideration. To determine the best work of each, the factors which influence each must be worked out, such as size and rate of feed, speed and moisture in feed.

When a combination of processes including regrinding among them, is seriously in competition with a combination including no regrinding, then the cost of regrinding must be carefully considered, but fortunately, this is not so often the case. There is generally a wide enough difference between the results obtained with regrinding, and without, so that such close work is not necessary.

There are several variations of this process which should be tested out after the tests as above enumerated are made. A lot should be run, crushing to best size, etc., as above determined, except that the crushing is done in cyanide solution. If this shows any advantage, either in extraction or cost, then it will be worth while to make several other trials with different strengths of solution.

Another variation which might be tried is amalgamation again after regrinding.

Cyaniding Alone

There are three variations, viz., leaching, agitating, leaching sand and agitating slime. Aside from the fineness of pulp, the factors which influence the extraction are: Strength of solution, time of contact, amount of alkali, ratio of solution to ore, completeness of precipitation and facility of washing. The ease of percolation of solution is a factor of the fineness of pulp. The factors influencing the cost of the process are: The fineness of the pulp, consumption of cyanide, alkali, zinc and other chemicals, ease of filtration and washing. It is required to find the combination of the above factors that will give the greatest profit.

Leaching—First determine finest size permitting percolation as previously described. Several representative small lots are then crushed through different-sized screens, and used for the determination of the other factors. The most important of these are the strength of solution and time of contact, along with comparative consumption of cyanide. The amount of alkali necessary is first determined. Too much alkali has been found to lower extraction. Trials are then made with different strengths of solution, each for some length of time, determining consumption. The most economical strength is then tried for varying lengths of time, again determining consumption. Enough check tests should now be made with other strengths of solution besides the one first chosen and with other lengths of time than that chosen in the last test, to be sure that no other combination is better than the one above chosen.

In Table I is given an example of treating a $5 ore with different strengths of cyanide solution, other factors remaining constant. The best strength at three days is

TABLE I. TESTING WITH DIFFERENT SOLUTION STRENGTHS

% Solution	Time	Extraction	Consumption	Relative profit
0.1	3 days	$4.00	0.5 lb. @ 25c = $0.12	$3.88
0.2	3 days	4.25	0.7 lb. @ 25c = 0.17	4.08
0.3	3 days	4.40	1.5 lb. @ 25c = 0.37	4.03

evidently 0.2%. In Table II are shown the results of varying the time of contact, using a 0.2% cyanide solution. The 0.2 solution for four days' leaching would, therefore, generally be taken as the best combination. But suppose on testing with 0.1% solution, for five days, it is found to give $4.45 extraction with 0.7 lb. consumption, or $0.17. The relative profit is then $4.28, or better than any with 0.2%. This latter precaution is sometimes neglected.

TABLE II. VARYING THE TIME OF CONTACT

% Solution	Time	Extraction	Consumption	Relative profit
0.2	2 days	$4.00	0.5 lb. @ 25c = $0.12	$3.88
0.2	3 days	4.25	0.7 lb. @ 25c = 0.17	4.08
0.2	4 days	4.40	1.0 lb. @ 25c = 0.25	4.15
0.2	5 days	4.50	1.5 lb. @ 25c = 0.37	4.13

After finally deciding on the various factors large lots are crushed at different sizes and leached. The true consumption of cyanide and alkali is determined in the large tests. Consumption tests in small samples are not reliable except in a comparative way. By testing sufficiently large lots the maximum profit by cyanide leaching is ascertained.

Agitating—The size of crushing is determined as before. Other details are then worked out until the best combination is found as described under leaching. Several sizes are then agitated in large tanks. Size of the pulp as affecting ease of agitation should be noted. Comparison should be made with grinding in cyanide solution.

Leaching Sand and Agitating Slime—This is worked out as under the second variation of amalgamation and cyanidation, omitting, of course, amalgamation. Crushing in cyanide solution should be compared with crushing in water.

The tests under so called "straight cyaniding" are the first that have not been limited to crushing by stamps, or similar machines preparing ore for amalgamation. The style of crushing may have some influence on the limiting size of crushing. For instance, it might be necessary to crush to a smaller maximum size with rolls, than with stamps, due to lesser amount of slime formed. The cost of crushing will also be affected. These points can be determined by trial.

As special cases under cyanide tests would come the preliminary treatment of old tailings, and of some ores, such as washing, roasting before cyaniding, and tests according to special cyanide processes, such as electrocyaniding and bromocyaniding.

Amalgamation, Concentration, Cyaniding

After amalgamation and concentration, there are again the three possibilities of cyaniding by leaching, agitating, or both. As before, several lots are crushed through a range of screens, amalgamated and concentrated. On the tailings from concentration are made the detailed tests as described under cyaniding. The tailings are then tested in large lots by the three modifications of cyanide practice.

The complete test would include the following, on several different sizes: Amalgamate, concentrate, leach; amalgamate, classify, concentrate sand and slime separately, leach sand tailings, agitate slime tailings; amalgamate, classify, concentrate sand and slime separately, regrind sand tailings and agitate combined tailings; amalgamate, classify, concentrate sand and slime, regrind sand tailings and reconcentrate, agitate combined tailings. The latter test should always be tried where there is a cyanicide present which is capable of being removed by concentration.

Each of the above variations is tried on pulp originally crushed through enough different-sized screens to determine the maximum profit. Crushing in cyanide solution at the start is also to be compared. The remarks concerning regrinding made before, of course, apply in this case also. Whenever concentrates are made which contain no amount worth considering of other valuable metals than gold and silver, the concentrates themselves should be tested to determine the possibility of cyaniding them on the ground, as compared with shipping to a smelter. A complete cyanide test is necessary, determining maximum profit, as compared with the cost of transportation to smeltery and smeltery returns.

The preceding test is probably the most complicated of any. The saving by the individual processes will vary with the size to which the ore is first crushed. Saving by amalgamation will generally increase with finer crushing, while the saving by concentration will decrease. The less the saving by the first two processes, the more must be accomplished by cyaniding. It may be of special importance to make as large a saving as possible by concentration, either because of cyanicides, which can be so removed, or the presence of copper, lead, etc., or because

of precious metals contained in the sulphides being slow to yield to cyaniding. In comparing this process with others, the losses in marketing the concentrates must be deducted in due proportion from the total saving. It can easily be seen where so many factors enter into the problem that the only correct method of solution is actually to mill an ore according to the different variations, and compare the results so obtained.

Concentration Alone

Concentration includes several different methods, ordinary concentration (based on specific gravity), flotation, electrostatic and electro-magnetic separation. The reasons for making concentration tests are: (1) To decide whether to concentrate an ore or smelt it direct, and (2) to determine the best method of milling and details of the process. The decision of the first point depends on the ratio of concentration, percentage of saving, cost of milling, cost of smelting, including deductions, and cost of transportation to smelter.

The best method of concentrating is the one yielding the largest profit, and the details of the method influence both the saving and the cost of operating. The fineness of crushing, closeness of sizing, number of stages in crushing, the size of tailings discarded, etc., all affect the saving, and it is, therefore, necessary to find the relation between them all which will give the best profit.

After the maximum profit by one method, say concentration by specific-gravity methods, has been determined, this should be compared with flotation, or, on special ores, with some of the other methods of concentration.

The following is the method of procedure for ordinary concentration. The size to which the ore shall be crushed is first to be determined. This, of course, is the size at which the valuable minerals contained are first freed from the attendant gangue matter. Crush a representative sample, screen out successive sizes until one is reached at which an appreciable amount of mineral is set free.

Sometimes the size to which the ore should be crushed is apparent on inspection of the screen sizes. With other ores, a gradually increasing amount of mineral is set free, the finer the size, so that it is difficult to decide by inspection. In such a case determine the amount set free. For the coarser sizes, the free mineral may be picked out by hand; on the finer, a small model concentrator can be used. Suppose the decision lies between 0.5 in. and 0.4 in. There is some amount of mineral free in the through 0.5 in. on 0.4 in. size, and a larger amount in the through 0.4 in. on 0.3 in. size. If now we crush through 0.5 in. we have an increased cost in screening, concentrating, and handling of tailings. If, on the other hand, we crush through 0.4 in., some of the mineral already set free between 0.4 in. and 0.5 in. will be reduced to slime in the finer crushing, and a poorer saving will result on the slime portion. The additional slime made can be approximated by screening out the through 0.5 in. on 0.4 in. size, then recrushing this through 0.4 in. and determining the through 200-mesh portion.

After deciding this point, the next in order is the number of sizes to make in preparing the ore for concentration. A close sizing test will show any heaping up of valuable mineral in certain sizes. Where such occurs, these sizes are worthy of special attention. The screening test will indicate the sizes to make. In a doubtful case, comparative tests can be run, making different sizes in each.

A large lot is now crushed and screened to the size decided upon in the preceding tests. Determine weight of each size, concentrate each separately, keeping each concentrate and each tailing separate, and sampling each tailing. After the tailings samples are assayed, we are ready to consider recrushing of tailings.

We can first decide which tailings can be thrown away. Tailings to pay for recrushing must contain enough recoverable mineral to pay for handling, recrushing and reconcentration, and an excess for profit. Wherever any particular size is in doubt, recrush it, concentrate and determine the amount of mineral recovered.

If the coarser sizes of tailings to be recrushed contain much mineral, they may be recrushed in two or more stages. To decide which course is the more profitable, the tailings in question may be divided into two or more lots. One is recrushed in one stage, another in two stages, and so on. The recrushed ore is concentrated separately and the saving determined. The lot crushed in two stages must yield enough more concentrate to pay for the extra expense of two-stage crushing. In any case the tailings are recrushed until they in turn yield tailings which can be thrown away. The above test is not strictly in accordance with mill practice. In a mill the sized pulp at any given stage is a mixture of ore from first crushing and the successive recrushings, while in the test these are all separate.

If desired, another lot may be run by throwing all ore of a size together. In some cases this may make a difference. For instance, the proportion of concentrates in a given size from first crushing may be quite different in the same size from the second crushing, and may affect the saving to some degree.

The final saving and ratio of concentration are determined from the combined weights and assays of concentrates. A screen test on a sample of combined concentrates will give further information concerning the best mill sizes to make. The amount of feed to the different types of machines can be calculated.

The maximum profit to be had by ordinary gravity concentration should be compared with that by flotation. Flotation is rapidly assuming more importance in the concentration of ores, and if the legal entanglements connected with it are once straightened out, it will be much more generally adopted. The combination of flotation and ordinary concentration may also be tested.

On more complex ores, such as contain zinc, for example, special methods must be tried, as electrostatic. The general methods in any case are similar to the above outlined. It can now be decided with certainty whether to mill any given ore or to smelt it direct, what method of milling will give best returns, and what is the best practice with regard to this method.

Some Ores May Be Amenable to Several Processes

The foregoing is all descriptive of special combinations of processes. An ore can be imagined which might give some recovery to any one of the six combinations, though such an ore would be rather a freak. However, a good many ores will yield a high saving to two, three or even four of the above combinations.

For instance, a gold ore may give a good recovery by amalgamation and cyaniding, cyaniding alone, or amalgamation, concentration and cyaniding. The yield and working cost by each combination will be different, and hence each will give a different profit.

In testing to determine which combination will yield the highest profit on a given ore, it is not necessary, of course, to try all of the above combinations, or other possible ones that might be thought of. Some can be eliminated at once by inspection, others by preliminary tests, until the list is cut down to those which by preliminary test give promise of being competitors. These latter are then fully tested to determine the maximum profit yielded by each, and the one yielding the greatest profit is the one finally chosen.

Enough ore should be milled by each of the competing processes to give accurate results. For instance, in the ore above mentioned a carload lot for each test would be none too much.

The process to treat an ore is too often chosen by a combination of inspection and testing. For instance, it is decided by inspection, reasoning or guesswork that amalgamation, concentration and cyaniding is the correct process. A test by the chosen process is then made, and if it gives a 90% recovery, this is taken as corroboration of the previous judgment. It might, however, have been found that amalgamation followed by regrinding and agitation, cutting out concentration altogether, would give better results.

Treatment of ore sometimes follows the fashions. It is often influenced by advertising campaigns of new machinery. For instance, there are some ores now being treated by regrinding and agitation with its attendant filter pressing, which would yield a greater profit, if not a higher saving, by the old-fashioned leaching process, or leaching of the sands at least. The determination of the most profitable process of treating an ore should be approached with an open mind, and not with a preconceived idea.

Russian Salt Industry

For several generations the salt derived as a natural sediment from the numerous salt lakes and marshes fringing the shores of the Black and Azof seas, and also from those in the vast depression at the north of the Caspian Sea, formed an important factor in the commerce of this consular district, says John H. Grout, U. S. Consul at Odessa, in *Daily Consular and Trade Reports,* Apr. 11, 1913. The government levied an excise tax on the trade, which brought in a heavy revenue. Toward the close of the reign of Alexander II, the tax was abolished, and this gave a great stimulus to the salt-gathering industry, so that it soon nearly doubled in volume of output.

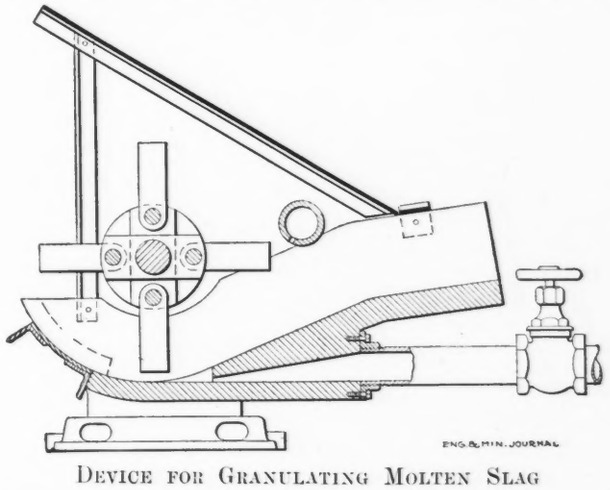
The industry, however, which centered at Odessa, soon experienced trouble. The large profits attracted attention and many attempts were made to realize through monopoly the sum of money returned to the public by the remission of the tax. Eventually one such syndicate was formed at Eupatoria and gained great wealth. At the same time another and quite unforseen obstruction to the development of the lake-salt industry appeared. This was the discovery of the immense underground field of rock salt in the Backmut region, which soon began to be worked. The syndicate secured control of this rock-salt mining, and for some time there was no real competition in the trade. The serious attention of the government was finally attracted, and the syndicate at last fell to pieces.

The present price of fine-ground salt at Odessa ranges from 8½ to 9c. per pood (36 lb.) delivered into railway trucks, and even these are much higher than those which existed before the formation of the syndicate. It is said that the salt millers gain too much profit in charging 1½ to 2½c. per pood for grinding, since rough crystal salt can be had at 6½ to 7½c. per pood. The salt dealers here are now working hard to obtain such railroad rates as will enable them to undersell rock salt in Poland and western Russia and that obtained from boiling down brine pumped up from the layers underground.

Granulating Molten Slag

In the process of John T. Bergwith, of Chicago, Ill. (U. S. pat. 1,047,370), for the granulation of blast-furnace slag, the attempt is made to produce a dry granulated slag, nothwithstanding the use of water.

This is done by delivering the stream of molten slag to the action of a rotary feeder, driven at a high rate of speed, the feeder members of which scrape or shear off extended portions of the stream of slag and project it upward into the air. Simultaneously with the separation of the portions of slag from the main stream by the



Device for Granulating Molten Slag

feeders, it is subjected to the action of a small stream of water, which combines with the feeders to produce the granulating action. During its flight through the air, it cools and dries, so that it is deposited in a nearly dry granulated state. As may be seen from the accompanying illustration, the lower portion of the feeder wheel runs in a suitable trough or runner, the sides of which rise nearly to the hub of the wheel. A guard bar, or shield, is arranged above the wheel. The trough, or runner, is approximately V-shaped in cross-section before it reaches the disintegrator, but broadens out to a flat-bottom trough in that portion which underlies the feeder blade. At a point approximately central to the lowermost part of the trough, a wide, relatively thin water inlet communicates with the trough. The feeder wheel comprises a number of plates supporting rods, or bars, separated by a number of face blocks.

Preparation of Barium

According to *Echo des Mines,* June 2, 1913, it is possible to prepare barium by heating an intimate mixture of silicon and anhydrous barium oxide.

$$3\ BaO + Si = BaSiO_3 + 2\ Ba - 37\ calories$$

The reaction takes place at about 1200° Centigrade.

Mammoth Copper Co.'s Hospital, Kennett, California

The Mammoth Copper Co.'s hospital at Kennett, Calif., was built in 1906-7. It is a two-story wooden building containing two wards and two private rooms. There are 14 beds, eight beds in one ward, four in the other and one each in the two private rooms. Beside these the office and operating room and the living apartments are also within the building. The hospital is in charge of Dr. J. P. Sandholdt. He is assisted by a trained nurse and an orderly. Dr. T. E. Grubbs is physician-in-charge at the mine, where there is a building containing an office and a small ward provided with two emergency beds and such other accessories needful for the immediate care of men in cases of serious accident. The mine is situated about four miles distant from the hospital at an elevation of about 3500 ft., while the elevation at Kennett is

HOSPITAL AT KENNETT, CALIF.

about 700 ft. The seriously injured men are carried to the hospital in an ambulance. The full number of men employed by the company when the mine and smelting plant are working at maximum capacity is about 1200. In 1913 the number was 800, the reduction being due to the fact that the plant was not being run at full capacity on account of the complaints of farmers in the county respecting alleged damages from fumes, although there has been no actual damage done to crops since the installation of the baghouse in 1910.

The larger percentage of patients treated in the hospital are there on account of accident. There are no chronic diseases. The number of serious cases of accident is low considering the number of men employed. The average number of patients in the hospital at once is one to three. The hospital has been entirely without a patient for periods of from one to six weeks. The larger percentage of accidents are among unskilled laborers, but the foreigners in such cases do not exceed the Americans. Thirty per cent. of the serious cases are men who have worked at the mine or smelting plant less than one week. The men employed who are generally familiar with the work are largely in the majority, and it is the new men or green hands usually who are hurt. The percentage of men receiving their time checks on account of leaving the employment of the company is quite low, considering the number of men employed and will average about 10 per month.

The healthful climatic conditions at Kennett and at the mine are attested by the fact that while malarial fever is quite prevalent 10 to 20 miles south in the valley there have been only four cases of malarial fever in the Mammoth hospital in the past five years. The records of the hospital show a mortality at Kennett in 1912 of 5½ per 1000 persons. The mortality in the state at large is 12 to 14 per 1000 persons. This hospital does not restrict patients to employees of the Mammoth Copper Co., but patients are received from among the residents of the town of Kennett. The hospital is supported by a fund paid in by the employees of the company at the rate of $1 per man per month.

The accompanying photograph illustrates the hospital and garden and shade trees. It is situated on a hillside across a ravine from the smelting plant, within about 500 ft. of the yards. The photograph was made in May, 1913, when the flowers were in bloom and the lawn and trees were green. There was no evidence of any effect from fumes, because there were no fumes.

Aluminum and Cobalt Alloys

As a result of exhaustive experiments, Doctors Borchers and Schirrmeister have shown that among the great number of theoretically and practically possible aluminum and cobalt alloys those containing from 9 to 12% Co represent a structure which, though rather coarse-grained and of scarcely greater tensile strength than pure aluminum, is not only substantially harder and easier to work by turning, polishing, etc., but also much less liable to atmospheric influences (*Min. Journ.*, June 14, 1913). They have now found that by small additions of metallic wolfram or molybdenum, the structure is rendered much finer, and, at the same time, the tensile strength of the alloy is increased to three times that of pure aluminum. The resulting material is also easy to be worked or rolled. The composition of the alloy may vary within the following limits: 0.8 to 1.2% wolfram, 8 to 10% cobalt, and the balance aluminum. The more the cobalt contents approach the higher of the above limits, the greater will be the tensile strength, while the suitability for rolling will decrease. The alloys which are richer in cobalt will, therefore, be most adapted for foundry purposes, and the poorer ones for the manufacture of wrought and rolled material. The molybdenum-cobalt-aluminum alloys may vary within the following limits: 0.6 to 1% molybdenum, 9 to 10% cobalt, balance aluminum. They are in all respects similar to the wolfram alloys, except that the hardness seems to be slightly less. The alloys are produced in accordance with methods well known and generally used in the technics of metal alloys.

Billiton Tin Sold in Batavia, Java, at the first three public sales of 1913, according to Consul B. S. Rairden, at the following prices: Jan. 8, 5500 slabs @ $0.4806 per lb.; Feb. 5, 6000 slabs @ $0.4697; Mar. 5, 5500 slabs @ $0.45422. The slabs weigh 74.8 lb. each.

Milling in Southeastern Missouri—IV.

By Claude T. Rice

SYNOPSIS—The experimental section of the mill of the St. Louis Smelting & Refining Co. is described as an illustration of the Overstrom system, which departs radically from prevailing practice in the district. Jigs play a minor rôle, being used to treat the material between 3 and 12 mm. The tailing is recrushed and returned to the trommel system. Three Overstrom hydraulic classifiers handle the fine material, making 21 different products which are sent direct to Overstrom tables.

In previous articles in this series have been described the milling methods used in the Doe Run No. 3 and the Federal mills. These have differed from one another in important features, although resembling each other in the main point of using Hancock jigs. In the present article will be described the Overstrom experimental section of the mill of the St. Louis Smelting & Refining Co., St. Francois, Mo., which is a radical departure in milling methods.

Overstrom System Being Tried

The section to be described incidentally in the elucidation of the Overstrom method of classification and general scheme of ore treatment is far from being what will finally become the accepted pattern for the rest of the mill. Indeed, the section has served mainly as an experimental one in which the new problems that come with the treatment of large tonnages by a new system could be worked out. Two things have already become evident: First, that it is simpler to classify products above 3-mm. size, than to size them, and, second, that a closer classification has been made on the finer sizes of pulp than was necessary for making a good saving on this ore.

In the first section 15 classified products are made from that portion of the pulp ranging from 1½ mm. down to the undersize of a 200-mesh screen, but it is probable that in the future sections this will be reduced to about six products. The number of classifications of the coarser sizes now treated on tables will be about the same as in the experimental section, or possibly a few more.

The most important change will be the substitution of hydraulic classification for screen sizing on pulp running as coarse as 10 mm. The feasibility of extending the range of classification into the field formerly universally considered to belong to screening systems is due to the experience obtained in this first section. It was found that coarse particles ranging up to as high as ⅝ in., resulting from broken trommel screens, have been safely carried up the ¾-in. pipe of the safety column of the classifier without causing any trouble.

The question still to be decided is whether the sizes coarser than 3 mm. will be jigged or treated on tables. If jigs are to be used it will be necessary to decide whether a harz or a Hancock jig, or a combination of the two, is to be employed. At present harz jigs are used, but there is a constant delay occasioned by the necessity of beating the screens once every 24 hr. in order to keep them in good working condition. The marked success that has attended the working of the coarse Overstrom tables handling the immediate undersize from the 3-mm. screen makes this form of concentrator worthy of consideration in a field which has heretofore been the exclusive domain of the jig.

Outline of Experimental Section

A brief outline of the manner in which the ore is crushed and treated in this new section of the mill of the St. Louis Smelting & Refining Co., is given herewith. The ore from the different shafts is hauled to a bin in the crusher house. This crusher house is arranged in two sections, having in each section one 6D and two 3D Gates crushers with trommels having 1¾-in. openings ahead of each of the smaller crushers. The large gyratories crush to about 3½ in. and the smaller ones to 40 mm. The ore is then carried to the mill building by an inclined belt conveyor. Later a set of 24x54-in. rolls is to be installed in each section of the crusher house to break all the ore so that it will pass a 10-mm. opening. The ore will then be delivered directly to the Overstrom classifier that is to be installed to handle the coarse feed, instead of its going to trommels and being sized as in the present section. The ore is sampled by one Snyder and three Vezin samplers in series. The cut from the last Vezin goes to a sample grinder and is ready then for the assay office where electrolytic assays are made for lead. The rejects from the different samplers fall into the boot of an elevator and are taken to the conveyor at the top of the bins.

From the fine-ore bin the ore goes to a bucket elevator which delivers it to two trommels 48 in. in diameter and 18 ft. long, having 3-mm. screens on the first section, 6-mm. screens on the second section and 12-mm. screens on the last. Water is added at these trommels. The oversize joins the tailings from the jigs and goes to the Cole type of dewatering wheel, which is used to feed the 16x36-in. recrushing rolls. This recrushed material goes back to the first elevator and is returned to the trommels.

Material Coarser than 3 Mm. to Harz Jigs

The undersize from the 3-mm. screen goes to the No. 1 Overstrom classifier, the undersize from the 6-mm. screen to one of the harz jigs, and the undersize from the 12-mm. screen to the second jig. These jigs are of the large harz type, having sieves 36 in. wide by 60 in. long. They are arranged so as to make gate concentrate chiefly, since, owing to the flap valves in the bottom of the plunger of these jigs, the suction stroke is not especially strong.

On the jig treating the 6- to 12-mm. sizes a screen having 3-mm. openings is at present used, while on the jig treating 3- to 6-mm. material screens having 2-mm. holes are used. Both jigs are run at 160 r.p.m. The coarse jig has a stroke of 1¼ in., while the stroke on the other jig is ¾ in. A bottom bed 1½ in. thick is used. The sieves on each jig are divided into two parts by a cross slat, while in the hutch there is also a cross slat coming up high enough to keep the two hutch workings apart. Owing to the size of screens used the hutch product is small in quantity, but there is some resulting from the

attrition of the galena in the bed of the jigs, and from undersize particles that are carried over with the oversize as is inevitable when trommeling large tonnages.

It is the intention to use a 2-mm. screen on the 6- to 12-mm. jigs, and a 4-mm. screen on the fine jig, so as to let any coarse undersize particles of the feed go into the hutch; with the finer screens and the thin bed now used there is always a risk of these coarse undersize particles being thrown into the tailings. When this change is made, hutch jigging will be done. When using these coarser screens a heavy middling product will be drawn off through the second jig from above the screen, and a small amount of clean tailing obtained from the jigs. These harz jigs have the novel feature of an adjustable mid-partition between sieve and plunger compartments. This is built according to the centerboard idea of catboats. Eccentrics are used having no projecting setscrews.

While fairly clean concentrate is made in the first part of the hutches of the jigs, still all of the concentrates are fed to a 16x4-ft. Overstrom table placed on the coarse-table floor to be cleaned. At the time this article was written no middlings were made on the jigs. Instead they were allowed to go into the tails which were all reground. The jigs work well, but in order to keep the fine sieves that are used from blinding, they are pounded once every 24 hours. As previously mentioned, the shovel wheel feeds the dewatered jig tails, together with the oversize from the 12-mm. screen, to a pair of 16x36-in. rolls for regrinding.

Overstrom Classifiers for Fine Material

The undersize from the 3-mm. screen goes to a series of three Overstrom classifiers, which make 21 different classified products and the slimes. The slimes are overflowed at No. 1 classifier, which in addition makes eight different classified feeds. The pulp that comes up the last or safety column of this classifier goes to the No. 3 classifier, while the pulp from the last classifying compartment, that is, the one just ahead of the safety column, feeds No. 2 classifier. In No. 3 classifier is treated the coarsest material. The overflow from its receiving compartment is water that goes to the tank that supplies

DATA ON OVERSTROM CLASSIFIERS

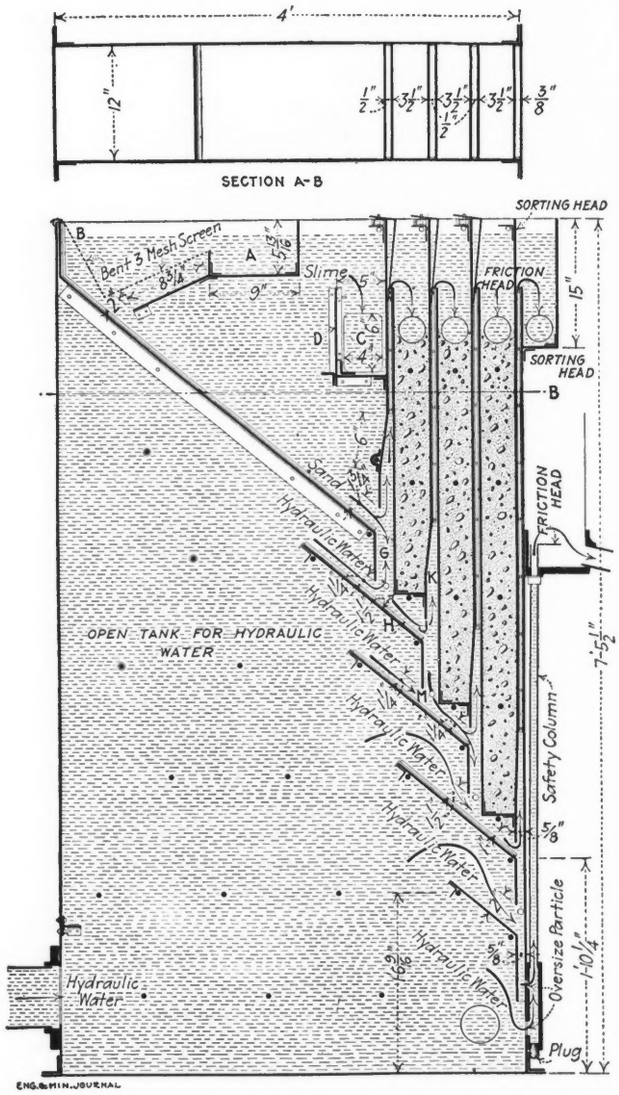
	Classifier No. 1	Classifier No. 2	Classifier No. 3
Spouting velocity of columns, mm. per sec....	300	500	1000
Sorting velocity of column 1, mm. per sec....	10	55	178
Sorting velocity of column 2, mm. per sec....	13	65	212
Sorting velocity of column 3, mm. per sec....	17	75	250
Sorting velocity of column 4, mm. per sec....	21	87	480
Sorting velocity of column 5, mm. per sec....	27	100	..
Sorting velocity of column 6, mm. per sec....	32	115	..
Sorting velocity of column 7, mm. per sec....	39	131	..
Sorting velocity of column 8, mm. per sec....	47	500	..
Sorting velocity of column 9, mm. per sec....	150	..	..
Sorting velocity safety column, mm. per sec. .	1800	..	1800
Tons raised in column 1, per 24 hr.....	9	26	48
Tons raised in column 2, per 24 hr.....	11	29	54
Tons raised in column 3, per 24 hr.....	13	31	57
Tons raised in column 4, per 24 hr.....	15	33	63
Tons raised in column 5, per 24 hr.....	17	35	..
Tons raised in column 6, per 24 hr.....	20	37	..
Tons raised in column 7, per 24 hr.....	22	39	..
Tons raised in column 8, per 24 hr.....	24	42	..
Tons raised in column 9, per 24 hr.....	272	..	..
Tons raised in safety column, per 24 hr.....	222	..	5

Specific gravity of ore, 2.89

hydraulic water to No. 2 classifier, which is fed at a lower level than No. 1. No. 3 classifier makes four classifications, while No. 2 makes eight, and the overflow at its receiving compartment is clear water, which is used for a wash on the tables.

These classifiers increase in height with the number of classifications that are made in them. No. 1 classifier is practically 15 ft. high, and is 2 ft. 6 in. wide; No. 3 classifier, which is placed alongside it, is 7 ft. 6 in. high and 12 in. wide, while No. 2 classifier is 13 ft. high and 24 in. wide. An accompanying table gives the sorting velocities used in each compartment, and the tonnage lifted by each with the pulp at a dilution of 10:1.

The material from the safety column and the last compartment of the No. 3 classifier is treated on one 3x17½-



Section of Overstrom Classifier

ft. Overstrom table riffled over its top with a broad stratifying groove between riffles. Owing to its taking the feed from the safety columns, which is the catch-all of this system, the feed to this table is not closely classified. In order to get a lean middling, therefore, it is necessary to classify the middlings coming from the lower corner of the table so as to free them of fine sand and oversize particles of gangue that often follow the concentrates along the riffles. This classifier is simply a pipe affair of reducers, tees, nipples, elbows and other standard pipe fittings working on the old downward-discharge principle.

The three other compartments of No. 3 classifier each feed a table, there being two other 3x17½-ft. tables and

one 4x16-ft. table. Each spigot product of the other two classifiers feeds a table. The coarser sizes go to 5x11-ft. diagonal tables, and the finer sizes to 6x14-ft. diagonal tables, there being 10 of the larger size and eight of the smaller. The slimes go to a 7x9-ft. slime table, and several 6x14-ft. diagonal tables.

The long tables handling the coarse pulp are driven at 210 r.p.m., and have a stroke of ¾ to 1 in. The intermediate tables run at about 240 to 245 r.p.m., and have a stroke of from ⅝ to ¾ in. The slime tables run at 285 r.p.m., and have a stroke of ½ in. The riffles on the coarse tables have a depth at the head-motion end of ⅝ in. and taper to $\frac{1}{16}$ in. On the last two of the long tables grooves in the linoleum become important, and the riffles are only put on in sufficient number to carry the concentrates to the end of the tables. These grooves are ⅛ in. deep and taper at the discharge end to $\frac{1}{32}$ in. On the intermediate tables there are no riffles, and the grooves cut in the linoleum are ⅛ in. deep as a maximum and taper to nothing. On the slime tables the grooves are $\frac{1}{16}$ in. deep and taper to nothing.

The first two coarse tables make middlings that are sent back to the regrinding rolls and thence returned to the trommel system. The middlings from all the other tables go to the boot of an elevator and are returned to tables where a narrow streak of galena is saved and a pyrite-chalcopyrite concentrate is obtained. The tailings from the jigs and tables of each section go to a teeter-box sampler of improved type, and then by cars to the dumps.

Overstrom Classifier Discharges at Top

The whole system is built around the Overstrom classifier, which is of a somewhat similar type to the Richards pulsating classifier, in that it raises its products instead of drawing them off at the bottom, as is the practice in all of the many variations of the time-honored idea in classification that has prevailed almost unquestioned since the time of Rittinger. The sorting columns are arranged side by side longitudinally, and what pulp cannot be raised in the sorting column ahead drops down from the bottom of it and goes out in a thin feed to the next column, where the next coarser size is floated up and discharged.

By reference to the accompanying engraving, which shows the design of No. 3 classifier, which is handling the coarser feed coming from the 3-mm. screens, the action of the Overstrom classifier will be better understood. The feed to the classifier comes to the box *A* and overflows past the screen *B*, in case a scalping screen cannot be put in on the launder some place ahead of the classifier. From there it drops into the first or receiving compartment, which connects with the hydraulic water of the classifier to the opening *E*. The head of the feed and the head of the hydraulic water are approximately equal; consequently, there is no upward flow of hydraulic water through *E* and no downward flow of slime other than that induced by the settling of the heavier pulp through the opening *E*. In case these two heads are not exactly balanced, the adjustment is made by means of a movable lip *C* of the slimes-overflow box.

The slime overflows from the first compartment; the only slime that can be drawn down into the classifier proper is that enmeshed by the heavier sands. The small percentage of slime that is thus carried down is floated off in the second or third sorting columns before it has gone far in the classification. The water coming off with the different sizes is comparatively free from slime. This freedom from slime is important in table work and is the leading feature of this Overstrom classifier.

The feed other than slime drops through the opening *E* into the sorting column of the first compartment. This opening *E* is a slot in the present type of classifier, which is made only for handling pulps 3 mm. and finer, such as are at present considered proper to send to classifiers. Consequently, the feed is spread out into a broad band that practically fills the opening and blocks the escape of any hydraulic water up that way. As the pulp slides off lip *E*, it meets the hydraulic water which comes into column *G* through the opening *J*, connecting with the common hydraulic tank that serves all compartments.

The compartment *G* is contracted just above the feed slot into the sorting column marked *F*. This sorting column varies in height with the size of the particle to be lifted, but is at least 3¾ in. high. At the top it contracts further into the discharging column so that the classified product issuing from that compartment may be carried up at a great velocity to the top, where it is discharged into the receiving box. From the latter, a discharge pipe takes the pulp to the concentrating device on which it is to be treated.

The main reason for this contraction of the top part of the sorting column is to cut down the amount of water necessary in discharging the pulp as well as to keep the sorting column from extending too high and thus becoming too sensitive to overfeeding. Also because of the higher velocity there is less liability of any trouble through plugging, and less likelihood of doubtful material dropping back into the sorting column and thereby discommoding the sorting action.

The pulp that is too heavy to be lifted in the first sorting column drops through *G* to the sloping lip *H* and goes to the next compartment where the action is repeated. The flow of the sorting water up the different sorting columns is due to the fact that there is a slight head given the water through dropping through the height of the discharge lip in each successive compartment. In order to prevent the robbing of any compartment, owing to this head, the drop of the discharge from one compartment to another is exceedingly small, and only enough to balance the frictional losses due to the greater travel of the pulp. Owing to the presence of sand in the pulp the friction is much greater than if water alone were rising in the column. The sorting velocities are obtained by the width given to the sorting column up which the water must pass with the head that has been decided upon.

A Safety Column Provided for Oversize

At the end of the classifier after all the classifying compartments have been passed, a safety column is provided to take away any oversize that may get into the system. It is due to this column that the other compartments are kept from being clogged by oversize. In order to carry the oversize up this column, which is generally a ¾-in. pipe, with as little water as possible it is given a much greater head than the other compartments. Consequently, it has to be served first, and not until it gets its supply of water and feed do the other compartments begin to work properly. If the safety column does become

blocked, the heavier sands that were going to it gradually build up in the classifier, stopping up the different compartments in turn as the sand extends back. When the safety column begins to discharge again, the classifier cleans itself and operates again just as before.

When underfed greatly the tendency of the classifier is to cause the overflowing slime to be thinner, for some of the hydraulic water will rise through the first feed slot as the settling sands no longer plug the opening. Owing to the head and the fact that less of the area of the discharge columns is taken up by sand, all the different classifications become more diluted. Because of the greater head within the safety column, there is always a tendency for it to take its full feed and because of the suction that is developed by the safety column, the last compartment also tends to take more nearly its proper feed of sand than do the others.

In case the classifier is overfed the bulk of the surplus goes to the last classifying compartment. In fact, the whole tendency is for the overfeed to be taken by the latter compartments. These are the ones treating the coarser sizes of the pulp and are the ones feeding the tables best able to stand an overfeed.

In handling pulp finer than 3 mm., the rectangular type of classifier would be used, but when coarser sizes are to be treated, pipes would probably be used for forming both the sorting and discharge columns. The classifiers at the mill under discussion are built of iron with cement between the discharge columns, but where the water is acid, the classifiers would be built of wood with a wood filling between the discharge columns.

With this type of machine Professor Overstrom considers that it is entirely practical to classify any size of pulp without excessive dilution. With the slimes closely classified he thinks that the field of the centrifugal-concentrating machine will be greatly restricted. He believes that the large dilutions necessary with other classifying systems are the cause of stopping classification before the 80- to 100-mesh sizes are reached.

By using several different classifiers in series, much of the water fed with the pulp to the later classifiers can be overflowed in a manner similar to that in which the slime is overflowed in the first classifier. This water is clear enough to be used as hydraulic water for the next classifier. The water overflowing from the receiving compartment of the last classifier is used for wash water on the tables. In this way the water is used over and over again without the necessity of clarifying.

The cost of these classifiers, which are at present sold outright, depends upon the size of the pulp to be classified. It varies from about $25 per compartment handling exceedingly coarse material, to $200 per compartment when handling exceedingly fine sizes.

Before closing this subject of classification, it is important to state that Professor Overstrom has found that on the finest sizes, when handling large tonnages, a sorting velocity approximately twice that given in the accompanying tables has to be used in order to overcome the inertia of the pulp, which has a tendency to fall in mass instead of as individual particles in the sorting column. In fact, it is partly on account of this mass action that as high velocities are used in the discharge columns as are consistent with handling the pulp without plugging the columns.

The Overstrom classifier, however, is no cure-all for all conditions, or to be prescribed for any set of conditions. Each Overstrom classifier has to be designed to suit the tonnage and the dilution desired, as well as other conditions that present themselves in the problem, so that a more careful study of the ore has to be made when an Overstrom classifier is to be used than when one of the older type of hydraulic devices is used.

Close Classification Avoids Many Tabling Troubles

Having gone rather thoroughly into the work of this classifier, it is now time to take up the subject of treating the closely classified pulp on Overstrom tables. The trouble with most table work at present is that the pulp going to the tables is not closely classified. In practically all mills, the Federal mill being one of the few exceptions, the table work is greatly hampered by the large amount of fines that have been sucked down at the classifiers into the different table feeds.

A principle of tabling worked out, I believe, by Professor Overstrom, is that on the riffled surface the finer particles in the feed work under the larger particles, irrespective of specific gravity. This is well shown in panning. This being so, it becomes highly important to keep out the finer sizes of gangue particles from the coarser classifier sizes in feeding tables.

The reason that the Wilfley table, with its diagonal termination of riffles, has been able to preëmpt the field of tabling and hold it so long has been that it provides the cleaning area so necessary in treating poorly classified material. Most of the improvements made in tables recently have been along the lines of providing a cleaning area some place on the deck without using the diagonal termination of the riffles.

The separating action on the table is the result of two actions. There is the jerk of the table, which through friction carries the concentrates, or the material in contact with its surface ahead. There is also the washing of the material down the slope by the water in the pulp. The slanting line down which the material tends to travel as it works off the table is the result of the action of these two forces, which operate practically at right angles to each other. With the heavier quickly settling pulp the jerk forward along the table is the more important. With the finer, slower-settling pulp the carrying action of the water is the more important; consequently one shape of table cannot be made to handle all sizes of pulp equally efficiently. In the Overstrom improved table there are eight different sizes.

Grooves Better Than Riffles for Fine Sizes

On the tables handling the coarser feed, riffles must be provided to allow the settled product to stratify and to keep the coarse concentrates from being rolled down the deck. In the finer sizes, Professor Overstrom believes that grooves are better than riffles for allowing the stratification to take place. The depth of the riffle or the groove is more important than the shape. The proper ratio between the diameter of the gangue particles and the depth of the riffles varies with the size of these particles. The depth should diminish gradually as the discharge end of the table is approached until, at the end, it has a depth equal to the diameter of the gangue minerals in the pulp being treated. The riffles should be tapered in order that the larger and lighter pieces in a classified feed will gradually come to the top of the riffle

and be washed over. The shallower the riffles the better work, generally speaking, will the tables do, but the riffles must be of sufficient depth to carry the concentrates to the end of the table and keep them from being forced up too high in the bed behind the riffle when the feed first comes on the table.

Also the flatter a table can be run and still accomplish the separation, the better work it will do. The minimum flatness at which a table is to be run determines the minimum width that can be given the table. These details depend upon the size of the pulp that is being treated. Experiments have shown that with any but the finest pulps it is impossible on a short, wide table to get any tailings down off the lower side without an excessive tipping of the table, and if the table is tipped excessively, there is practically no separation. The reason for the narrow tables on the coarse feed now becomes evident, for a slight transverse inclination is especially to be desired upon the coarse table.

If the length and width of the table are proportioned properly for handling that size of feed, there will be enough concentrates left in the top riffles where the sand separates from the concentrates to prevent the finer sands working down into the concentrates and remaining buried by them. The bulk of the concentrates will be up rather high on the table. The bottom riffles must be filled with concentrates, or tailings will be carried along the upper side of them and contaminate the concentrates. If the table is too wide for its length, the top will have to be tipped too much in order to fill the lower riffles and the separating action, due to the rush of the water down the table slope, will not be as effective as it might otherwise be. In handling classified feeds the table does not have to be so wide as when unclassified pulp is being treated. The Overstrom tables are designed to handle classified material and are therefore built exceedingly narrow compared to the length.

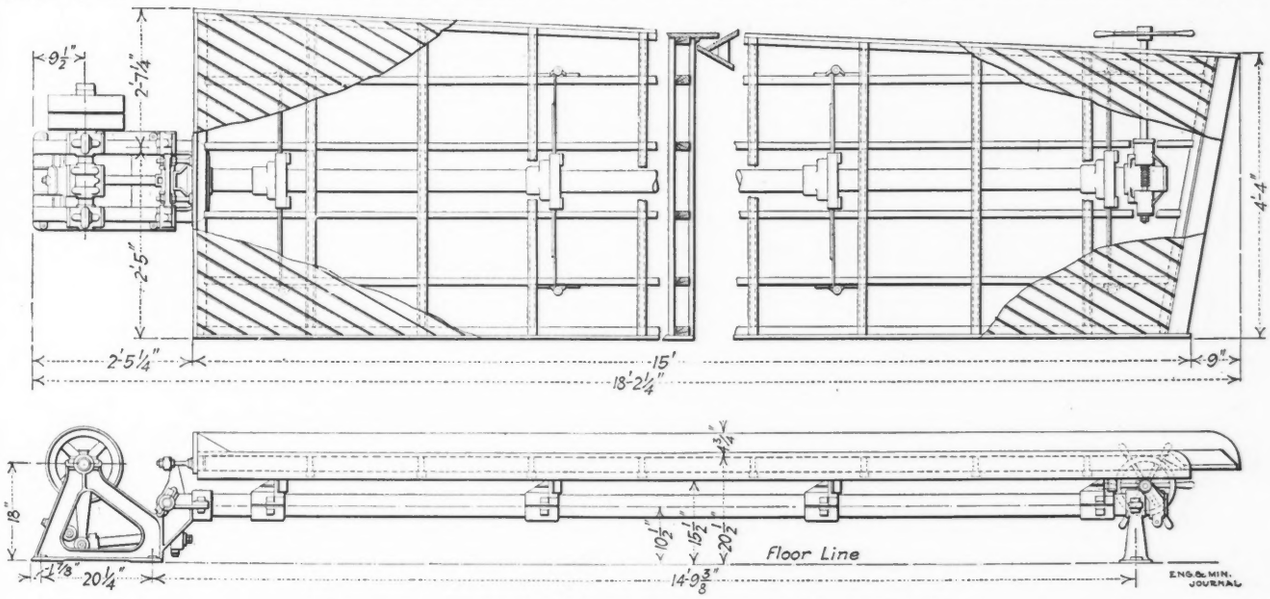
In treating large tonnages the tables are given capacity by increasing the length. In order to obtain high capacity it is necessary to have a loose bed of pulp in the riffles, and this bed must not be too thick. In order to spread the large feed over the table a long feed box is necessary. For the long table handling the coarse sizes of pulp coming from the No. 3 classifier the pulp is fed to the table for one-third its length, while the wash water obtained from the feed extends up as far as one-half to two-thirds the length before it meets the real wash water coming in at the end of the feed launder. On the tables treating the intermediate pulp the feed is distributed along the top of the table for approximately half its length; the slimes, for about three-fifths the length.

The proper dilution of the pulp is also important in obtaining a loose bed. For the coarser pulp the ratio of water to ore should be 10:1 by volume; for the sandy feed the dilution should be 12 to 15:1; for the finer sand and the slimes that have not been settled in tanks the best dilutions are from 15 to 18:1 by volume.

Slime Problem Solved for Close Classification Preceding Tabling

Coming to the question of slimes, Professor Overstrom holds that for the sandy slimes the solution is simply to do closer classification and avoid settling. He thinks that the settling results in the formation of a clay, due to the combination of the amorphous slimes of the gangue and the sandy angular particles of fine ore, which makes further settling difficult without great dilution of the pulp. That ore particles tend to slime to a certain size and then slime no further, at least not to as great an extent as up to that point, is partly confirmed by some of Professor Overstrom's investigations on classification with small sorting velocities. It was these tests on the classification of the finest pulp that led him to give up the idea of trying to work out a centrifugal machine for handling fine pulp, and to take up the subject of close classification, especially a system that was capable of classifying the finest pulp.

For classified slimes Professor Overstrom thinks that tables are better than vanners, as the capacity of the former is greater, and the concentrates obtained cleaner. From the slime table in the Overstrom section a concentrate assaying 73% lead is made, from 10 to 12 tons



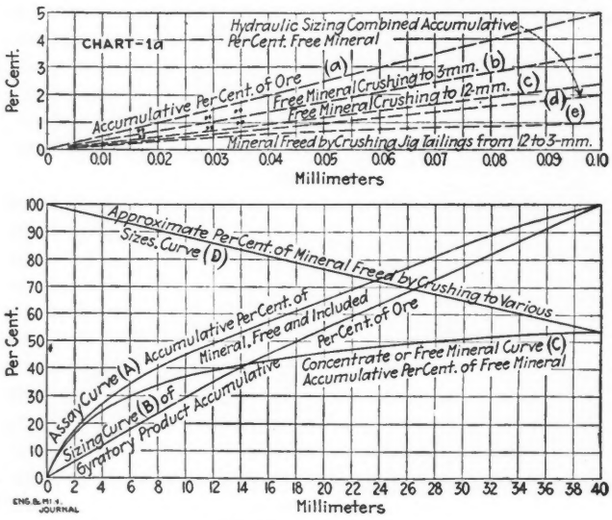
Overstrom Table, St. Louis Smelting and Refining Co.

of dry slime being treated. For unclassified slime and clayey pulp that will not settle well, the vanner is probably better than the table.

For the treatment of difficultly settled feeds that come from the first compartments of the Overstrom system, it is believed that vanners or traveling canvas belts will do fully as well as centrifugal machines. In the treatment of the pulp it is necessary to bring the particles in contact with the vanner belt by making the film of pulp going over the table as thin as possible, so as to make the distance that the particles have to settle infinitesimal.

Overstrom Tables Long and Narrow

It may be of interest to say something in regard to the construction and design of these improved Overstrom tables, as there is as yet no commercial literature, and little technical description of them. It might be thought



Charts I and Ia

that there would be some trouble in keeping these long, narrow table decks from warping, but after four months' operation no tendency toward warping had developed. This absence of any tendency to warping comes from the fact that selected wood is used, and nothing but wood is put in to tie the decks together. Warping of table tops was often due to using two different materials, like wood and iron, in binding together the decks. The two tend to expand and contract differently under changing conditions.

The cross braces of the deck butt up against the longitudinal stringers, to both of which members the deck is fastened. On the bottom of the table deck is a series of cross-bracing planks that are lag screwed only to the longitudinal members of the frame. The deck is carried from a tipping shaft by means of transverse springs turned on edge and made up of three leaves. These springs are loosely secured at their ends to brackets that fasten to the deck itself.

The table deck is operated in tension. These leaf springs are made so that it requires a push of 160 lb. to straighten them. They are put in so that the head motion pulls against them during the backward stroke, while they push back against the head motion on the forward part of the stroke. On the slime tables there are only three of these springs, so that the deck is all operated in tension. In the long tables the deck is carried by a series of these springs placed approximately 3½ ft. apart, so that the table operates as a series of sections, all of which are in tension. The deck is covered with thick, fine-grained cork linoleum, which is grooved and also riffled in the case of the tables handling the coarser pulps, so as to prevent the rolling of the coarse concentrates.

The feed box and the wash-water box are combined in the form of a simple V-shaped launder with keyhole openings in the back. The wash-water pipe comes into this launder at the concentrate end of the table, while the table-tilting mechanism is also placed at that end so that the attendant, as he walks along the table aisle, can adjust the dip of the table and the amount of wash water conveniently. The concentrate end of the table is cut off with a backward-pointed bevel looking down the slope of 1:6, so that no pipe is required to drop water on the concentrate end of the table in order to keep the extreme edge of it moist.

The engraving on p. 61 shows the construction of the table and manner of supporting the deck. The table is extremely simple. It has a head motion that can be changed as to length of stroke without varying the ten-

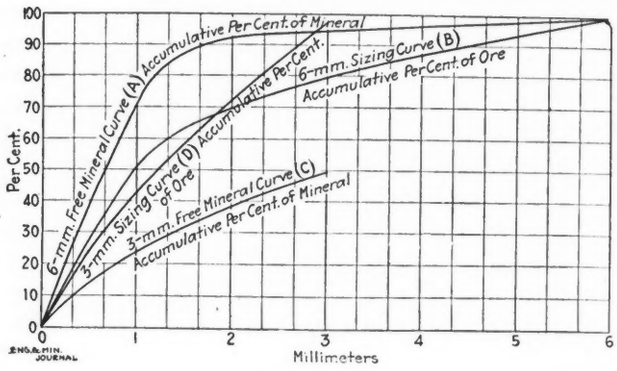


Chart II

sion of the spring under which the deck is working. The decks of the different tables are designed as to width so that they will run with a slope of approximately ½ in. per ft. The table is made in several different sizes; the dimensions of the tables used in the experimental section were given earlier in the article.

Extensive Tests before Designing First Section

Before designing the experimental section, Professor Overstrom tested the ore thoroughly. He was fortunate in that he was able to see how the ore actually crushed down to a size of 12 mm. when being handled on a large scale. This is somewhat different from what it would have been in a testing plant where the scale of operation is naturally small. Below 12 mm. the crushing of the ore had to be done in a testing plant and so was on a small scale. Representative samples of the ore were taken and the results of several tests were plotted and full curves drawn so as to average the results. In the tests used in making up the charts there were no large variations from the curves adopted. But it must be remembered that the curves are not those resulting from the study of the ore crushed in the first section but the preliminary curves used in working out the system of treating the ore and the flow sheet of the mill. All curves are plotted with the same origin, independent of each other and the percentages are cumulative.

It will be noted that only in Chart I is a curve given showing the assays of the different screen sizes as to total lead contents. This is because Professor Overstrom in all his milling work lays particular stress on the free mineral at different sizes, for it is only the free mineral that the concentrating devices can save. The amount of free mineral in the tailings indicates the character of the concentrating work on any device and not the assay results. Panning gives much information in regard to concentration that assaying never can.

In Chart I are shown the results of tests on ore from the gyratory crushers which are crushing to 40 mm. as a maximum. Curve *A* is the assay curve of the ore when it comes from the gyratory. Curve *B* is the sizing curve of that ore. Curve *C* shows the free mineral that is in the ore in different screen products. Curve *D* shows the amount of mineral that would be freed by crushing the mineral to various sizes.

In Chart Ia is shown the manner in which the undersize of a 200-mesh screen, or the slime as it is commonly called, is formed. These slimes are the sandy and the

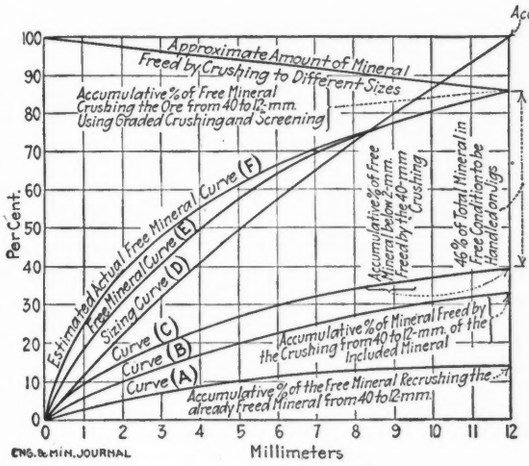


CHART III

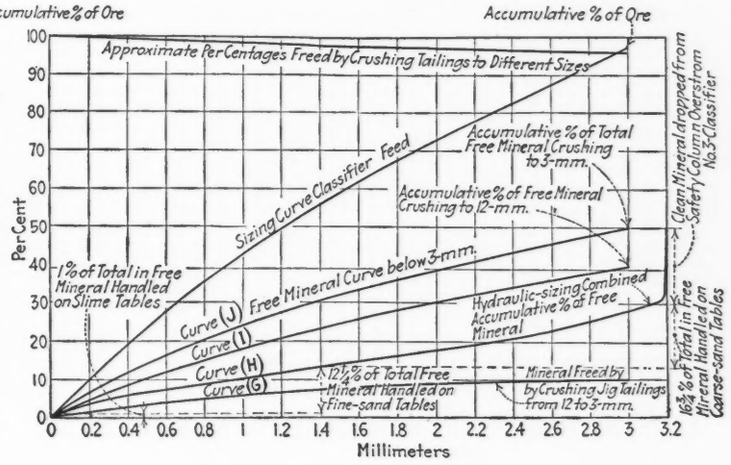


CHART IV

true slimes combined. The different curves of this chart were obtained by drawing straight lines from the point of origin to the actual point determined by weighing the 200-mesh undersize obtained from each of the different products that were tested. The chart is given simply to show graphically the way in which the slimes are formed by the different crushings. It must be remembered that Chart Ia is strictly a hypothetical one. The labeling on the different curves, I believe, makes clear what each is intended to represent.

Chart II shows the advantage in regard to sliming that comes from taking the ore particles out by concentration at different stages of the crushing instead of leaving them in, even when the fine crushing is done entirely by rolls, which are rightly considered to be the apparatus that forms the smallest amount of slime. In this chart full-line curves *A* and *B* refer to the results obtained by stage crushing to 6-mm. size only, but without stage concentration. It is the result of crushing the ore in a mill handling 1800 tons per day and shows actual mill crushing. Dotted-line curves *C* and *D* show the results of stage crushing and stage concentration when the tailing or gangue material, but not the ore minerals, is crushed so that all of it will pass a 3-mm. screen. These latter curves show the results of the preliminary testing and do not show the actual results obtained in the finished section. However, they are probably not far different from the actual work.

Charts III and IV are the ones that show the main metallurgical results of the preliminary testing. They do not purport to give the actual results in the finished section, although they show conditions not far from the ones prevailing in the mill section. Chart III shows the test upon the product obtained by crushing the oversize of the 12-mm. screen in rolls so as to pass that screen and also includes the original undersize from the gyratory crushing. This carries the ore one step further than Chart I. Curve *D* is a sizing curve of the ore. Curve *E* is a curve showing the total mineral freed by the crushing at this stage. Curve *F* is one drawn in by Professor Overstrom to show what is the actual distribution of the free mineral at this stage of the crushing in a finished section, but it is purely hypothetical. The dotted curve at the top of this chart shows the amount of mineral that from the crushing test in the preliminary work could be expected to be free, as the ore is all crushed to these lower sizes before it is allowed to pass out of the mill.

Chart IV shows the total free galena below 3-mm. size that has resulted both from the recrushing in rolls of the tailings from the jigs and from the original gyratory and first-roll crushing. The curves can easily be understood by the labels that accompany them, except that curve *H* is a new one showing the amount of free mineral that would be in different spigot products, the sizes of which are rated by the size of the average limestone particle that would be in that spigot product. It is a theoretic curve, as is shown by its being dotted, and is obtained by transferring the points of the total free-mineral curve by multiplying the abscissas of any free-mineral particle by the free-settling ratio of limestone and galena, in other words, by 3¼, so as to throw the galena into the spigot size where theoretically it would be found. This curve is used in determining the manner of dividing up the feed in the classifier for the different tables.

Four tables were decided upon for handling the coarser sand in the feed from the 3-mm. trommels. After this decision was made, the rest of the subdivision of the pulp except as to number of classifications came as a matter of course. It was also decided to make 21 different classi-

fier products for treatment on the tables simply because there were 21 tables available, and it was considered advisable to err on the side of too close classification in the first section at least. A system of classification that will permit of making that many products without excessive dilution of the pulp, and which does the classification in such a way that not a single settling device of any kind is required in a whole mill, is worthy of consideration.

Electro-Metallurgy in Norway

The Christiania correspondent of the *Journal du Four Electrique* (through *Min. Journ.*) communicates interesting information and statistics relating to the progress of the electro-metallurgical industry in Norway in 1912.

The electrothermic manufacture of iron and steel has not progressed as speedily as was anticipated, owing to unforeseen difficulties. The Hardanger works produced 2200 tons of iron from its electric furnace of 3500 hp. The two furnaces of the Tinfos works were started toward the end of 1912 and are running 10 tons of good pig iron each daily. The ore smelted contains only 44 to 45% of iron, and 700 cwt. of coke are consumed to produce a ton. The furnaces at Ulefos, Stavanger and Jossingford have also produced iron in smaller quantities.

The carbide factories rapidly increased their output as indicated:

	Tons		Tons		Tons
1908	36,895	1910	50,579	1912	64,000
1909	48,352	1911	60,593		

The value of the 1912 production reached £560,000. The agreement to restrict the production of carbide has been unsuccessful, since the output increases yearly. However, the uses developed for cyanamide have enormously increased the exports, which have risen from 752 tons in 1909 to 13,892 in 1912.

During the last three years the exportations of ferrosilicon have been only slightly augmented. In 1910 the amount was 5121, and in 1912 only 6493 tons.

The two factories of Vigeland and Stangfjord exported 1792 tons of aluminum in 1911 and about the same quantity in 1912. A new works is to be established at Arendal. There are now two works where zinc ore is reduced by the electric furnace. In 1911 were exported 6600 tons, which in 1912 was enhanced to 8928 tons.

[We are doubtful respecting the zinc statistics, conceiving that the correspondent who is quoted has made some mistake.—EDITOR.]

Starting Compensator for Induction Motors

It is an inherent characteristic of squirrel-cage type induction-motors to take a heavy starting-current ranging from three to seven times the full-load current. This, in the case of large motors, may cause a serious drop of potential in the supply circuit, and to avoid trouble from this source, a starting compensator is offered by the General Electric Co., which consists of an auto transformer with taps for obtaining a number of reduced potentials. Suitable mechanism connects the motor to these taps momentarily for starting, and then, when the motor has attained full speed, disconnects it and throws it directly on the supply circuit.

Utilization of Highly Silicious Iron and Manganese Minerals

BY N. TARUGI

It is known that in Italy, as well as in other countries, immense deposits of iron and manganese minerals exist, that cannot be utilized in the iron industry on account of their excessive content of silica, amounting to 20% and upward. Many methods to make such minerals serviceable have been devised without apparent success. My method offers a solution of this important problem.

It is commercially payable, as the material to be applied may, without much expense for handling, be recovered with small loss in a continuous circuit. The reaction on which the method is based is as follows: By action of heat and of steam under pressure, HCl is obtained from magnesium chloride, which is allowed to act on the mineral in suitable vessels. Iron and manganese are converted into their corresponding chlorides and these are separated from silica by leaching. The solution of iron and manganese chloride thus obtained acts upon the magnesium oxide, which remains in preparing the HCl from magnesium chloride. The whole of the iron is precipitated as hydrated oxide and magnesium chloride is re-formed.

The separation of manganese from iron can be effected at the same time or separately by replacing at the start the magnesium in part or in its entirety by lime. This substitution is also advantageous in case iron-bearing minerals exclusively are to be treated, because by another simple and inexpensive method of mine, calcium chloride may be converted into magnesium chloride through the action of carbonic acid after a calculated amount of magnesia is added to the solution.

As is known, the manganese in manganiferous iron minerals is chiefly present in the form of its higher oxide and will generate chlorine by the action of HCl. The chlorine is taken up by the mineral when heated to a high temperature, or furnishes pyrolusite with the lime added at the start when manganese passes through the precipitation vats. The principal stages of this method will be indicated by the following equations:

With iron minerals:

$$(1)\ 3\,MgCl_2 + 3\,H_2O = 3\,MgO + 6\,HCl.$$
$$(2)\ 6\,HCl + Fe_2O_3 = 2\,FeCl_3 + 3\,H_2O.$$
$$(3)\ 2\,FeCl_3 + 3\,MgO = Fe_2O_3 + 3\,MgCl_2.$$

With manganiferous iron minerals:

$$(1)\ 4\,HCl + MnO_2 = MnCl_2 + Cl_2 + 2\,H_2O.$$
$$(2)\ Cl_2 + MnO_2 = MnCl_2 + O_2$$
$$(3)\ 3\,MnCl_2 + 3\,CaO + O = Mn_3O_4 + 3\,CaCl_2$$
$$(4)\ Cl_2 + MnCl_2 + 2\,CaO = MnO_2\ 2\,CaCl_2$$
$$(5)\ CaCl_2 + MgO + CO_2 = CaCO_3 + MgCl_2$$
$$(6)\ CaCO_3 = CaO + CO_2$$

The product obtained by this method possesses the following advantages: (1) It is free from sulphur even if the initial material is rich in it. (2) It is free from phosphorus no matter how much the original mineral contained. (3) It may be briquetted easily. (4) It may be made to contain any desired percentage of iron, manganese, calcium or magnesium. (5) Its easy reductibility means a considerable saving in fuel.

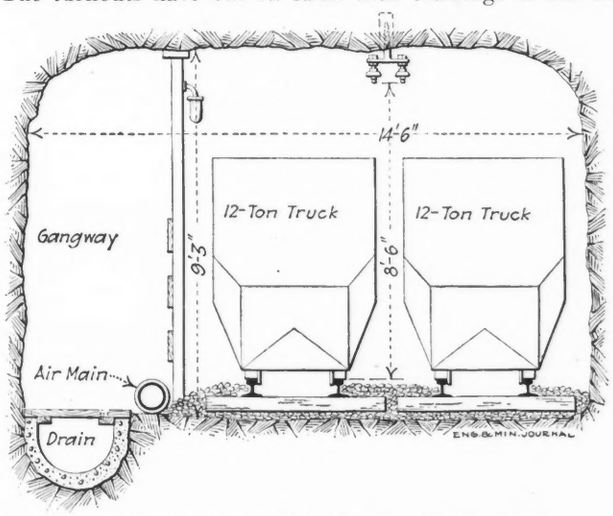
Note—Translation by O. H. Hahn from the "Chemiker Zeitung," Apr. 26, 1913, of an article by N. Tarugi, an Italian metallurgist.

DETAILS OF PRACTICAL MINING

Design of Main Haulage Drift

The 13th level of the Crown Mines, Ltd., on the Witwatersrand is opened up as a main haulage level. The main drift in its course through the property picks up ore for transport to shafts Nos. 5 and 7, the main hoisting shafts. At present, only that part of the drift tributary to No. 5 shaft is in use. It is almost a straight drift, says R. C. Warriner (*Journ.* So Afr. Inst. of Engrs., April, 1913), there being only a few gentle curves. It has a grade of 0.54% in favor of the load. The dimensions and arrangement are as shown in the accompany cross-section.

The 45-lb. rails rest on mild-steel chair plates on 4x6-in. tarred wood ties, the latter set at 2½-ft. centers. The track is ballasted and packed like a surface railroad. The turnouts have 240-ft. radii with crossings of one in six. The minimum curve entering any crosscut is of 50-ft. radius.



CROSS-SECTION OF TWO-TRACK HAULAGEWAY

The two trolley wires are carried in the center of the haulageway, eight inches apart, thus making it possible to support both insulators on the same T-hanger. To compensate for inequalities in the height of the back, adjustable extension pieces were provided for these hangers where necessary; the voltage is 500. The manway on one side provides against contact with the trolley wires ordinarily. Where it is necessary for men to pass under them, protecting troughs are installed. At the crosscut entrances and at the first loading chute in the crosscuts, there are automatic cutouts, so that the line is dead when opposite the chute at which cars are being loaded and when the locomotive is out of the crosscut.

❖

A Manganese Steel Dipper on a steam shovel should never be heated to remove frozen material or for any other reason, according to the "Excavating Engineer." Manganese steel requires delicate heat treatment to give it toughness and take away its brittleness. Indiscriminate heating restores it to the brittle state.

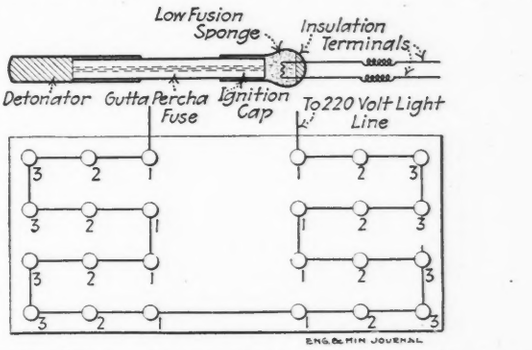
Sinking with Delay Action Fuses

BY W. V. DECAMP*

Many of the electrical firing devices placed on the market during the last five years have been a failure, due largely to the skeptical attitude of mining men regarding any new and unproved device for simplifying their work. Most miners have had a limited experience along this line and they are generally prejudiced against anything of an electrical nature for firing purposes.

In addition, certain electrical firing devices, and, in fact, those longest on the market, depend for their operation on the instantaneous explosion of all holes connected on a circuit; the resulting explosion being so great that the danger to timber carried close to working faces, far offsets any advantages gained by their use. Moreover, improper manipulation or a poor firing device often results in missed holes.

The more recent development of the electrical cap, known as the "delay action fuse," placed on the market some years ago by the Giant Powder Co. and later by the du Pont company has neither the disadvantages of the old instantaneous nor those of the long gutta-percha fuse, subject to so many causes of failure.



SECTION OF DELAY ACTION DETONATOR AND DIAGRAM OF WIRING IN SHAFT

The delay-action fuse is in reality an electrical means of spitting holes; for it consists simply of a small piece of gutta-percha fuse, on one end of which is placed an ordinary detonator, and on the other, a cap containing the igniting material. Through this cap, terminal wires are inserted and connected by a ribbon or sponge of low-fusion material. This sponge is ignited by the passing current and in turn ignites the fuse which burns to the cap and explodes the charge. It is obvious that any length of delay can be obtained by lengthening the piece of fuse. At the present time there are 10 different lengths placed on the market. The entire device, fuse, detonator and ignition cap, is incased in a rubber tube and coated with a good waterproofing paint. The terminal wires, where they enter the ignition cap, are also incased in sulphur, insuring perfect insulation. In most underground work

*General manager, Pacific Copper Mining Co., 206 East Gurley St., Prescott, Ariz.

only three, or possibly four delays are necessary. Each fuse with terminal wires attached has a tag fastened to it, stating its number, so that there need be no confusion whatever in loading holes.

Recently a thorough trial of this type of fuse was made at the property of the Pacific Copper Mining Co., Crown King, Ariz., which resulted in a material reduction in sinking costs.

The shaft in which the trial was made was broken about 7x10 ft., and while sinking through an extremely hard siliceous schist a large volume of water was encountered; this, with the small dimensions of the shaft and the hard rock, greatly delayed the work; 20 to 24 holes were required to break a 4-ft. round; missed holes were a regular occurrence and the cost became almost prohibitive. The average time required for a full round was from 36 to 48 hr. and the average depth broken was four feet. During

COMPARATIVE COSTS OF SINKING WET SHAFT WITH AND WITHOUT DELAY ACTION FUSES

	Ordinary Method Depth Sunk, 63 Ft. Time, 30 Days			Using Delay Action Fuses, Depth Sunk, 48 Ft. Time, 15 Days		
Labor	Total Cost	Cost per Ft.		Total Cost	Cost per Ft.	
Miners	$1210.75	19.20		617.50	12.87	
Topmen	242.00	3.84		116.00	2.42	
Engineers	522.80	8.35		310.00	6.45	
Foreman	186.00	2.95		99.00	2.06	
Blacksmith and helper	239.30	3.81		122.00	2.54	
			38.15			26.34
Power supplies						
Fuel oil	648.00	10.30		402.00	8.38	
Lubricants	37.87	0.60		21.00	0.43	
Coal	35.50	0.56		16.20	0.33	
			11.46			9.14
Supplies						
Machine repairs	22.80	0.36		19.50	0.40	
Powder	194.00	3.09		91.50	1.90	
Fuse	42.15	0.68		*a* 24.00	0.50	
Caps	6.60	0.01		.....	....	
Candles	34.75	0.56		*b* 12.10	0.25	
			4.70			3.05
Timbering						
Setting	72.00	1.15		45.00	0.94	
Framing	63.00	1.00		46.50	0.97	
Timber	190.00	3.02		146.50	3.05	
			5 17			4.96
Water						
Fuel and oil	139 50	2 22		210 50	4 37	
Pumping labor	27.00	0.43		124.00	2.58	
			2.67			6.95
Total			$62.15			$50.44

a—Electric fuses.
b—Lamp.

the month previous to the use of delay fuses the daily average advance was 2.1 ft. The delay fuses were used on the last 48 ft. of shaft sunk, 10 rounds being required in this distance. Every round fired was satisfactory, there being only two missed holes in the entire 10 rounds.

Operations were as follows: After loading, the holes were connected in series and thence to a 220-volt direct-current lighting line on which there were two switches, one at the nearest level, the other at the collar of the shaft, both under lock and key, the key in possession of the boss. Three different lengths of fuse were used, one length on the eight cut-holes, the second length on the next row of four holes on each side and the third length on the two rows of end holes; as per diagram. The length of fuse in each case was 1.5 in., 2 in. and 3 in., respectively. From such a round one would naturally expect to get three distinct reports, but such was never the case. There would be from eight to 16 reports for the entire round; the reports would be close together and sounded much like the rattle of a bunch of firecrackers. The large number of reports obtained was probably due to the fact that pieces of fuse of the same length would not burn down in exactly the same time, and to the probable difference in resistance of the ignition material in different caps, thereby requiring a slightly longer time for ignition.

In all of the 10 rounds the rock was broken much finer than had been the case with ordinary fuse, this was probably due to the rapid succession of the explosions, thereby maintaining the rock mass in a constant state of rapid vibration and resulting in greater fracturing, as the successive charges would explode. The average depth of round using delay fuses was five feet, the average depth broken, 4.8 ft., and the average time for each round, 36 hours.

The accompanying drawing shows a longitudinal section of a delay-action fuse, and also the order in which the holes were fired and the manner of connecting the terminals. The table shows the difference in cost of shaft sinking by the two methods. It will be seen from total costs, that there was a large increase in the expense of handling water, also an increase in cost of engineers, due to some heavy repairs made, otherwise the costs check up fairly well.

Delay-action fuses can be obtained with practically any length of terminal wire up to 10 ft.; the cost varies from 7.5c. in shorter lengths to 16.5c. for those with longer terminals.

Concreting Methods in Michigan Copper Shafts

In the Baltic mine the concrete support for the roof of the shaft is reinforced with 1¼-in. ropes, three carried down each skipway and stretched between eye-bolt anchorages. The ropes are stretched until at the center they are about six inches from the edge of the concrete. At intervals of 8 to 14 in., cross-reinforcement of the same material is put in. Alternate ropes of this cross-reinforcement are turned up about one-third of the way out from the side walls and also turned up to pass over the dividings for the purpose of taking the shear.

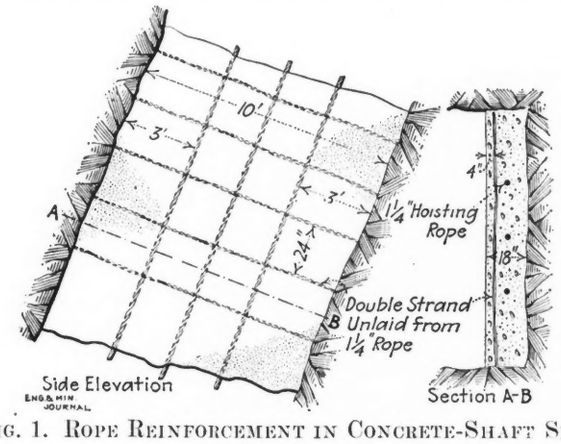
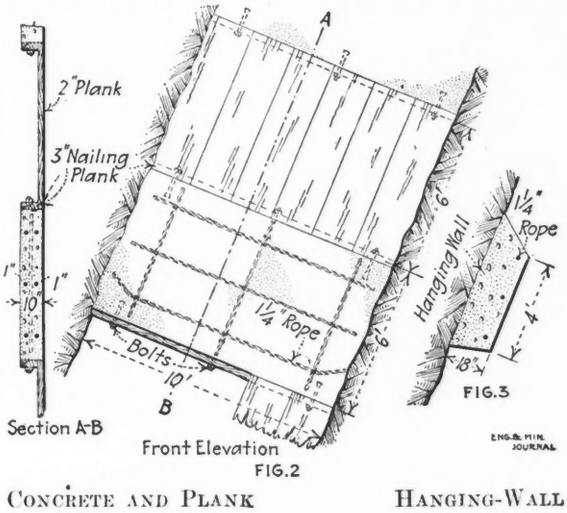


FIG. 1. ROPE REINFORCEMENT IN CONCRETE-SHAFT SIDE LINING

Along the sides, three ropes in the direction of the shaft afford reinforcement. Cross-reinforcement in these side walls consists of double strands unlaid from 1¼-in. cable. These are set in a vertical plane and at right angles to the long axis of the shaft, about two feet apart and four inches from the face of the concrete. Fig. 1 shows the general arrangement.

When there is continuous concrete on the hanging, dividings are put in 10 in. thick and 6 ft. along the shaft with 6-ft. spaces between. These are shown in Fig. 2. Three 1¼-in. ropes in the direction of the shaft and three pairs at right angles, spaced as shown, afford reinforcement. The pair lowest in the divider is bent at the ends to take shear. Bolts in the direction of the shaft axis are set in at top and bottom of the divider and serve to carry 3-in. nailing strips to which the planks covering the spaces between the dividers are nailed. These nailing strips are set back two inches so that the planks are flush with the concrete and are thus protected against being knocked off by falling rock.



CONCRETE AND PLANK DIVIDER

HANGING-WALL CROSSBEAM

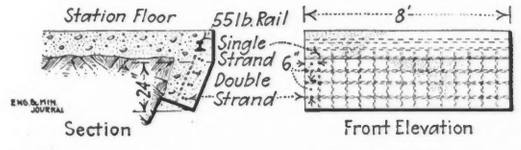


FIG. 4. CONCRETE STATION BROW REINFORCED WITH 55-LB. RAIL

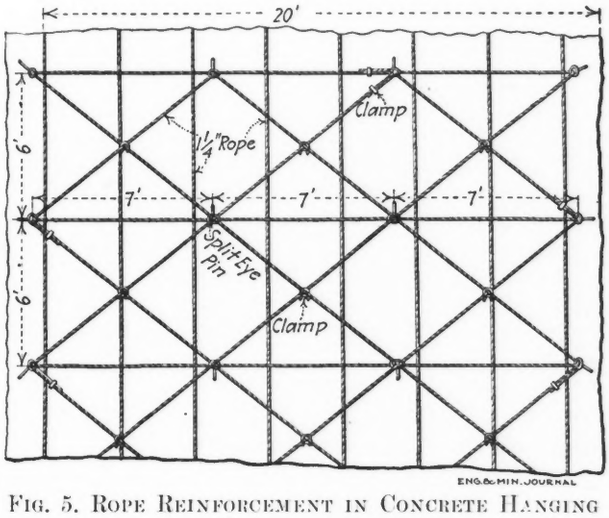


FIG. 5. ROPE REINFORCEMENT IN CONCRETE HANGING WALL OF SHAFT

In case the hanging wall stands, but the sides give trouble, the latter are reinforced as described and dividers also set, but with the spaces between increased to 10 ft. To take the side thrust of the walls, a crossbeam against the hanging is put in about every 25 ft. This is 10 to 18 in. thick and four feet wide as shown in Fig. 3. This brace is reinforced with three 1¼-in. ropes across the shaft. It has its top face beveled to prevent material from lodging. These beams are set at the same points as the dividings so as to be braced against side bending.

The stations are equipped with concrete brow pieces over the skipways, shown in Fig. 4. These are reinforced with a grilling of double strands across and single strands in the direction of the shaft, so put in as to form 6-in. squares. The angle at the floor of the station is strengthened with a 55-lb. rail.

In the Champion shafts, the roof reinforcement of 1¼-in. rope is put in as a network in the manner shown in Fig. 5. The cross-ropes are strung through eye-bolts and carried up and across in a zigzag manner. The ropes in the direction of the shaft are anchored only at the top and bottom. The ropes in the network are clamped at the crossing points and ends. The approximate spacing is as shown.

Safety Rules—The Shaft*

(1) There should be provided and maintained at every mine two outlets to the surface, or an underground communicating passageway between every such mine and some other contiguous mine, so that there shall be at all times at least two distinct and available means of access to the surface to all persons employed in such mine or mines. Such outlets should not be less than 50 ft. apart and should, if covered, be provided with separate and distinct and nonconnecting houses on the surface.

The following are exceptions to rule (1):

(A) New workings being opened between two or more shafts or for searching for or developing ore.

(B) Any mine in which one of the outlets has temporarily become unavailable, provided that every effort is being made by the management to open such outlet, and provided that the situation is not dangerous to the health or life of the miners.

(2) No structures should be permitted over any shaft except headframes, hatches or doors or buildings constructed of fireproof material.

(3) If houses cover the shafts, no inflammable material should be stored within 30 ft. of the exterior walls of the house.

(4) Shaft collars should be guarded with self-closing gates equipped with toe boards at least 6 in. high, set close to the ground.

(5) The collars of timber shafts should be guarded with a fence which may be constructed in the shape of gates on two or more sides to permit lowering of timber.

(6) At all shaft stations a gate or a guard rail not less than 3 ft. or more than 4 ft. above the floor should be provided and kept in place across the shaft, except when cage, skip or bucket is being loaded.

(7) At timber tunnels the shafts should be protected by a gate connected with a derailing switch on the tramway, so that if the gate is open the switch is set to derail an approaching car.

*From Inland Steel Co.'s book of rules.

(8) Wherever the tracks of any level lead directly to any compartment of the shaft, a safety switch should be used there.

(9) If hoisting be done from greater depth than 100 ft. by means of a bucket, shaft doors must be constructed that will prevent any material from falling into the shaft while the bucket is being dumped.

(10) Operating shafts are dangerous places; all men should keep away from them except as imperatively called there by their duties, and they should stay near shafts only so long as such duties require. Where pipe or other telephones are provided, particularly around incline shafts, men should not approach the shaft closer than is necessary to use such telephone, until the skip has arrived at the level.

(11) All stations or levels shall have a passageway around or through the working shaft, so that crossing the hoisting compartment may be avoided.

(12) Men should never cross the bottom of a shaft to get from one side to the other.

(13) Counterweights should be properly boxed in or protected and care must be taken that they are in good working order.

(14) Every shaft, if exceeding 50 ft. in depth, shall be provided with an efficient means of interchanging distinct and definite signals between the top of the shaft and the lowest level and the various intermediate levels from which hoisting is being done. The signaling shall be a cord or wire actuating a knocker, bell or whistle, which should be supplemented with a speaking tube or telephone or an electric system.

(15) Special care should be taken to keep the signaling apparatus in good order.

(16) If either of the two systems of signaling is out of order, extra care should be taken and report made at once.

(17) The timbers in all manways in daily use should be cleaned of all loose rock lodged upon them at least once in every 24 hr. Such manways should be kept clear of obstructions.

(18) When a skip pit is to be cleaned, or when men are ordered to work in the shaft, they should make sure that the hoisting engineer is notified not to move the skip, cage or bucket until signaled that the shaft is clear.

(19) Men engaged in sinking a shaft shall be protected from the danger of falling material by a suitable covering extending over the whole area of the shaft, a sufficient opening being left in the covering for the passage of men or the conveyance used in the sinking operations.

(20) In sinking a shaft a bell rope shall be provided which can be operated by a man standing in a bucket at the bottom of the shaft.

❋

An Ore-Feeding Device

By W. F. Boericke*

Trouble was experienced in a small Wisconsin zinc mill by the chute from the rock breaker to the rolls choking with the crushed ore, making it necessary for a man to push it along with a rake to the rolls in order to prevent overflowing. It was impossible to increase the grade of the chute and some schemes to do away with the manual persuasion had to be devised.

The blacksmith was called upon, and a bar of ¾-in. iron 6 ft. long was bent into a 6x7-in. rectangle, proportioned so as to fit snugly the channel iron of the chute. The other end was bent and forged into a loop. This loop was fitted to the bolt that held the heavy spring in front of the breaker in place, and by nuts and washers was kept in front of the spring. This spring constantly vibrating back and forth when the breaker was in operation communicated the motion to the bar which agitated the crushed ore in the chute sufficiently to cause it to move forward into the rolls. By this simple device a man's labor was saved, and the capacity of the mill considerably increased.

*Mining engineer, Mineral Point Zinc Co., Mineral Point, Wis.

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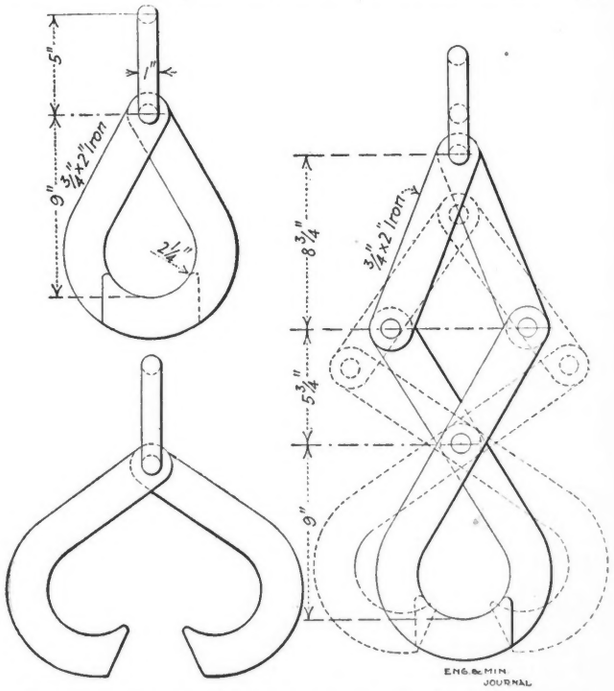
Safety Bucket Hooks

By F. C. Rork*

The accompanying drawing shows two styles of bucket hooks which are quite common in Canadian mines. They



Bucket Hooks Complying with Ontario Law

comply with the Ontario laws, which specify that no open hook shall be used in hoisting or lowering.

The hooks can be made by any blacksmith from material which is usually kept in stock at a mine and combine safety with ease and speed of operation.

❋

Seven Fatal Mining Accidents Occurred in Ontario during the third quarter of 1912, according to the report of E. T. Corkill, chief inspector of mines. There were also two fatal metallurgical accidents, and one quarry accident. The total number of fatal accidents in Ontario mining and similar operations for the first nine months of 1912 was 26, as compared with 34 for the same period in the previous year. Non-fatal accidents for the third quarter were 110, an increase over 1911, due to the fact that accidents less serious are now being reported.

*Mine superintendent, Moose Mountain, Ltd., Sellwood, Ont., Canada.

DETAILS OF METALLURGICAL PRACTICE

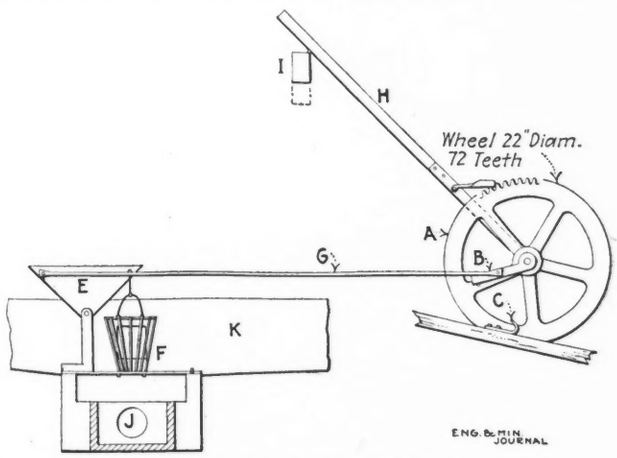
Automatic Sand Sampler

By L. D. Davenport*

The automatic sampler described below is used in front of the duplex Dorr classifier in the Ernestine mill, Mogollon, New Mexico.

The power which moves the sampler is derived from one of the classifier rods *I*, shown in section on the sketch. This rod moves up and down about 4 in. with each stroke of the classifier. The top of the rod, protected with a piece of round iron, moves the lever *H*, the lower end of which is supported by the shaft carrying the gear *A*. There are two dogs fastened to the lever *H*, one being about ¼ in. longer than the other so that with each movement of the lever, the gear is turned half the width of a tooth.

In front of the gear *A*, and turning on the same shaft, is a piece of 1¼-in. square iron 9 in. long, marked *B* in the sketch. About 4 in. from the end of *B* is a stud which



Automatic Sand Sampler

carries the connecting-rod *G* which in turn is connected to the triangle *E*. This triangle is supported at its lower corner and the other corner is connected with an iron link to the sampler *F*. This sampler consists of eight half-round troughs 8 in. long by ½ in. deep, fastened together at their ends and hinged at the lower end on a ¼-in. iron rod, as shown. The square outlined in the sketch behind the sampler is an opening in the launder *K* through which the sand product from the classifier flows into the launder *J* and thence to the sand vats.

The stud *L* on one of the spokes of the wheel raises *B* until the latter stands perpendicular, then at the next movement of the wheel, *B* swings of its own weight through a half-circle, and is caught by the spring *C*, which prevents it from oscillating. When *B* swings through the half-circle just described, the rod *G* transmits the motion to the sampler *F* through the triangle *E* and causes *F* to dip up a small quantity of sand. The sample thus taken is thrown into a small pan placed directly in front of *F*.

This device takes a sample every 10 min., the total sample for one shift amounting to about 5 lb. It was designed and constructed by Fritz Aude, mill superintendent for the Ernestine Mining Company.

*Engineer, Ernestine Mining Co., Mogollon, N. M.

Concentrating High-Grade Fines by Hand

By A. L. Flagg*

In the early history of a mine producing high-grade ore, all or a part of which is of shipping quality, it is frequently a problem to know just what disposition to make of the fine material. This is especially true if it is attempted to keep the mine self-supporting until a plant can be installed to treat all the ores, depending in the meantime on the revenue derived from shipments for all or a part of the development fund, or even setting aside such income as a sinking fund for the purchase of the necessary mill equipment.

A mine which can pay for its own development and in addition build a mill for itself is indeed rare. However, such mines do exist. It is the purpose of this paper to describe a method adopted to make a marketable product out of the fine material taken from a high-grade silver mine in Mexico during the early stages of its development.

The mine was nearly a hundred miles from a railway. In addition to the charge of $20 per ton for muleback transportation, there was an additional railway freight charge of nearly $5 per ton to the smeltery. To this must be added the smelter's charges, assaying and commissions for liquidating at the smeltery, taxes and the cost of mining. To stand all these charges and still pay a profit the ore had to be high-grade indeed. As broken in the mine the ore under consideration ran from 40 to more than 1000 oz. of silver per ton, with a small amount of gold. Almost invariably the higher the silver content, the greater the percentage of fines produced in the mines.

At the period when this process was put into use the mine was in the prospect stage. A small, single-compartment incline shaft was being sunk on the vein with drifts each way at intervals of 50 ft. As a rule the ore was exceedingly hard but, it carried many minerals rich in silver and extremely brittle. The predominant minerals were galena, proustite, pyrargyrite and stephanite, besides native silver in wires and flakes. The gangue was quartz and rhodonite with local occurrences of calcite. Zinc and iron sulphides also occurred as accessory minerals. In instances where quartz or calcite predominated as the gangue mineral, every round fired would produce a large amount of fines composed of the more brittle components of the ore. The result was that frequently 20% of the

*Mining engineer, Tucson, Ariz.

mine-run would pass a 1-in. screen and assay from $60 to $150 per ton.

As each carload of ore was brought from the mine, it was dumped on the patio. There it was sorted by boys into: (1) Mill ore, which went to a stack, to await the erection of a mill; (2) shipping ore, which went through the usual sorting process common in such instances; (3) fines, that is, material which would pass a 2-in. ring. In some cases where the face showed exceptionally brittle ore which was correspondingly high-grade, the fines were put in sacks to lessen the risk of loss from rehandling.

After all the coarse material had been picked out, the fines were shoveled over a screen having a 1-in. opening. Of the oversize, about 4% was picked out as shipping ore, the rest being sent to the mill stack. The undersize was all treated in a two-compartment hand jig. While some material of a grade suitable for shipping was obtained as coarse concentrates from the two compartments, the real value of the jig lay in the classification between the coarse material, which remained on the screens and the high-grade hutch product.

The overflow water from the jig was run through settling tanks to save the slimes. Just what disposition can be made of these slimes is at present a problem. It is quite probable that they can be mixed successfully with the mill feed in small quantities and not cause any trouble. The amount of slimes saved was small, being about 1% of the whole, but they were worth $50 per ton.

The coarse concentrates were removed by skimming; the tailings were dumped from the boxes after lifting them out of the jig. While the amount of ore won in this way was comparatively small, it was sufficient to justify the expense. In the period of test, the average amount obtained this way was 81.4 pounds per day per man, running 534.58 oz. of silver per ton.

The frequency with which the hutch product was removed for retreatment on a *planilla* varied with the percentage of fines produced. As a rule, it was necessary to clean out the hutch every third day, sometimes oftener To do this, the screen boxes and plunger were removed and the material taken out with a short-handled shovel.

The *planilla* requires some skill to operate. In this instance it consisted of a shallow box 10 in. deep, 4 ft. wide, 6 ft. long, open at one end, and resting on the ground, with a slope of not over three inches in its length. Directly in front of the lower open end, a soap box was sunk even with the ground surface. A 1-in. cleat, six inches from the end and extending to within one inch of the sides of the box nailed across the bottom completed the device. A small pipe leading from the creek kept the soap box full of water.

After piling about 25 lb. of the hutch product against the back of the *planilla,* the operator takes his position over the soap box with a small, oval, wooden bowl, called a *batea,* in his hand. With this he scoops up water from the soap box and throws it on the *planilla* heads all in one motion. After a while it is necessary to scrape the concentrates back into the end of the box as they wash down with the sands. The sands are carried off by the wash water past the ends of the cleat at the open end of the *planilla.* The washing is continued until a remarkably clean product is obtained, this being dried and sacked for shipment as concentrates from any table would be.

A careful record of production and costs was kept, covering a period of about six months. It was found that with the labor of the jig men at $0.50 a day, clean concentrates could be produced at a cost of $6.16 per ton, exclusive of mining. The average amount of concentrates produced daily over the period of test was 136.4 lb., of which 81.4 lb. was a coarse jig product, while the remaining 55 lb. was from the *planilla.* The accompanying table will express more concisely the results that were obtained.

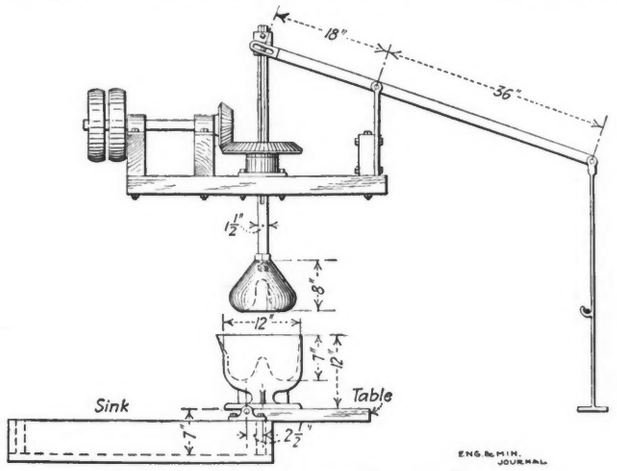
RESULTS OF HAND CONCENTRATION

	Pounds	Oz. of Ag per ton
Undersize from 1-in. screen, jig heads...	39,304	172.9
Coarse jig concentrates, shipped.....	1,760	582.2
Coarse jig middlings and tailings, stacked	17,732	58.2
Hutch product	9,680	307.0
Planilla concentrates	6,776	534.6
Planilla tailings	2,904	146.4
Planilla slimes	55	26.5
Jig slimes	15	105.9

❖

A Small Clean-Up Mortar

The accompanying drawing shows the details of a mortar and muller which are used for cleaning up small quantities of amalgam from gold-milling operations. It consists of an ordinary mortar fixed to a wooden table mounted on a shaft so that it can be tilted into a sink and emptied. The muller is power driven and arranged so that it may be raised and lowered, with respect to the mortar, by means of a lever as shown. A hook on the lever handle allows the muller to be suspended free of the mortar when desired. The device was designed by Mr. Schmal, superintendent of the South Eureka mill, Sutter Creek, Calif., where it is in use.



CLEAN-UP MORTAR FOR SMALL PLANTS

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Electrolysis with High Current Densities

In order to secure electrolysis with high current densities without the likelihood either of contaminating the cathode by float slime, if the circulation is too high; or of getting sprouts and nodules, if it is too low; Kenneth S. Guiterman, of New York, purposely directs the flow of electrolyte so as to scour the anodes (U. S. pat. 1,062,966). The electrolyte is withdrawn continuously, and filtered before returning to the tank. Preferably the incoming electrolyte is directed down against the anode and the outgoing stream is withdrawn from the bottom, so that, as far as possible, the force of gravity (as manifested in the natural fall of the slime) will assist the moving current of solution.

NOTES FROM CURRENT LITERATURE

Economic Sulphate Minerals in Utah

It appears that in the oxidized ores of Utah there are present in comparative abundance several complex basic ferric sulphates, sulpharsenates and allied minerals, according to B. F. Butler (*Econ. Geol.,* June, 1913,). One of the principal of these minerals is plumbojarosite, the hydrated sulphate of lead and iron. This is a yellow or brown mineral, looking like hydrated iron oxide but distinguishable by its smooth, oily feel. It is usually crystallized, though it may be finely so, and appears micaceous when rather coarse. This has been found in many different mines in the state. A similar mineral is beaverite, which includes a copper oxide in its composition. Beudantite and corkite are names for a series of variable and uncertain minerals which are sulpharsenates or sulphophosphates of lead and ferric iron, with minor quantities of other constituents, especially copper. Jarosite, a hydrated sulphate of iron and potash, and utahite, a hydrated iron sulphate, have been noted in various localities. All these minerals are found in the oxidized portion of the vein slightly below the outcrop. They are the result of oxidation of mixed sulphide and arsenide ores, and are an intermediate step in the formation of the more permanent carbonates. They would seem to be particularly common in arid regions, but have been reported from Leadville, Colo. Their discovery and study indicates that all yellow and brown, more or less earthy materials, are not limonite. They may be composed of one or several of these minerals described, and when such material contains metals other than iron, these are not necessarily present as carbonates or "chlorides," intermixed with the iron oxide.

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Cement Copper Making at Butte

The following notes on cement copper precipitation at Butte are taken from the *Mining Journal,* Mar. 30, 1912:

The plants which secure their water direct from the mines and those operated on the sites of abandoned smelting plants have by far the strongest water with which to work. The water as it comes from the mines averages from 0.04 to 0.06% copper. With the 0.06% water copper precipitate as high as 90% is secured, and from this it runs as low as 30%. Some of the operators are so favored in the location of their plants that they can cause the water to flow through the tailings of the abandoned smelting plants [possibly concentrators is meant. —ED.], thereby materially increasing the efficiency of the water.

At present there are two methods of precipitation, the box system and the tower system. The latter is generally conceded to be the more successful, the towers occupying less space, while the precipitant is more thoroughly exposed to the water. The box system consists of a series of troughs from 1 to 3 ft. wide and 1 ft. deep, covering a great deal of surface. The boxes are so arranged that there is a gentle incline, and gravitation keeps the water in motion. Into these troughs the scrap iron and tin cans are thrown. The copper precipitate, after being washed through many compartments, sinks to the bottom of the receiving tank, which is cleaned out about once a month. The tower system consists of a tower about 3 ft. wide, 20 ft. high, and 30 ft. long, and is partitioned off by means of floors 18 in. apart. These floors are made of 2x4-in. scantlings, placed 3 in. apart, running lengthwise. Tin cans and scrap iron are placed on the several floors. By means of a small motor the copper solution is raised to the top of the tower, where it is distributed equally and constantly over the scrap iron. The tin cans and smaller pieces of iron are eaten up in a comparatively short time, but the larger pieces must be scraped regularly in order to remove the precipitate. The latter is washed to the bottom, and then into tanks alongside the towers.

The operators sell their output to the smelters at 4c. less than the market quotations for copper, and the shippers must pay a treatment charge of $5 per ton. The cost of making a pound of copper is estimated at betwen 7 and 8c., so that the present price of copper gives a fair return.

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The Uranium Deposits of Portugal

Under the title, "Uranium Depoits of Portugal," MM. Segaud and Humery publish a study in *Annales des Mines* (p. 111, 1913), from which we give the following abstract:

Until recently most of the uranium and radium products of Europe were derived from the deposits of nickeliferous and cobaltiferous pitchblende of Joachimsthal. Cornwall and Devonshire have also produced the two metals, but in an irregular way. Norway also possesses two deposits of fergusonite, rich in uranium.

The existence of minerals of uranium in Portugal has been known for about 40 years, but they were not developed until about 1908. Following the researches of Mme. Curie, on radio-active substances, a number of enterprises for the exploration and working of these deposits, were constituted, among which we note: L'Urane (E. Urbain); A. Feige & Co.; Paul Girod; Harding Brothers & Co.; the Guarda Co., Ltd.; and Henry Burnay & Company.

This region of uranium ores is situated in the great granite basement which covers almost all of the north of Portugal, from the frontier of Galicia to Castello Branco, extending over the provinces of Minho, of Tras-os-Montes and of Beira. The richest part is found between the villages of Guarda and of Sabugal, toward the south of the granite basement. The uranium deposits are found in Cambrian strata to the north of Guarda, the veins are chiefly made up of wolframite. Finally the region of Villar-Formoso is equally uraniferous. The uranium veins outcrop at the surface of the granite, and exist also in the Cambrian schists; for example, at the mine of Pontao de Raponla.

At the depth attained by present workings, that is, above ground-water level, scarcely any other minerals have been encountered except of the types autunite and torbernite or chalcolite. Autunite presents itself under different forms, either in little groupings of square crystals of an intense yellow, or in thin plates of almost pure autunite, or in spots of brilliant yellow disseminated in a yellow rock. In clayey strata the autunite is often completely invisible and its presence is only shown by electroscopic methods. Finally, there is often an impregnation of the country granite foot wall, which presents so intense a yellow color as to lead to the belief of a high uranium tenor, but, although the granite is sometimes workable, it is never rich.

The autunite is probably accompanied by uranocircite, $BaO(U_2O_3)_2P_2O_5.8H_2O$. Chalcolite presents itself under analogous forms to those of uranite, but the color is a beautiful emerald green.

The tenor of the uranium minerals varies greatly, but a content of 2% is excellent, and 1% is good, while some deposits are workable at even 0.3 to 0.5%. Probably all the ores yet found are secondary, caused by uranium minerals reacting with apatite in the region of the circulating waters. There is some reason to believe that the original ore if found, would be pitchblende.

According to the present theories, that the slow disintegration of an atom of uranium gives an atom of helium and an atom of ionium, and that the latter, in turn, gives an atom of helium and one of radium, and calculating by Boltwood's coefficient, there should be 0.1 gram of $RaBr_2.2H_2O$ per 30 kg. of U_3O_8. In the chemical treatment, the radium is found with the barium-sulphate precipitate (from the autunite).

Making Copper Wire by Electro-Deposition

Patents have been granted to William E. Gibbs, of Plainfield, N. J., for the manufacture of copper wire by electrodeposition, says the *Brass World,* May, 1913. Attempts formerly have been made to accomplish this object, but they have been unsuccessful.

The Gibbs method requires a fine copper wire as a core for making the desired product, and the additional copper is deposited on it while it moves through a tank containing the solution. The fine copper wire is made endless and passed through a regular plating solution containing sulphate of copper and a little sulphuric acid. The wire passes over grooved rollers operated from outside while passing through the tank. After leaving the tank, the wire passes through a small rinsing tank to remove the solution, and then goes to a reel around which it passes a number of times, returning again to the plating tank. The plating may thus be continued until the required thickness is obtained.

Pyrrhotite at Elkhorn

The Elkhorn district about 33 miles northeast of Butte, Mont., has been sufficiently described, particularly the lead-silver Elkhorn mine. The discovery of an auriferous pyrrhotite orebody is described by Adolph Knopf (*Econ. Geol.,* June, 1913) in the Golden Curry mine. The body of sulphide is isolated from the other ore deposits and is wholly inclosed in granite whose intrusion has given rise to most of the ore deposits on its border. The pyrrhotite body is elliptical in plan, measuring 100 ft. long, 18 ft. wide and has been stoped upward to a height of 10 or 12 ft. It has yielded 2000 tons of ore containing $4 in gold, 2% in copper and 35% iron excess over silica. It consists of a mixture of pyrrhotite, chalcopyrite and dark green or black pyroxene. The best evidence indicates that the body is a magmatic segregation from the surrounding granite, but it is remarkable in being segregated from a relatively siliceous rock, other pyrrhotite orebodies, such as at Sudbury, being segregations from basic formations; it is also extraordinary in its high gold content which is most unusual in orebodies of this origin.

Trinidad Oil-Field Development

The absorption of a big oil-field company of Trinidad by a British petroleum syndicate, has created public apprehension that it is an attempt to monopolize the oil trade of the colony, says Vice-Consul Edward B. Cipriani, Port of Spain, in *Daily Consular and Trade Reports,* June 25, 1913. It is reported from London that the transaction has made it difficult for independent oil-field developers to obtain money. A lake-petroleum company, which had a daily flow of 17,000 to 20,000 bbl. for several days from its No. 37 well, has obtained not less than 2000 bbl. daily for nearly six months; present flow is 300 bbl., which, it appears, would be maintained. Another concern has drilled a productive first well at the southern end of the island, while two other companies are producing extra-good oil from shallow wells.

The local demand for fuel oil is increasing steadily. Four sugar factories are using it, and it is hoped that the government railways and steamers will, in the near future, use this home product rather than imported fuel. Some automobile and motor-boat owners are also using locally made petrol (gasoline) with excellent results. This can be bought much cheaper than imported petrol. The supply is limited, but one company has ordered large stills from England which, it is thought, will enable it to supplant the imported petrol.

Nickel Determination with a-Benzildioxime

A new reagent for nickel has been proposed by Frederick W. Atack (*Chem. Trade Journ.,* June 14, 1913), an ammoniacal alcoholic solution of a-benzildioxime. The reagent was quite as delicate as the dimethylglyoxime reagent of Tschugaeff, and has the advantage that coloration was produced almost immediately even with minute traces of nickel, whereas with dimethylglyoxime the solution had often to be allowed to stand for some time.

a-Benzildioxime, said the author, was particularly suitable for the estimation of small amounts of nickel, giving a much more insoluble precipitate which contained only 10.93% of nickel, whereas that from dimethylgloxime contained 20.31% of nickel. Moreover, quantitative precipitation took place immediately with the new reagent, whereas the precipitation was only complete after some time in case dimethylglyoxime was used. The method was available in presence of cobalt, iron, manganese, zinc, chromium and magnesium.

The Sanitation of Mining Towns*

The U. S. Bureau of Mines has recently incorporated a new section within its organization which is known as the mine sanitary-engineering section, the function of which is to improve sanitary conditions in and about mines. This is a logical step in the development of the Bureau's work in promoting greater safety and efficiency in mining operations. Certainly the waste caused by unnecessary sickness and death on account of unsanitary surroundings must be stopped, as well as the loss caused by explosions, fires and other similar mining disasters.

No Way of Measuring Value of Sanitary Improvement

I suppose the reason why sanitary improvements are neglected and why people hesitate to spend money on them is because it is difficult to get an accurate measure of the returns on the investment. It is unfortunate that the results are not more tangible. You can install a meter and readily discover the slippage in a pump or you can put an indicator on the steam chest of the engine and get an actual photograph of the waste, but you cannot calibrate humanity. We do possess an imperfect method—viz., vital statistics—but they are difficult and expensive to obtain, are subject to gross misinterpretation, and even when their story is told in the most graphic way they fail to drive the lesson home. Even epidemics arouse only local interest. The simple practice of learning from the experience of others is theoretical rather than real.

I assume that most of you come from in and about Pittsburgh and that your ideas of a mining town are rather clear and well defined, so that instead of giving a general description of a typical mining town I shall outline its unique characteristics and lay stress upon how it varies from the ordinary incorporated village or town of the same size and shall endeavor to show how these special conditions affect some of the established principles and practices of sanitation, justifying the phrase "mine sanitation."

The unique characteristics of a typical mining town are: (1) Company ownership, e.g., the streets, lots, houses, stores, churches, schools, hospitals and the public utilities are owned and controlled by the operator of the mine. (2) The completion of the town at the time of its inception; it is a "made-to-order" product and only occasionally the result of growth and development extending over a period of years. (3) The absence of permanency; the life of the average mining town is 20 to 25 years and the idea of abandonment at some time in the future is manifest. Modern mining towns are now being constructed with a longer life in view. (4) The pronounced similarity and sameness of the occupations of all the people residing in the town. (5) The absence of local self-government. (6) The dual capacity of landlord and employer vested in the same party.

Let us investigate how these conditions affect some of the fundamental sanitary problems; on account of limited time we will discuss only the following three: (1) Housing problems; (2) water supply and disposal of waste; (3) the establishment and enforcement of sanitary rules and regulations.

Mining Towns Uniformly Bad or Good

Let us take up the housing problem. I drew your attention to the fact that the mining town does not grow but is built at a single stroke. The effect of this is that the valuable lessons learned by the "try-out" method and the profit gained by previous mistakes do not exert their powerful influence, so that the errors existing in one house exist in all; if one house is not properly lighted, none of the houses will be properly lighted; if a few houses are placed too closely together, all houses will be similarly spaced; if there is congestion in one section, there will be congestion throughout; if one privy is unsanitary, all the privies will be the same. Of course, one could have learned from the experience of other mining towns already built, but this information was perhaps not readily available and local conditions modify each case. One of the first investigations which the Bureau intends to take up is this house problem, with a view to putting before the mining world the best practices and the ones which have stood the test of time.

I believe you can see that the uniformity of occupation of the tenants has its effect upon the housing situation. While no two human beings are the same, none of us can deny that similar means of livelihood has marked effects upon our practices, habits, recreations and dress. This in a way simplifies the housing problem, as it eliminates the variety of conditions and conveniences that must be provided.

The company ownership is the most important factor entering into housing conditions. Every house reflects the standard which the operator wishes maintained—comparisons, variations and gradations are absent. It is difficult to stimulate personal pride among the inhabitants and friendly rivalry is absent. However, if improvements are introduced they are far-reaching, and the tone of the entire town is raised, so that one house does not point the finger of scorn at its neighbor. The employer being also the landlord means, as a general rule, compulsory payment of rent, and the importance of an assured income should be given due weight.

In discussing the water-supply situation, it must be kept in mind that the town site is generally determined by the situation of the mine shaft, which in turn is established by such factors as topographic conditions, formation of coal, economic transportation and similar commercial considerations. The necessity and importance of a satisfactory domestic water supply for the people who were to get out the coal was probably not given much consideration in the past; it is hoped that more consideration will be given to this phase of mine development in the future. In some places the men are carried daily to the mine in work trains, and numerous difficulties are thus avoided. In studying conditions with a view to introducing a public water supply into a town, the cost of improvements and the age of the town must be carefully balanced. Another factor which may complicate the problem is the relatively large industrial consumption of water, compared with the demands for domestic use. This may mean an extra large filter plant to purify all

*Excerpts from an address before the senior sanitary engineers, University of Pittsburgh, May 20, 1913, by J. H. White, sanitary engineer, U. S. Bureau of Mines.

water (both domestic and industrial), or the installation of separate pumping and distribution systems. The possibility of piping water in from a neighboring town may furnish a solution at certain places and its feasibility should always be investigated. In many mining towns the domestic water supply is from individual wells, and while this system is far from perfection, it can be brought up to a safe standard. The usual indictment against the system is the susceptibility of the wells to infection, and on account of the inconvenience of drawing water an insufficient amount will be used for household and personal cleanliness. The danger of infection may be minimized by abolishing the unsanitary privies (this will be discussed more fully later on) and improving conditions around the well by lining it with terra-cotta pipe (if it is a dug well), placing the water-tight covering of concrete over the top and installing a pump. The nature of the soil plays an important part in the safety of the well, sandy soil furnishing a natural protection. In a limestone region pollution may come from miles away, which makes the potential danger of the well great. This may involve the distribution of drinking water in bottles throughout the town, the well water being used for cooking and washing purposes only. The inconveniences due to the difficulty of getting water from the wells may be eliminated by establishing bath houses at the mine shaft, so that the men may wash upon coming out of the mine. These bath and change houses are being widely introduced; in a few states they are required by law. A public laundry is a great convenience for the women: lugging in several tubs of water preliminary to doing a week's washing is a severe burden. Bath houses in or near schools for the women and children are almost necessary accessories to the perfect well system. Wholesome and safe drinking water is essential to existence; its supply is one of the gravest responsibilities accompanying company ownership.

Difficulties of Sewage Disposal

Relative to the subject of sewage disposal, you probably know there are few mining towns with sanitary sewer systems and some of the statements already made explain their absence. A sanitary sewer system presupposes a public water supply for flushing purposes, and all that has been said about the difficulties of a public water supply bear indirectly upon the sewerage question. In the second place, the approximate location of the town site is determined by the mine shaft and the topography must be accepted as it is. This is generally rough and hilly and a single gravity system of sewers is next to impossible, as the cost of leveling off the hills and grading the streets is prohibitive. Moreover, a suitable stream to take the discharge of the sewers may not be near at hand; and the necessity of installing a sewage-disposal plant looms up. Besides these difficulties, the expense of making house connections, installing plumbing fixtures and keeping these in repair, means a large expenditure. In the construction of new towns, some of these objections could be avoided by a more careful selection of the town site and arranging streets so that they follow contours. In some cases also, the experiment has been tried of building the outhouses or privies over the sewers and having a single automatic flush serve for a number of houses. This obviates expensive plumbing fixtures and cuts down the extravagant use of water.

I believe we are now prepared to take up the question of dry closets or privies, and the reason of their existence is probably now better appreciated. At its best the dry closet is not an institution to be proud of, and one would hesitate to estimate the sickness and loss of life caused by these neglected filth spots that abound in most mining towns.

A privy is sanitary when there is: (1) No possibility of ground pollution or infection of water supply; (2) no possibility of the spreading of germs by flies or other insects or animals.

The ground pollution and water infection is eliminated by the water-tight receptacle, but it is difficult to shut out flies. Methods used are darkening vault, covering each deposit with sand or clay or ashes, placing of a strong deodorant in the cans, or possibly by half filling the cans with water which causes an immersion of the stools. Depending upon fly-tight construction is seldom practicable.

The sanitary collection and disposal of night soil is another important feature, and one which has not been satisfactorily solved. It is almost impossible and practically uneconomical to destroy this material by fire. Disinfection by a liquid is not efficient because of the impermeability of the solid matter and the nauseating work of bringing about thorough mixture by stirring. Burying in the ground is not without its drawbacks, because of the pollution of water supplies and because in the development of the fly larvæ, disease germs may be brought up from several feet under the surface. One method which is being experimented with is placing this material in a septic tank and promoting liquefaction of the solid matters by various agencies in the tank and then applying a liquid disinfectant to the effluent. This method is being tried out by an Alabama mining company.

The collection of garbage, trash and waste of all kinds offers no special difficulties. There is a surprisingly small amount of this and the hens, hogs and dogs usually consume it.

In closing, I can just briefly discuss how the establishment and enforcement of health laws and regulations in mining towns vary from those of other places. Company ownership expedites the legislation and simplifies the enforcement. The official sanitary inspector is in absolute control, and he need be retained only so long as he does his work satisfactorily. It is not necessary for him to cater to any particular parties or show any favoritism or partisanship, as his job does not depend upon his popularity. The dual capacity of landlord and employer commands obedience to the laws, as their violation may be punishable by discharge and eviction from the town. On account of similarity of occupation, the regulations will affect all the inhabitants with same severity, and one class is not discommoded for the benefit of another—like, for instance, in a city where stable regulations and permits bring neighbors into conflicts. These are the advantages that mining towns possess, but the drawback lies in the fact that the initiative in maintaining sanitary and clean conditions throughout the mining town rests entirely with the operator. Indifference on his part may give rise to deplorable sanitary conditions. The residents have no official voice in the government of the town and unofficial aggressiveness is seldom exerted because the total absence of property rights breeds irresponsibility.

CORRESPONDENCE AND DISCUSSION

Calculation of Extraction in Concentration

The custom of using the content of bullion produced plus the content of tailing discharged as the value of the feed[1] in milling operations easily accounts for the high percentages of extraction frequently reported. Occasionally more reasonable estimates[2] may be found in the reports published by large mining companies working low-grade ores, as such companies generally make use of sampling devices and employ their own assayers, but no calculation into which the assay value of the tailing enters can be of value because, under working conditions, it is impossible to ascertain directly the real value of the tailing.

From the moment concentration commences the water made use of carries off mineral of value, and this continues all through the process. The amount of floating mineral will vary with the fineness of division of the particles, degree of concentration, amount of water used, and inclination of the tables, or with the rapidity of concentration. The effect of these circumstances is to cause the settled tailing to be invariably of lower assay value than if there were no float.

The subject of extraction percentages is one which occupied my attention for several years, owing to my having been engaged by a mining company to carry out investigations with a view to ascertaining the amount and manner of loss in the wet concentration of silver ores. No trouble or expense was to be spared and ample opportunity was afforded to make experiments on whatever scale seemed advisable.

To estimate the extraction it was clearly necessary to know either the correct value of the mill feed or of the tailing. To obtain the tailing value was difficult on account of the constant loss in the overflow and the impossibility of collecting the whole of the material under ordinary circumstances of working, and it was therefore decided to depend on the assay value of the feed.

During the tests, samples of the settled tailing were taken and assayed, but in no instance did their value agree with the theoretical value obtained by difference. Their value was invariably lower and the difference greater with higher degrees of concentration. At first, it was supposed that some error had been made in sampling or assaying, and check samples were taken and assayed, but these only confirmed the low value of the settled tailing. In the opinion of the operators, the water only carried off the more soluble portion of the waste. It seemed, however, that the mineral accompanying this might account for the low value of the settled tailing. After this, a number of tests were made to ascertain the extraction in jigging, in sand treatment, and in concentrating slime, by concentrating in the usual manner about 10 tons of ore in the same condition as fed to the different machines, it being possible in concentrating a moderate quantity of ore to collect the entire tailing in tanks. As a result of many tests it appeared that the percentage of floating material was proportional to the fineness of the particles treated and that its value was more than twice the theoretical assay value of the tailing. Thus, the discrepancy between the theoretical and actual assay value of settled tailing was accounted for.

The tests referred to were made with the same care in weighing, sampling and assaying the ore and products of concentration as would be exercised by a smelter purchasing ore, and were under my constant personal inspection, the object being to arrive at the actual rate of loss per degree of concentration of value in each of the three operations mentioned. The assumption was that with this data it would be possible to calculate with precision the probable results to be obtained in concentrating ores of different assay value to different degrees of value, by the methods of concentration made use of at the establishment under consideration, without the necessity of weighing the feed or the tailing.

Loss in concentration appears to arise from: First, the unavoidable loss characteristic of the particular ore concentrated, arising from the degree of natural concentration of the value in the gangue, its combination with various sulphides, and the nature of these; and second, the degree of division of the particles, which is the main cause of loss.

Some minerals are more friable than others, but the percentage of mineral to gangue is so small that it would not materially affect the general friability of the mass, and it may be assumed that ore of different minerals will crush in a similar manner and that the effect of division would be similar, although the float slime might be of higher value with friable ore. Hence, the weight of float arising from a certain degree of crushing an ore may be taken to be a measure of the percentage of float in crushing any ore to a similar degree, and this appears to be confirmed by the few examples which it has been possible to obtain.

The accompanying scale of extraction percentages obtained in concentrating a silver ore, crushed to pass a 30-mesh screen, aperture 0.0166 in., will illustrate the application of the results of some of the tests made. The silver was associated mainly with iron pyrites and a small amount of blende and occasional small quantities of galena, and occurred as pyrargyrite and in combination

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[1] "The calculation of extraction is performed by using the content of bullion produced plus the content of tailing discharged as the value of head sample." "Silver Cyanidation at Tonopah III," by Herbert A. Megraw. "Eng. and Min. Journ.," Mar. 8, 1913.

[2] A formula much used for calculating the extraction, and which is stated to be convenient for approximate estimations when it is impracticable to weigh the products, is the following:

$$\frac{A - B}{C - B} \times 100\,C \Big/ A = \%\ \text{extraction.}$$

When
A = Assay value of feed;
B = Assay value of tailings;
C = Assay value of concentrates.

This formula would give correct results if the assays of feed and tailings could be relied upon, but with an assay of settled tailings, i.e., tailings minus float, the extraction percentages so obtained may be more than 18% above the actual extraction and it is therefore undesirable to make use of this formula. Ashcroft. "The Flotation Process," "Trans.," I. M. M., 1912, and "Eng. and Min. Journ.," Dec. 7, 1912, p. 1085.

with copper (fahlerz). The matrix was quartz of average hardness.

The extraction by formula based on the assay value of the settled tailing was 4.2669% at 2:1 concentration, and 18.3545% at 12:1 concentration, in excess of the actual extraction.

It will be observed that the difference in the assay value of the settled tailing and the total tailing is so small in low degrees of concentration that, with ores of little value, it might escape attention unless great care were taken in sampling and assaying.

The method adopted for finding the percentages of extraction and loss incurred, weight and value of concentrates and tailings, for any degree of concentration or value of feed, according to results obtained in carefully made tests, was as follows:

The total possible loss being 100%, the loss due to different degrees of concentration of the values will be proportionate percentages of this loss according to the degree of concentration:

PERCENTAGE OF LOSS IN VARIOUS DEGREES OF CONCENTRATION

Degree =	% of total loss	Degree =	% of total loss
0	= 0	9	= 88.28
2	= 50.0	10	= 89.06
3	= 62.5	11	= 89.84
4	= 75.	12	= 90.625
5	= 78.125	13	= 91.41
6	= 81.25	14	= 92.19
7	= 84.375	15	= 92.97
8	= 87.5	16	= 93.75

To find the total loss, first divide the assay of the concentrate by the assay of the feed to find the degree of concentration, then by means of the table find the relative percentage and, from this, the total loss. When the total loss is found by means of a test, the loss in concentrating similar ore of any assay value, and in a similar state of division, may be found, as it will correspond to the percentage of the total loss for that degree. In this manner the percentage weight of tailing and concentrate may be found and the actual value of the tailing.

The total loss may exceed 100% when the rate of loss is great, due to water used in concentration being excessive—or there is a reversal of concentration.

A knowledge of what the actual value of the tailing may be at different degrees of concentration is of great importance, as concentration may be carried to such an extent as to become negative, that is to say, the discard will be of greater value than the feed, owing to the tailing increasing in value in proportion to the degree of concentration. The first tailing discarded, up to a concentration of 2:1, is the largest in amount and the least valuable. After this it becomes richer and less in quantity; this, however, is liable to pass unnoticed, as the amount being small in comparison with the first tailing, the average value of the whole of the tailing is not greatly increased. The following example of concentrating copper ore, sand and slime, with buddles will illustrate this:

Degree of Concentration	Tons Concentrate %	Tons Tailing %	Extraction %	Loss %	Average Value of Tailing Units
2	22.56	77.44	45.12	54.88	7.0868
4	4.42	95.58	17.68	82.32	8.6127
8	0.495	99.505	3.96	96.04	9.6518

The unit has been taken as 10 for feed.

In this scale of concentration the total loss found by experiment was 109.76%, so that there was a reversal of concentration at some point. Concentrating 22.56 tons to 4:1 would produce 4.42 tons concentrate with 18.14 tons tailing at 15.127 units, but concentrating to 2.5 deg. the tailing would be worth 9.463 units, the limit to which concentration could be carried without reversal.

In the vanner treatment, the total possible loss, found by experiment was 106.66, about the same as with the buddles; consequently it was not possible to concentrate beyond 2.5 degrees in either case. The concentration, however, was carried to 4.9471 degrees by vanners and 2.6277 degrees by buddles. The combined concentration was, by jigs, 12.734 degrees, extraction, 57.095%; by vanners, 4.9471 degrees, extraction, 17.589%; and by buddles, 2.6277 degrees, extraction, 36.545%; and combined, 8.4692 degrees, extraction, 69.575%. Assuming the data given to be correct, the tailing would have an average content per ton, 0.70443% copper, of which, according to the loss in float resulting in tests of silver ores, 35% of the weight of tailing would have been carried off with 57% of the calculated contents of same, and the value of the settled tailing would have become reduced to 0.46594% copper, equal to a reduction of 0.23849% in the percentage value.

Calculating the percentage of extraction by the formula, with value of settled tailing 0.46594%, an extraction of 80.10% would be obtained or 15.127% in excess of the actual combined extraction. The excess, however, would be much more in calculating separate recoveries by vanners or buddles.

The relative extraction by the different machines at the same degree of concentration was: Jig, 76.48%; vanner, 46.67; buddle, 45.12%. This must not be considered as a measure of efficiency but, if anything, a measure of the fineness of division of the particles. The float percentage on the tailing was: Jig, 10 to 15%; sand tables, 30%, due to a portion being reground; buddles, 45%, due to nearly all being reground.

A single test was not found to be sufficient as a test of the recovery or of the amount of float occurring in the operations of a mill, because, in working, buddle heads are sent to tables, and table seconds and slime go to buddles, and these combinations alter the conditions. It was

COMPARISON OF EXTRACTION PERCENTAGES. THE FEED IS SILVER ORE CONTAINING 20 OZ. PER TON

Degree of Concentration of Values	Tons Concentrate %	Tons of Tailing %	Extraction %	Loss %	Calculated Assay of Total Tailing per Ton Oz.	Assay Value of Settled Tailing % per Ton, Oz.	Extraction by Formula %	Total Tailing Tons	Settled Tailing Tons	Assay Value per Ton Oz.	Float Tailing Tons	Float Assay Value per Ton Oz.
2	39.25	60.75	78.51	21.49	7.0748	6.1428	81.86	60.75	51.41	6.1428	9.34	12.2056
3	24.38	75.62	73.14	26.86	7.0960	5.8766	78.29	75.62	61.09	5.8766	14.53	12.2644
4	16.94	83.06	67.77	32.23	7.7606	6.0742	75.35	83.06	63.91	6.0742	19.15	13.3890
5	13.28	86.72	66.43	33.57	7.7422	5.9826	74.55	86.72	65.89	5.9826	20.83	13.3654
6	10.84	89.16	65.08	34.92	7.8332	5.9420	73.96	89.16	66.88	5.9420	22.28	13.5100
7	9.10	90.90	63.74	36.26	7.9780	5.9516	72.84	90.90	67.31	5.9516	23.59	13.7600
8	7.80	92.20	62.40	37.60	8.1562	5.9772	73.59	92.20	67.40	5.9772	24.80	14.0806
9	6.89	93.11	62.07	37.93	8.1472	5.9442	72.68	93.11	67.83	5.9442	25.28	14.0586
10	6.17	93.83	61.73	38.27	8.1572	5.9240	72.53	93.83	68.13	5.9240	25.70	14.0778
11	5.58	94.42	61.39	38.61	8.1684	5.9116	72.39	94.42	68.34	5.9116	26.08	14.1180
12	5.09	94.91	61.05	38.95	8.2078	5.9072	72.24	94.91	68.46	5.9072	26.45	14.1616

found that the regrinding greatly increased the loss and this without doubt was the main cause of lower results being obtained under working conditions than in single tests. The main loss arises from float whatever machne is used and there appears to be little chance of overcoming this difficulty. The great loss of tin slimes in Cornwall is evidence of this—but it may be possible to improve extraction by paying more attention to coarser crushing and jigging. It is not sufficient to infer from observation only that an ore requires to be crushed fine to obtain the best results in its concentration and the possibility of obtaining better results from coarse crushing may well repay the trouble of carefully ascertaining the most favorable degree of crushing in each case, as even adjacent veins vary much in the natural concentration of their values. With silver ores, the tailing is hardly ever of lower value than 8s. per ton; consequently, every ton of waste picked out by hand before concentration results in a considerable saving, as it raises the value of the remainder, thereby reducing the degree of concentration required and, at the same time, reducing the loss in treatment of the whole.

WILLIAM S. WELTON.

London, Eng., Apr. 8, 1913.

Milling in Southeastern Missouri—I

In the JOURNAL of June 21, "Milling in Southeastern Missouri—I," page 1231, there is a description of the method employed at the Doe Run No. 3 mill of the Doe Run Lead Co. for the estimation of weight of the feed to the mill. This, if it is correctly reported, furnishes a rather interesting example of the fact that many plants, apparently built under the best of supervision, are still deficient in certain ways, so that the management is actually depending upon impressions, instead of upon the information that it should have, and, no doubt, thinks it is receiving.

After describing in some detail the general conditions of the district, and especially the construction of this particular mill, which he says represents an investment of about $600,000, C. T. Rice states that the tonnage sent to the mill is determined by recording the number of mine cars dumped into the crusher (presumably at the various mines) and delivered to the railroad cars. The weight of ore per mine car is in turn estimated by occasionally weighing a railroad car containing a known number of mine-car loads, on a railway-track scale.

Mr. Rice evidently feels that this process demands some apology, but his excuses reflect on the ingenuity of the designers of the mill, since the methods of weighing ore which he mentions are not all of those in common use, nor are automatic methods barred by dust.

At a certain mill with which I was connected, where all the ore is dried and where fine crushing and screening is practiced and where the dust is almost unbelieveably dense, all the ore was received from two mines in 50-ton, hopper-bottom steel cars, pushed up a siding as delivered, and dropped to the crusher by gravity via a standard railway-track scale. The time taken to weigh a car was short, and opportunity was found for frequently checking the tare weights also. At that mill, as now arranged, all the ore is weighed satisfactorily on a belt-conveyor scale, which is by no means free from dust.

At the mill which I am now operating, all the mill feed is weighed in an automatic dumping scale, and with good results, although the place is dusty, and it is necessary to have a boy blow off the joints of the apparatus at half-hour intervals with an air hose.

Almost everyone who has handled muckers and trammers underground knows of the fondness of the tribe for sending out short cars, and in an actual test covering a period of over a year, with a mine under ordinarily good supervision, the output as figured from the average supposed load of the mine cars, checked at intervals in much the same manner as is done at Doe Run, showed 17% higher than the weight given by automatic scales.

The method of weighing at this otherwise well designed mill, taken in connection with the absence of automatic samplers except for concentrate, leads one to view with considerable doubt the statements of recovery, although securing 83% to 86% of the lead from such an ore as described is not a matter of extreme difficulty. The doubt arises from the fact that the denominator of the recovery fraction is an estimate; an impression, instead of information.

In the second article of this series, in the JOURNAL of June 28, Mr. Rice describes the Hancock-jig practice of this same mill, and this also, if correctly reported, does not appear to represent the best kind of work, since, although only a single separation is made, the quantity of middling produced is so great as to be too much for a single jig and part of it is returned, after recrushing, to the jigs where it originated, although the capacity of a 25-ft. jig is given as 600 tons per day, which is conservative. If it is true that 25% of the feed to the mill is in circulation as middling it would seem that improvement might be made. So far as my own work is concerned, I have found that much better results can be obtained with this jig by clothing it from end to end with heavy screen cloth with the same size openings throughout, large enough to pass the maximum feed particle, and making an artificial bed which is independent of feed variations.

W. O. BORCHERDT.

Austinville, Va., July 3, 1913.

Copper Precipitation Box

It seems worth noting that the copper-precipitation box illustrated in the JOURNAL of July 5, 1913, p. 18, is nothing but a zinc-shaving box as used in the cyanide industry, with the exception that the screens which support the shavings are omitted.

However, the advantages of this sort of box, whether originally discovered by a copper or a gold-metallurgist, cannot be too strongly urged. The producer of copper precipitate will be amazed, after beginning to use a box of this sort, to note how much higher will be the tenor of the precipitate recovered, which will save him freight and smelting tolls, and how much lower will be his iron consumption.

I would suggest this improvement, however. Make the box double ended, then when the iron is almost consumed in the first compartments, clean them, throw the scrap in the last compartments, fill up the first with clean iron, and reverse the direction of flow.

BLUESTONE.

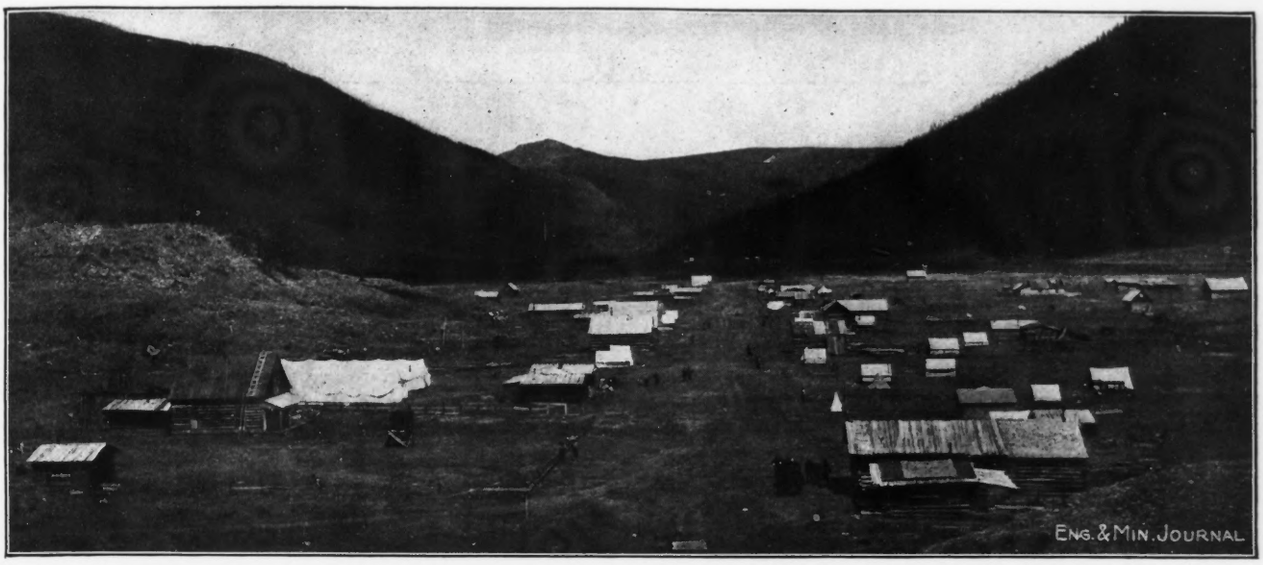
Wilmington, Del., July 7, 1913.

PHOTOGRAPHS FROM THE FIELD

LADY BELLE MINE IN THE NEWLY DISCOVERED SILVER DISTRICT, EAGLE, COLO.

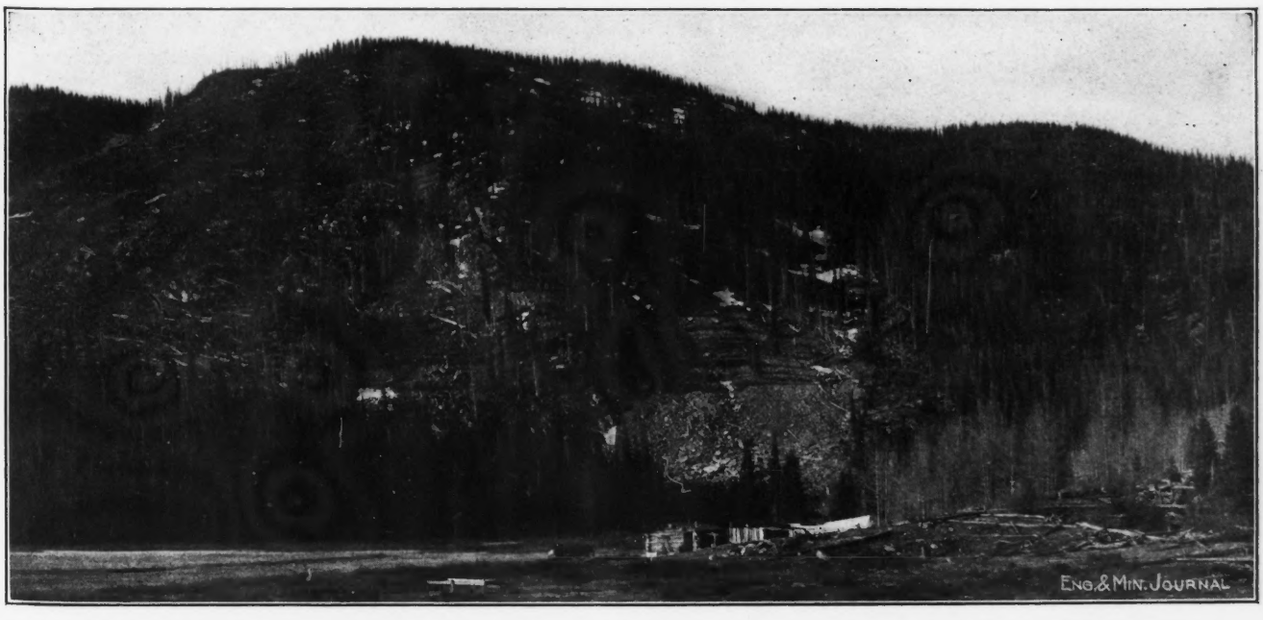
STUNNER, COLO., IN THE PLATORO DISTRICT, WITH NEWLY ESTABLISHED SAWMILL IN FOREGROUND

Photographs furnished by the Denver & Rio Grande R.R.



PLATORO, COLO., MAY 31, 1913, WHERE PROMISING GOLD DISCOVERIES WERE RECENTLY MADE

EAGLE, COLO. THE SILVER STRIKE AT THE LADY BELLE CLAIM WAS MADE SEVEN MILES TO SOUTH



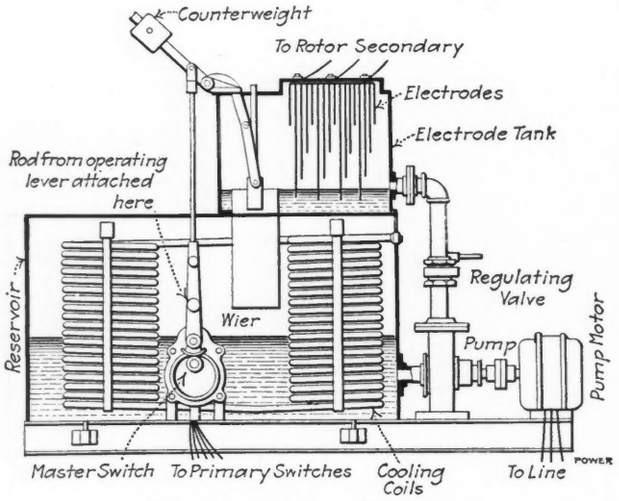
GILMORE, THE ACTUAL SITE OF THE FIRST OF THE RECENT DISCOVERIES IN THE PLATORO DISTRICT

Photographs furnished by the Denver & Rio Grande R.R.

Liquid Rheostats for Large Alternating-Current Motors

The use of large alternating-current slip-ring motors for mine hoists, has created a demand for a simple, efficient and economical controller. To meet this demand the Westinghouse liquid rheostat was developed. This rheostat provides an infinite number of steps between the minimum and maximum limits, thus permitting fine speed adjustments and smooth acceleration. The rate of acceleration can be definitely fixed and is independent of the rate at which the operator manipulates the starting lever, making it impossible to injure the motor or the machine it drives by too rapid acceleration.

As shown in the accompanying diagram, the rheostat consists of two compartments, an upper tank for the electrades, and a lower reservoir. The three phases of the rotor are connected to electrodes suspended in the upper tank. A small motor-driven pump delivers a steady stream of liquid, usually a solution of soda, from the reservoir into the electrode tank, and back into the reservoir over the weir. By raising or lowering the weir, the



SECTION THROUGH RHEOSTAT

height of the liquid in the electrode tank is correspondingly varied; the resistance in the rotor circuit decreases as the liquid level rises; and the motor speed increases.

The primary circuit of the motor is closed and opened by means of electrically operated switches, which are controlled by a master switch mounted on the rheostat. The operating lever of the rheostat controls both the master switch and the weir. When the lever is in the central, or off, position, the primary switches are open and the weir at its lowest level, so that the secondary resistance is at a maximum. Moving the lever in one direction closes the proper primary switches for starting the motor forward and raises the weir. Moving the lever in the opposite direction reverses the motor and also raises the weir. Speed control is secured by varying the position of the weir with the lever; the primary switches do not open until the lever is placed in the off position.

A valve in the intake pipe of the electrode tank regulates the rate at which the liquid is pumped in, so that no matter how quickly the operating lever is moved, the liquid can rise only at the rate for which the valve is adjusted, thus fixing the rate of acceleration. When the lever is returned to the off position, the weir drops and the liquid level promptly falls. Cooling coils in the reservoir prevent rapid evaporation of the liquid. The rheostats are made in capacities varying from 400 to 1500 horsepower.

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Broken Hill Proprietary Co., Ltd.

The Broken Hill Proprietary Co., Ltd., New South Wales, Australia, for the half year ended Nov. 30, 1912, reports that the gross profits were £177,594, which after deducting £12,691 for depreciation gave a net profit of £164,903 as against £186,884 for the preceding six months. During the period two dividends aggregating £144,000 were distributed. The sum of £29,341 was expended in construction during the half year.

The amount of ore mined was 120,839 tons, which would have been increased if sufficient labor were obtainable. Development work was retarded from the same cause. The regrinding section handled 88,364 tons of dump tailings yielding 3057 tons of lead concentrates. An improved method of feeding was introduced with satisfactory results as to working costs. The residue handled by the zinc-concentration plant amounted to 148,132 tons producing 42,003 tons of zinc concentrates.

The slime plant was only worked for about 2½ months as the zinc distillation furnaces at Fort Pirie could not treat more, owing to shortage of labor. During the period under review, 17,414 tons of slime were handled, producing 5472 tons of concentrate.

The smelting plant at Fort Pirie, during the half year, treated 100,605 tons of ore, flue dust, refinery drosses, etc., yielding 50,302 tons of bullion, which is a record production. The refinery treated 45,730 tons of bullion, producing 2,059,197 oz. of silver, 872 oz. of gold, 43,578 tons of soft lead and 362 tons of antimonial lead. The spelter plant, although not fully running, owing to want of labor, produced 1367 tons of spelter and 212 tons of blue powder. The output of lead for the six months was 49,052 and of silver 2,687,411 ounces.

Mechanical feeders were installed for charging the sulphur burners. The production of strong acid from the sulphuric-acid plant was 2503 tons, of which 429 tons were sold to other consumers, while 550 tons of acid were produced from the gases of the zinc roasters. An aërial ropeway was constructed for the conveyance of tailings from the zinc-concentration plant to the underground chutes with good results.

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Peruvian Mineral Production

The following figures of the mineral production of Peru for 1910 and 1911, are taken from Boletin 78, of the Cuerpo de Ingenieros de Minas del Peru, and are arranged in order of descending values of the 1910 production (quantities are given in metric tons, except when otherwise noted):

	1910	1911
Copper	27,375	27,734
Silver, fine, kg.	252,565	289 383
Petroleum	167,712	195,276
Vanadium ore	3,130	2,251
Coal	307,320	324,000
Gold, kg.	708	741
Salt	17,594	24,867
Borax	2,351	1,923
Lead	1,866	2,209
Bismuth, refined	24	24.5
Tungsten ore	12	48.5
Quicksilver, kg.	350	560
Antimony	49	.....

EDITORIALS

Copper at the Midyear

We have often pointed out that the copper statistics considered month by month are unreliable as an indicator of the trend of things. Considering the statistics quarterly, the disturbing factors are ameliorated and we become able to obtain a fair idea of the situation, although, of course, with no such certainty as we can upon the basis of the annual figures.

Considering the American statistics for the first half of 1913, and using round figures, it appears that the refinery production in the first quarter was 410,000,000 lb.; in the second quarter, about 398,000,000 lb. The average quarterly production in 1912 was about 395,000,000 lb. The decrease in the second quarter of 1913 is attributable to the labor troubles at the Nichols refinery during June.

The smelters' production in the first quarter of 1913 was about 402,000,000 lb.; in the second quarter, about 409,000,000 lb. Their average quarterly production in 1912 was about 413,000,000 lb. By the "smelters' production" we mean all of the crude copper that comes to the American refiners.

It appears consequently that primary production, i.e., the copper as reported by the miners and smelters, has been going on in 1913 at a less rate than in 1912. On the other hand, the refiners' figures show a larger rate in spite of the recent check at the Nichols refinery. The reason for this is that the refining of the smelters' production in 1912 was delayed, which was freely discussed at the time, and during 1913 the refiners have been catching up. There may be still some surplus of crude copper at the refineries, but the quantity ought no longer to be considerable and before long the refiners' figures ought to fall into step with the smelters'.

Turning now to the deliveries, it appears that the shipments to domestic consumers in the first quarter were about 201,000,000 lb.; in the second quarter, about 228,000,000 lb. The average quarterly domestic deliveries in 1912 were 205,000,000 lb.

The foreign deliveries in the first quarter of 1913 were 210,000,000 lb.; in the second quarter, 222,000,000 lb. The average quarterly delivery for export in 1912 was about 187,000,000 lb.

The statistics of deliveries look peculiar in view of the talk that we have been having lately about contraction in consumption. There has been such talk ever since the first day of January. The prophets of recession have foretold that each month's reduction of stocks would be the last. When the May figures were out they spoke approvingly of them, but shook their heads and said: "Just wait until you see the June figures." Now that the June figures are out and look good, they are saying, "Wait until we have the July figures, a month hence."

During the first half of 1913, the consumption of American copper has exceeded the supplies to American refineries by 50,000,000 lb.; stocks of refined copper have been largely decreased and also the stocks of standard copper reported from Europe. The excess of the second quarter has been greater than that of the first. Yet the price for copper has declined to the lowest point of the year and such pessimism prevails in some circles as might be explained by the belief that within a few weeks the brass makers, wire drawers and sheet rollers are going to cease using copper. This pessimism obtains extensively among traders and an occasional producer, but it does not extend, we think, beyond one or two of the big agencies, although all of them are disturbed, no doubt, in that buyers do not buy. In view of the general situation in the world's markets it is but natural, however, that buyers should defer their necessary purchases until the last possible moment.

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The Witwatersrand Strike

The strike of the white miners on the Witwatersrand, which is gradually subsiding, but is not yet entirely over, will temporarily reduce the gold production of the Transvaal, which had been, up to the end of May, heavier than ever. The strike was the outcome of discontent with existing conditions which had existed for some time past, and might have been expected at any time. The alleged cause—the discharge of a few men from the Kleinfontein mine—was really trivial, and could have been arranged easily, had there been no underlying reasons. The wages of miners on the Rand have apparently been fairly good in comparison with other districts, but they have been coupled with a very high cost of living and with other conditions tending to make life undesirable. Prominent among these has been the unhealthy condition of many of the mines and the prevalence of miner's phthisis and other occupational diseases. Some companies and many managers have been trying to improve the health conditions, but with little success so far.

Besides these, there has been the demoralization due to the employment of a great body of workmen of an inferior class or race. This has been unavoidable if the mines were to be worked at all; but the use of a class of workmen who were, temporarily at least, in a condition approximating slavery, could not fail to have an unfavorable effect on all labor of a higher grade. It made discipline difficult and always suggested the idea that the negro was the main cause of lower wages and bad conditions; while it was difficult to attract to the mines the better class of men, who will not, if they can help it, work with a host of inferiors.

All of these causes, and perhaps others, worked together to produce a feeling of discontent and of bitterness against the large companies which control the mines. The Transvaal is a country of large mines, where there is little opening for individual effort, and employment by one of the large companies is the only opportunity.

The violence accompanying the strike and the conflicts with the police and soldiers seem to have been due, in

part at least, to the presence in Johannesburg of a number of unemployed men, some of whom ascribe their condition to the general use of negro labor, while many others are adventurers who are ready to take a hand in any disturbance which may offer a chance of profit or temporary license. The strike is approaching its end for the present, but some time will be required to put matters on a better basis which will give promise of permanency.

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Air Hose

It is sometimes difficult to ascertain how far current engineering practice is based on experiment and reason, and how far it is merely inherited tradition, unproved and often unwise. Occasionally a skeptic discovers some surprising facts. For instance, it has long been supposed that for air drills underground, armored hose was necessary, the wire windings being applied to resist wear and abrasion. Observation and analysis will show that the armoring is a nuisance. Armored hose in ordinary mine use soon becomes badly distorted either by short kinking or by being crushed, and, though the fabric may be still intact, the air friction passing the strictures is soon excessive. A dent, once occurring, can hardly be straightened out again. Furthermore, to cut and patch the hose in such case, or if it be punctured, is a vexatious job, as the wire winding gives trouble.

Mr. Catlin, of the New Jersey Zinc Co., noting this trouble, adopted a hose similar to that used for air couplings on railroad trains, with a heavy fabric to stand the pressure, protected by thick rubber on the outside, on the principle of an automobile shoe. Such hose is not injured by short kinking nor is a stricture formed by rock falling on it, and should it be cut by a blast it can be quickly mended. A length of this was coupled to a length of armored hose and put in service in the South Mine opencut, at Franklin Furnace, in February, 1908. It remained in continuous service until September, 1912, while the armored hose connected with it had to be renewed every few months. In fact it outwore so many lengths of the latter that count was lost.

The material broken here was not particularly hard and sharp, and it is possible that in a quartzose mine the wear on rubber might be so excessive as to make armoring advisable. However, we are inclined to think that the idea of armored hose being necessary for rock drills is a superstition in the same class with the belief that dynamite in exploding exerts all its force downward.

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Respecting Some Trust Busting

The disclosure in Washington last week that the resolution constituting the Stanley committee to investigate the Steel Corporation in 1911 was in fact framed by one David Lamar, whose character is best indicated by his notorious sobriquet of the Wolf of Wall Street; and was hawked about in New York for stock-market purposes for several weeks before its introduction in Congress; threw a ray of light into the minds of the altruistic legislators of Capitol Hill. The Hon. Mr. Stanley was innocent, no doubt; he was simply "taken in."

That the shaft went home was manifested in the remarks of a gentleman from Texas a few days later, in the course of which he indulged in some animadversions upon the disingenuousness of Mr. Untermyer, who steered the Pujo committee. In about the same time Elbert Hubbard has been discoursing upon Mr. Brandeis, who almost attained a seat in the cabinet.

The upshot of it all is the awakening of the statesmen of Wisconsin, Oklahoma, etc., to the realization that "trust busting" is not always what it seems. The polyonymous Lamar's confession will give the people of the country some information respecting the attacks against the Steel Corporation and the motives behind them, and may lead them to inquire along with the New York *Sun*: "How far has the Congressional fury against great corporations been a supposed concession to popular sentiment? How far has it been fanned and exploited by the chevaliers of industry?"

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Right-of-Way in Mining

An interesting piece of litigation is now pending in Arizona, between the Inspiration Consolidated Copper Co. and the New Keystone Copper Co. The Inspiration Consolidated was formed by the combination of the old Inspiration company and the Live Oak, the properties of these constituent companies being separated by that of the New Keystone. This separation was manifestly disadvantageous to the Inspiration Consolidated, and that company sought to buy the Keystone property, but it proved impossible for the two parties to agree upon terms.

Among other things, it is necessary for the Inspiration Consolidated to have a main haulage gallery connecting the two divisions of its property. A few months ago it was discovered that the Inspiration Consolidated was driving such a gallery through the Keystone ground and under the Keystone orebody, without having obtained authorization from the New Keystone company. The latter immediately obtained an injunction, restraining further work, the final hearing upon which has not yet been held. In the meanwhile the Inspiration Consolidated has brought suit to condemn a right-of-way through the Keystone ground.

Some unsettled points of law are involved in this case. In the late litigation at National, Nev., which was recently reviewed in the JOURNAL, it was held by the court that, although the law of the apex gave the owner of the apex of a vein the right to follow it outside of his side lines, there was no right conferred to take anything but the vein. In this case, the vein was very narrow, and in order to extract it some of the back claims' country rock had to be extracted, which was held to be illegal. Consequently, although the owner of the apex won its suit, it was, nevertheless, obliged to buy the back claims in order to be able to secure what the court had declared to be its own property.

Opposed to this principle of law are the statutes of several states, which, under certain circumstances, confer upon mining companies the right of eminent domain. Apparently, the Inspiration Consolidated is proceeding under the terms of such a statute. It is doubtful, however, whether such a statute is constitutional, and it may consequently remain for the United States Supreme Court ultimately to decide. There are some nice points of law herein, and altogether the case is interesting from both the legal and the practical standpoints.

BY THE WAY

Experts should avoid stepping outside their own special lines. A well known physician in New York, who died recently, left among his nominal assets 36,000 shares of mining stocks, the list including such choice properties as San Juan Gold, Goldfield Century, Heart of Goldfield and Red Elephant. The official appraiser lumped the whole lot as "of no value." The doctor evidently could not diagnose the case of a mining company.

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In Madagascar there is no commission to revise rates downward, apparently; in fact, there is only one railroad and that belongs to the government. It is 229 miles long, from Tamatavo to Tananarivo. An express passenger train runs twice a week, taking 15 hours for the run, an average of 15.3 miles an hour; on other days there is a mixed passenger and freight which runs at an average rate of 6.3 miles an hour, taking 36 hours for the trip. First-class passenger fares are 6.2c. per mile, though a third-class passenger can ride for 1.24c. per mile. Freight rates vary from 1.5 to 18c. per ton-mile.

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In the JOURNAL of Apr. 19, 1913, we related circumstances of the cruel killing of Boris Gorow by Mexican rebels Our story of this led to the matter being brought to the attention of the Department of State. J. B. Moore, counselor of the department, writing in behalf of the Secretary of State, communicated the following letter to a reader of the JOURNAL who interested himself in the matter:

In further reply to your letter of May 9, transmitting a published account of the murder of Mr. Boris Gorow by Mexican bandits, you are informed that the Department is in receipt of a report from the Consul at Mazatlan in which it is stated that the account of the death of Mr. Gorow which you forwarded to the Department is substantially correct. The Consul adds that he is informed that the two persons who were arrested for this murder escaped from jail.

The Department has instructed the American Embassy at Mexico City to bring to the attention of the appropriate authorities the circumstances connected with the murder of Mr. Gorow, and the reported escape of the persons arrested therefor, with an urgent request that immediate measures be taken looking to the apprehension and punishment of the persons guilty of this crime.

Boris Gorow was a Russian prince, who having been exiled from Russia came to the United States and in due course of time became naturalized as an American citizen. His murder was one of the crimes that have been committed in barbarous Mexico. The stories of many others have not been told.

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In accordance with the recently amended act requiring all mining and other property to be assessed at the "cash value," the Arizona Tax Commission has been sending out blank forms to all owners of mining property for a statement of the gross and net value of the products, the assessed value being based on 12½% of the gross and four times the net value of the products. Complete reports have been submitted by most of the large companies. Occasionally no figures are submitted, as explained in the following reply from an owner in Mohave County:

Gentlemen—Your Elaborite and Finished Product of the Printer, named Statement of the Gross and Net Products of holes in the ground, at hand and noted, I take it that the Law and Your Request applies to Producers, and as I have no mining property that ever produced anything but Assessments I construe it that I am exempt from its Force and Effect. I am somewhat interested in holes in the rocks that have cost something like $40,000 to explore, but no dividends or even gross proceeds marketed. I am very sorry that this is so, as I would be very glad to have something for you to tax, then I might expect some revenue, but the ways of the pay shoot is devious and past finding out by the treasure seeker without means. I have no patented wildcats or producing claims on the sandy Public Domain. I don't understand this law to apply to anything I claim, or of any kin of mine, maid servant or uniformed keeper of the gate. Understand I am not in contempt of the great majesty of the law; it is exceeding great, but I am not as yet in the Income Tax column, like our friend Rocky Fellow and Ca-negie. Hope the State will find some way of taking my wildcats over and seperating me from any further worry of raising assessments. I Remain,

STILL A DIGGER WITH HOPES LONG DEFERED.

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The mining industry is often accused of slackness and wasteful methods. The mechanical engineer in particular is accustomed to hold up his hands in horror at the power installations of the average small mine. This criticism is mostly undeserved and is the result of ignorance on the part of critics as to how uncertain and temporary an affair mining is bound to be. But sometimes we must plead guilty. One J. H. Stretton, writing in *Power,* June 24, 1913, gives an account of some funny things he saw when he had no gun. On a ramble through Nevada County, Calif., he stopped to look at a compressor plant that had just been installed for a mine on Deer Creek. The compressor was direct-connected to a waterwheel. Mr. Stretton watched them make a trial run, shut down to repair leaking pipes and start again against the full air pressure, a matter of some difficulty, accomplished by opening the gate slowly until the water from the nozzle could turn the machine over against 100 lb. of air. His suggestion that a relief device be installed to permit starting the machine against atmospheric pressure was met with the remark by the superintendent that the man who had put in the plant had made a business of that for several years and he guessed that if he could not do it right, nobody else could. It developed that later, starting under the same conditions, they wrecked the waterwheel and compressor and removed part of it at high velocity to the other side of the creek. Still more remarkable was the unique design of a first-motion hoist that he happened upon, as he says, about half way between Grass Valley and the mining camp of Rough & Ready on the righthand side of the trail. The hoist had a vertical, single-cylinder engine that was bought, the rest was home-made; the drum was originally the spool on which the hoisting cable came; the throttle was an ordinary globe valve, so placed that the engineer could not reach it, without leaving the brake and clutch levers. To hoist he had to bring the engine up to fair speed, throw in the clutch, release the brake, jump for the throttle, give the engine more steam and then help on the flywheel until things were going. In conversation he remarked that he always wondered, when hoisting, whether he could get the men to the top without the hoist going to pieces. It appears that if he did not get to the throttle before the engine stopped, he had to jump back and apply the brakes or the car would drop and hurt somebody underground. Apparently all Nevada County mining is not up to the standard of the Empire and the North Star.

Miners Strike on the Rand

The strike of the white miners on the Rand, after raging about a week, is probably in process of successful settlement as we go to press. It was a strike of unusual virulence, and was apparently almost unexpected. The first intimation of trouble was contained in press dispatches of July 1, stating that the miners had voted to strike on July 6; dispatches of the next day, however, reported the strike as having broken out with violence.

The dispute arose out of a simple question of working hours at the New Kleinfontein and spread thence over the whole district. The original strikers were placated by the mine owners, who conceded their demands as regards working hours, but a new dispute arose because the owners refused to displace the men who had worked during the strike or to recognize the union. A general strike was called by the leaders and the men responded. Some fear was felt that a sympathetic strike might bring out the railroad employees and the electricians of the power plants, but this apparently did not occur. Fierce rioting, however, took place and the Governor-General, in response to a request, is reported to have sent in 3000 troops. Martial law was declared, and to judge from the reports the city of Johannesburg became a veritable battlefield with hourly encounters between the strikers and the troops taking place. In the actual fighting, the strikers always got the worst of it, and suffered large losses, but their resistance was so stubborn that the government sought a compromise, and a meeting between representatives of the mine owners, the men and the government was arranged, at which General Botha presided.

A settlement was then arranged on the following terms: (1) The strike to be declared off, the men to return to their homes, no further disturbances or destruction of property to take place; (2) the New Kleinfontein strikers to be reinstated, the strike-breakers not to be victimized and to receive compensation from the government; (3) the strikers in the other mines to be taken back to work as operations were resumed and not to be victimized; (4) representatives of the miners to be at liberty to lay other grievances before the government, which would make investigations. Unfortunately, as often happens, the men refused to abide by the decision of their leaders and only a part of them returned to work. Compensation for the "martyrs" shot by the troops was demanded, and the rioting continued to some extent. The final outcome remains in doubt, but it seems probable that the government, acting with many of the strike leaders, should be able to end the trouble soon.

The total number of casualties is estimated at 110. During a few hours of the fiercest fighting, it is reported that 60 were shot. The city and district are still in a state of terrorism. Many white citizens are under arms and are guarding the residences of the wealthy classes, where it is feared that the miners will use dynamite. An extremely keen source of anxiety is the great number of natives, some 250,000, now under close guard in their compounds. If they should be liberated and looting should begin, it is difficult to say what the end might be. The Rand club was a special point of attack, as being composed largely of mine owners. It was partly demolished in one raid. The Union club also suffered to some extent. The Wernher-Beit & Co. headquarters were attacked at one time. The weapons of the strikers were partly obtained by looting a gunsmith's store. No street cars are running in Johannesburg and no railroad trains are being moved. An agreement was reached between the newspapers and the trade unions, providing that no papers should be issued other than a sheet got out by the printers' union, which gives an unprejudiced account of the events taking place.

It is a good many years since there has been so savage and bloody a strike in the metal-mining industry. It is customary over the world, especially in other English-speaking nations, to assume that such violence and lawlessness are possible only in the United States. Here, in what is in many ways one of the most British among the British colonies, is an example that it would be hard to match in recent American history. We may expect the usual crop of statements that the trouble all started with irresponsible agitators from the United States.

The Beatty-Guggenheim Case

A brief note in our issue of July 5 announced the decision of the New York Supreme Court against the plaintiff in the case of Beatty vs. Guggenheim Exploration Co. The suit was brought by the plaintiff to recover $54,000 in cash, 23,000 shares of the Yukon Gold Co., and—on tender to the defendant company of the cost of said shares, about $2 per share—40,000 additional shares of the Yukon Gold Co. Plaintiff also asked $225,000 damages for the non-delivery to him of said stock. It appears that the money and the stock were held by the defendant company for delivery to O. B. Perry, but the Guggenheim Exploration Co., having learned that the stock was to go from Perry to the plaintiff, Beatty, withheld its delivery on the ground that Beatty was employed as its agent, and while so employed became interested with Perry secretly in the ownership of certain mining claims in Alaska and increased the price of them and the commission paid in order that he might obtain a share for himself. The defendant company therefore claimed that it was entitled to all profits made by the plaintiff through what was claimed to be a breach of his fiduciary relations. Perry, who was made a codefendant, took a neutral position and made no claim to the shares, leaving the court to decide as to the legal ownership.

The case was heard by Justice Gerard, and the elaborate opinion which he has filed gives a rather interesting history of the case from the evidence accepted and the point of view taken by the Court. The first part of the decision goes fully into the contract, made in 1903, between A. Chester Beatty and the Guggenheim Exploration Co., and to subsequent action thereunder, establishing the acceptance and understanding of its terms. It is not necessary to take this part up in detail; simply to say that the Court holds plaintiff's position as an agent and employee of the company, holding in such capacity confidential relations with its management. As such there appear to have been for a time no differences and a clear and satisfactory understanding. The plaintiff made certain investments in mining property on his own account, but in all cases with the full knowledge and consent of his employer.

These conditions persisted, according to the narration of the Court, until the Yukon properties came into ques-

tion. In 1905 one Erbsloh appeared upon the scene and gave the Exploration Co. the information that A. N. C. Treadgold, who had been prominent in the early days of the Yukon excitement, had acquired a number of claims on Bonanza Creek, where the first important gold discoveries were made, and had a plan for working them as a whole, in which he wanted to interest capital. Erbsloh's role was confined to the conveying of the information or suggestion, and he appears no more in the narrative. The company did take an interest in the suggestion and it was referred to its consulting engineer, John Hays Hammond, who was at San Francisco at the time, as was also the plaintiff Beatty. Hammond and Beatty consulted together and also conferred with the silent defendant Perry, who had an office in San Francisco and was a mining engineer with much experience in placer mining and apparently some knowledge of the Yukon. An agreement was made under which Perry received $25,000 for examination and prospecting expenses, with the promise of an interest in any property which might be bought on the strength of his recommendation. This, however, was only temporary and was subsequently terminated when the negotiations for the Bonanza Creek properties were begun.

It appears that Treadgold gave the company an option on the property owned by him. He owned 25% of the claims on Bonanza Creek and controlled 25% more. Perry went to the Yukon in June, 1905, and telegraphed back in July that the business could be arranged for $250,000. The company was not willing to advance this without further examination, and Beatty was sent to the Yukon in August. He reported back that besides the Treadgold property, 30% more of Bonanza Creek claims could be secured, besides a large extent of hill ground which could be worked through the creek claims; that $300,000 would be required immediately, with $300,000 later; that he estimated the whole property would return $12,000,000. On the strength of this he was authorized to expend $300,000 in the purchase of claims. The company, however, thought that Treadgold wanted too much, a 40% interest, and was not willing to promise over 30%; moreover, it preferred to close the negotiations with him in New York. About the end of August, Beatty again telegraphed the company, reducing his estimate of return to $9,000,000, receiving in return a despatch saying that "business is not attractive on the basis of money returned and $9,000,000 profit, in view of terms of promoters. Therefore, do not commit us to deal on that basis." The court calls attention to the point that neither in this telegram nor any other put in evidence did the company withdraw its authorization to spend $300,000 to protect the situation. The plaintiff, however, claimed that his understanding was that the last telegram terminated the transaction, and he telegraphed back, "Cannot buy independently."

Here began the series of transactions to which the opinion of the court takes exception. The court says that on Aug. 29, 1905, Beatty and Perry entered into an agreement to buy claims 89 to 104 below discovery on Bonanza Creek, which were outside the Treadgold option. Through their claims the hill ground could be satisfactorily worked. In fact, these claims formed the key to the situation, and could have been secured for the company under the $300,000 authorization. From the evidence it appears that Perry and Beatty discussed them as the basis of a "small dredging scheme." To enable Perry to secure these claims, Beatty caused to be sent by his brother in New York, who was not in any way connected with mining, the sum of $15,000 and later $20,000 additional. These sums, the plaintiff claims, were loans to Perry to enable him to buy the claims as stated.

Later Perry and Treadgold came together again, and the claims 89 to 104 below discovery were placed under option to Treadgold, Perry advancing the money for the purchase, it being agreed that for each $1 advanced he should receive $1 in cash, plus $1 in preferred stock and six-tenths of a share of common stock in any company that might be formed. Plaintiff claims that the managers of the Exploration Co. had notice of these transactions and of his loan to Perry, but the court holds that there was no such notice or information given. Finally Perry and Treadgold came to New York and concluded a deal under which the Exploration Co. took the property concerned, and based on them the Yukon Gold Co. with a capital of $3,000,000 preferred and $5,000,000 common stock; also the Northwest Hydraulic Co., the latter to take over properties which might be acquired in the future, and not appearing in the present action at all. Treadgold received a large amount of stock, but the terms of his contract are not material to the present proceeding. Perry accepted as compensation for his services in examining the property and conducting the negotiations, an engagement as manager for two years at $15,000 a year; 4% of the preferred and common stock of the Yukon Gold Co., with an option of purchasing at cost 4% additional and 2% of the stock of the Northwest Hydraulic Co. It further appears that Treadgold besides the 30% of the stock which he received, was to be paid back what he had spent on the property, and for the claims 89 to 104 on lower Bonanza he did receive $205,000, though the actual cost was $160,000; the $45,000 additional being the profit to Beatty and Perry for advancing the money. This $45,000 he paid over to Perry and it is part of the money which plaintiff sought to recover in the present action.

On the Treadgold agreement the court makes no criticism, nor would the agreement with Perry be questioned if it had been solely for his own benefit. The point now criticized is that by a private agreement Beatty was to receive 1¼% of the Yukon Gold Co.'s stock, Perry retaining 2¾% for himself; while of stock on which an option was given Perry was to take only one-fourth and Beatty the other three-fourths. This private agreement, the court holds, is evidence that the transaction was not known to the company nor made with its consent. If it had been so made, there was no reason why Beatty's compensation should not have been openly expressed. Perry testified that he would have been satisfied with 2¾% of the stock, but asked 4% in order that he might settle with Beatty. It was claimed that John Hays Hammond was informed of the transaction, but the evidence showed that all Mr. Hammond knew of it was that Beatty had loaned Perry money; and even if he did know more, such knowledge did not constitute legal notice to the company. Some illumination is cast on this question by the fact that the plaintiff after accompanying the president and another director to the Yukon in 1906, called attention to the fact that he had advanced money to Perry and thus made it possible to put through the

transaction and asked that in return he be given an option to buy 180 shares of Guggenheim Exploration stock at $200 per share. As the stock was then selling at about $310, this was equivalent to a present of $20,000. After some objection the request was granted. "It is inconceivable," says the judge, that this would have been granted if he had disclosed to the company the great profit he had made out of the Yukon deal.

The court goes at considerable length into the law governing the relation of principals and agents and finds no deviation from the absolute rule that the agent is stopped from acquiring for himself any interest in the property which he is directed to purchase for his principal, or from seeking any profit in the transaction beyond the salary or commission due him by agreement with the principal.

This rule is held so strictly that no inquiry is permitted into the fairness of the purchase or the terms on which it is made. Moreover, if the liability of the trustee or agent depends upon disclosure of his transactions, such disclosure must be made in full, and it is not sufficient for the trustee or agent to say that he had given sufficient information to put the principal upon inquiry. There is no question of the fact that the plaintiff went to the Yukon as an agent for the company, by its direction and in its employ; and no question that as agent he had been liberally treated, though that does not affect the decision in the case.

The opinion of the court, in conclusion, sums up the reasons for its decision against the plaintiff as follows:

"The Guggenheim Exploration Co. has never, with full knowledge of all the facts of the transaction, waived any rights that it has. The plaintiff, who was sent to the Yukon in order to negotiate for the Guggenheim Exploration Co. with reference to the purchase of certain claims, had no right, under the circumstances of this case, to become interested himself in the purchase of these claims or of any of them, and the Guggenheim Exploration Co. cannot be required to pay over to the plaintiff any part of the stock or money claimed in this action, which stock or money is profit made by the plaintiff out of the purchase of these claims by himself in partnership with Perry, because of the fact that he, the agent of the defendant company and acting in a fiduciary capacity for it, was sent to the Yukon for the purpose of negotiating for the purchase of these claims."

If Justice Gerard's deductions are correct—and the decision seems to be carefully worked out—the plaintiff seems to have allowed the hope of large and immediate profit to overbalance all other considerations. Or, perhaps, the "lure of the Yukon," about which the poets and novelists have written, was strong enough to overbalance his judgment.

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Ojibway, the New Town of the Steel Corporation

Ojibway, the site of the big new plant of the United States Steel Corporation, on the Detroit River, just below Sandwich, was officially born on Dominion Day, July 1, when it joined with the rest of Canada in celebrating the federation of the various provinces which make up the Dominion. A cottage has been dignified with the title "Town Hall," and on Tuesday a new Union Jack was floated from a high pole in front of the hall, rented from the Steel Corporation as the temporary seat of government. There Mayor Wollatt and the four councilmen held a public reception. A number of visitors from Detroit, as well as from Windsor, Walkerville and other Essex County towns, participated in the celebration. Ojibway consists of 1650 acres and the mayor extended the "freedom of the city" to the visitors. At its first meeting, the council will plan sewers and drainage and other improvements, to include a fine harbor on the most modern lines. The population of the town is now about 1500, mostly farmers.

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New England vs. Mining Investments

Hayden, Stone & Co., possibly inspired by a recent article in the JOURNAL, has published in its weekly bulletin the remark that the argument has frequently been advanced that New England investors should invest their money at home instead of seeking Western mining enterprises. Capital, however, is influenced not by sentimental considerations, but by the dividend return which it can obtain, and in the past year or two the shareholders in some of the Western mining companies have fared better than the shareholders in what were formerly considered some of New England's soundest investment corporations, as appears in the following table, showing the changes of the past year, in the rate of dividend payments made by some of the leading home industries and mines in which New England capital has been interested:

New England investments:

	Dividend Reductions	Net Loss to Shareholders
Boston & Maine	4% passed	$1,580,120
New Haven	8% to 6%	3,600,264
Arlington Mills	8% to 4%	320,000
Draper Co.	20% to 12%	480,000
New England Cotton Yarn (com)	7½% passed	292,500
Total		6,272,884

Mining investments:

	Dividend Increases	Net Gain to Shareholders
Calumet & Arizona	$4 to $5	$599,383
Chino	Began $3	2,507,400
Homestake	6% to 7.8%*	452,088
Nevada Consolidated	50c. extra Dec., 1912	1,000,000
Ray Consolidated	Began $1.50	2,174,652
Total		6,733,523

*Also paid 15% stock dividend.

"Moreover, it is noticeable that every one of these New England companies has been subjected to either legislative and public hostility, or the fear of tariff revision. The mines have no occasion to dread any reduction in the tariff, as there is no duty on copper or gold, their income is not limited by the rulings of any government commission, as the market for their product is entirely open and competitive, and there is practically no danger of any suit being entered for dissolution under the Sherman law. Is it any wonder that harassed capital is finding the shares of the well managed Western mines more and more attractive as investments?"

In these remarks we concur. It may be pointed out that the mining dividends ought not to be figured wholly as income, but partly as return of principal. However, the present trouble of the Boston & Maine railway results from previous distribution of principal in dividends, and after all there may not be so much difference in that respect among mines, and railways and cotton mills as is commonly thought.

PERSONALS

Robert J. Kerr, of New York, has sailed for England for a short trip.

Philip L. Foster has returned to New York from a short trip to Colorado.

W. A. R. Brockway, operating in the Helvetia district in Arizona, has gone to Los Angeles.

Fredrico Stallforth, of the House of Stallforth at Parral, Chihuahua, Mexico, is in New York.

Bulkeley Wells, of Telluride, will make a trip abroad for recreation before returning to Colorado.

J. E. White, of the Yucca Mining Co., has returned to the mines in Arizona after a visit to Los Angeles.

Kirby Thomas, of New York, will be in Ontario during July on examinations in the Sudbury and Cobalt districts.

C. Ivan Murray has accepted a position as metallurgical engineer with the Pittsburgh Electric Furnace Co., Pittsburgh.

F. G. Clapp, managing geologist of the Associated Geological Engineers, sailed for Europe on June 24 for professional work in Hungary.

C. B. White is superintendent of the Idaho-Alamo Mines at Three Forks, B. C. These mines are owned by John A. Finch and associates of Spokane.

Sir Starr Jameson has been elected to the presidency of the British South Africa Co., rendered vacant by the death of the late Duke of Abercorn.

H. H. Armstead, president, Mexican United Co., sailed from New York for Vera Cruz, July 10, to make an inspection of the company's property in Guanajuato, Jalisco and Tepic, Mexico.

T. Walter Beam recently returned to Denver, Colo., from the Similkameen district, B. C. He is prospecting with the diamond drill a group of mineral claims in Hedley camp, Similkameen.

Chas. A. Banks, manager for the Jewel & Denero Mines, Ltd., operating a gold mine and stamp-mill in Long Lake Camp, Boundary District of British Columbia, has returned from a visit to England.

F. Z. Nedden, of London, England, has been appointed engineer in charge of the centrifugal pump department of the Goulds Manufacturing Co., Seneca Falls, N. Y. He has had much experience in Europe.

James Finlay, for several years actively connected with the management of the Sullivan mine and smelting works in East Kootenay, B. C., is now manager of the Maple Leaf coal mine, near Frank, Southwest Alberta.

A. L. Gatsinger, of New York, is spending some time on the property of the Dividend-Lakeview Consolidated Gold Mining Co., Ltd., on Dividend Mountain, Osoyoos mining division, British Columbia, in which property he is interested.

H. F. Wierum has gone to Coram, Calif., to make preparations for the trial of the Hall process at the Balaklala works, but the beginning of actual tests will have to be deferred until a suitable gas producer for making gas from oil can be installed.

Albert I. Goodell, formerly manager of the copper smelting works at Boundary Falls, B. C., and afterward of the Le Roi Mining Co.'s smeltery at Northport, Washington, is now manager for the Idaho-Continental Mining Co. He represents the Ryan interests.

OBITUARY

Charles F. Hoffmann, who died at his home in Oakland, Calif., June 20, was one of the older generation whose work was perhaps less well known to younger men than it deserved. Born at Frankfort-on-the-Main in 1838, he was one of the pioneer engineers of the Pacific coast, and in particular he was a large factor in laying the foundation of American supremacy in topographic surveying. Trained at Freiberg, he obtained his first practical experience as topographer of the Lander's expedition and J. D. Whitney found him in California, 24 years of age and eager for a new task, when the California Geological Survey was organized. As a member of its staff he was associated with Whitney, King, Brewer, Ashburner, Gabb, and others whose names are now well known. Whitney ranked Hoffmann with Brewer as the best of his staff, and he placed in his hands all the topographic and cadastral work of the survey. As a result, Hoffmann was the engineer who developed the methods that have proved of such wide usefulness. He was able to reconcile the accuracy of engineering to the conditions under which geologists must work, and combined a well controlled base with sketched detail. After the disbanding of the California survey corps, Hoffmann spent two years as a professor at Harvard and then turned to mining, and he was for many years associated especially with gravel mining in California. He examined and reported on many of the more important properties of the Pacific Coast from Alaska to Mexico and also made pioneer studies in Siberia and the Argentine. Later he engaged in actual operation. For years he was engineer and manager at the Red Point mine in Calaveras county, long the largest drift mine in the state. His four sons, George, Jack, Karl, and Ross, have all followed him in the profession and in South Africa, Mexico, and Siberia, as well as in North America.

William Penn Miller, who died June 14 in San Francisco after a lingering illness, was one of the most widely known mining engineers of the Pacific Coast. Born in Philadelhia in 1837, he obtained his engineer's degree from the Polytechnic College of Pennsylvania in 1856, and he engaged for a few years in the anthracite coal fields of Pennsylvania, where his father was a pioneer operator. In 1861 he went to California and entered upon a career which carried him into every mining district of note throughout the Pacific Coast. In the early days of the Central Pacific railroad, Mr. Miller became connected with that enterprise as contracting engineer and division superintendent. In 1871 he went to Arizona, where, after considerable success with various mines he discovered and developed the rich lead-silver mines of Castle Dome, which he operated successfully until, in 1880, associated with the late William P. Blake, he organized a company in New York to take over the mines and establish a smelting and refining plant at Melrose, Calif., of which plant he was manager during the life of the company. During Mr. Miller's individual operation of the Arizona properties he established, about 1874, a small smelting furnace at San Francisco. During his experience with Castle Dome ores, Mr. Miller developed and put into successful use the present form of inverted siphon for connecting furnace crucible and outer lead-well. The past 25 years of Mr. Miller's life, previous to his illness, were devoted to active work as examining and consulting engineer in various fields of mining and metallurgy, during the course of which work he added largely to the general store of knowledge of mining geology and vein formation, and the treatment of ores. In 1891, during the infancy of the cyanide process, appreciating its possibilities as a means for recovering gold and silver from the slimes, after exhaustive laboratory work and experimenting, he was granted patents covering the application of agitation and filtration to slime treatment. Owing to lack of economically operated filtering appliances, such as have since been evolved, he was unable at that time to put his invention into practical operation.

SOCIETIES

Kansas State School of Mines and Metallurgy—A number of students from this school accompanied by Superintendent B. L. Wolfe, Profs. E. C. O'Keeffe and A. W. Young, inspected the mines, smelteries and mills in the mining district around Joplin, Mo., and in southeastern Kansas, during the first week in July.

Utah Society of Engineers—The regular monthly meeting, usually held in Salt Lake City, took place June 21, out of town in Ogden cañon, at the Hermitage, a summer inn. A paper on "Electric Traction" was read by C. P. Kahler, electrical engineer for the Oregon Short Line. Following the reading of the paper, dinner was served to the members and their families.

Lake Superior Mining Institute—Secretary A. J. Yungbluth has announced that the meeting this year will take place on the Mesabi range on Aug. 26-30. The arrangements are now being made by the general committee at Duluth and the program will be announced soon. A report will probably be made by the committee on "Mining Methods on the Mesabi Range" appointed by the president of the institute in the past year. It consists of Willard Bayliss, Chisholm; E. D. McNeil, Virginia, and J. S. Lutes, Biwabik.

TRADE CATALOGS

Myers-Whaley Co., Knoxville, Tenn. Bulletin No. 3-1913. Shoveling machines. Illus., 26 pp., 10½x8½ in.

Green Fuel Economizer Co., Matteawan, N Y. Folder. Conical-flow fans. Illustrated.

The Gardner Governor Co., Quincy, Ill. Duplex power pumps. Illustrated, 8 pages, 6x9 in.

Detroit Lubricator Co., Detroit, Mich. Catalog No. 36L. Locomotive lubricators. Ills., 56 pp., 5x8 in.

Henry R. Worthington, 115 Broadway, New York. Bulletin No. 202. Volute centrifugal pumps. Ills., 62 pp., 6x9 in.

Sprague Electric Co., 527-531 W. 34th St., New York. Catalog No. 521. Flexible steel-armored hose. Ills., 16 pp., 5½x7½ in.

The Goulds Mfg. Co., Seneca Falls, N. Y. Bulletin No. 115. Horizontal double-acting plunger pumps. Illustrated, 8 pages, 8x10 in.

Chicago Pneumatic Tool Co., Fisher Building, Chicago, Ill. Bulletin No. 127. Pneumatic drills, reamers, wood borers, etc. Illus, 40 pp., 6x9 in.

The Baldwin Locomotive Works, Philadelphia, Penn. Record No. 75. Mikado type locomotives. Illustrated, 40 pages, 6x9 in.

A. S. Cameron Steam Pump Works, 11 Broadway, New York. Bulletin No. 150. Centrifugal pumps. Illustrated, 16 pages, 6x9 in.

Ideal Case-Hardening Compound Co., 1784 Broadway, N. Y. Pamphlet. Case-Hardening and Heat-Treating of Steel. 38 pages, 6x9 in.

The Yale & Towne Manufacturing Co., 9 East Fortieth St., New York. Catalog No. 12 D. Chain Blocks, Electric Hoists, Trolleys and Cranes. Illus. 32 pp., 5¼x3½ in.

Smooth-On Manufacturing Co., 572-74 Communipaw Ave., Jersey City, N. J. Pamphlet. Extracts from Smooth-On Instruction Book No. 12. Illustrated, 16 pages, 3½x6 in.

Chicago Pneumatic Tool Co., Fisher Bldg., Chicago, Ill. Bulletin No. 34. Illustrated; 48 pages, 6x9 in. This bulletin treats particularly of general engineering information of value to users of compressed air. It contains tables giving efficiencies of air compression at different altitudes, density of gases and vapors, mean effective pressures and horsepowers, loss of pressure due to friction in pipes; also information for intending purchasers, showing the data required for intelligent estimates. Various types of compressors are illustrated.

Eimer & Amend, New York. Catalog C. Chemical and Assay Laboratory Supplies. Illus.; 483 pp., 8x11 in.

The recently issued catalog of Eimer & Amend may be considered an indispensable treatise to the chemist and physicist. The practitioner should look this book over simply to see what is being done in the manufacture of various forms of specialized apparatus, with the chances strongly in favor of his discovering something not in his stock which he cannot get along without. The book is not the mere trade catalog of commerce, it is an addition to the scientist's library.

Baldwin Locomotive Works, Philadelphia, Penn. Record No. 73. Recent development of the locomotive. Illus., 54 pp., 6x9 in. Record No. 74. Gasoline locomotives. Illus., 24 pp., 6x9 in.

In the second of the above publications, is taken up the question of the adaptability of the gasoline locomotives for industrial purposes. The locomotives are built under patents granted to A. H. Ehle and combine automobile practice with steam-locomotive design. They are said to be suitable for work around mines and are safe, efficient and clean. Their availability, of course, is largely determined by the relative cost of gasoline and electric or other power. The principle on which they operate embodies a central longitudinal shaft transmitting power from a four-cylinder vertical engine to transverse shafts connected to the drivers and having a suitable arrangement of gear ratios and clutches to give two different speeds in either direction. The arrangement is such that for forward motion, the two drivers on one side are employed and for backward motion, the other two. The fuel consumption under normal or rated load is stated to be about ⅓ gal. of gasoline per hp.-hr. The locomotives are built in 3½-, 5-, 7- and 9-ton sizes, ranging in horsepower from 25 to 65 and in drawbar pull from 750 to 1700 pounds.

NEW PATENTS

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

ALLOYS—Process of Manufacturing Alloys. Ludwig Weiss, Berlin-Charlottenburg, Germany. (U. S. No. 1,065,855; June 24, 1913.)

SLIME CONCENTRATORS—Improvements in Slime Concentrators. W. F. Deister, Fort Wayne, Ind. (Brit. No. 18,626 of 1912.)

BLAST FURNACE. C. Hicks, Hellertown, Penn. (Brit. No. 15,685 of 1912.)

BLAST FURNACES—Improvements in or Relating to Blast Furnaces. R. Kunz, Georgsmarienhutte, Germany. (Brit. No. 26,806 of 1912.)

EXTRACTION—Process of Extracting Iron and Steel. A. Hiorth, Christiana, Norway. (Brit. No. 16,275 of 1912.)

FURNACE TOP. Frank C. Roberts, Wynnewood, and Albert Broden, Reading, Penn. (U. S. No. 1,066,225; July 1, 1913.)

MANGANESE-STEEL CASTING and Process of Producing the Same. Edgar A. Custer, Philadelphia, Penn. (U. S. No. 1,066,258; July 1, 1913.)

PUDDLING FURNACES—Improvements in Puddling Furnaces. F. J. Millard and R. J. Hadlington, West Bromwich, Eng. (Brit. No. 22,073 of 1912.)

TIN—Improvements in or Relating to the Extraction of Tin from Ores or Slags. W. E. Gibbs, Birkenhead, Eng. (Brit. No. 11,643 of 1912.)

ZINC—Improvements in and Relating to the Extraction of Zinc or Precious Metals from Their Ores. T. Dobbie, Selukwe, S. Afr. (Brit. No. 11,244 of 1912.)

ZINC FURNACES—A Device for Mechanically Discharging Metallurgical Furnaces, particularly Zinc Muffle Furnaces. F. Meguin & Co., A. G., Dillingen-Saar, Germany. (Brit. No. 494 of 1913.)

CAR UNLOADING—System for Unloading Cars Into Vessels. George H. Hulett, Cleveland, Ohio, assignor to the Wellman-Seaver-Morgan Co., Cleveland, Ohio. (U. S. No. 1,066,015; July 1, 1913.)

DUMPING CAR. Ernest H. Schur, Hibbing, Minn. (U. S. No. 1,066,156; July 1, 1913.)

EXCAVATING MACHINE. George W. King, Charles B. King and Benjamin Jacoby, Marion, Ohio, assignors to the Marion Steam Shovel Co., Marion, Ohio. (U. S. No. 1,066,286; July 1, 1913.)

FLUME—Trough or Open Flume. William Lennon, Manitou, Colo. (U. S. No. 13,586, reissue; June 24, 1913.)

FLUME GATE. Lorentz Ritzman, Canon City, Colo. (U. S. No. 1,065,839; June 24, 1913.)

FLUME GATE. Minnie Bedorie Andersen and Martin Andersen, Redlands, Calif. (U. S. 1,065,494; June 24, 1913.)

MINE-CAR WHEELS, Roller-Bearing for. Franklin C. Hockensmith, Pittsburgh, Penn., assignor to Hockensmith Wheel & Mine Car Co., Penn Station, Penn. (U. S. No. 1,066,276; July 1, 1913.)

SEALING SHAFTS, Tunnels and the Like, Method for. Ralph G. Johnson, Pittsburgh, Penn. (U. S. No. 1,065,369; June 24, 1913.)

TUNNEL CONSTRUCTION. Frank Bradley, New York, N. Y. (U. S. No. 1,065,502; June 24, 1913.)

CRUSHER. William H. Lieber, Milwaukee, Wis., assignor to Allis-Chalmers Co., Milwaukee, Wis. (U. S. No. 1,065,535; June 24, 1913.)

CRUSHING—Ball Mill. Charles Lewis Carman, Riverside, Calif. (U. S. No. 1,066,077; July 1, 1913.)

CRUSHING ROLLS. Richard Bernhard, Milwaukee, Wis., assignor to Power & Mining Machinery Co., New York, N. Y. (U. S. No. 1,065,998; July 1, 1913.)

WASHING, ETC.—Improved Apparatus for Washing, Grading and Concentrating Ores, Minerals and the Like. G. Michel, Paris, France. (Brit. No. 29,617 of 1912.)

ALLOY—Lead-Copper Alloy. Edward D. Gleason, New York, N. Y., assignor, by mesne assignments, to Plastic Metal Co., Inc., Brooklyn, N. Y. (U. S. No. 1,066,403; July 1, 1913.)

CLAD METALS—Process of Producing Clad Metals Having a Ferrous Base. William Marshall Page, Philadelphia, Penn. (U. S. No. 1,066,312; July 1, 1913.)

CRUCIBLE FURNACES—Improvements in or Relating to Crucible Furnaces. F. Hundt, Giesweid b/Seigen, Germany. (Brit. No. 4908 of 1913.)

FURNACE GASES—Apparatus for Treating Furnace Gases and Preparing Fuel. Burdett Loomis, Hartford, Conn., assignor to Loomis Utilization Co. (U. S. No. 1,066,296; July 1, 1913.)

FURNACES—Improvements in Connection with Furnaces for Melting and Alloying Metals in Vacuo. W. S. Simpsom, London, Eng. (Brit. No. 12,067 of 1912.)

ROASTING—Improvements in or Relating to Stirring or Agitating Devices for Use in Roasting Furnaces and the Like. M. Van Marcke de Lummen, Cologne, Germany. (Brit. No. 13,551 of 1912.)

ROASTING—Improvements in or Relating to a Process of and Apparatus for Roasting Ores and the Like. E. Bracq, Lens (Pas de Calais), France. (Brit. No. 20,108 of 1912.)

ROASTING—Furnace for Roasting Ores. John B. F. Herreshoff, New York, N. Y., assignor to Nichols Copper Co., New York, N. Y. (U. S. No. 1,066,110; July 1, 1913.)

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—July 2

Eldorado County Needs Boosting, in the opinion of a San Francisco engineer who has recently visited the district. He recommends that public interest in the mining industry of the county be increased by establishing a mining bureau and making a display of the mineral products in connection with the board of trade. He not only recommends the boosting of the mineral industry, but of the fruit-growing advantages of the region as well. Until one has visited this county, and gone underground in many of the mines, he is not apt to appreciate how much work is actually being done. Two mills are running regularly, the one at the Poverty Point mine is dropping 15 stamps and the Ajusta below El Dorado, 10 stamps. The comment is made, that there has been a tendency to spend too much money above ground, and not in developing enough ore to assure the profitable working of a large mill. Near Fairplay, hydraulic mining is soon to be resumed in the Slug Gulch property. It will be necessary to build a retaining dam to impound the tailings, but there is a splendid site for such a dam. A revival of placer mining is expected to follow the resumption of mining at this property. The company owns riparian rights which assures a bountiful supply of water at all seasons, but probably the present dam on the river will be enlarged. Prospecting work on the Livingstone mine next to the Slug Gulch property is being done by R. B. Pate, who holds a lease on the property. The Edner mine, above Fairplay, is being reopened. Development work is in progress at the Martin mine, near Grizzly Flat, and to the southwest of the Mount Pleasant, and also on the Mount Pleasant. At the Poverty Point mine, the 15-stamp mill is in continuous operation; a large crew of men is employed, and four drifts and a raise are being driven. The ore is run out in cars and dumped into a long chute which carries it down to the bins just above the mill. An aërial tramway is used to carry the concentrates to the top of the hill for shipment. Shortage of water is hampering operations at the Fort Jim mine above Smiths Flat. A peculiar feature of this mine is that no water has yet been encountered in the gravel. Dr. J. W. Hyatt, who is in charge of operations, expects to drive a long tunnel on the Sunshine property to intersect the main channel, this summer. There is much activity in the district south of El Dorado. O. A. Ingram is operating the 10-stamp mill on his property, the Ajusta, and is working in good ore. Near-by the Hill Brothers are installing a gasoline engine and air compressor for operating drills. This will facilitate work greatly. Grant Busick, on the Hillside, has done a great deal of development work in the last year, more than 1000 ft. of tunnels and crosscuts having been driven to cut the orebody. There is a 5-stamp mill in operation, which has been crushing the ore taken out in development work. It is expected that the company will install a modern mill, probably using rolls as the ore is easily crushed. The Union property has been recently examined by a San Francisco engineer. In Placerville, mutual harmony seems to be lacking to such an extent as to be positively detrimental to the progress of the mining industry of that district.

DENVER—July 5

Investigation of the Smelting Trust has been the subject of many rumors and it has been reported for some time that the Attorney General at Washington would take some action in the matter. One of his staff is now in Colorado with the object of ascertaining the facts in the relation of the American Smelting & Refining Co. to the producing mines. He will interview competitors in the ore fields and the main facts will doubtless be brought out.

Gold-Bearing Coal is said to exist in Montrose County. The story comes from Delta and is to the effect that a gold-coal mine has been found in the Grand Mesa just north of the town. The owner of the coal seam, which is called the "Rollins Mine," claims to have been taking samples for two months, and that the assays show from $8 to $11 per ton in free-milling gold, also that ashes from the boiler furnace were panned and showed a string of colors. It is quite possible that the gravels, clays and shales of the Grand Mesa, in which this coal seam lies, contain gold, but the coal story will be still more interesting when corroborated by expert sampling, which is about to be done.

Claim Grabbing at Platoro, the recently revived old gold district in southwestern Colorado, has begun as was to be expected, for those enterprising people known as "claim hogs" are at work with their location stakes, says the state commissioner of mines. They are taking from 30 to 80 claims each, not to work them, but to sell them before the 60 days expires in which they must commence the work of proving up their locations. Unfortunately there is no law to prevent a man staking as many claims as he can work, but there is an unwritten law which will probably be invoked as it used to be in the early days, when claim grabbers were simply run out of camp. These men do no digging on their claims, and they work great hardship on the real prospector who begins to develop just as soon as he has stuck his stakes and recorded.

SALT LAKE CITY—July 5

Silver King Coalition Mines Co. has made two payments, together amounting to $450,000 on the judgment awarded the Silver King Consolidated for ore taken from jointly owned ground. The total amount of the judgment, with interest, is $905,000, and the $455,000 remaining must be paid on or before July 15. The suit for trespass recently filed against the Silver King Coalition Mines Co. by the Silver King Consolidated has been dropped, as a recent survey of the Coalition workings has failed to disclose trespass.

The Oquirrh Tunnel Has Been Completed. This is a drain and transportation tunnel, which was driven by the Utah Metal Mining Co. through the Oquirrh range, to connect Bingham and Tooele. It is 11,478 ft. long, and is exceeded in length only by one other similar work in the state, the Ontario drain tunnel at Park City, which is 3½ miles long. The present company took over the work from the Bingham Metal Co., when the tunnel was about 2000 ft. long, and in the last three years has completed the project at the rate of over 3000 ft. yearly, working from both ends a part of the time. The company is financed by Boston men, and operations are under the direction of E. P. Jennings, of this city, consulting engineer and president of the company. Water amounting to 800,000 gal. daily has been developed. This will furnish more than ample power to drive the cars used in transportation and to carry on development work. The surplus will be used by other companies. In the progress of the work, six or eight ore-bearing fissures, some of them as much as 5 ft. in width, were opened, and development on these will begin immediately.

BUTTE—July 1

Railroad Electrification of the Butte end of the Butte, Anaconda & Pacific line, is being completed with all possible speed, and it is expected that trains will be running under the new power within a few weeks. There are about seven miles of line around the Butte mines of the Anaconda Copper Mining Co. and these lines will be equipped with alternating current, automatic block signals, the Union Switch & Signal Co. having taken the contract to install the system. Similar signals are being used on the lines of the Illinois Traction Co.

HOUGHTON—July 4

Exploration at the Wolverine will not be continued for the present, although the management is by no means satisfied that the Osceola lode is without commercial value. Just now all energies are being concentrated in the extraction of the copper rock on the main Kearsarge lode. It might be stated, however, that the Wolverine has, in several places, opened the foot-wall lode and found it carrying copper in fairly good amount, although in none of these instances has the grade been as high as in the similar openings in the South Kearsarge branch of the Osceola mine where the foot-wall openings have been in rich rock.

ISHPEMING—July 5

The Tax Commission of the state of Michigan has had several geologists, working under the direction of R. C. Allen, state geologist, inspecting the iron mines of the upper peninsula with a view of placing new valuations on most of the properties. There has been a great deal of dissatisfaction all through the region since James R. Finlay made his appraisals a few years ago. Many of the companies have paid their taxes under protest and several suits have been brought, but

the companies lost every case in the lower courts and have taken appeals to the state supreme court. Mr. Allen and his crew have completed their work in Gogebic, Dickinson and Iron Counties and have just started work on the Marquette range and it will be at least a month before they are through. They have received figures from the companies as to their operations during the last five years, Mr. Allen stating that the operators have met him more than half way. He has made personal examinations of all of the mines and should be able to present reliable figures to the tax commission.

MARQUETTE—July 2

Expense of Spanning the Chapin "Cave," on the Menominee range is increasing steadily. Railway tracks and a public highway are maintained over this cave. Filling is necessary because, as the ore beneath is taken out, the surface drops away, and there has already been created a pit of immense proportions. This spring the Chicago, Milwaukee & St. Paul R.R. alone was engaged in track-filling work for 50 days. During that time fully 100,000 cu.yd. of gravel were dumped. The Chicago & Northwestern likewise is compelled to do much filling, while the Steel Corporation, operator of the mine through its subsidiary, the Oliver company, has men and teams engaged the year round in maintaining the grade of Stephenson Ave. The ground dropped much faster this spring than ever before. In fact, the filling operations seem endless and are becoming more burdensome. The end will be reached only when the Steel Corporation suspends mining work, which will be a long time in the future. The cost of filling to date has run well into the hundreds of thousands of dollars, sufficient to build several substantial bridges.

DULUTH—July 3

Work on the New Steel Oredock for the Duluth, Missabe & Northern Ry., in Duluth, is progressing favorably. The foundation is composed of concrete, and the work is sufficiently advanced to permit beginning the work of erecting the steel superstructure. The steel for the great oredock is being furnished by the American Bridge Co. This new concrete and steel dock will be the largest ore-shipping dock in the world and will cost about $2,700,000.

Reports from the Cuyuna Range are to the effect that two drill holes on the property of the Mesabi-Cuyuna Iron Co. have gone through greenstone into ore. The two holes are 250 ft. apart, and in each case, after going through about 200 ft. of ore the drill went through from 12 to 15 ft. of greenstone and into ore again. Greenstone is usually the signal to stop drilling, and the reason the first drill hole was put through that rock was due to the crew having received no definite order to stop, and the second was put down for general information. Whether this greenstone, which is underlaid with iron ore is a horse, or intrusion, with the ore extending back under it, or whether there actually is ore under the main mass of the greenstone remains for further development to establish.

ROCHESTER—July 1

A Geological Examination of Rochester has been made by F. C. Schrader, of the U. S. Geological Survey, and is interesting from the fact that this department of the Government sent a representative there within almost six months of the discovery of the camp. The ores are chiefly silver bearing, but also carry gold, which in some of the ore amounts to 50% of the value. The ores were apparently deposited from solutions. The strike in Nenzel Hill was made late in November, 1912, and the shipment of a few carloads of high-grade ore by Joseph Nenzel, Frank Schick and Walter Moynaugh about Christmas started the Rochester boom. In less than a month the hitherto desolate cañon had a reported population of 3000 and contained many substantial two-story frame buildings. Leases on blocks 300x600 ft. in area were taken and were operated by experienced mining men, with the result that to date the development of the mines and the showing of ore are remarkable. Six or eight leases are opened to a depth of 130 ft. by crosscut tunnels from 100 to 300 ft. in length. About 2000 tons of ore averaging $30 per ton has been mined and shipped, and it is said that 100,000 tons of ore is in sight. Nearly a score of properties are producing. The Rochester district lies mainly on the eastern slope of the Humboldt mountains, between 4000 and 8400 ft. in elevation, in an area about six miles long by five miles wide, on which the Survey will probably later publish a report accompanied by a geologic and topographic map. The district is easy of access, being 10 miles east of Nixon, formerly Oreana, the nearest station and ore-shipping point on the main line of the Southern Pacific R.R., and 25 miles northeast of Lovelock. With both of these places it has daily freight, express, passenger, mail and auto service and telephone connections.

The country is mountainous but not rugged. The ravines are open and most of them are passable for team and wagon. Nenzel Hill, in which lie the orebodies from which the present production is chiefly derived, is situated in the eastern portion of the district and forms a part of the crest of the range between the head of Rochester cañon on the west and South American cañon on the east. It is a northeastward-trending oval part of the ridge about 3000 ft. long by 2000 ft. wide and rises to 7300 ft. in elevation, or about 500 ft. above the adjoining portions of the divide. In Nenzel Hill the veins, 10 or more in number, range from 100 to 3700 ft. in length and some apparently have a vertical range of at least 400 ft. The west vein or lode, now being worked chiefly on the Codd lease and the Platt lease, is about 32 ft. in width and contains two veins, seven to eight feet wide, of good ore composed chiefly of alternating layers of quartz and silicified rhyolite. The workings on these veins have been continuously in ore.

Lincoln Hill, which also contains producing properties and received much attention last winter, is a prominent landmark in the western part of the district, 2½ miles distant from Nenzel Hill, on the north side of Rochester cañon, above which it rises 1200 ft. or to 6600 above the sea. Packard Hill, the seat of the new "strike," is in the southern part of the district, at an elevation of about 5800 ft. in the lower part of a broad ridge, and on the trend of the Nenzel Hill zone of mineralization. The ore deposits of the district are chiefly quartz replacement veins in fissures and shear zones in rhyolite and rhyolitic rocks which are of great thickness. The rocks range from felsitic to coarsely prophyritic. They are more or less silicified, devitrified and sericitized, and were referred by the geologists of the fortieth parallel survey to the Triassic period. The rocks dip about 35° east, but the veins dip 60° west and are approximately conformable with the dominant sheeting and shear structure of the country rock. The principal camp is East Rochester, with a population of 700, situated at an elevation of 6200 ft. in the head of Rochester cañon, at the foot of Nenzel Hill, where about 200 miners are at work. Rochester or "lower town," two miles down the cañon at the foot of Lincoln Hill, has a population of 250, and Packard, the newest settlement, but a few weeks old, at the south base of Packard Hill, has a population of about 100, which is daily increasing. Panama, on the northeast near Spring Valley pass, in the head of Limerick cañon, has about a score of people.

FAIRBANKS—June 15

The Output of Fairbanks from lode mining in 1912 is given by the banks as $200,000. The year of 1913 should witness a considerable increase. There are now in the camp 14 mills ranging in size from two to ten stamps, and it is likely that several more will be built during the summer. Of these 14 mills, however, only three are being operated with any degree of regularity, although it is hoped that several more will get under way soon. The Rhoads-Hall mine has made the best showing during the winter. Spalding, lessee on the property of the Reliance Mining Co. on Dome Creek, has done well, as have Crites & Feldman, on Fairbanks Creek. Other mines that have shown encouraging results are the properties of the Chatham Mining Co. and the Pioneer Mining Co., both on Chatham Creek, and the Rainbow mine on Skoogy Gulch. As a whole, however, the outlook for quartz mining is not as favorable as it was a year ago. All of the mines so far have proved rather disappointing in depth, but this may be only a temporary setback.

JENA, GERMANY—June 23

Decision in the German Oil Controversy is the one sensational event that has transpired in the commercial world lately. The judgment of the supreme court of the empire in the case of the German Standard Oil Co. (D. A. P. G.) against the European Petroleum Union controlled by the "Deutsche Bank," is adverse to the former. The supreme court has ruled that the contract between the two concerns which was made in London, in the English language, is null and void as it violates the rules of "business morals." The action of the Deutsche Bank in breaking the contract has thus been vindicated. The decision of the court has, however, no bearing upon the proposed illuminating oil monopoly pending before the German parliament. A good many chambers of commerce and other influential bodies of western Germany have passed resolutions opposing the monopoly and memorialized the secretary of the imperial treasury to withdraw the bill. The secretary has, however, declined to interfere. The bill is expected to come up in parliament for discussion in the autumn session.

THE MINING NEWS

The items in this department are classified by states and counties. Whenever it can be done conveniently the post office address of each company or mine that is mentioned is given in parentheses immediately after the name of the mine or company.

ALASKA

AN INTERESTING DECISION was rendered recently in the U. S. circuit court of appeals for the ninth district, in the case of Jesse Nobie, Ben Noble and Luther C. Hess, vs. Algot Gustafson, in which it was ruled that laborers helping to repair ditches on a claim have no lien on the dump.

THE FIRST SHIPMENT OF BERING RIVER COAL to be mined by the United States Government party was received at salt water at Katalla, June 26; the shipment weighed 2½ tons and was brought down the river in a small boat. A total of 700 tons of this coal is to be taken out for a test in the cruiser "Maryland."

REPEAL OF THE ROAD TAX law has worked a hardship upon those who are compelled to travel the roads of the Fairbanks district. The objectionable tax was removed at a time when there was urgent need of repair work, and, though the local offices have stretched available funds to the utmost, the unpreparedness of the road commission to take up the work has left the district in a sorry plight.

BESSIE BENCH (Nome)—A large dredge is being placed on this property, which has yielded well in the past.

ALASKA TREADWELL (Douglas)—In May, 71,512 tons of ore were crushed, the yield being $190,072, or $2.68 per ton, and the profit $96,389.

ALASKA MEXICAN (Douglas)—May profits are estimated at $28,280, 20,286 tons of ore having been crushed from which $54,052 or $2.69 per ton was recovered.

ALASKA UNITED (Douglas)—The Ready Bullion mill crushed 17,934 tons of ore in May, $36,419 worth of bullion and concentrates being recovered at an estimated profit of $8343. The ore yielded $2.03 per ton. In the 700-Ft. Claim mill 18,738 tons ore yielded $2.64 per ton, a total of $48,034, $16,498 being estimated as profit.

MACGILLIVRAY & TREML (Fairbanks)—Colon MacGillivray and Joseph Treml, lessees on the Wild Rose claim on the right limit of Dome Creek, have found ore wherever they have uncovered the vein by trenching. A working shaft has been started, for which timbers sufficient for 50 ft. have been landed on the claim.

HUDSON BROS. (Fairbanks)—The two-stamp Nissen mill recently completed the crushing of a shipment of 60 tons of ore from this mine, on the divide, between Ready Bullion and Moose Creeks, tributaries of Ester Creek. The mill is no claim No. 7, Above, Ester. The cleanup showed the ore to average between $35 and $40 per ton. Considerable ore has been blocked out, and it is thought that no difficulty will be experienced in keeping the mill supplied during the summer.

ARIZONA

Cochise County

GREAT WESTERN COPPER CO. (Courtland)—This company recently purchased the old Mammoth-Collins mine near Mammoth. The new company proposes to open up the property only below the 800-ft. level.

Gila County

TRANSMISSION LINE CONSTRUCTION between the Roosevelt dam and Superior, via Miami, is being done by a force of about 25 white men and 75 Indians. It is now at the head of Queen Creek box cañon, one mile from Superior. As the concrete foundations for the towers are laid a road gang cuts a 4-ft. trail, building it at a wagon grade, and slight widening of the trail in the future will transform it into an excellent wagon road, filling in the gap between Iron's ranch and the town of Superior and thus placing Globe, Miami, Superior, Florence and all the intermediate towns and mining camps on a direct line of communication, beside bringing Ray and vicinity into closer relation with the Miami mining districts. When the line reaches Superior it may be considered feasible to build a branch line to the Calumet & Arizona property 2½ miles south, whence a transmission line leads to Winkelman, where the power is generated. With such arrangements temporary disability at either the government plant at Roosevelt or the Ray Consolidated power plant at Winkelman could be relieved at the other end.

MIAMI (Miami)—In a letter addressed to stockholders of this company, Adolph Lewisohn & Sons state: "There is every likelihood of continued large increase of ore reserves and of a reduction in costs, particularly as we have just arranged with the Greene Consolidated Copper Co. for a reduction of ½c. per lb. of copper in their smelting charge, such reduction to commence at once. We expect the production to be increased within a reasonable time to 3,500,000 or 4,000,000 lb. of copper per month, and hope that in the not distant future it will be at the rate of 50,000,000 lb. of copper per year, at a cost of not over 8c." No radical changes of any kind will be made at the concentrator until the Inspiration's tests of the flotation process and the tests being conducted at the Miami mill by Mr. Canby with Keystone ores have resulted in definite conclusions. It was thought that the two holes recently drilled would be the last, but two more have been started. There is no particular interest attached to the present drilling. The ground now being drilled was only partly developed during the original exploration.

INSPIRATION CONSOLIDATED (Miami)—Grading at the millsite is going on at a steady rate, the grading for the primary crushing plant just west of the main east and west shafts of the property is finished, the railroad grade between the mine and millsite is complete, and the concrete work on the mill foundations should be begun in July. Preparatory work for blocking out the orebody is well under way, but beyond admitting that the Colorado orebody is to be caved as is the ore at the Ray, a process differing somewhat from that in use at the Miami, the Inspiration management has not yet announced its plans for mining the reserves. Although a good water supply has been developed in wells below Miami a contract has been made with the Old Dominion for its surplus mine water, which probably will be handled as the Miami handles the water from the same mine, pumping it from a place in Pinal Creek, about five miles below and northwest of Globe. The request of Inspiration's attorney for calling of a special venire that a jury might be selected therefrom for trial of the Inspiration-Keystone suit makes it probable that the case will not go over to the September term of court, as a trial will be possible this month if a special venire is called.

OLD DOMINION (Globe)—The steel-erecting gang is working on the new sampling mill adjoining the concentrator orebins. Most of the erecting work is completed, but some riveting remains to be done. The steel work on the crusher plant has been delayed because of the late arrival of some steel columns. Excavation work in connection with the new concentrator has been completed and forms are now being put in place for the concrete. The foundations for the rolls are already in place. The steel work on the new concentrator will not be started before the crusher plant, sampling mill and various conveyors are completed. The capacity of the custom orebins above the "A" shaft will be doubled. The timbering and lining of the pockets at the 1200 and 800 levels has been completed and a pocket is now being cut for concentrating and smelting ore on the 1600 level, the lowest level of the shaft at present. Several changes are being made in various stations near the shaft in connection with the new skip hoist, and the tracks will be changed later. Ore production and development in the mine continues about normal. The sinking of the "K" shaft for a sump below the 1400 level is finished and in a few days all timbering will be in place and the shaft will be ready for hoisting ore. It was expected that the raise from the 1200 level of the Old Dominion to connect with the present bottom of the Gray shaft would hole through about July 5, and the shaft will then be timbered with shaft sets down to the 1200 level. A new slime pond has just been completed near Pinal Creek on the old Hamm ground, and will be used for settling slime from the concentrator. No changes or improvements of note have been made at the smelting works.

Greenlee County

ARIZONA COPPER CO. (Clifton)—This company has recently created the post of local inspector at its mines and has employed Frank Farmer in that capacity. He has familiarized himself with all the underground workings of the company's properties at Morenci, Metcalf and Coronado, and his duties will be chiefly to advise and instruct the miners in matters relating to the safety of their work and to anticipate as far as is possible any conditions that might arise to endanger the men working underground. The company recently purchased apparatus for resuscitating men overcome by smoke or gas.

Yavapai County

COMMERCIAL MINING CO. (Skull Valley)—This Phelps-Dodge company is shipping about 40 tons per day of high-grade ore to the Douglas smelting works. The company is operating two properties in this district; one, the Senator, producing high-grade sulphide ore from fissure veins, the other, the Copper Basin, in which a large tonnage of 3% oxidized ore has been developed. High-grade ore is shipped from the last property but unless sulphides are encountered, an attempt to leach the ore will probably be made eventually. The properties are managed by Maj. A. J. Pickerill of Prescott.

CALIFORNIA

Amador County

SOUTH EUREKA (Jackson)—All of the 80 stamps are now dropping. Preparations are being made to put 20 stamps of the Oneida mill in commission. The recent development of the vein extending from the South Eureka south into the Oneida has proved the orebody to be extensive and warrants the increased milling capacity.

MAPKLEE (Volcano)—It is probable that this mine will be reopened. It was a producer in the early days of mining in the east belt of the Mother Lode and development disclosed some rich ore. The mine was then equipped with a 10-stamp mill and rock breaker driven by steam. There are 80 acres in the holding. A. F. Nivergoll, of Sacramento, has a purchase option.

Butte County

GOLD BANK (Forbestown)—The lack of water has necessitated the temporary closing down of the 20-stamp mill, for a period of probably 60 days. The mill obtains water from the Forbestown ditch and at present the ditch is obliged to supply the demands for irrigation at a sacrifice of the mine. The present year has been an exceptionally dry one in the Forbestown district.

Calaveras County

PENN MINING CO. (Campo Seco)—A switch tender at the mine was killed June 20, while ascending the shaft on a water skip. He fell from the skip, a distance of 300 ft., to the bottom of the sump. The man had been ill, and the two men on the skip with him were of the opinion that he became dizzy or fainted, as there was no other apparent cause for his falling.

Nevada County

GOLDEN CENTER (Grass Valley)—The new electric pump has been completed and given the initial try-out. The pump has a capacity of 300 gal. per minute.

BRUNSWICK (Grass Valley)—The new compressor is ready for duty. It is a direct-acting Ingersoli-Rand 64,000-lb. machine. It has a capacity of 1500 cu.ft. of air per min.

OUSTAMAH (Nevada City)—The mine has been unwatered to the 600-ft. level. The shaft will be deepened to 1500 ft. There are 700 tons of ore in the bins ready for the stamp mill which will resume operation immediately.

VICTOR GATES VS. NUMITOR GOLD MINING CO.—Gates was recently awarded a verdict of $10,000 for the loss of a leg which was caught in machinery at the Numitor mine. The defendant has asked for a new trial.

Placer County

CRANDALL (Auburn)—The strike of electricians of the Pacific Gas & Electric Co. has interfered with the installation of the new electric hoist at this mine in the Ophir district. A 20-ton orebin has been built. The ore will be trammed direct to the mill; a compressor will be installed. A tunnel has been driven to intersect the shaft at the 75-ft. level for tramming the waste. The ore will be hoisted through the shaft to the surface. A new headframe will be built.

Santa Clara

QUICKSILVER MINING CO. (Almaden)—The mine will be reopened under the management of W. H. Landers, managing director, who was recently appointed at a stockholders' meeting in New York to examine the mine and the books. Since the change in management it is believed the mine will again be put on a paying basis. It is said that the new directors elected in New York June 18 have refinanced the company and will supply Mr. Landers with sufficient funds to do necessary development.

Shasta County

BALAKLALA (Coram)—Preparations are being made to test an apparatus for condensing the fumes from the smelting plant.

MOUNTAIN COPPER CO. LTD. (Keswick)—Transportation facilities for handling ore from the Iron Mountain mine have been increased by the addition of two engines and other equipment. A large amount of ore is being extracted and stored on the dumps at the mine. Large shipments of ore are going to the company's plant at Martinez. Should the fume trouble be settled under the present state law and the proper method adopted for neutralizing the smoke it is probable that the Keswick works will be rebuilt.

Sierra County

GOLDEN SCEPTER (Bunker Hill)—This gravel property has been bonded to San Francisco men and work has been begun under the direction of Telfer & Winters.

HIGH COMMISSION (Downieville)—S. W. Van Syckle, of Sierra City, has a bond on this property and a tunnel is being driven at a lower level to intercept the rich sulphide ore which was found in shallow workings.

RIO ANTIGUA (Forest)—Work has been resumed in the main tunnel which is now in more than one mile and will be driven 300 ft. farther and then a raise will be made for gravel. A Los Angeles company is the owner.

SIERRA BUTTES (Sierra City)—Work has been resumed with a large force of men, and the 40-stamp mill is to begin operating soon. The outlook here is better than for many years. Hayes Bros., of San José, are the owners.

COLORADO

Aspen District

MOLLIE GIBSON—The shaft has now been drained by the Smuggler Leasing Co., and the output will be largely increased, as it is said there are large bodies of ore in the lower levels. The unwatering was done by a drift from the Free Silver shaft.

Clear Creek County

LITTLE MATTIE (Idaho Springs)—It is reported that a rich strike has been made in this mine on Chicago Mountain. The ore is 3 ft. wide and assays have ranged from 10 to 40 oz. gold and 100 to 300 oz. silver per ton, probably picked samples.

Lake County

MANY PROSPECTORS ARE ARRIVING daily in Lackawanna Gulch, owing to the recent strike in the Eureka claim, where 4 ft. of 6-oz. gold ore has been opened in the main tunnel.

San Juan Region

AT OURAY the Virginius lessees are shipping 150 tons of 200-oz. silver ore and the Camp Bird has completed the shaft to the 800-ft. level and will now drift for the orebody.

IN THE LA PLATAS great excitement prevails owing to a rumor that 4 in. of almost pure gold has been opened in the May Day, already famed for its extraordinarily rich shipments. So far, however, nothing official has been given out.

ORIENTAL MINING & MILLING CO. (Lake City)—The Hidden Treasure mine has resumed the shipment of concentrates. The orebodies are stated to be large and the ore high grade. Shipments will from now on go out regularly.

Summit County

PRODUCTION FROM PLACERS in the Breckenridge district for June was nearly $100,000. The Colorado Gold Dredging Co. in Swan Valley has produced $1000 worth of placer gold per day for weeks past, the Reliance Gold Dredging Co. in French Gulch, $800 per day, and the French Gulch Dredging Co., 64 lb. of gold in the last 10 days.

Teller County

PRODUCTION FOR JUNE in the Cripple Creek district was as follows; the first figures indicating tonnage, the last gross value: Smelters, 3850, $250,250; Golden Cycle, 3400, $680,000; Portland (Colorado City), 9950, $218,900; Portland (Cripple Creek), 13,600, $30,000; Stratton, 11,800, $27,845; Colburn, 4245, $11,674; Gaylord, 1800, $5400; Kavanagh, 1500, $3450; Wild Horse, 1300, $4160; Isabella, 620, $1250; Grand Total, 82,670, $1,233,732.

CRESSON (Cripple Creek)—The output from this mine on Raven Hill for May was 4700 tons and in June 4000 tons, nearly double what was produced in previous months.

EL PASO (Cripple Creek)—The output for June was 148 cars of ore of good grade. Of this 48 carloads were from lessees and 100 cars on company account. As the main oreshoots have now been opened in the lower levels, there is more ore in sight than at any time during the last few years.

IDAHO

Coeur d'Alene District

HERCULES (Burke)—A cave-in has resulted in an almost complete shutdown of this mine. The collapse of the galleries took place June 4, closing all the underground openings above the No. 4 tunnel. An effort is being made to resume operations in the levels off the winze, and some ore is being removed.

TUSCUMBIA (Wallace)—The final payment of $25,000 on the bond and option of the Tuscumbia group was recently made. The Tuscumbia was owned by George B. Markle, of Hazelton, Penn., and has been under bond and option to the Tuscumbia Mining Co. for $50,000. The property is in the Sunset Peak district. The company has spent about $15,000 on the property during the period of option, with satisfactory results.

INTERSTATE-CALLAHAN (Wallace)—The new 300-ton concentrator has been in operation since about June 1. It is estimated that 250,000 tons of ore is blocked out in the mine. The company has an option on the Amazon-Manhattan property for $160,000, the first payment on which has already been made. The Interstate and Callahan mines are now connected by a 5400-ft. tunnel which is being extended a distance of 2000 ft. to connect with the Amazon-Manhattan. The Callahan property lies on the Nine Mile or Wallace side of the divide and the Callahan and Amazon-Manhattan properties lie on the north or Beaver Creek side of the divide. The purpose of the long tunnel connecting the three properties is to permit bringing the ores from the different properties out on the Nine Mile side, where there is transportation. The ores from the mines are conveyed to the mill by an aërial tramway capable of hauling 1000 tons per day and the mill, as now constructed, can be increased to that capacity. The three properties have been developed by a series of tunnels and there is a vertical depth of 1200 ft. between the lower tunnel on the Amazon-Manhattan and the highest tunnel on the Callahan property.

MICHIGAN

Iron

PORTLAND (Michigamme)—A shaft is being sunk at this mine on the western end of the Marquette range and several mine buildings are being built, a force of about 25 men being employed. No stripping is being done this summer so no ore is going to the docks.

BENGAL (Stambaugh)—This new mine of Pickands, Mather & Co. has begun shipping ore; a temporary wooden headframe is being used pending the completion of the permanent steel headframe. The new steel headframe will be one of the largest in the Iron River district, 105 ft. from shaft collar to center line of sheaves.

LAKE ANGELINE (Ishpeming)—The management of this company states that there is less than 100,000 tons of ore left in the mine and it will not be long before the property will have to be shut down. This mine has produced the richest iron ore of any Lake Superior property and when it ceases to be worked Jones & Laughlin will have only one mine on this range, the Rolling Mill at Negaunee.

IMPERIAL (Michigamme)—This property has been placed in first-class condition for mining by the Cleveland-Cliffs company, but is still idle and there is little likelihood that it will be reopened this summer. A new steel headframe has been erected, an addition has been made to the change house, the coal dock has been lengthened and several other improvements have been made, but there is little demand for limonite ore at this time, so the company will not operate the mine and stock the ore. The mine is owned by the Michigan Land & Iron Co. and the lease expires in 1919, but the Cleveland company will probably have an opportunity to renew.

TILDEN (Bessemer)—Considerable argument recently arose over the valuing of this mine of the Oliver Iron Mining Co. for taxation purposes. The local assessors at Bessemer considered the mine worth at least $1,000,000, while the representative of the State Tax Commission valued it at $150,000, exclusive of personal property. The local board of review finally adopted the figure of $200,000 for realty value.

TULLY (Stambaugh)—Sinking at No. 2 Shaft has made practically no progress for several weeks, as considerable difficulty is being experienced from quicksand and water. The depth remains at 160 ft. with 18 ft. more to go before bedrock is reached. It may take several months more to sink to bedrock. This is not the first shaft to give trouble from sand and water in the Iron River district, Tully No. 1, Bates and Rogers shafts were expensive sand shafts, although compressed air at 40 lb. pressure was used in the caisson at the Rogers to hold back the water. The new headframe at Tully No. 1 is nearly completed.

CLEVELAND-CLIFFS IRON CO. (Negaunee)—This company will in the near future start sinking a shaft on the Harvey lots, which are owned by the Athens Mining Co. It has been known for years that a large orebody existed there,

but the lands were in litigation, being claimed by the Cleveland company and the Breitung interests, but all differences were settled a short time ago with the formation of the Athens Mining Co. The ore lies at a depth of more than 2000 ft. and it will require several years to open up the mine as the shaft will be concreted from the top to the bottom. The equipment will be an almost exact duplicate of that at the Negaunee mine, which is considered the most uptodate in the district. The specifications have been drawn and the contracts will be awarded in the near future.

ASHLAND (Ironwood)—This mine on the Gogebic range, owned in fee and worked by Congressman E. A. Hayes and his brother, both of California, is idle, work having been suspended recently. The Ashland was operated by the Cleveland-Cliffs company for several years until last February, when the lease was surrendered. Since then the Hayes brothers had been doing exploratory work in the western part of the property. They also rebuilt the No. 9 shaft, in which the old timbering was removed and steel sets were substituted. It had been understood that a new and what was said to be an important body of ore had been encountered on the 14 level, and for this reason the suspension of operations has caused surprise. The Ashland was employing 130 men. These have all found places at other properties in the Ironwood district.

MINNESOTA

MAPS OF THE IRON RANGES have been prepared by the School of Mines of the University of Minnesota. The set is very comprehensive, including the Mesabi, Vermilion and Cuyuna, with an authentic list of the principal ownerships. The data was gathered under the supervision of Dr. Rukard Hurd, Secretary of the Minnesota State Tax Commission. The maps are the most important and best of their kind that have been issued for several years. A limited number of sets are available for free distribution and can be had by addressing Dean W. R. Appleby, of the School of Mines, Minneapolis, Minn.

INTERESTING LITIGATION is now pending in the district court of St. Louis County to determine whether or not, under certain conditions, a minority interest in the fee ownership of mineral property, may force the development of the property, even against the wishes of the majority interests. The property involved is a 160-acre tract in Sec. 3, 61-15, on the Vermilion range, near Tower. John Brannan, owner of approximately 18% of the property, has brought suit against Thomas Walsh, a prominent Vermilion range mine operator, and others for an equitable partition of the tract, or the sale of same and a division of the proceeds. Conversely, some of the defendants in this suit are bringing action against the plaintiffs under a Minnesota law which provides that when a majority of the owners of a mining property fail to proceed with development work and abandon such work, then the minority owners may proceed with the work. The particular tract involved is said to be of doubtful or speculative value, but the precedent to be established is exceedingly important to fee owners on the Minnesota iron ranges, where many ownerships are split to small fractions.

KENNEDY (Crosby)—This mine will be electrically operated as soon as present plans are carried out. A 5-ton electric locomotive will be installed underground. The company expects to generate its own power. The new steam shovel has arrived, and shipments from stockpile will begin immediately. There is more than 90,000 tons of ore into stock.

MORTON (Hibbing)—The experiments which have been carried on at this property of the Oliver Iron Mining Co. for the last month with a Sullivan coal puncher and a Jeffrey auger have proved satisfactory and it is not at all unlikely that more of the machines will be used. One of the orebodies is being undercut and the coal puncher does the work more rapidly than would be possible with any of the iron mining machines that have been tried out. The auger is working well because the hematite is soft and of uniform texture. Steam and air augers have been tried out at other places in the district but have not given satisfactory results because of the fact that the ore was not uniform. The augers would be able to go just so far when iron of a harder grade would be encountered and it would be impossible to proceed farther.

MONTANA

Butte District

ANACONDA (Butte)—At the Pennsylvania mine the main shaft has been sunk to a point 40 ft. below the 2200-ft. level. Sinking has been temporarily suspended at this depth and the work of cutting a station on the 2200-ft. level has been started. With the completion of the station a pump will be installed to assist the one on the 2000-ft. level in relaying the flow to the large electric pumps on the 1800-ft. level.

GAMBRINUS (Butte)—The shaft on this property, recently acquired by the Corbin Copper Co., has now reached a depth of 70 ft. A wooden headframe has been erected and a hoist which can be used to a depth of 500 ft. has been installed. The trestle from the shaft, running north across Caledonia St. to the Butte, Anaconda & Pacific Ry., is rearly completed. This will be used for transporting timber and supplies to the mine.

Lewis & Clark

MONTANA COPPER SILVER MINING CO. (Helena)—E. R. Purnell, superintendent, reports that the shaft at the company's property in the Scratch Gravel hills is 370 ft. deep, and a new air compressor will be installed to operate machine drills in the place of the hand work being done at present. No crosscutting to the lode has been done as yet and the company is undecided whether to crosscut in the near future, or wait until the 500-ft. level is reached.

Madison County

A NEW ROAD is being built by the forestry service from Sheridan to the head of Mill Creek, near Branham Lake, which will enable the owners of several mines that yield low-grade ore to ship the ore, and work the mines with profit.

FAIRVIEW (Sheridan)—Arthur B. Clark, who is operating the Bonanza group, has a lease and bond on this group of claims on Wisconsin Creek and will soon begin development work there.

BLOWOUT (Rochester)—In crosscutting on the 500-ft. level at this property of the Corbin Copper Co., a 4-ft. vein of ore was recently cut which contains from 4 to 5½% copper. The ore is of excellent milling grade and drifting on the vein will be begun at once to determine the extent of the shoot.

NEVADA

Lyon County

OAKLAND COPPER BELL (Yerington)—The shaft on this property recently cut a 3-ft. vein of good-grade copper ore at a depth of 40 ft. Shipments will be made soon.

NEW YERINGTON (Yerington)—The new orebins have been completed and are now in use. Shipping will be started in a few days. Recent development has disclosed orebodies of large size and good grade.

COPPER BELT (Ludwig)—The orebody recently discovered in the shaft at this mine continues downward. A loading station, it is reported, will be erected at Ludwig, and shipping will begin in the near future.

Mineral County

CINNABAR HAS BEEN DISCOVERED nine miles east of Mina. Large quantities of ore averaging 1% mercury are reported. Specimens of high-grade ore are on exhibition. There is a rush of prospectors to the locality.

A GOLD DISCOVERY has been made six miles west of Kinkead. A gold-bearing vein has been discovered, which is 6 to 8 ft. wide, and has been proved for several hundred feet in length. Native gold specimens have been taken out from near the surface.

SHIPPER COPPER CO. (Luning)—This company owns four claims five miles southeast of Luning. Regular shipments of ore averaging 8% copper are being made. It is reported that negotiations for a sale to Eastern men have just been completed.

Nye County

TONOPAH EXTENSION (Tonopah)—The north crosscut on the 750-ft. level from the new main working shaft has encountered a vein about 10 ft. wide carrying good ore in spots, and drifting on this ore has been started. This is believed to be the extension of the North vein in the eastern workings, but is 500 ft. west of these.

Washoe County

A RICH SILVER STRIKE was recently reported as having been made near Pyramid Lake. There was a rush of prospectors from Reno, Rochester and Tonopah.

THE OLD CAMP OF OLINGHOUSE, 28 miles from Reno, east of Derby, is again attracting attention. The mines are shallow, none being over 300 ft. deep. Several properties are being worked on a small scale by lessees. The average value of the ore after sorting is from $40 to $100 per ton. It is treated in a custom mill, equipped with Huntington mills and plates.

White Pine County

CONSOLIDATED COPPER MINES CO. (Ely)—It is reported that Butte, Mont., stockholders of Butte & Ely Copper Co., have begun injunction and receivership proceedings in the district court against Joseph B. Cotton, John W. Neukom and Edward J. Meaney of Duluth, executive officers of the company, to prevent absorption by Consolidated Coppermines Co. It is charged the defendants have grossly mismanaged affairs of Butte & Ely since Giroux interests secured control Sept. 11, 1909, when Giroux purchased 229,175 shares of Butte & Ely stock for $1 per share, when it was worth $2, the deal being made on representation that the money be used for developing Butte & Ely ground. It is further alleged that not more than $20,000 has been spent on Butte & Ely development and that the defendants took $100,000 out of the Butte & Ely treasury without authority from directors and loaned it to the Giroux company taking that company's note as security. At the time Giroux got hold of the company, Butte & Ely had $246,000 in its treasury and no debts. Suit is brought by I. A. Heilbronner, local broker, owner of 23,794 shares of stock. In regard to plans for development of the consolidated properties it is reported that the old Giroux concentrator will be used as an experimental plant to test the flotation process of concentration. Much of the machinery of the old mill has been dismantled for use on other parts of the property and the work of putting it in shape for even an experimental run would involve some time and expense. Its location, however, is excellent for the intended purpose, as it is only a short distance from all the principal properties of the Consolidated company and is in direct rail communication with several of them. Water for concentration purposes can be pumped from the Giroux shaft. The experiments will not be the first test of the process to be made in the Ely district. The Nevada Consolidated has also done some experimenting along these lines but the tests were made at a time when the process was not so well understood as it is now. Copper Flat ores of the Nevada Consolidated and those from the Giroux are said to be well adapted to such concentration, but those of the Veteran mine could not be treated on account of an excess of oxidized matter. It is reported that the plans of the company also include the unwatering of the Giroux shaft which was flooded at the time of the general strike in the Ely district last autumn when the strikers refused to allow the Giroux management to continue working the pumps. The shaft and all workings below the 1000-ft. level are now filled with water and the draining of the mine will be slow and expensive process. Shipments from the Morris and Bunker Hill shafts of the Giroux company are going on as usual at the rate of about 800 tons a day.

OREGON

Baker County

DUTCH GULCH PLACER (Susanville)—A large nugget was panned June 19 by George Armstrong and Richard Staunton on their placer claim, three miles from the town of Susanville and 60 miles from Baker. The nugget is worth $1500; it weighs 6¾ lb., and is worth $17.50 per oz. The men were hydraulicking when the nugget was found. They have worked the claim for about 40 years.

Jackson County

BEAVER-PORTLAND CEMENT CO.—J. C. Burch, president, states that this company will build a modern cement plant at Gold Hill at once, owing to the decision of the Oregon railroad commission allowing the Southern Pacific a low freight rate on cement.

UTAH

Beaver County

GLASGOW & WESTERN EXPLORATION CO., LTD. (Salt Lake City)—This company is a parent concern to the Adelaide Star Mines, Ltd. It owns the Copper Cañon and Copper Basin group of claims in Lander County, Nev., and the Montreal group in Beaver County, Utah. The Adelaide Star Mines, Ltd., owns the Adelaide group of claims near Golconda, and the Star group at Cherry Creek, both in Nevada. Reduction plants of expensive design were erected at both these places and were failures. A large sum of money has been squandered on these properties during the last 15 years, the sum approximating $5,000,000. At present a reorganization of the business of the company is being arranged, and it expected that in a few weeks things will be in such shape that mining may be done, as the Montreal and the Copper Basin and Copper Cañon properties possess merit to justify extensive work, but no mining has been done up to the present. Arrangements are being made to sink two three-compartment shafts to water level at the Montreal property. These shafts will be sunk to depths of about 500 and 850 ft., respectively. The various properties are being surveyed for patent, for although the number of claims is large, and although the large sum mentioned has been squandered, no effort to patent the property was made except to a small extent. On Apr. 1, debts against the company amounted to over $95,000, and up to within about six weeks before the company's executive left England there was no idea that any such indebtedness existed. In order to avoid the tediousness of bankruptcy the executive was empowered by the petitioning creditor to offer a composition, and has settled with the various creditors upon a basis approximating 40c. on the dollar.

Juab County

THE OUTPUT FROM TINTIC is increasing, and shipments for the week ended June 27 amounted to 182 cars. This is a gain of 25 cars over those of the week preceding.

GRAND GENTRAL (Robinson)—This property is keeping up its record of steady production, and ore is being mined from many levels. The 2400 will not be unwatered before winter.

EAGLE & BLUE BELL (Eureka)—What is thought to be a new vein carrying shipping ore has recently been opened in a winze 50 ft. below the 1350 level. The new find is in hitherto unprospected territory, and occurs in limestone; 18 cars were shipped the week ended June 27.

MAY DAY (Eureka)—Owing to the cessation of zinc shipments while the low price for that metal holds, the working forces have been reduced. Lead ore is being mined from between the 1000- and 1100-ft. levels, and prospecting for ore of this character is being done in other parts of the mine.

DRAGON CONSOLIDATED (Silver City)—The tunnel which is being driven through this property from north to south is in more than 600 ft., and drifting is being done along the vein encountered a short time ago. The tunnel will afford an outlet for the ore which is now being mined through the Iron Blossom.

OPOHONGO (Robinson)—Lessees on this property shipped two cars of ore the week ended June 27. Prospecting is being done on company account for the possible continuation in Opohongo ground of an orebody developed on the 700-ft. level of the Gold Chain; and from the main tunnel level of that property a drift is being driven for the Opohongo. This is within 100 ft. of the line.

MAMMOTH (Eureka)—The case of this company versus William Werrett, resulting from the sale to the latter and associates of an old mill dump was settled out of court. After a considerable quantity of dump ore had been shipped, the company got out an injunction to prevent further shipments by the defendant, and started suit, alleging that misrepresentation on the part of the purchaser had resulted in the sale of the dump for less than its actual worth. The company retains possession of the dump, after a money settlement the amount of which has not been made public.

Summit County

SNAKE CREEK TUNNEL—(Midway)—The Williams Contracting Co. recently secured the contract for driving the Snake Creek tunnel about 9000 ft. This bore is 9 ft. 4 in. wide by 6 ft. 6 in. above the track (both in the clear), and carries a ditch 3 ft. 6 in. deep by 4 ft. wide on the right-hand side of the tunnel. A large amount of preparatory work has been finished and work on the contract proper, it is expected, will be begun about July 1. The tunnel is a drainage and exploration bore for the southwest portion of the Park City mining district and the eastern portion of the Alta district.

WASHINGTON

Ferry County

SAN POIL (Republic)—Installation of the new machinery at this mine is nearing completion, and the plant will be in operation at an early date.

Stevens County

UNITED COPPER (Chewelah)—Delay of about 30 days has been occasioned in the installation of the new concentrator and other equipment at this mine. However, the installation will be completed by the end of the month, and 40 more men will be added to the already large force. The capacity of the new plant will be 120 tons per day.

CANADA

British Columbia

REVIVAL OF THE MINING INDUSTRY is being brought about by the availability of money for legitimate mining ventures and the optimism that seems to prevail in regard to metal prices and markets for the near future. With nearly all the metalliferous mines being operated at full capacity and better conditions now existing in the coal fields, the whole mining industry is healthier in British Columbia that it has been for some time. The oldest gold-producing camp, Hedley, is about to enter upon an era of expansion. The British Columbia Copper Co. has started prospecting on its claims in the Voigt camp and on Copper Mountain; President Erb states that large orebodies have been found and that the grade of the ore is higher in proportion to quantity than in any other properties owned by the company. When the Kettle Valley Ry. connects Princeton with the numerous Okanagan towns and the Vancouver, Victoria & Eastern gives a direct line to the Pacific Coast and the new Wenatchee field, then the coal operators will not be handicapped by discriminating transportation rates. Since these lines have already been started, it seems probable that the coal-mining industry will shortly receive a unprecedented boost.

Ontario

HOLLINGER (Schumacker)—The entire working force of the company has been put on an 8-hr. day basis without reduction of wages, anticipating the new law limiting the number of hours of underground work to eight, which does not come into operation until next January.

STERLING SILVER MINES CO. (Elk Lake)—An order has been issued by the court in Toronto for the winding up of this company. It has a nominal capital of $1,250,000, but only a small proportion of the shares were taken up. It is stated that the failure is due to the nonpayment of assessments by shareholders.

FOSTER (Swastika)—About $7000 in gold has been realized from the first cleanup of this mill in the Kirkland Lake district, after a month's run during which about 10 tons per day were treated, about $10 per ton going into the tailings. The shaft is now 170 ft. deep, and the ore holds good at that depth, carrying about 9 in. of high-grade split into stringers in addition to milling ore.

DANE COPPER (Dane)—A recent report issued on this company's properties, states that they have several veins of quartz carrying about 4% copper, and in addition, shoots of rich ore are occasionally encountered which have been known to run as high as 17%. The high-grade ore is shipped to the smelters and the company is making arrangements for the purchase of a plant to treat 100 tons per day of the lower-grade ores.

CANADIAN NICKEL CORPORATION LTD.—This corporation has been organized with a capitalization of $30,000,000, divided into $10,000,000 6% debentures and $20,000,000 common stock. The properties held by the company cover 17,500 acres in the Sudbury district, including the Murray mine, and as a result of development up to May 1, 6,800,000 tons of ore is said to have been blocked out. Among those connected with the company are Dr. F. S. Pearson, president of the Brazilian Traction, Light & Power Co.; J. Frater Taylor, vice-president of the Lake Superior Corporation. J. E. McAllister, Benjamin Lawrence, of New York; E. R. Wood, Walter Gow, and Miller Lash.

MEXICO

Mexico

EL ORO MINING & RY. CO. (El Oro)—In June 23,500 tons of ore and 11,640 tons of tailings were treated yielding bullion worth $214,930. Railway profit was $12,710; net total profit, $88,210 for the month's operations of mines and railway.

Sonora

ARCHIPELAGO (Cumpas)—This mine is being operated by the Minneapolis Copper Co. The force at the mine was recently increased and it is expected that work will continue now without interruption.

ESTRELLA—(Nacozari)—Norton Hand, who is leasing this property from the Moctezuma Copper Co. is shipping about two cars per day to the smelting works at Douglas. He recently encountered a streak of high-grade ore.

MINNEAPOLIS COPPER CO. (Cumpas)—After being shut down for a week while some minor repairs were being made, the furnaces have been blown in again and are now making about 10 tons per day of matte containing about 30% copper.

MONTE CRISTO (Moctezuma)—Carlos C. Soto is now shipping another car of high-grade silver-lead ore to the El Paso smelting works. The ore contains about 250 oz. silver and 20% lead. Shipments will amount to one car per week before another month.

MEXICAN METALS CO. (Cananea)—Power facilities are to be increased so that the mill may be operated to its full capacity of 100 tons per day and still provide for ample power for all other departments. Shipments are made regularly to El Paso and 100 men are now employed.

CHURUMIBABI (Nacozari)—This property of the Moctezuma Copper Co. is being operated by Colonel Hand, who reports that a strike of high-grade ore has been made in some of the old workings of the mine. About 100 men are employed and shipments are made regularly to the Douglas smelting works.

EL TEMBLOR—(Esqueda)—The new mill on this property recently built by W. L. Rynerson, who has a lease on the mine, is running well, and about two tons of concentrate are made each day. This concentrate will run about 250 oz. silver and 2½ oz. gold per ton. The ore being milled contains about 20 oz. silver and about 0.20 oz. gold. The shipping ore contains about 400 oz. silver and about 3 oz. gold per ton.

LUCKY TIGER (Yzabal)—Because of the annoyances and inconveniences attending the settlement of duties, arising from the stipulations of the "constitucionalistas" at Agua Prieta, an attempt will be made to ship ore to the Copper Queen smelting plant at Douglas, Ariz., instead of to El Paso, although United States import duty on lead will have to be paid as the ore cannot be shipped to Douglas in bond as it can to El Paso.

SOUTH AMERICA

Ecuador

DEVELOPMENT OF OIL LANDS will now be carried out by S. Pearson & Son, Ltd., a contract with the government having recently been signed giving the company exclusive right to explore and develop the oil lands of the republic.

THE MARKET REPORT

METAL MARKETS

NEW YORK—July 9

The metal markets have generally been rather quiet, under the combined influences of the holiday and of the midsummer season.

Copper, Tin, Lead and Zinc

Copper—The market continues dull and weakish. Buyers both here and abroad are evidently deferring their purchases as long as possible, and while it is believed that the time is approaching when they will have to replenish their stocks, the inquiry remains very small. Sellers generally have reduced their prices in an effort to find a level at which business would be stimulated. The old "asked prices" have been abandoned completely among the sellers of electrolytic, all of whom are apparently willing to meet buyers and trade. During the week electrolytic has been freely offered at 14⅜c., delivered, usual terms, or about 14.20@14.25c., cash, New York. The Lake producers on the other hand are more stand-offish. No transactions in Lake have been reported during the week, and the market for this sort is quoted nominally at 0.25c. over electrolytic. At the close we quote electrolytic in cakes, ingots and wire bars at 14.20@14.25c. Casting copper is quoted nominally 13.95@14.05c. as an average for the week.

The London market for standard copper has again declined. On July 3, it was £63 8s. 9d. for spot and £63 12s. 6d. for three months. On July 7 it advanced to £63 17s. 6d. for spot and £64 three months, closing at £62 10s. for spot and £62 15s. for three months.

Base price of copper sheets is now 20c. per lb. for hot rolled and 21c. for cold rolled. Full extras are charged, and higher prices for small quantities. Copper wire is quoted at 16c. per lb., for carload lots at mill.

Exports of copper from New York for the week were 3751 long tons. Our special correspondent gives the exports from Baltimore at 1532 tons for the week.

Visible stocks of copper in Europe on June 30 are reported as follows: United Kingdom, 19,230; France, 2860; Rotterdam, 4700; Hamburg, 3400; Bremen, 1910; total, 32,100 long tons, or 71,904,000 lb.; a decrease of 1770 tons from the June 15 report. In addition to the stocks given 1360 tons are reported afloat from Chile and 4700 from Australia, making a total, visible and afloat, of 38,160 tons.

Tin—Further heavy liquidation in the London market brought about a severe decline in quotations, and the metal today is selling at a lower price than has been quoted for almost two years. The market, as so often in the past, is entirely in the hands of speculators, the bear party having it all its own way. The short position in this metal must be abnormally large, and this fact may mean an abrupt change in the situation one of these days. While consumers in this market were liberal buyers, especially for future delivery, the latter part of last week, the continual decline in the London market has entirely checked all buying for the time being; even at concessions on the importation price, no interest is shown. The close is weak at £177 5s. for spot and £178 5s. for three months, and 39c. for July tin here.

Messrs. Robertson & Bense report the arrivals of tin ore and concentrates at Hamburg, Germany, in May at 2022 tons, of which 1982 came from Bolivia and 80 tons from South Africa.

Shipments of tin from the Straits in June are reported by cable at 4820 long tons, an increase of 540 tons over June, 1912. Deliveries into American consumption in June, 1913, are estimated at 3800 tons.

Tin production of the Federated Malay States five months ended May 31 was 19,817 long tons in 1912, and 19,148 in 1913; decrease this year 669 tons.

Lead—The market is unchanged at 4.17½@4.20c. St. Louis and 4.30@4.35c. New York.

The London market was somewhat firmer early in the week. Spanish lead being quoted £19 10s.@£19 15s., but it eased off on July 8 and 9 and closes at £19 7s. 6d. for Spanish and 7s. 6d. more for English lead.

Spelter—The market is dull with some inquiry both for early and distant shipment which is being freely met. Prices are unchanged at 5.05@5.15c. St. Louis and 5.20@5.30c. New York.

The London market is quiet and somewhat easier, good ordinaries being quoted £20 7s. 6d. and specials £21 7s. 6d. per ton.

The price of zinc sheets was reduced ¼c. per lb. on June 25, and is now $7 per 100 lb., f.o.b. Peru, Ill., less 8% discount. Included in exports from Baltimore for the week were 560,000 lb. spelter to Liverpool.

Zinc smelters have lately curtailed their operations materially; also some of the zinc miners. The American Zinc, Lead & Smelting Co. is operating only two blocks at Caney and two at Deering, but at Hillsboro four are running.

Cadmium—The latest quotation from Germany is 725@750 marks per 100 kg. f.o.b. works in Silesia. This is equal to 78.27@80.97c. per lb. at works.

DAILY PRICES OF METALS

NEW YORK

July	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb	St. Louis, Cts. per lb.	New York, Cts. per lb.	St Louis, Cts. per lb.
3	4.8685	58¼	14.50 @14.60	14.30 @14.40	40½	4.30 @4.35	4.17½ @4.20	5.20 @5.30	5.05 @5.15
4	.....	..	.....	.....		.....	.....	.....	.....
5	4.8700	58⅜	14.45 @14.50	14.20 @14.25	40½	4.30 @4.35	4.17½ @4.20	5.20 @5.30	5.05 @5.15
7	4.8685	58½	14.45 @14.50	14.20 @14.25	40⅜	4.30 @4.35	4.17½ @4.20	5 20 @5.30	5.05 @5.15
8	4.8680	58⅜	14.45 @14.50	14.20 @14.25	39¼	4.30 @4.35	4.17½ @4.20	5.20 @5.30	5.05 @5.15
9	4.8675	58⅜	14.45 @14.50	14 20 @14.25	39	4.30 @4.35	4.17½ @4.20	5.20 @5.30	5.05 @5.15

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

July	Silver	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
		Spot	3 Mos	Best Sel'td	Spot	3 Mos		
3	26⅞	63 7/16	63⅝	69	185	185¼	19½	20⅜
"	27	63½	63⅝	69	186¾	187¼	19¾	20½
5	26 15/16	....	....	....	....	....	....	....
7	26 15/16	63⅞	64	69¼	183½	184¼	19½	20½
8	26 13/16	63 5/16	63½	69	178½	179½	19½	20½
9	26 15/16	62½	62¾	68½	177¼	178¼	19⅜	20⅜

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

Other Metals

Aluminum—Business is still rather light and unsettled, and prices are rather uneven. Quotations are 23@24c. per lb. for No. 1 ingots, New York. Foreign is quoted at 19@19½c., in bond.

Antimony—Business is of a retail order only, and prices are unchanged. Cookson's is 8.65@8.75c. per lb.; Hallett's 8@8.25c.; while 7.50@7.75c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—The market has been quiet and prices are unchanged here at $40 per flask of 75 lb., with 60c. per lb. for small orders. San Francisco, $39.50 for domestic orders and $37 for export. London £7 10s. per flask, with £7 2s. 6d. asked from second hands.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Nickel—Shot, block and plaquettes are quoted at 40@45c. per lb., according to quality and size of order. Electrolytic nickel is 5c. per lb. higher.

GERMAN FOREIGN METAL TRADE

Imports and exports of metals other than iron and steel in Germany for the quarter ended Mar. 31 are reported as below, in metric tons:

	Imports		Exports	
	1912	1913	1912	1913
Copper	59,548	53,446	21,817	26,286
Tin	3,756	3,379	2,481	2,916
Lead	16,271	21,655	12,322	15,896
Zinc	10,585	12,692	24,643	32,864
Nickel	470	581	632	455
Aluminum	3,781	3,006	1,174	2,358
Miscellaneous	460	525	4,137	5,853

Exports of metals include alloys and manufactures of those metals.

Gold, Silver and Platinum

Gold—Prices on the open market in London continued at the Bank level, 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. In New York a total of $5,000,000 has been taken for export to France, and more is expected to follow.

Sales of gold bars from the U. S. Assay Office in New York in June were $2,815,847. For the six months ended June 30 the total sales were $13,950,242 in 1912, and $16,984,648 in 1913; an increase of $3,034,406. These sales are for use in the arts.

Gold in the United States, July 1, is estimated by the Treasury Department as follows: Held in treasury against gold certificates outstanding, $1,086,727,169; in treasury current balances, $173,084,093; in banks and circulation, $608,979,598; total, $1,868,790,860, an increase of $7,420,965 during June.

Iridium—Prices are unchanged at $85 per oz., with a fair demand.

Platinum—The market is quiet but steady and prices are unchanged. Dealers ask $45@46 per oz. for refined platinum and $49@52 per oz. for hard metal.

Our Russian correspondent writes under date of June 29 that the situation is strong. Demand is fair and fully up to the current supply. Stocks are small and in strong hands. Supplies offered by the starateli are considerable, but are quickly taken by speculators. The quotations for small lots at Ekaterinberg are 9.75 rubles per zolotnik for crude metal, 83% platinum; at St. Petersburg, 37,700@37,800 rubles per pood for the same grade. These prices are equal to $36.66 and $37 per oz., respectively.

Silver—The market has fluctuated within narrow limits. June, usually a brisk month with the Indian bazaars, was this season rather dull, and the merchants were poor buyers. An occasional order from China has helped to steady the market. Buyers are watching the course of the Monsoon, on which so much depends. So far this season the rainfall has been fair.

Exports of silver from London to the East, Jan. 1 to June 25, reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India	£3,336,700	£3,653,600	I. £316,900
China	893,500	344,500	D. 549,000
Total	£4,230,200	£3,998,100	D. £232,100

Exports of silver from New York for the week ended July 5 were $702,782, chiefly to London. Imports were $194,934, mostly from Mexico and South America.

Coined silver in the United States July 1 is estimated by the Treasury Department as follows: Dollars, $565,618,020; subsidiary coins, $175,471,210; total, $741,089,230. Of the dollars, $483,550,000 are held in the treasury against silver certificates outstanding.

Zinc and Lead Ore Markets

JOPLIN, MO.—June 28

The high price of zinc blende is $47, the base per ton of 60% zinc ranging from $41 to 44. Calamine sold on a base of $20@22 per ton of 40% zinc. On account of an unusually heavy sale of calamine the average of all grades dropped to $38.78 per ton. Nothing has happened to cause a change in the lead situation and prices are quoted steady at $52.50 per ton of 80% grades and the average of all grades $51.04 per ton.

SHIPMENTS WEEK ENDED JULY 5

	Blende	Calamine	Lead ore	Value
Totals this week ..	9,497,680	1,848,620	1,770,380	$271,030
Totals 27 weeks ...	293,080,360	20,735,310	49,031,740	$8,174,217

Blende value, the week, $203,233; 27 weeks, $6,618,120.
Calamine value, the week, $22,609; 27 weeks, $268,780.
Lead value, the week, $45,195; 27 weeks, $1,287,417.

PLATTEVILLE, WIS.—July 5

The base price paid this week for 60% zinc ore was $42@42.50 per ton. The base price paid for 80% lead ore was $52@53 per ton.

SHIPMENTS WEEK ENDED JULY 5

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,931,190	118,360	955,950
Year to date.....	75,716,830	3,694,080	32,213,740

Shipped during week to separating plants, 1,988,700 lb. zinc ore.

The report for June 28, received too late for publication last week showed shipments of 2,452,340 lb. zinc ore; 195,850 lb. lead ore, and 1,119,010 lb. sulphur ore; zinc ore sent to separating plants, 2,047,930 lb. Base prices, 60% zinc ore, $42@42.50; for 80% lead ore, $52@53 per ton.

IRON TRADE REVIEW

NEW YORK—July 9

There is little change in the market situation, except the inevitable slowing down over the holiday.

Production of pig iron in the first six months of this year has easily equalled 16,500,000 gross tons, against 15,655,000 tons in the second half of last year, the best previous record. Steel production has shown a corresponding gain. The chances appear even as to the second half breaking the first half record.

There has been an almost complete cessation of new business since July 1, and specifications against old contracts have also decreased, this latter being due partly to the expiration of a number of contracts on June 30 at lower than prevailing prices. Despite the market stagnation the mills are able to continue operation at practically full capacity, due to old business. Without any improvement in buying or specifying, the majority of mills will be able to run full until early September, but it is conceded that unless there there is a decided improvement in buying by that time there will have to be a material curtailment in output. There are those who seem to regard it as certain that there will be no improvement, while the majority of steel producers predict that there will be a buying movement in September of sufficient volume to insure full operation to the close of the year. It goes without saying that the present month will be dull.

There is rather more inquiry for pig iron, but many furnaces are holding out for some advance. They claim that there is no money in working at present prices of coke.

PITTSBURGH—July 8

Prices are very well maintained all along the line, except as to wire products and sheets, which began to show weakness months ago. Black sheets have not declined further in the past week, but galvanized are quotable $1 a ton lower.

Pig Iron—The feature in the pig-iron situation is the developments in coke. Furnacemen claim that prices asked for coke are too high. Pig iron prices do not advance. There has been moderately heavy buying in the past two or three weeks but this has not helped the situation and may indeed have injured it, by removing so much demand. We quote: Bessemer, $16; basic, $14.50; malleable, $15.25; No. 2 foundry, $14; forge, $13.75, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh. Bessemer has possibly sold in small lots at concessions from the quoted price. The American Steel Foundries bought 3000 to 5000 tons of basic, delivery to the middle of August, at a price which figures back to about $14.25, Valley, but the iron is understood to come from a furnace having a special rate.

Ferromanganese—The market continues to soften, with little demand. Prompt lots can be had at $58, Baltimore, and the nominal contract price of $61, Baltimore, could be shaded to $59 or $58 in all probability. Freight to Pittsburgh is $2.16 per ton.

Steel—Billets and sheet bars continue scarce. The National Tube Co. has bought a round lot of billets and the American Sheet & Tin Plate Co. at least 2000 tons of sheet bars in the open market, the supplies from corporation mills being insufficient. The large mills are indifferent as to sales and are maintaining prices strictly at $26.50 for billets and $27.50 for sheet bars, at maker's mill, Pittsburgh or Youngstown.

Sheets—Until the past few days a price of 3.30c. on galvanized sheets has been exceptional, though done on occasion, but this figure is now common enough to be regarded as the quotable market. Black sheets are rather firm at the former quotation of 2.25c., while blue annealed are firm at 1.75c. New business is light, but some of the mills have specifications to run from six to eight or 10 weeks. Others are disposed to restrict production. In the past week about 90% as many sheet mills have been in operation as at the time of greatest activity, the leading interest and the independents running about evenly.

IRON ORE

Little is doing in iron ore, either in the East or on the Lakes, so far as buying is concerned. Nearly all furnaces have completed their arrangements for the year.

Total production of iron ore in 1912 is estimated by the Geological Survey at 55,150,000 tons, an increase of 25.7% over that of the previous year.

Imports of iron ore into the German Empire five months ended May 31 were 5,593,659 metric tons; exports 1,162,565. Imports of manganese ore were 300,002; exports, 3885 tons.

OTHER ORES

Manganese Ore is quoted in London as follows, c.i.f. United Kingdom port: Indian or Brazilian, 50% manganese, 22@22½ per unit; 48%, 21@22c. Caucasian, 50%, 18½@19c.; 48%, 18¼@18½c. per unit.

COKE

Connellsville Coke is the feature of the market. According to the most trustworthy estimates, there was about 175,000 tons a month of furnace coke contracts expiring June 30, and the group of operators holding these contracts months ago made up their minds to insist upon $2.50 for their renewal. The furnacemen absolutely refused to pay the price, and in the closing days in June a compromise was effected with some furnaces, chiefly in the East, whereby coke for July only was purchased at $2.50, the price being guaranteed against sellers' declines. Such sales amounted to about 90,000 tons for July, about one-half the amount supposed to be required. The remaining consumers have not bought, nor do they inquire and at this writing the operators do not know whether they have covered, will blow out or bank, or are about to appear in the market. The operators intended to blow out ovens to shut off any coke not sold. Last week the holiday helped, and the operators involved made Saturday an idle day also. This week coke is somewhat scarce and it remains to be seen whether the operators will weaken as to price or will curtail production.

Coal Production of German Empire four months ended Apr. 30, metric tons:

	1912	1913	Changes
Coal mined	56,083,434	63,379,455	I. 7,296,021
Brown coal mined	26,769,972	28,176,021	I. 1,406,049
Coke made	9,061,330	10,660,315	I. 1,598,985
Briquettes made	7,855,712	8,803,963	I. 948,251

Of the briquettes reported this year 6,886,452 tons were made from brown coal or lignite.

CHEMICALS

The general market is still inclined to be dull. Little or no improvement is expected this month.

Copper Sulphate—The market is dull, but prices are unchanged, at $5.25 per 100 lb. for carload lots and $5.50 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is very quiet. Quotations are 2.37½c. per lb. for spot and August; 2.35c. for September and forward. Buyers seem to be holding back in hope of lower prices.

Arsenic—Practically no business is being done. Supplies are good, but there is little demand. The quotations are $3.12½@3.50 per 100 lb., but are largely nominal.

PETROLEUM

The monthly review of the "Oil City Derrick" gives new wells completed in June as follows: Pennsylvania grade, 794; Lima-Indiana, 102; Kentucky, 16; Illinois, 153; Kansas-Oklahoma, 1072; Texas-Louisana, 103. This is a grand total of 2240 wells completed with a new production of 68,242 bbl. The increase in the completions over May is 214, but the new production is 653 bbl. less. Among the completions were 367 dry holes and 168 gas wells, an increase in the failures of 115 and of 8 in gas producers. At the close of the month there were 642 rigs and 2387 drilling wells.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	Feb.	March	April	May	June
Alaska shipments..	660,250	472,293	1,730,252	1,771,508	.....
Anaconda.....	21,250,000	22,900,000	23,800,000	25,600,000	.....
Arizona, Ltd.....	3,000,000	3,200,000	3,100,000	3,200,000	3,000,000
Copper Queen.....	6,810,706	7,558,709	8,210,166	8,301,605	7,477,936
Calumet & Ariz...	4,050,000	4,250,000	4,500,000	4,300,000	.....
Chino.....	3,898,998	4,464,723	3,925,409	3,883,611	3,787,157
Detroit.....	1,689,277	1,640,671	1,856,517	2,001,633	1,750,601
East Butte.....	1,325,000	1,400,000	1,400,000	1,268,595	.....
Mammoth.....	1,661,150	1,641,091	1,450,000	1,700,000	1,750,000
Giroux*.....	600,000	625,000	600,000	625,000	.....
Mason Valley.....	1,348,070	1,608,492	1,264,304	1,186,560	.....
Miami.....	.....	.....	.....	1,943,900	2,612,000
Nevada Con.....	4,798,537	5,555,320	5,650,000	5,933,275	.....
Ohio.....	380,849	591,651	690,001	650,071	.....
Old Dominion.....	2,381,000	2,853,000	3,040,000	2,749,000	2,511,000
Ray.....	3,610,000	4,287,000	4,379,128	4,384,400	.....
Shannon.....	1,152,000	1,260,000	1,238,000	1,080,000	924,000
Sontz, Utah.....	*nil*	62,224	132,267	200,000	.....
Tennessee.....	1,600,151	1,796,394	1,718,188	.....	.....
United Verde*....	2,750,000	3,000,000	3,000,000	3,000,000	.....
Utah Copper Co..	7,585,303	8,248,880	9,539,847	10,003,227	.....
Lake Superior*....	19,000,000	19,000,000	17,000,000	18,705,000	.....
Non-rep. mines*...	5,399,849	6,203,606	6,000,000	6,300,000	.....
Total prod.....	94,951,140	102,619,054	104,224,079	.....	.....
Imports, bars, etc.	21,372,292	24,215,480	25,578,297	.....	.....
Total blister....	116,323,432	126,834,434	129,802,076	.....	.....
Imp. ore & matte..	9,459,432	11,911,041	7,177,363	.....	.....
Total Amer.....	125,782,864	138,745,475	136,989,439	.....	.....
Miami†.....	2,817,200	3,102,200	2,312,900	.....	.....
Shattuck-Arizona	1,136,480	1,234,450	1,158,326	1,026,170	.....
Brit. Col. Cos:					
British Col. Cop...	688,312	844,735	794,000	.....	.....
Granby.....	1,740,000	1,967,962	1,857,452	1,782,570	1,789,000
Mexican Cos.:					
Boleo†.....	2,535,680	2,204,720	2,811,200	2,424,800	.....
Cananea.....	4,880,000	4,772,000	3,581,690	272,0002,	.....
Moctezuma.....	2,730,914	3,062,159	2,753,240	2,695,881	3,438,793
Other Foreign:					
Braden, Chile....	1,178,000	1,472,000	1,512,000	1,150,000	1,804,000
Cape Cop., S. Af..	712,320	732,480	586,880	387,520	.....
Kyshtim, Russia..	1,352,960	1,478,400	2,544,640	.....	.....
Spassky, Russia...	1,003,520	974,400	974,400	721,280	.....
Exports from					
Chile.....	5,824,000	7,840,000	7,616,000	3,584,000	.....
Australia.....	5,512,000	6,944,000	6,608,000	7,840,000	.....
Arrivals—Europe‡.	8,509,760	15,585,920	10,545,920	13,661,760	.....

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines.

‡ Does not include the arrivals from the United States, Australia or Chile.

STATISTICS OF COPPER

	United States			Visible Stocks.		
Month	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
VI, '12.	122,315,240	66,146,229	61,449,650	49,615,643	117,801,600	167,417,244
VII....	137,161,129	71,094,381	60,121,331	44,335,004	108,186,000	152,521,003
VIII...	145,628,521	78,722,418	70,485,150	50,280,421	113,299,200	163,579,621
IX.....	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X.....	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI.....	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII....	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I, 1913.	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II.....	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III....	136,251,849	76,585,471	77,699,306	122,302,890	81,244,800	203,547,690
IV.....	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V.....	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI.....	121,860,853	68,452,571	68,067,901	67,474,225	77,235,200	144,709,425
VII....	.....	.....	.....	52,904,606	71,904,000	124,808,606

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

Assessments

Company	Delinq	Sale	Amt.
Arlington, Ida	July 3	Aug. 4	$0.302
Atlas Wonder, Nev	July 14	Aug. 6	0.01
Aurora-Sampson, Ida	June 16	July 16	0.002
Belcher, Calif	July 21	Aug. 14	0.10
Black Pine, Utah	June 30	July 21	0.005
Blue Star, Ida	July 10	Aug. 1	0.004
Caledonia, Nev	June 3	July 25	0.05
Central Eureka, Calif	June 6	July 5	0.025
Challenge Con., Calif	July 15	Aug. 5	0.03
Clary Gold, Calif		July 31	0.05
Con. Virginia, Nev	July 9	July 30	0.10
Eagle Mountain, Ida	July 19	Aug. 16	0.0005
East Hecla, Ida	July 16	July 15	0.003
Giant M. & D. Co	June 17	July 17	0.001
Gould & Curry	July 14	Aug. 5	0.03
Houghton Copper, Mich		July 15	1.00
Hypotheek, Ida	June 20	July 14	0.004
Imperial M. & M., Ida	June 2	July 21	0.002½
Imperial Mg., Ida	June 10	July 15	0.002½
Old Evergreen, Utah	June 17	July 17	0.01
Overman, Calif	July 24	Aug. 13	0.05
Savage, Nev	July 14	Aug. 5	0.05
Silver Moon, Ida	June 2	July 26	0.005
Silver Pick, Nev	June 23	July 28	0.011
Tintic Standard, Utah	June 21	July 19	0.005
Union Chief, Utah	July 10	July 31	0.01

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28 983
February	52.222	59 043	61.642	24.081	27.190	28 357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59 490	24.595	27.284	27.416
May	53.308	60 880	60.361	24.583	28 038	27.825
June	53.043	61.290	58.990	24.486	28 215	27.199
July	52.630	60.654		24.286	27.919	
August	52.171	61.606		24.082	28.375	
September	52.440	63 078		24.209	29 088	
October	53.340	63.471		24.594	29.299	
November	55.719	62.792		25.649	29 012	
December	54.905	63.365		25.349	29.320	
Year	53.304	60.835		24.592	28 042	

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16 767	62.760	71.741
February	14.084	14.971	14.329	15.253	62 893	65.519
March	14.698	14 713	14.868	14.930	65.884	65.329
April	15 741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16 245	15.738	72.352	68.807
June	17 234	14.672	17 443	14.871	78.259	67.140
July	17.190		17.353		76.636	
August	17.498		17.644		78 670	
September	17 508		17.698		78.762	
October	17.314		17.661		76.389	
November	17.326		17.617		76 890	
December	17.376		17.600		75.516	
Year	16.341		16.560		72.942	

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

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.150
March	42.577	46.832	192.619	213.645
April	43.923	49.115	200.513	224.119
May	46.063	49.038	208.830	224.143
June	45.815	44.820	205.863	207.208
July	44.519		202.446	
August	45.857		208.351	
September	49.135		223.762	
October	50.077		228.353	
November	49.891		227.619	
December	49.815		226.875	
Av. year	46.096		209.322	

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4 321	4.327	4 171	15.597	17.114
February	4 026	4.325	3 946	4.175	15 738	16 550
March	4.073	4 327	4.046	4.177	15.997	15 977
April	4 200	4.381	4 118	4.242	16 331	17.597
May	4 194	4.342	4 072	4.226	16.509	18.923
June	4 392	4.325	4.321	4.190	17 588	20.226
July	4 720		4.603		18 544	
August	4 569		4 452		19 655	
September	5.048		4.924		22.292	
October	5.071		4.894		20 630	
November	4.615		4.463		18 193	
December	4 303		4.152		18 069	
Year	4 471		4.360		17.929	

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

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26 114
February	6.499	6.239	6.349	6 089	26 661	25.338
March	6.626	6 078	6.476	5.926	26.048	24.605
April	6.633	5.641	6 483	5.491	25 644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	5.124	6 727	4.974	25.763	22.143
July	7.116		6 966		26 174	
August	7.028		6.878		26 443	
September	7.454		7 313		27.048	
October	7.426		7.276		27.543	
November	7 371		7.221		26.804	
December	7.162		7.081		26 494	
Year	6.943		6 799		26 421	

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

PIG IRON IN PITTSBURG

	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.35	$14.00	$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	17.90	13.90	16.71	14.15	16.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	17.14	14.11	15.40	14.22	15.10
July	15.15		14.38		14.38	
August	15.43		14 90		14.85	
September	16.86		16.03		15.63	
October	17 90		17.18		17 22	
November	18 07		17 09		18 00	
December	18.15		17.45		18 73	
Year	$16.01		$14.93		$15.28	

STOCK QUOTATIONS

COLO. SPRINGS July 8

Name of Comp.	Bid.
Acacia	‡.02⅔
Cripple Cr'k Con.	‡.01
C. K. & N.	‡.12
Doctor Jack Pot	.05½
Elkton Con	.50⅔
El Paso	2.50
Findlay	.02
Gold Dollar	.08
Gold Sovereign	‡.02⅔
Isabella	.09½
Jack Pot	.04½
Jennie Sample	‡.05⅔
Lexington	‡.008
Moon Anchor	‡.0095
Old Gold	.01
Mary McKinney	.53
Pharmacist	‡.01
Portland	.95
Vindicator	.88
Work	‡.004

SALT LAKE July 8

Name of Comp.	Bid.
Beck Tunnel	.05½
Black Jack	.09
Cedar Talisman	.00⅔
Colorado Mining	.15
Columbus Con	‡.07½
Crown Point	.01½
Daly-Judge	6.30
Grand Central	.50
Iron Blossom	1.32½
Little Bell	‡.10
Lower Mammoth	.01½
Mason Valley	5.00
May Day	.06
Nevada Hills	.92
New York	.01
Prince Con	.35
Silver King Coal'n	3.12½
Sioux Con	.03
Uncle Sam	.02
Yankee	.03

TORONTO July 7

Name of Comp.	Bid	Name of Comp.	Bid
Bailey	.08	Foley O'Brien	.26
Coniagas	6.75	Hollinger	15.75
T. & Hudson Bay	66.00	Imperial	.02
Timiskaming	.34	Jupiter	.36
Wettlaufer-Lor	.11	Pearl Lake	.28
Apex	.01	Porcu. Gold	.10
Crown Chartered	.00½	Preston E. D	.03
Dobie	.25	Rea	.12
Dome	15.00	Swastika	.05
Dome Exten	.09	West Dome	.15

SAN FRANCISCO July 8

Name of Comp.	Bid	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.05	Belmont	6.05
Belcher	.17	Jim Butler	.69
Best & Belcher	.05	MacNamara	.17
Caledonia	1.35	Midway	.41
Challenge Con	‡.02	Mont.-Tonopah	1.00
Chollar	.01	North Star	.93
Confidence	‡.21	West End Con	1.27½
Con. Virginia	.13	Atlanta	.14
Crown Point	.20	Booth	.02
Gould & Curry	.01	C.O.D. Con	.04
Hale & Norcross	.07	Comb. Frac	.03
Mexican	.71	Jumbo Extension	.11
Occidental	.70	Pitts.-Silver Peak	.48
Ophir	.17	Round Mountain	.46
Overman	.50	Silver Pick	.03
Potosi	.01	Tramp Con	‡.01
Savage	.11	Argonaut	‡1.60
Sierra Nevada	.12	Bunker Hill	‡1.90
Union Con	.08	Central Eureka	.10
Yellow Jacket	.22	So. Eureka	2.00

N. Y. EXCH. July 8

Name of Comp.	Clg.
Amalgamated	63¼
Am. Agri. Chem	46½
Am. Sm. & Ref., com	61¾
Am. Sm. & Ref., pf.	99⅜
Am. Sm. Sec., pf. B	81
Anaconda	32
Batopilas Min	1⅛
BethlehemSteelpf	65
Chino	33
Federal M. & S., pf.	35
GreatNor.,ore. ctf.	31⅜
Guggen. Exp	42
Homestake	100
Inspiration Con	14
Miami Copper	20⅞
Nat'nalLead,com	45
National Lead, pf.	105½
Nev. Consol	14⅛
Phelps Dodge	190
Pittsburg Coal, pf.	74½
Quicksilver, pf	4½
Ray Con	16¼
RepublicI&S,com.	18½
Republic I & S, pf.	76¼
SlossSheffl'd,com.	23
Sloss Sheffield, pf.	85
Tennessee Copper	28
Utah Copper	41½
U. S. Steel, com	52⅛
U. S. Steel, pf	104¼
Va.Car. Chem., pf	95

N. Y. CURB July 8

Name of Comp.	Clg.
Barnes King	1.43
Beaver Con	.30
Big Four	.41
Braden Copper	6½
B. C. Copper	2¼
Buffalo Mines	2⅜
Can. G. & S.	.22
Con. Ariz. Sm	⅝
Davis-Daly	2 1/16
Diam'field-Daisy	.03
Ely Con	.10
Florence	.35
Giroux	1¾
Gold Hill Con	‡⅛
Goldfield Con	13⅞
Greene Cananea	5⅞
Greenwater	.05
Internat. S. & R.	‡109
Kerr Lake	3⅛
Keystone	‡2
La Rose	2⅜
McKinley-Dar-Sa	1⅜
Min. Co. of A. new	2⅛
Motherlode Gold	‡.60
Nipissing Mines	8½
Ohio Copper	⅝
Pacific Sm. & M	1/16
Puebla S. & R	2⅛
South Live Oak	‡2
South Utah M. & S.	¼
Stand'd Oil of N.J.	354
Stewart	1⅛
Tonopah	4⅜
Tonopah Ex	2⅛
Tonopah Merger	.61
Tri-Bullion	⅛
Tularosa	⅝
Union Mines	1⅞
United Cop., pfd.	‡3
Yukon Gold	2⅜

LONDON June 26

Name of Com.	Clg.
Camp Bird	£0 15s 3d
El Oro	0 15 0
Esperanza	0 17 6
Mexico Mines	0 12 6
Oroville	0 5 0
Santa Gert'dis	1 2 6
Stratton's	0 1 9
Tomboy	1 7 6

BOSTON EXCH. July 8

Name of Comp.	Clg.
Adventure	1⅛
Ahmeek	280
Alaska Gold M	17¾
Algomah	1⅛
Allouez	31½
Am. Zinc	18¼
Ariz. Com., ctfs.	2½
Bonanza	.32
Boston & Corbin	.60
Butte & Balak	1½
Calumet & Ariz	59⅛
Calumet & Hecla	415
Centennial	11
Cliff	1½
Copper Range	40
Daly West	2½
East Butte	10
Franklin	5
Granby	54¼
Hancock	15
Hedley Gold	32
Helvetia	.30
Indiana	5
Island Cr'k, com	47½
Island Cr'k, pfd.	79
Isle Royale	18
Keweenaw	1½
Lake	7½
La Salle	3⅜
Mass	2⅜
Michigan	1
Mohawk	44
New Arcadian	1½
New Idria Quick	‡17⅛
North Butte	24¼
North Lake	13¼
Ojibway	.67
Old Dominion	44
Osceola	74½
Quincy	57
Shannon	8¾
Shattuck-Ariz	22½
Superior	23¾
Superior & Bost.	2
Tamarack	26½
Trinity	3¼
Tuolumne	1⅛
U. S. Smelting	34⅞
U. S. Smelt'g, pf	46
Utah Apex	1½
Utah Con	9
Victoria	.90
Winona	1½
Wolverine	43½
Wyandot	.65

BOSTON CURB July 8

Name of Comp.	Bid
Bingham Mines	2½
Boston Ely	.48
Boswyocolo	‡.01
Butte Central	.17
Cactus	.05
Calaveras	2⅞
Chief Cons	1½
Corbin	1⅛
Cortez	.10
Crown Reserve	3⅛
Eagle & Blue Bell	.80
First Nat. Cop	1½
Houghton Copper	1⅞
Majestic	.35
Mexican Metals	.54
Moneta Porc	.07
Nevada-Douglas	1½
New Baltic	.70
Oneco	.85
Raven Copper	‡.01½
Rhode Island Coal	.02
Smokey Dev	‡⅛
S. W. Miami	1½
South Lake	4
Trethewey	.35
United Verde Ext.	.60

‡Last quotation.