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## Burro Mountain Copper District

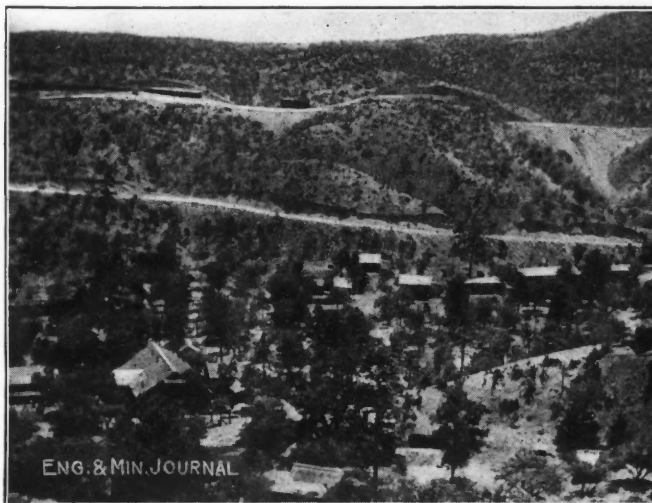
BY W. ROGERS WADE\*

*SYNOPSIS*—Description of this New Mexico district, noting history, present operations and conditions, geology, mineralization, development and probable costs. The ores are disseminations in monzonite and granite, typical "porphyry copper." Secondary enrichment has produced workable bodies carrying chalcocite. The Phelps-Dodge company is the only operator of importance at present.

The Burro Mountain copper mining district is situated in Grant County, 12 miles southwest of Silver City, N. M. The town of Tyrone is the center of the camp

owned the St. Louis, Burro Chief, Boston, Marshall, Copper Mountain and several other claims. The nearest railroad point was Deming, N. M., over 50 miles distant and the wagon haul cost \$15 per ton. The ore was secured mostly from the St. Louis mine and smelted in a reverberatory furnace. The supply of high-grade material was small and the operating costs so high that the company soon failed. The large masses of low-grade ore in the company's ground were, of course, worthless in those days.

Two years later, another company under the manage-



TOWN OF TYRONE, RAILROAD GRADE, EXPERIMENTAL MILL, NOS. 2 AND 3 CHEMUNG SHAFT AT RIGHT

and is reached by the Burro Mountain R.R. from White-water on the Atchinson, Topeka & Santa Fe. Three trains a week now run over this line, which has been but recently completed. The service is to be increased to daily trains later. The mines of the Chino Copper Co. are at Santa Rita, 17 miles the other side of Silver City, and 27 miles from the Burro Mountain district.

### HISTORY OF THE CAMP

Copper ores were discovered in the Burro Mountains in 1871 by the Metcalf brothers, the discoverers of the Clifton-Morenci district. In 1881, the Valverde Copper Co. built a smelting plant in Deadman Cañon. The town around the works was called Paschal for the organizer of the company, Paschal R. Smith. The company

ment of Col. Paschal R. Smith built another smelting plant at Oak Grove, but this ran only a short time.

Soon after Judge Deming organized the Alessandro Copper Co. to work a group of claims about three miles east of the St. Louis mine. The treatment plant installed here involved a leaching process using sulphuric acid. The acid was made on the ground from pyrites. Where these sulphur ores came from I do not know. The low grade of the ore, the lack of a railroad, and the attempt to leach 30 years ago, resulted in failure to make a profit, and the mine closed.

In 1904, Theodore W. Carter got the Leopold brothers of Chicago interested in the district and they organized the Burro Mountain Copper Co. This company took over the St. Louis, Sampson, Boston and other claims belonging to the Southwestern Copper Co., which itself

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was a reorganization of the Valverde Copper Co. The Leopolds erected a 250-ton concentrator and treated ore from the Sampson and St. Louis claims running between 3% and 4% copper. Soon afterward, they sold a one-third interest to the Phelps-Dodge company, and gave it an option on the other two-thirds at the same time.

About 1905 the Comanche Mining & Smelting Co. and the Copper Gulf Development Co. started developing property in the camp. In May, 1906, the Briggs-Oliver Development Co. took under option the Burro Chief group belonging to Thomas S. Parker and started Nos. 1, 2, and 3 shafts at Tyrone. This company later became the Tyrone Development Co. and then the Chemung Copper Co.

The Comanche and Copper Gulf companies merged into the Savanna Copper Co. The Phelps-Dodge company bought out the Leopolds' interest in the Burro Mountain Copper Co., and in 1913 it purchased the Chemung Copper Company.

#### PRESENT OPERATIONS

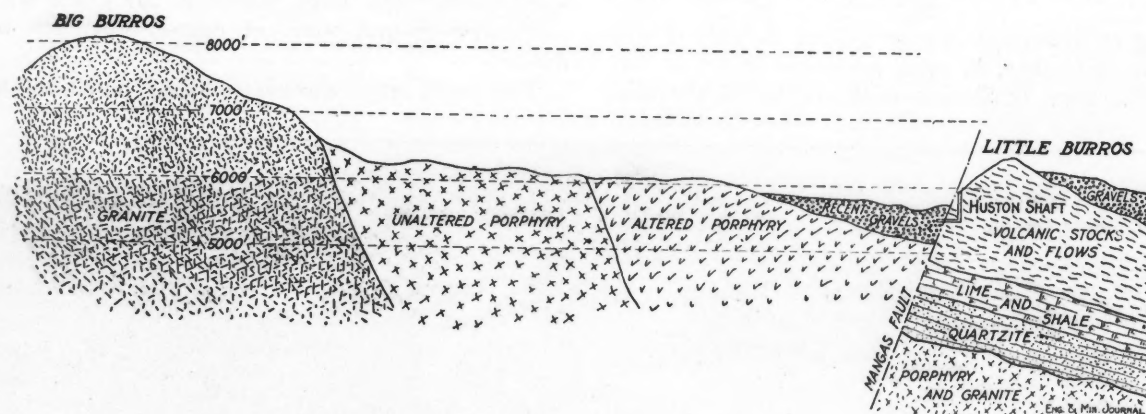
At the present time the Burro Mountain Copper Co. is driving a transportation tunnel from the end of the railroad grade at Tyrone to Leopold. This tunnel is

\$2.50 per day for machinemen, who are also Mexicans. The equable climate and the cheap labor make possible low costs per ton, an all-important factor in handling low-grade ores by underground methods.

#### GENERAL GEOLOGY

The Burro Mountains proper consist of coarse-grained pre-Cambrian granite. This granite mass is many miles in diameter and was a deep-seated intrusion as evidenced by its coarse structure. The three central domes already mentioned seem to have been at about the center of the mass.

This granite contains crystals of feldspar up to 1½ in. long. A noticeable quantity of biotite is present throughout the rock, where fresh and unaltered. Northeasterly from the three central domes of the Burros, along the marginal edge of this basal intrusion lies a large area of quartz-monzonite porphyry. Near the main peaks this porphyry is hard, fresh and unaltered. As the mineralized area of the porphyry is approached, however, it becomes crushed, iron stained and impregnated with secondary silica, while the feldspars are mostly kaolinized. In the fresh porphyry, biotite is conspicuous, but in the mineralized zone, it is wholly absent. Just beyond Ty-



CROSS-SECTION THROUGH THE BURRO-MOUNTAIN REGION ACROSS THE MANGAS VALLEY

practically completed and connects below the bottom of the Sampson mine, 7000 ft. from its portal, with the extensive underground workings at Leopold. The company is testing out the flotation process at Tyrone in a 75-ton experimental mill, is erecting a central power plant, is building a five-mile railroad spur to the mill site, and will soon begin the erection of a 1000-ton concentrator.

#### TOPOGRAPHY, CLIMATE AND LABOR

The three central peaks of the Burros are rounded domes rising to 8050 ft. above sea level. The mining area is situated in the rolling foothills to the northeast of these peaks at an average elevation of about 6000 ft. The gulches in this area seldom exceed 300 ft. in depth and tunnel mining with one or two exceptions is not usually practicable.

The climate is never exceedingly hot in summer, being on an average cooler than in the Eastern states, and in the winter snow lasts but a day or so at a time, while the temperature is seldom below freezing in the day time.

Mexican labor is employed and is efficient when properly handled, as on the bonus or contract system. The wages are \$1.75 per day for muckers and trammers, and

rone the outcrops of porphyry are covered by the Mangas Valley gravels. These gravels are deposits of recent geological origin and cover the mineral-bearing rocks in the neighborhood of Tyrone. Across the Mangas appears a well marked and extensive fault. This fault extends for miles in a northwest direction along the northern side of the valley and dips nearly vertically. The fault wall is marked in places by escarpments several hundred feet high. On the northern side of this fault occurs a series of rhyolite, andesite and basalt flows and dikes, cutting through and covering Cretaceous sediments. The basal granite undoubtedly underlies this series, the fault being later than the granite intrusion and the deposition of the sediments. The rhyolite in the Little Burros is extremely porphyritic, much shattered and appears to be copper bearing. Whether or not this upper rock will contain workable orebodies remains for development work to prove. The vertical movement along this fault has been extensive, the granite and porphyry area being elevated in relation to the sediments and volcanic flows. The relations of the various rocks are shown on the accompanying cross-section.

The copper-bearing area is the northeastern marginal zone surrounding the basal granite intrusion. This zone



consists of an area of monzonite porphyry intrusions in the granite. The largest of these intrusions extends from a point near the base of the Big Burros to the Mangas Valley and has a width of three to four miles. This area is not entirely unbroken porphyry however. Floating in it and cutting into it are large areas of the granite. At Leopold the porphyry has only a relatively small proportion of granite blocks intermingled with it, while in the Chemung mine at Tyrone, the granite areas are extensive. Both the granite and the porphyry are much altered and it is often difficult to tell them apart. The porphyry has practically the same chemical composition as the granite and undoubtedly was derived from the same magma, representing a cooling phase in the crystallization of the granite mass. Orebodies occur in both rocks and seem to depend more on the fractured condition of the rock than on its crystallization or chemical composition.

This mineralized area has been extensively faulted and crushed by a series of fracture systems. The main fracturing took place first in a series of northwest and south-



AT PORTAL OF HAULAGE TUNNEL

Showing power-house foundation, railroad grade and No. 2 Chemung shaft headframe at right.

east fractures, dipping sharply to the southwest. The movement along this system was relatively small. Next followed a series of northeast and southwest fracturing dipping at  $50^{\circ}$  to  $75^{\circ}$  to the northwest. After this, there occurred deep and extensive faulting running northeast and southwest with the same strike as the series just mentioned, but with an opposite dip of from  $35^{\circ}$  to  $65^{\circ}$  to the southeast, the average being about  $40^{\circ}$ . This is the predominating system and forms the fissures in which the greatest mineralization took place. Finally, a minor series of north and south faulting occurred but with a small displacement. This last series is of recent origin, since it cuts an existing orebody.

#### ORIGIN AND CHARACTER OF THE OREBODIES

The granite contained cupriferous iron pyrites disseminated through its mass. Mineralizing solutions succeeding the cooling and fracturing of the intrusion, naturally circulated away from the denser center, and following the lines of least resistance flowed into the extensively fractured marginal area. Here the solutions deposited primary cupriferous pyrite, chalcopyrite and silica in the faults and crushed zones, attacking the rock, dissolving out the biotite and other ferro-magnesian minerals and altering the feldspar to kaolin. Subsequent

descending surface waters dissolved the pyrite and chalcopyrite, forming sulphates of iron and copper. The copper sulphate was redeposited at water level as chalcocite, by the reaction between copper sulphate and iron pyrites. This process of secondary enrichment has resulted in concentrating the copper into orebodies of workable grade from a primary ore that probably contained not over 0.1% to 0.2% of copper, possibly much less.

At the two developed mines in the district, namely, the Burro Mountain at Leopold and the Chemung at Tyrone, bodies of commercial ore have been found varying in size from 100x400 ft. in horizontal dimensions to 500x800 ft. One orebody is 820 by 1500 ft., but I doubt if this is of commercial grade. The vertical extent of these orebodies is not yet fully proved, but several of them have a thickness of at least 250 feet.

It appears from the nature of these secondarily enriched orebodies, that the deeper the leaching has extended, the greater the amount of copper there is deposited below. The deepest leaching has occurred along the strongest fissures. This is shown in the Chemung mine, where at 700 ft., leached ground is encountered, especially in the strong northeast and southwest fracture zones.

Several varying water levels have occurred in the district in the past as is shown by the occurrence of orebodies and leached areas both above and below the present water level.

The movement of the descending waters carrying copper sulphate in solution has been both downward and to the northeast. As a result the concentration of copper has been greatest in the northeast end of the mineralized zone. This is proved underground in the developed mines, higher grade ore being found in the Chemung than in the Burro Mountain at Leopold. The process of leaching and enrichment is still going on in the district, as is shown by the water coming from the mines, which is charged with copper sulphate.

#### VALUE OF DEVELOPED OREBODIES AND FUTURE COSTS

The ore in the camp runs from 2% to 3.25% in copper. All material below 2% has been considered of too low a grade to be classed as ore in the past. However this is an economic problem and I am of the opinion that future operations on a large scale will show a lower grade than this to be profitable.

I am not in a position to give an exact statement of the total ore reserves developed in the district but should estimate that twelve million tons of developed and partially developed ore is already in sight. The unprospected area is enormous and the ultimate tonnage mined from the district will be many times greater.

The probable cost per pound of copper from the Burro Mountain mine will be between 8 and 9c. All of this ore will be hauled through the 7000-ft. tunnel by electric locomotives and taken by steam from the portal of the tunnel to the mill, five miles distant. The ground is well suited to mining by the caving system. The Chemung ores will have to be hoisted and because of this and the other factors of increased costs attending deep mining the ore will cost more to mine. The probable cost will be about 9 to 10c. per lb. for copper mined from this part of the district. By the middle of 1915, the Burro Mountains should be producing at the rate of 12,000,000 lb. of copper annually.

## Utilization of the Waste Heat of Slag

Much has been done in the last few decades to utilize the heat in iron blast-furnace slags, the annual production of which amounts to close on 200,000,000 tons. If their temperature is taken at 1500° C., the quantity of heat they contain must be enormous, all of which is wasted.—*Times* (London), May 21, 1914.

Efforts were made some years ago by the late Sir Lowthian Bell to save this heat, but the state of engineering achievement in his time did not permit a satisfactory solution of the problem. Further experiments have been in progress at the Clarence works of Messrs. Bell Bros., Middlesbrough, for some four years, the patents being in the hands of the Slag Power Co. The first plan was to drop the molten slag as it comes from the blast furnaces into water, and use the steam thus produced in a low-pressure turbine. But the considerable quantities of hydrogen and sulphuretted hydrogen produced along with the steam gave rise to difficulties in connection with obtaining the high vacuum necessary to the efficient working of the turbine. These difficulties were overcome, but a quantity of fine sulphur was also produced, and this it was found impossible to eliminate from the steam. Yet if it had not been removed it would have damaged the blades of the turbine with which it came into contact, and would also have blocked the steam passages. Another difficulty was caused by the fact that the hot blast-furnace slag when thrown into water froths up into a foam-like substance, which floats, and means had to be devised for submerging and removing it.

Instead of attempting to use directly in the turbine the dirty steam generated by the contact of the slag with the water, the plan finally adopted was to employ it indirectly for generating clean steam by means of a heat exchanger, the particular form adopted being a Kestner single-effect climbing film evaporator. The hot slag is run direct from the blast furnace into the primary generator, in which an upright shaft with four blades revolves, keeping the water in constant rotation. When the slag drops through the orifice the velocity of its fall carries it well below the lip, and before it rises to the surface it is swept by the moving water past the orifice and inside the seal. An elevator then lifts it from the generator and drops it through a second seal; by this time it is waterlogged and sinks, and it is then collected by a second elevator, which drops it into railway trucks for removal. The dirty steam passes from the generator to the evaporator, where it is used to produce clean steam, which is employed in the turbine. In the case of copper slag, the second elevator is not required, since the slag does not float in water, but immediately sinks.

Over 740 kg. of water have been evaporated per 1000 kg. of blast-furnace slag containing 550,000 cal.; deducting 18,000 cal. removed with the slag at 100° C. and 42,000 removed with the water taken up by the slag (on the assumption that it absorbs 50% of water), the available heat is 490,000 cal., or, if an allowance of 25% is made for loss, 367,500 cal., which divided by 622 give 590 kg. of steam. As the result of many experiments, the average efficiency of the evaporator is found to be 91%, but taking it at only 80% the amount of clean steam available for the turbine is 472 kg., and this with a consumption of 13 kg. of steam per horsepower, which

is an excess of that guaranteed by the makers of the turbine with a vacuum of 28.5 in. and a vacuum of 7 in. over the water in the evaporator, means a yield of over 36 hp. per 1000 kg. of slag. Copper slag contains less heat than blast-furnace slag, the amount being found by experiment to be from 318 to 350 cal. per kg., and therefore by a similar calculation 1000 kg. will produce 281 kg. of clean steam, equivalent to a yield of, say 21 hp. in the turbine.

It is estimated that with a 1000-kw. plant with 75% load, the cost of generating 1 kw. would be 0.32d., whereas with a high-pressure steam plant using coal at 14s. 6d. a ton it would be 0.48d., the economy realized by the aid of the heat from the slag being thus 0.16d. per kw., which under the conditions stated would amount to £4300 a year. It is stated that the upkeep of the generator and evaporator is small. As the slag goes directly into the water, only steam at 100° C. comes in contact with the plant, which is thus not subjected to any great differences of temperature, while experience indicates that there is no action from the gases on the plates or tubes of the evaporator, provided they are kept clean.

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## Sydvaranger Iron Mines, Norway

The increased layout for the so called "third construction period" is now completed, and the company is now in a position to export about 650,000 tons of ore annually. The amount of crude ore mined last year was about 1,000,000 tons, from which 425,000 tons of slig (concentrate) were produced. Of this about 180,000 tons were briquetted at Kirkenaes. The total export was about 450,000 tons of slig and briquettes, of which 70% went to Germany and 30% to England. As the increasing demand abroad for the company's briquettes had exceeded the capacity of their plant, an auxiliary briquetting works capable of turning out 100,000 tons annually was commenced last autumn.

The system to be adopted is that of the improved Gröndal-Raménske. It is estimated that the production and export in 1914 will be about 650,000 tons. A gross and net profit (the first hitherto obtained) of \$277,775 and \$48,045, respectively, appeared in the balance sheet for 1913. The value of the proposition is entered at \$8,230,000. The number of men and officials employed during the first half of 1913 was 1100, and during the second half, 1300.

The Sydvaranger ore zone is about 1,000,000 sq.m. in extent; the ore is magnetite, of 36 to 37% Fe., which, by magnetic separation, is brought up to 65 to 70% Fe. The Björnevand deposit has an estimated reserve of 50 millions of tons, and ore has been to a depth of 250m. The work is open cast, all borings being carried out with Ingersoll drills. Once a month, at Björnevand, giant blasts are carried out, and on a recent one (the record for Europe), 18,000 kilos of dynamite was used, at a cost of \$12,500. Steam shovels of a capacity of 500 tons in 8 hr. are employed, and the crushers are of the manganese-steel Gets type, handling 3000 tons in 18 hr. The Sydvaranger company was formed in 1906, with a capital of \$1,390,000, since increased to \$4,450,000, and is not subject to expropriation, nor to any royalties, beyond the payment to the state, as ground owner, of under 1c. per ton on "all ore mined."



# The Faultless Faultfinder

BY WALTER SCOTT WEEKS\* AND EDWARD V. HUNTINGTON†

**SYNOPSIS**—Description of two charts for use in the rapid solution of fault problems. Having obtained the position of the fault and of the unfaulted portion of the vein and the amount and direction of the faulting movement, two simple operations with these charts give the horizontal offset of the faulted portion of the vein and the direction in which it lies. Practical examples illustrate the application of the devices. Other miscellaneous applications to geological problems are exemplified.

When a vein or an orebody of plane form is displaced by a fault, the geologist or the mining engineer desires to know the relative position of the two portions of the vein which have been separated by the faulting movement. All fault problems can, of course, be solved by tedious graphical or algebraic methods, provided the necessary data have been obtained or can be assumed. To obviate the necessity for such methods, and to effect a simple, rapid and accurate solution of many fault problems for which the data are at hand, the two charts here described were devised.

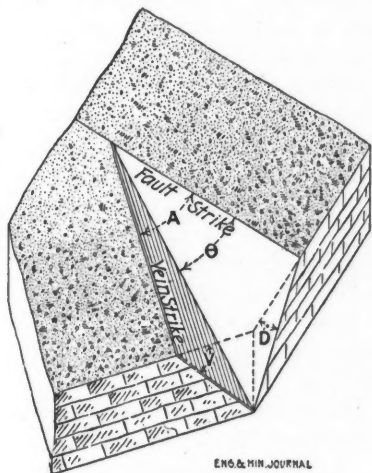


FIG. 1. RELATIONS OF THE PLANES AND ANGLES

When a fault plane intersects the plane of a vein, the line of intersection, which occupies in general an inclined position in the earth, makes a certain angle with the strike line of the fault plane. In solving a fault problem, it is essential to determine the position of this line in the fault plane, that is, the angle it makes with the fault strike. Its position depends on three angles: (1) That between the strike of the vein and the strike of the fault; (2) the dip of the fault; (3) the dip of the vein. Knowing these three angles, the value of the angle desired can be determined. For this purpose Chart I is used. The relation between these planes and angles is shown in Fig. 1. When this angle is known, and the position of the line of intersection of the two planes is thus determined, the relative position of the two parts of the vein can be found, provided the direction and amount of movement of the hanging-wall block with relation to the foot-wall block is known.

### DETERMINATION OF THE STRIKE ANGLE

The strike lines of the fault and the vein form four angles; considering the two angles on the hanging-wall

side of the fault, they are supplementary, one acute and one obtuse, unless they happen to be right angles. Of these two angles, that toward the interior of which the fault plane and the vein plane both dip, is to be called the "strike angle" and denoted by  $A$ . If one of the planes is vertical, in order to determine which of the two angles is the strike angle  $A$ , it is assumed that the plane dips either one way or the other, but the actual dip of  $90^\circ$  is used in performing the computation.

The nature and position of  $A$  are determined as follows: Draw the strike of the fault with the dip toward the bottom of the page; draw the strike of the vein on the hanging-wall side, that is, the lower side of the fault strike line; indicate by arrow the dip of the two planes. The strike angle  $A$  is the angle between the portions of the lines whence the arrows point approximately toward each other. The manner of making this diagram is illustrated in Fig. 2, which shows the four possible cases. It should be stated, to avoid all possible confusion, that the left-to-right position of the fault strike line on the paper does not indicate an east-west fault.

### DESIGNATIONS USED

It will be noticed that a part of each fault strike line in Fig. 2, lying on one side of the point of intersection, has been drawn heavy. The part is that adjacent to the strike angle  $A$ , and is to be called the "principal end of the strike."

The dip of the fault plane is to be designated as  $D$ , the dip of the vein plane as  $V$ . The inclined angle whose value it is desired to find, i.e., that made by the strike line of the fault with the intersection of the two planes, is to be called  $\theta$ . It must be understood that this angle is measured in the plane of the fault downward from the principal end of the strike to the line of intersection. This angle may be measured clockwise as in I and III, Fig. 2, or it may be measured counter-clockwise, as in II and IV. This question of the direction in which it is measured is of importance in the use of Chart II.

### DETERMINATION OF $\theta$ BY USE OF CHART I

The method of using Chart I, to find the angle  $\theta$ , is as follows: Suppose that the strike angle  $A$  has been found as shown in Fig. 2, from the data obtained in the

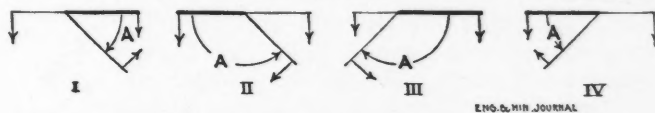


FIG. 2. DIAGRAM TO DETERMINE  $A$  AND PRINCIPAL END OF STRIKE

field; that  $D$ , the dip of the fault, has been ascertained from field work, as well as  $V$ , the dip of the vein. On Chart I, Fig. 3, find the number on the circumference corresponding to the value of  $A$ ; this will be at an end of a hyperbolic arc. Similarly, on the upper part of the vertical axis at the left of the diagram, find the number corresponding to the value of  $D$ ; this will lie at an end of an elliptical arc. Trace along these two arcs to their point of intersection, which we may designate as

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X. On the lower half of the vertical axis, find the number corresponding to the value of  $V$ . With a straightedge connect this point with the point X. Along this straightedge, lay a semicircular protractor, preferably one

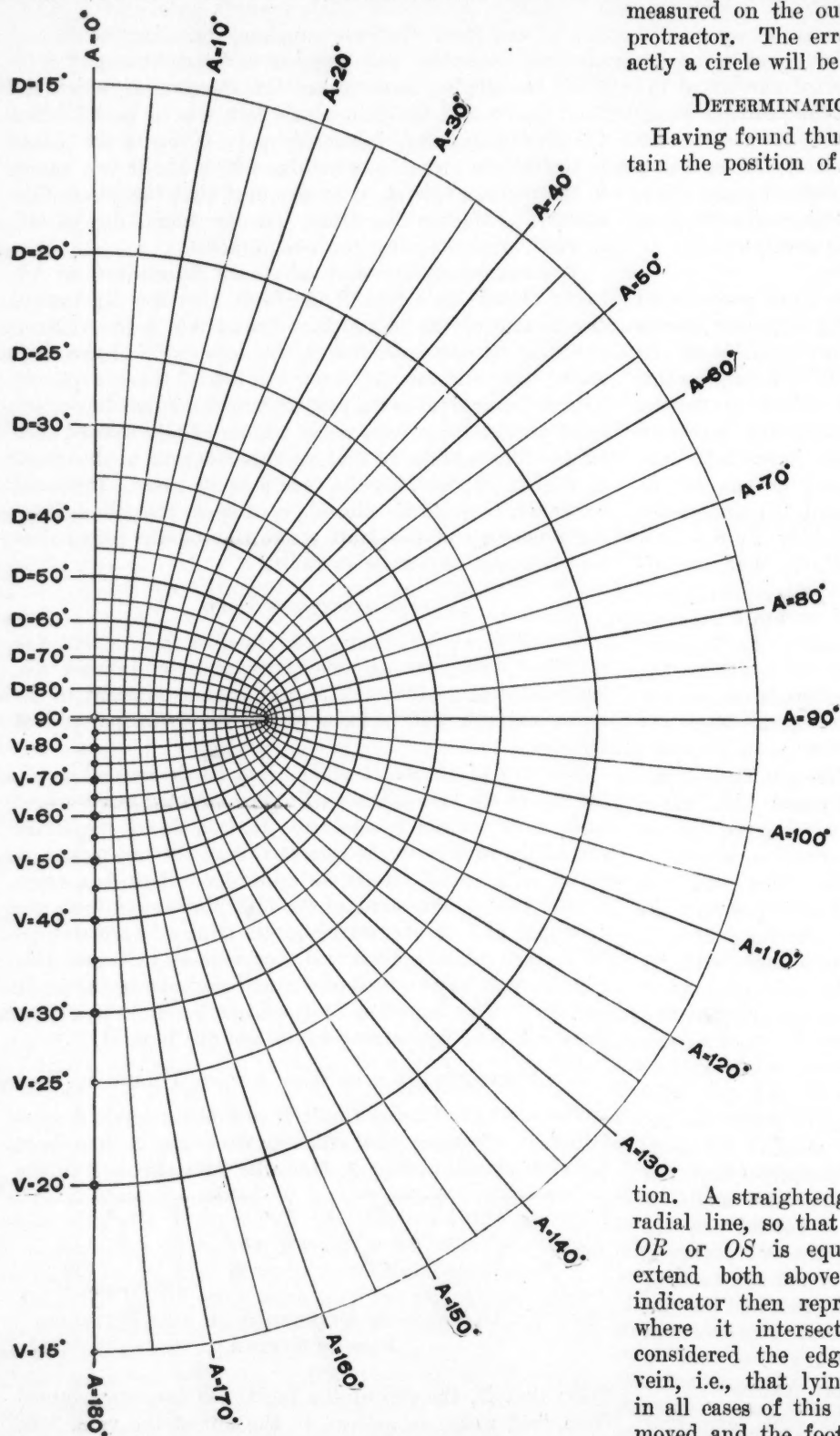


FIG. 3. CHART I, FOR DETERMINING  $\theta$

numbered counter-clockwise from zero on the right. The angle which the protractor thus measures between the straightedge and the vertical axis of the diagram, will be the angle  $\theta$ . The use of a protractor is not absolutely

necessary. The outermost elliptical arc is approximately a semicircle. Therefore, if a second straightedge parallel to the first be laid through the point marked  $90^\circ$ , the middle point of the vertical axis, the angle desired will be measured on the outermost arc, which becomes itself a protractor. The error due to the fact that it is not exactly a circle will be insignificant.

#### DETERMINATION OF OFFSET WITH CHART II

Having found thus the value of  $\theta$ , it remains to ascertain the position of the faulted portion of the vein by means of Chart II, Fig. 4. This chart is a view of the fault plane from the hanging-wall side, the paper itself being in the plane of the fault; that is, we may imagine the drawing to be actually made in the plane of the fault and that we are looking down at it from a point in the hanging wall. The line  $ROS$  is the strike of the fault. In use, this had best be kept horizontal, although it is not so shown here. It should be stated again that this line in the horizontal position must not be taken to represent an east-west fault; the diagram is not in any sense a map.

The value of the angle  $\theta$  is turned off downward from  $OS$  or  $OR$ , taking  $O$  as a center;  $OS$  is used if the principal end of the strike lies to the right of the point of intersection and  $OR$  if it lies to the left, this having been determined as illustrated in Fig. 2. It is not necessary to use a protractor for laying off  $\theta$ , as the bottom of the diagram shows two rows of figures at the ends of radial lines from  $O$ , becoming thus a protractor. The upper row of these figures is used if  $\theta$  is measured from  $OR$ , the lower if it is measured from  $OS$ . The figures around the circumference of the circle have nothing whatever to do with this first operation. A straightedge indicator is laid along the proper radial line, so that the angle included between it and  $OR$  or  $OS$  is equal to  $\theta$ . This straightedge should extend both above and below  $O$ . The edge of the indicator then represents the actual edge of the vein, where it intersects the fault plane and may be considered the edge of the unfaulted portion of the vein, i.e., that lying in the foot wall. It is assumed in all cases of this discussion that the hanging wall has moved and the foot wall remains stationary, this being the usual assumption in the study of faults, and also that the two lines made by the intersection of the two portions of the vein plane with the fault plane are parallel, although this may not always be true.

The direction of motion of the fault will have been ascertained in the field. It may conveniently be expressed



as making an angle with the dip line, up or down, to left or to right. Assuming the vertical line through *O* of Chart II, marked 0° on the circumference of the circle, to be the dip line of the fault, the direction of movement is traced from *O* out along that radius of the circle

gram; if the fault is reverse, that is, if the hanging wall has moved up the fault plane, the movement is traced above *ROS*. The movement is traced along the radius selected, as far as *Y*, a point on the circumference. From *Y*, the distance along a horizontal line, i.e., a line parallel to *ROS*, to a point *Z* on the inclined straight-edge through *O*, representing the fault intersection, is measured in units of the scale at the top of the diagram. This distance represents the distance that the vein has been displaced horizontally in the fault plane for every 10 ft. of actual sliding along the fault plane, the length of the radius of the circle being 10 ft. as measured in units of the diagram scale. This horizontal displacement we shall call the "offset" of the vein. The actual offset is found by proportion. Thus, if it is ascertained that the offset measured is 3 units, or 3 ft. for each 10 ft. of faulting movement, and the actual faulting movement is 80 ft., then the actual offset will be to 80 ft. as 3 is to 10, or  $\frac{3}{10} \times 80$ , or 24 ft.

If desired, the actual position of the intersection of the faulted portion of the vein with the fault plane can be represented by a second indicator through the point *Y* just found on the circumference, parallel to the indicator through *O*.

This general description of the method of using the chart can be made much clearer by a solution of some concrete problems. In all these problems the angle  $\theta$  is determined to the nearest 5°.

PROBLEM 1

Assume a fault striking east and west and dipping 40° to the south, cutting a vein striking N 60° E and dipping 50° to the northwest. Let the fault be of the reverse type, with a movement of 300 ft. and let the direction of movement be 30° to the northeast, that is, up the fault plane and to the right of the dip line, making an angle of 30° with the dip line (*K*, Fig. 5). Draw out the diagram *L*, Fig. 5, following the scheme of Fig. 2. It is found that the principal end of the strike lies to the left and that the strike angle *A* is 30°. We have given:

$$A = 30^\circ; D = 40^\circ; V = 50^\circ.$$

It is first required to find  $\theta$ . Using Chart I, trace curve *A* = 30° and curve *D* = 40° to their intersection at *X* (*M*, Fig. 5). Find the point *V* = 50° on the lower half of the vertical axis. Lay an indicator or straight-edge between this point and *X* and measure the angle  $\theta$  made by the indicator with the vertical axis. It is found to be 20°.

Turning to Chart II, turn 20° downward from *OR* and lay the indicator along this line from *O*, as in *N*, Fig. 5. This follows from the fact that *OR* is the principal end of the strike. Trace out the direction of fault movement from *O*, 30° to the right of the vertical and above *OS*, to the point *Y* on the circumference. Measure from *Y* parallel to *OS*, to the inclined straight-edge through *O* at the point *Z*. The distance measured in units of the diagram scale is 19. The offset was, therefore, 19 ft. per

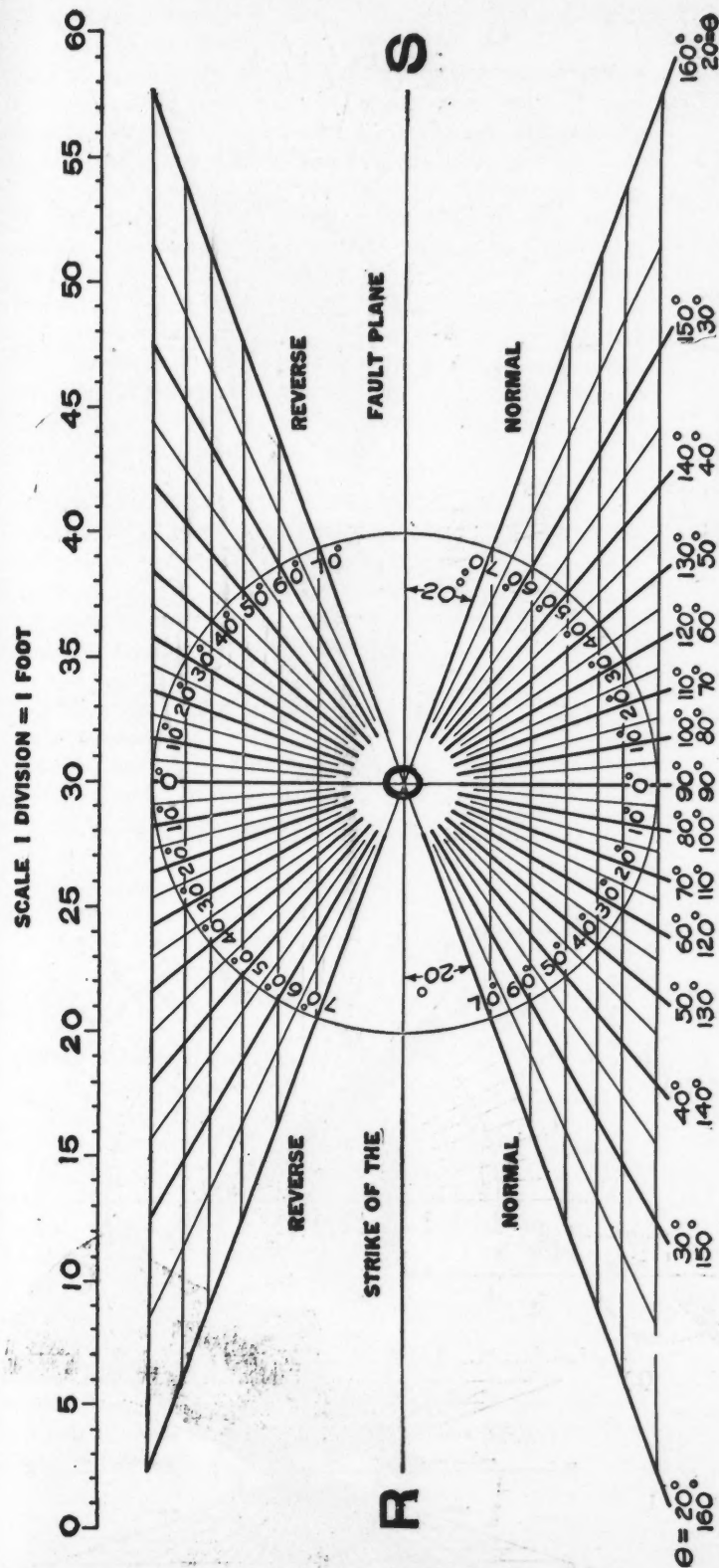


FIG. 4. CHART II, FOR DETERMINING OFFSETS

which makes the proper angle with the dip line and lies in the proper quadrant. If the fault is normal, i.e., if the hanging wall has moved directly or obliquely down the fault plane, the direction of movement is, of course, traced on a radius below *ROS*, as indicated on the dia-

10 ft. of movement. Since the actual movement was 300 ft., the actual offset is  $\frac{1}{3} \times 300 = 570$  ft. If a second indicator be placed through *Y* parallel to that through *O*, thus representing the intersection of the faulted hanging-wall portion of the vein with the fault plane, this will

be seen to lie to the left of the unfaulted foot-wall portion and since the fault is, in this case, east and west, the hanging-wall portion will have been offset to the west. A drift from the foot-wall portion along the fault to the west should pick up the vein at 570 ft.

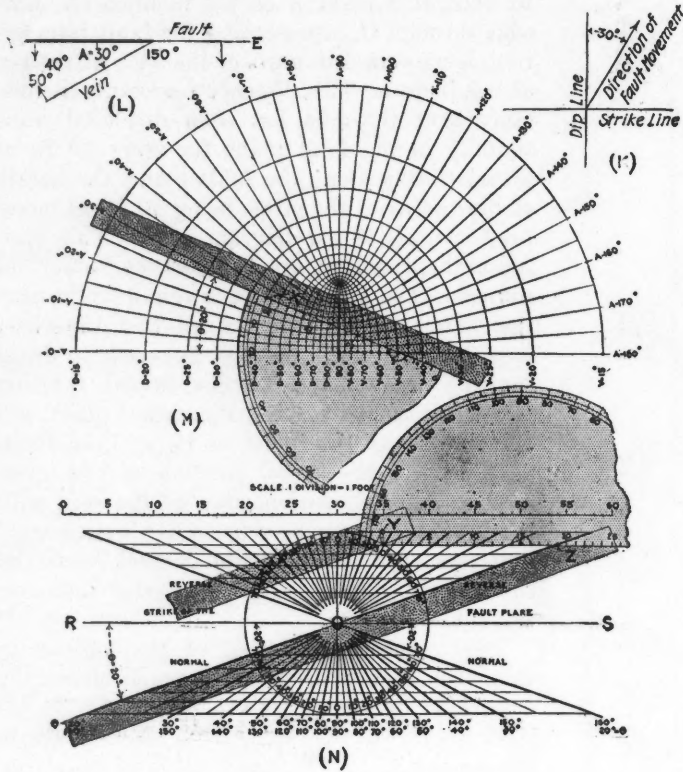


FIG. 5. SOLUTION OF PROBLEM 1

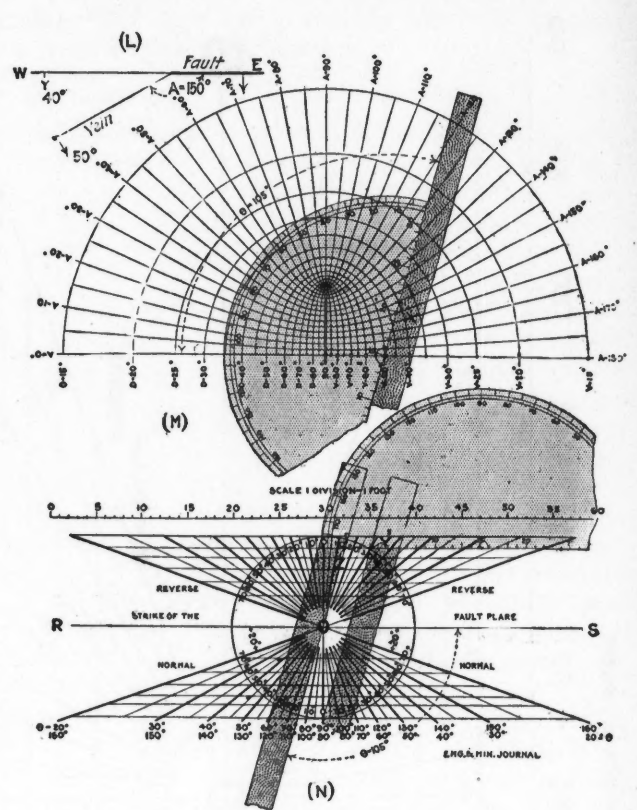


FIG. 6. SOLUTION OF PROBLEM 2

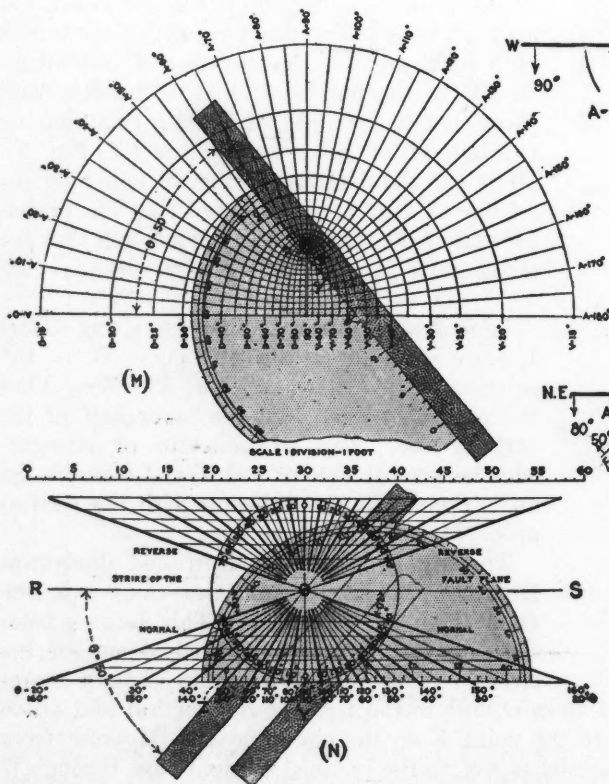


FIG. 7. SOLUTION OF PROBLEM 3

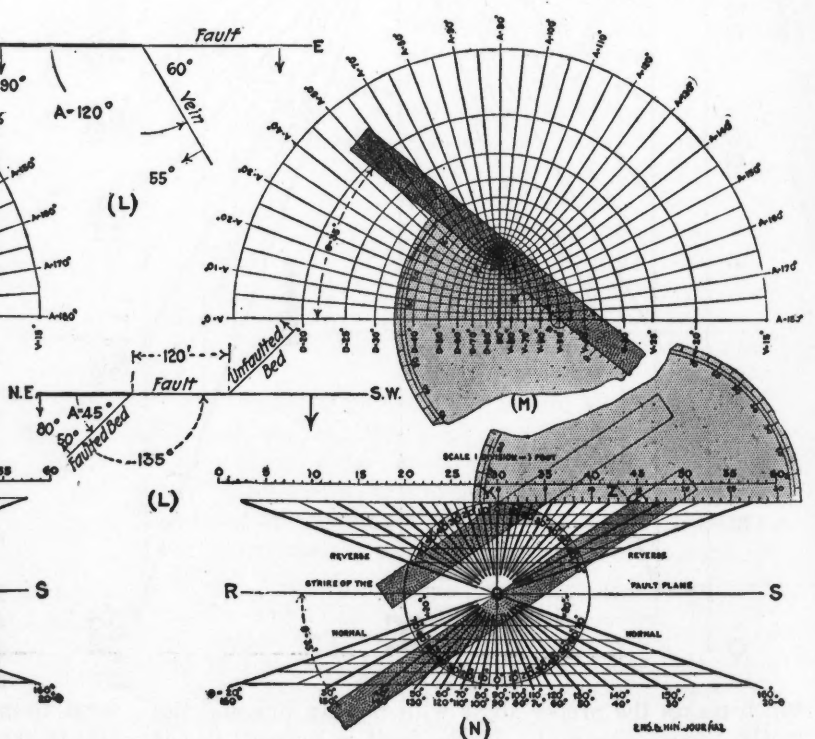


FIG. 8. SOLUTION OF PROBLEM 4



PROBLEM 2

Assume a set of conditions identical with those of Problem 1, but with the vein dipping to the southeast instead of to the northwest. By drawing the diagram *L*, Fig. 6, it will be seen that the principal end of the strike lies to the right and that  $A$  is  $150^\circ$ . The given data are then:

$$A = 150^\circ; D = 40^\circ; V = 50^\circ.$$

As in *M*, Fig. 6, obtain the intersection  $X$  of curves  $D = 40^\circ$ , and  $A = 150^\circ$ . Through this point  $X$  and the point  $V = 50^\circ$ , lay the straight-edge and measure the angle  $\theta$  as before. It is found to be  $105^\circ$ .

On Chart II, *N*, Fig. 6, measure  $105^\circ$  down from  $OS$ , the principal end of the strike being to the right; lay the indicator as represented. Trace out the fault movement, just as in Problem 1, to point  $Y$ . Measure over to the indicator at point  $Z$ . This distance is found to be 2.7. The offset is, therefore, 2.7 ft. for every 10 ft. of movement, or 81 ft. for the 300 ft. of movement. By laying the second indicator through  $Y$  parallel to that through  $O$ , the faulted portion is found to lie to the east of the unfaulded.

PROBLEM 3

Assume that a fault striking east and west and lying vertical, cuts a vein which strikes  $N 30^\circ W$  and dips  $55^\circ$  to the southwest. The fault movement was vertical and amounted to 40 ft. The data are plotted as in *L*, Fig. 7, the block on the south side of the fault being assumed as the hanging-wall block. This block moves down so that the fault, plotted thus, is normal. The principal end of the fault lies to the left and  $A$  is found to be  $120^\circ$ . The data are:

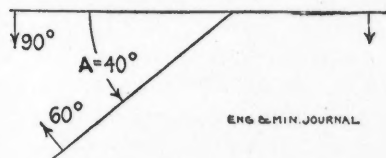


FIG. 9. DETERMINATION OF  $A$  FOR CASE I

$$A = 120^\circ; D = 90^\circ; V = 55^\circ.$$

On Chart I, *M*, Fig. 7, find the intersection of curves  $A = 120^\circ$ , and  $D = 90^\circ$  at  $X$ . A straight-edge through  $X$  and the point  $V = 55^\circ$  makes with the vertical axis an angle of  $50^\circ$ , which is  $\theta$ .

On Chart II, *N*, Fig. 7, turn off  $50^\circ$  from  $OR$ , the principal end of the strike, trace down the radius  $0^\circ$  from  $O$  to point  $Y$ . Measure from  $Y$  to the inclined straight-edge at  $Z$ . The result is 8.5. An offset of 8.5 ft. per 10 ft. of movement gives 34 ft. offset for the actual vertical movement of 40 ft. This offset, it will be seen, has taken place to the east.

PROBLEM 4

Assume a set of sedimentary beds cut by a normal fault across their strike. The fault strikes northeast and southwest, and dips northwest at an angle of  $80^\circ$ . The beds themselves strike north and south and dip  $50^\circ$  to the east. A bed of conglomerate is found to be offset 120 ft. to the northeast when measured along a horizontal plane. The faulting movement took place perpendicularly to the

strike of the fault, that is, directly up or down the dip. It is required to find the amount of displacement along the line of movement in the plane of the fault and whether the fault is normal or reverse. It should be noted that this problem is, to a certain degree, the reverse of those just solved, the offset being known, while the direction and amount of displacement are required. The data can be plotted as shown in *L*, Fig. 8. It is evident that the principal end of the strike lies to the left and  $A$  is found to be  $45^\circ$ . The given data are:

$$A = 45^\circ; D = 80^\circ; V = 50^\circ.$$

Finding the intersection of curves  $A = 45^\circ$  and  $D = 80^\circ$ ; and connecting this point  $X$  with  $V = 50^\circ$ , the angle  $\theta$  is measured as  $35^\circ$  (*M*, Fig. 8). The angle  $35^\circ$  is then measured down from  $OR$  on Chart II, *N*, Fig. 8. It is known that the bed is offset to the northeast (*L*, Fig. 8). The fault has been plotted so that the northeast direction lies at the left. Since we know that the hanging wall is offset to the northeast, it must lie to the left of the unfaulded portion both in diagram *L* and on Chart II. The movement is along the dip line, therefore, to be traced either up or down the line running from  $O$  to  $0^\circ$  on the circumference of the circle. To bring the faulted intersection to the left of the unfaulded, this tracing must be performed upward from  $O$ , and this indicates

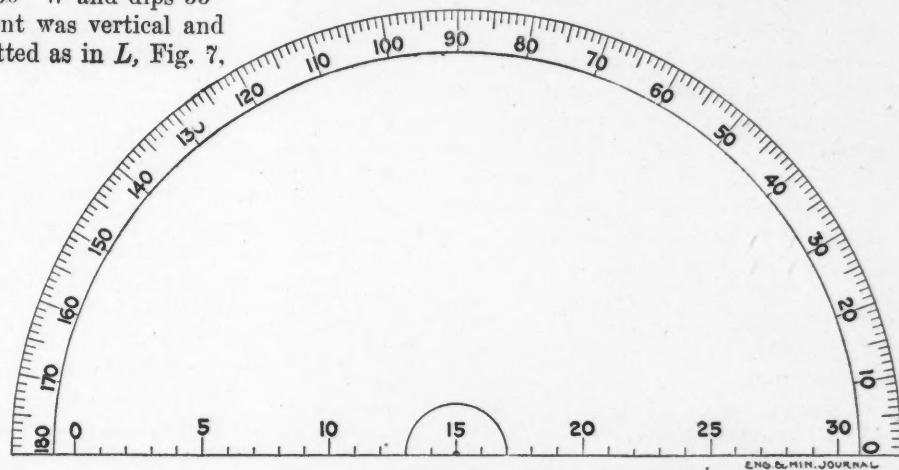


FIG. 10. PROTRACTOR AND SCALE FOR USE WITH CHARTS

that the fault was reverse. Tracing along the  $0^\circ$  radius to  $Y$ , and measuring horizontally to  $Z$  on the inclined indicator through  $O$ , we find the offset to be 14.5 ft. for each 10 ft. of displacement. Since the total offset is known to be 120 ft., the actual displacement along the dip is  $\frac{120}{14.5} \times 10 = 83$  ft.

USES IN PROJECTION, SUCH AS GEOLOGIC SECTIONS

The geologist is often called upon to project angles upon planes, as in plotting, say, a vertical section across a series of dipping beds, not at an angle of  $90^\circ$  with the strike of the beds. After the use of Chart I as a means of solving fault problems has been mastered, it will be found of great service as an angle projector, by thinking of the angles and planes now to be dealt with in the terms of the angles and planes used in the fault problems.

CASE I

Suppose a vein dipping at  $60^\circ$  is to be plotted on a vertical section made at an angle of  $40^\circ$  with the strike of the vein. By what angle will the dip of the vein be repre-

sented? The plane of the section can be considered a fault plane, and by plotting, as in Fig. 9, the angle  $A$  is seen to be  $40^\circ$ . We have then the data:

$$A = 40^\circ; D = 90^\circ; V = 60^\circ.$$

The value of the angle  $\theta$  is then  $47^\circ$ , obtained from Chart I in the usual manner. This angle, it must be remembered, is the angle made by the intersection line of the two planes with the strike of the vertical or fault plane; obviously, this is the angle which it is required to plot on the section. The dip of the vein, modified by the fact that the section is not taken at right angles to the strike, is therefore plotted at  $47^\circ$  instead of  $60^\circ$ .

#### CASE II

The line of intersection of a vein and a fault plane is found to make an angle of  $50^\circ$  in the fault plane with the strike of the fault. The dip of the fault is  $60^\circ$ . It is required to represent this angle in plan, that is, project the line of intersection on a horizontal plane. We can imagine a vertical plane passed through the line of intersection and its projection on the horizontal, to be a vertical vein. The desired angle, that made by the projection line and the fault strike, will be the angle  $A$ . The case will be that of a vertical vein cut by an inclined fault. We have given:

$$D = 60^\circ; V = 90^\circ; \theta = 50^\circ.$$

Using Chart I, place the center of the protractor at the center of the vertical axis, marked  $90^\circ$ ; turn off  $\theta = 50^\circ$ ; place the straight-edge along the bottom of the protractor; trace along the curve  $D = 60^\circ$  until it meets the straight-edge; trace out along the hyperbolic curve from this point  $X$ , and it will be found to correspond to  $A = 32^\circ$ . Therefore, the angle between the fault strike and the projection of the intersection line is to be plotted at  $32^\circ$  on the desired plan.

#### CASE III

The strike of a plane makes an angle of  $30^\circ$  with another horizontal line; the plane dips  $60^\circ$ . It is desired to find the angle between the strike of the plane and the vertical projection of the horizontal line on the plane. This, it will be noted, is the opposite of Case II. The given plane can be assumed as a fault plane, and the plane passed through the horizontal line in a vertical projection on the fault line can be considered a vertical vein. The angle which it is desired to find is, therefore,  $\theta$ . There are given the data:

$$A = 30^\circ; D = 60^\circ; V = 90^\circ.$$

By the use of Chart I,  $\theta$  is determined to be  $49^\circ$ .

#### CONCLUSION

In Fig. 10 is shown a protractor of suitable design for use with the charts, reading only counter-clockwise from  $0^\circ$  on the right to  $180^\circ$  on the left. On the bottom of this protractor is made a scale corresponding to the units of Chart II. It can thus be used for measuring offsets on Chart II. There is also printed in small type a set of rules for angle projection in using Chart I. These can be cut out and mounted on the front or back of the protractor. This, with the two charts also cut out, and all three properly mounted, will be a complete set of apparatus for solving the problems here described. For the straight-edge indicators, which are necessary, scales, cards, pencils, etc., can be used.

There has been no attempt to describe the mathematical

theory on which Chart I is constructed. It may be assumed as correct. Readers who are further interested can consult an article by E. V. Huntington, entitled "A Graphical Solution of a Problem in Geology," to be published in the *American Mathematical Monthly*. The equation on which the chart is based is:

$$\text{Cotan } \theta = \text{cotan } A \cos D + \text{cosec } A \sin D \text{ cotan } V$$

#### RULES FOR ANGLE PROJECTION

Case I: To find projection of dip angle on vertical plane.  $A$  = acute angle between strike of vein and strike of plane.  $D = 90^\circ$ .  $V$  = dip of vein.  $\theta$  = required projection of dip angle on vertical plane.

Case II: To find projection on horizontal plane of an angle in a dipping plane.  $D$  = dip of plane.  $V = 90^\circ$ .  $\theta$  = angle on dipping plane.  $A$  = plan of angle  $\theta$ .

Case III: To find the vertical projection of a horizontal angle on a dipping plane.  $D$  = dip of plane.  $V = 90^\circ$ .  $A$  = angle in horizontal plane.  $\theta$  = vertical projection of  $A$  on dipping plane.

✽

## Large Automatic Hoist

The Nordberg hoisting installation for the two shafts of the Inspiration Consolidated at Miami, Ariz., is going to be almost unique. The installation is in reality two separate hoists, one for each shaft, but as it will be possible to handle both from a single operating platform and as when running automatically, they will act as a single machine, it is customary to consider the set as in single hoist.

An idea of the size of the hoist can best be gained from a few figures regarding the work it is expected to perform. All hoisting will be done in balance, and since there are two shafts, this means that four skips will be in continuous operation. The skips will weigh 1500 lb. each and will have a capacity of 2400 lb., the net load to be hoisted. To allow ample time for repairs and emergencies, the hoisting period has been limited to 14 hr. per day and the capacity for the set for the period is 10,000 tons from a depth of 600 ft., corresponding to one skip of ore to the surface per minute. The hoist is so designed as to be entirely automatic in its operation, requiring no attendant whatever, neither on the surface nor underground at the loading pocket. It can, however, be disconnected at will so as to eliminate the automatic feature, making it hand operated. So far as known this is the first large hoist to be entirely automatic in its operation. Although the initial cost is much higher than it would otherwise have been, the amount saved in wages of engineers and attendants will soon offset the extra outlay.

✽

## Oregon Metal Production in 1913

The metal production of Oregon in 1913 was valued by Charles G. Yale, of the U. S. Geological Survey, at \$1,746,402, an increase of over 100%. The most valuable product was gold, the output being valued at \$1,627,710, of which \$1,177,082 was derived from lode mining and \$450,628 from placers. The silver production was 179,036 oz., and there were 87,207 lb. of lead produced. The copper output declined in 1913, the production amounting to only 43,330 lb. There were fewer mines in operation in 1913, but the tonnage from deep mines was materially increased. One new dredging operation was started during the year.



# A Comparison of Roasting Furnaces

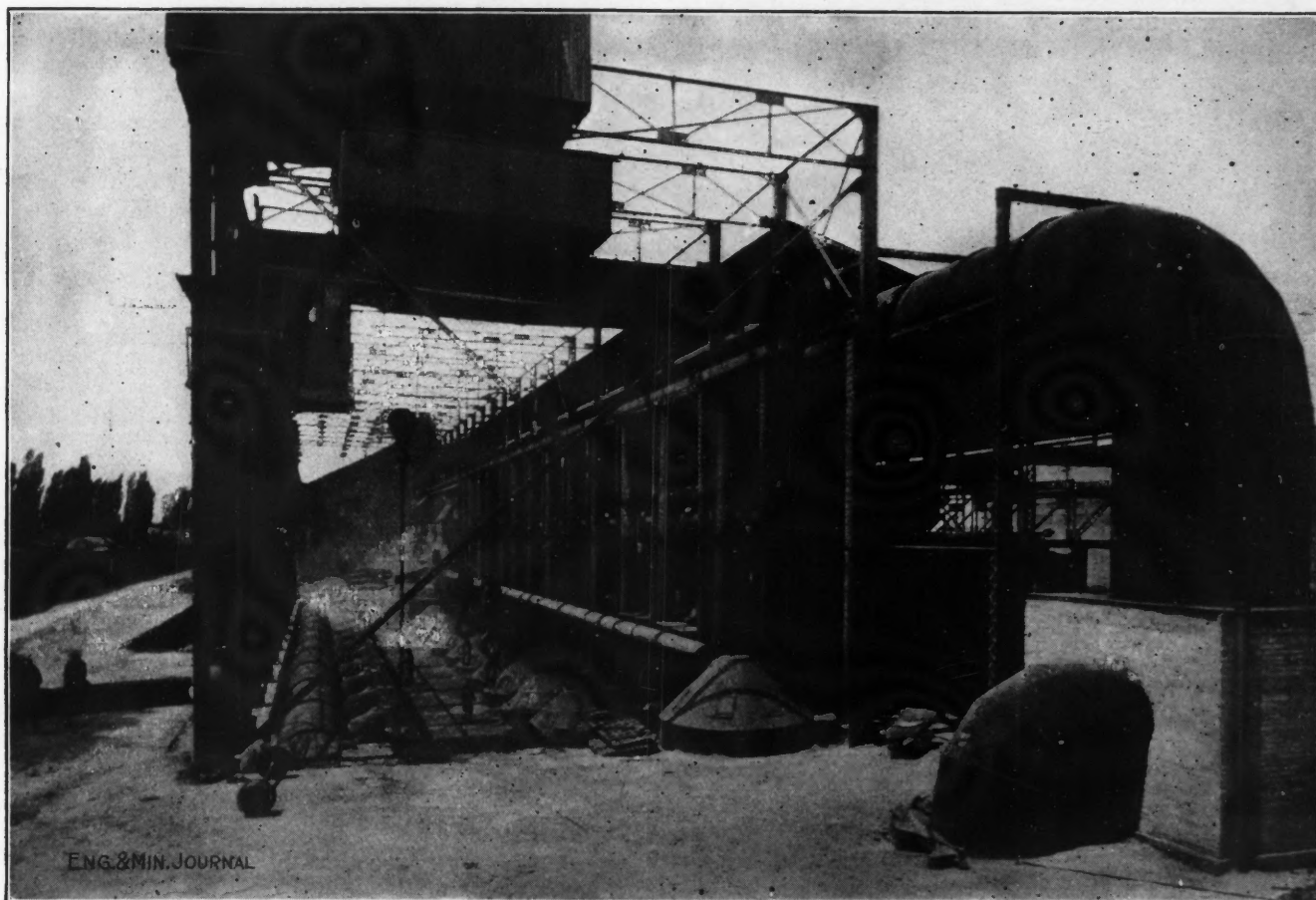
*SYNOPSIS*—An account of the experience at the Murray plant of the American Smelting & Refining Co. with both of these processes. Preroasting or diluting high-sulphur charges is necessary, as 15 to 18% sulphur was found to be the limit for satisfactory sintering. The Dwight-Lloyd plant has greater flexibility and the first cost is lower; the operating cost was in favor of the H. & H. plant, at Murray, and the product slightly superior, but both processes have given good results without any overwhelming advantage for either.

The gradually increasing proportion of sulphide ores which lead smelters of today are called upon to handle,

train of difficulties at the blast furnaces. The mechanically roasted ore was fine physically, the blast furnaces were choked and the troubles of the smelter were not at an end. Then Huntington-Heberlein pot system of roasting appeared upon the scene, and later on the Dwight-Lloyd machines were invented, and inasmuch as both of these processes were designed not only to roast the ore but to agglomerate it as well, it was apparent that distinct steps in advance had been achieved.

## SULPHUR LIMITS OF ROASTING EQUIPMENTS

At the Murray plant, modern roasting practice is fully exemplified and there are now in successful operation



HUNTINGTON-HEBERLEIN ROASTING POTS AT MURRAY, UTAH

has caused the roasting problem to become one of ever greater importance. We may look back a score of years or so and recall the old hand roasters, some of which turned out a finely divided roasted product, and others fashioned with a "fuse-box," wherein the roasted ore was slagged. Then came mechanical furnaces of several types, the Brückner cylinder, the Brown-O'Hara, the Ropp, and others, all designed to cut out the cumbersome hand labor of the old reverberatories. Roasting costs were thereupon reduced and tonnages stimulated to a gratifying extent. However, it seems to have been early recognized that this very feature of a greater amount of roasted sulphide ore as compared with oxide ore brought with it a

roasting furnaces or devices of several sorts; namely, Godfrey revolving-hearth furnaces, Wedge multiple-hearth mechanical roasters, Dwight-Lloyd sintering machines, and Huntington-Heberlein pots. Godfrey and Wedge furnaces will properly handle material high in sulphur, say ores with 25, 30 and 35% of that element; D. & L. machines and H. & H. pots will positively not treat efficiently ores or mixtures containing anywhere near the sulphur content mentioned, but are confined to charges containing from 15 to 18%. In passing, it may also be explained that, so far as the knowledge of the writer goes, Godfrey and Wedge furnaces do not economically eliminate sulphur to an extent sufficiently low for lead-smelting practice. With these simple facts in mind, it will be perfectly clear to all that the metal-

Note—Excerpts from a paper to be read by W. W. Norton at the Salt Lake meeting of the American Institute of Mining Engineers, August, 1914.

lurgist in charge may elect to treat sulphide ores either in one of two ways: He may pre-roast in Godfrey and Wedge furnaces and subject the partly roasted product to a final treatment on D. & L. machines and H. & H. pots, or he may dilute the average sulphur in the raw ore to 15 or 18% by means of an admixture of the requisite quantity of nonsulphur fines and send the mixture thus obtained to D. & L. and H. & H. machines. The Murray plant does both. A certain flexibility is thus afforded for a segregation of the various classes of sulphide ores; moreover, in the matter of oxide fines, one can limit screening operations to a point deemed best metallurgically.

Godfrey and Wedge furnaces are essentially pre-roasters; D. & L. machines and H. & H. pots are final roasters. At Murray all final roast is either D. & L. or H. & H. We turn now to the primary object of this paper, namely, a brief discussion of the comparative merits of these two widely distinct methods of final roasting.

#### COST OF INSTALLATION

The Murray plant is equipped with two D. & L. machines, the total daily capacity of which may be stated at 220 tons, and 23 H. & H. pots, with capacity of 400 tons. It would, of course, be manifestly unfair to compare directly the total costs of these two installations, but it seems quite safe to say that for almost any given tonnage capacity a D. & L. plant can be built for considerably less than an H. & H. plant, it being understood that H. & H. is meant the converting-pot portion of an installation only, with no reference to Godfrey furnaces. In the case of the H. & H. one must have heavy cast-iron pots for handling ore in comparatively large units, expensive overhead handling crane, substantial cooling floor, and, finally, a crusher which the D. & L. does not require at all. The cost of the installation item must be put down in favor of the D. & L. plant.

#### COST OF ROASTING

Any discussion of roasting costs should, of course, be based on units of sulphur eliminated. In a general way, our experience has shown that the D. & L. will reduce an initial sulphur of about 15 or 16% to about 4% in the roasted product, while the H. & H. is capable of handling a slightly higher initial sulphur, say 17 or 18%, with resultant 5% in product. During a recent period of 47 consecutive days, it is known that units of sulphur eliminated per ton of charge at the D. & L. practically equaled units of sulphur eliminated per ton of H. & H., and it is probable that an exhaustive examination of Murray plant roasting records would show about the same amount of sulphur per ton of charge driven off as between the two sorts of roasters now under review. It follows that figures representing costs of roasting are truly comparable.

The limitations of this paper will not permit of a detailed review of roasting costs, but it may be stated that during the entire year 1913 the H. & H. made the better showing to the extent of about 5c. per ton roasted, and for the first three months of 1914 the H. & H. also had an advantage of about 3c. per ton. Murray experience, everything considered, indicates slightly lower costs for H. & H., as compared with D. & L., but the fact that all calculations are based on operations at an H. & H. plant

having twice the capacity of a D. & L. plant must not be overlooked.

#### WIDE RANGE OF CHARGE

Any intelligent discussion of analysis of raw charge to roasters should have the fundamental thought in mind that the metallurgist must treat what comes to the plant. He cannot always be favored with the proportions of silica, iron and lead which would give the best results, consequently the adaptability of any given roasting device to a variety of materials will be accepted as an item of far-reaching importance.

Two or three years ago, in connection with a visit to three or four custom lead smelting works newly equipped with D. & L. machines, the writer was somewhat impressed with the limitations placed on the charge the machines were capable of handling. Inquiry brought forth the information that certain sorts of materials could be attempted only by resort to a special layer of fine limestone or other infusible material carried next to the grates; any percentage of raw matte at all seemed out of the question; zinc was naturally "side-stepped" as highly deleterious; much stress was placed upon the proportion of silica to the iron, and nearly all the enthusiasts demanded a goodly percentage of lead provided a choice quality of sinter was to be in evidence. Of late, however, the staff at Murray have found that a wide range of mixtures may be efficiently handled over the D. & L., and have no doubt that equally good progress has been accomplished at other works. Pre-roasted ore, any kind of raw sulphide ore or concentrates, flue dust, pre-roasted matte, or even raw matte may be combined in certain proportions and successfully sintered over these machines. A sufficient quantity of nonsulphur diluent to bring the average of the mixture down to 16% sulphur must always be added and, of course, the details of operation must be cared for. However, equally satisfactory results have been attained with H. & H. pots.

Turning now to physical character of the raw ore, it is, of course, recognized that the air currents are required to permeate a thin layer of charge in case of D. & L. treatment, whereas the pot roasters are committed to a much thicker layer; but a physically fine charge will restrict tonnage on D. & L. just as surely as it will in H. & H. pots, although the D. & L. process is able to treat slimes or rather fine material which it would be wholly useless to attempt to treat in the H. & H. By way of summing up, it may be stated that the D. & L. process possesses a slight advantage over the H. & H. in the matter of flexibility or range of charge, because the D. & L. permits more delicate application of operating details which are essential to success; also extremely fine materials find no proper place in the H. & H. charge.

#### LEAD LOSSES

We have certain data at hand showing a moderate lead loss on D. & L. machines, these data being based on standard operating conditions during which the resultant gases and fumes were sampled and analyzed. No data are available covering losses with H. & H. pots. The expense and difficulties in connection with accurately sampling an H. & H. output of 400 tons per day need not be pointed out and gas measurements and samples taken from the combined gases of 23 pots on two different main flues might eventuate in metal-recovery data not wholly



dependable. . . . It is regarded as doubtful if the D. & L. process is productive of any lower metal losses than is the H. & H. process.

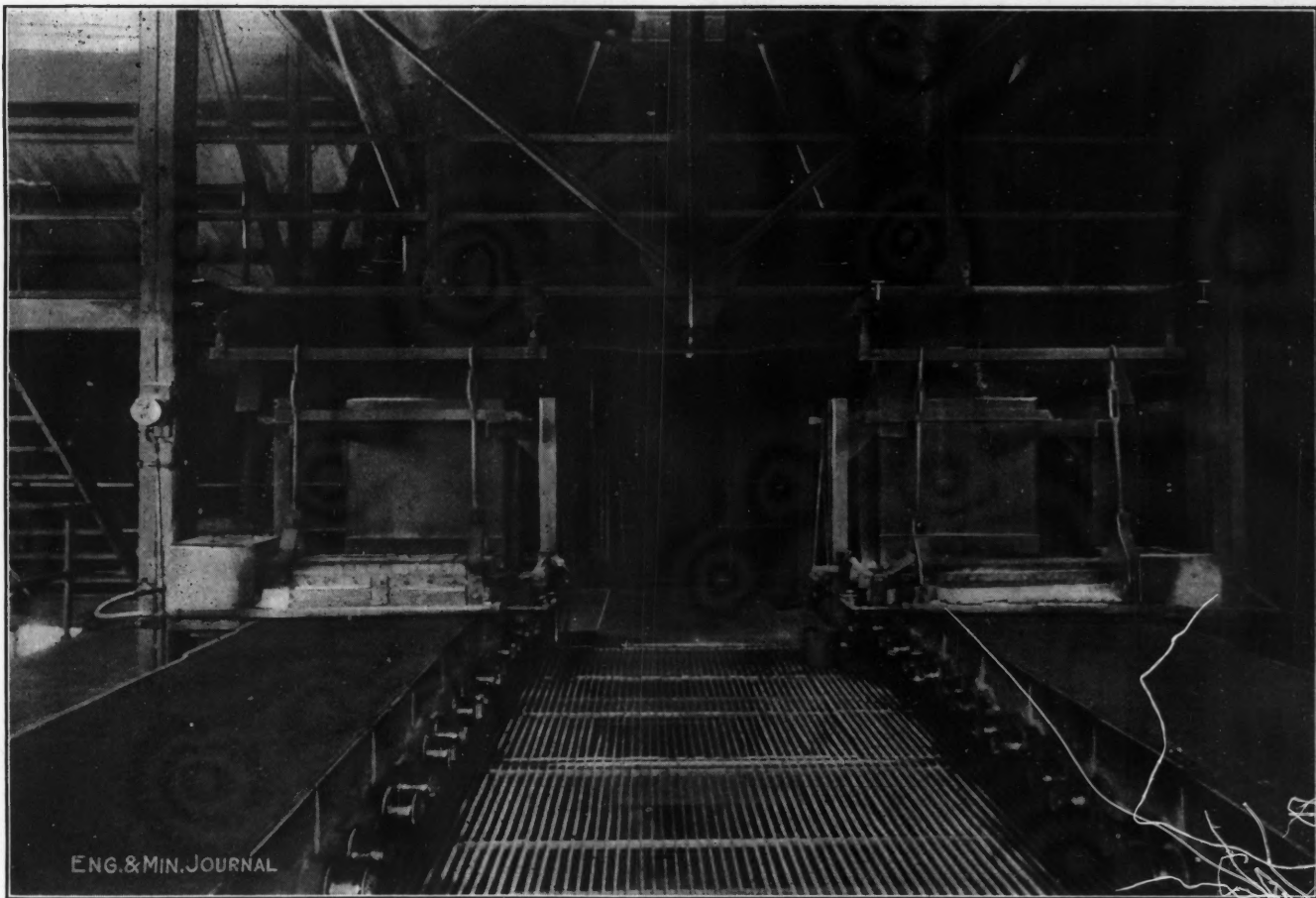
PHYSICAL CONDITION OF PRODUCT

Final-roasting treatment results in a sintered or agglomerated product, and material of a desirable physical character is passed along to the blast furnaces. The D. & L. sinter is usually of a porous or cellular structure; the H. & H. tends to greater density or firmness. Published and unpublished opinions of metallurgists have sought to show that the peculiarly open or coke-like structure of the D. & L. sinter carried with it certain extraordinarily favorable properties when subjected to the smelting process in the blast furnace, and have even claimed appreciable saving in the coke percentage used for smelt-

With all due respect to the theories above set forth, it was considered that more dependable conclusions could be drawn by means of actual operating tests and accordingly the Murray furnaces during five days of August, 1912, were run on two charges, the one containing no D. &

TEST CHARGES WITH AND WITHOUT D. & L. SINTER

	Furnaces 1, 3, 7 and 8 (No D. & L.)	Furnace 5 (D. & L.)
Coke, 920 (11½%).....	.....	.....
Bed 36, bin 7.....	2970	320
H. & H. roast.....	2000	.....
D. & L. roast.....	.....	4800
Hand-roasted matte.....	600	400
Iron ore.....	690	540
Limestone.....	1640	1840
Scrap iron.....	100	100
Total.....	8000	8000
	Per Cent.	Per Cent.
Average lead in slag for the run.....	0.63	0.91
Average lead in matte for the run.....	10.7	14.96



THE DWIGHT-LLOYD SINTERING MACHINES AT THE MURRAY PLANT

ing. Rather exaggerated ideas concerning the efficiency of an exposure of porous surfaces to contact with reducing gases have been advanced and intimate mixtures (possibly intimately combined silica and lead) have been proclaimed as "predigested," and therefore more easily reduced. The writer believes that a partly fused or "predigested" combination may tend to poor results rather than to good results when smelted, for the reason that such substances fuse at too low a temperature in the furnace. Certain writers have gone so far as to examine the cell structures of the D. & L. product microscopically and have declared that glazed or unglazed surfaces have a bearing upon the readiness with which the products were later reduced in furnaces.

L. roast at all, the other containing a rather large amount of this material. It was believed that any peculiar virtue existing in D. & L. product would have abundant opportunity to make itself manifest. The exact charges used are given above, together with the average lead in resultant slag and matte.

Great pains were used to make the experimental-run one of value. The D. & L. roasted product was of a typically honeycombed character. No. 5 furnace was in excellent condition, its operations were closely watched by the metallurgist in charge of the furnaces and by the writer, yet absolutely no strengthening of reduction appeared. On the contrary, No. 5 did worse than the other furnaces.

General blast-furnace experience covering a wide range of charges and a considerable period of time indicates that no particular effect, either good or bad, can be claimed for D. & L. sinter as relating to strength of reduction during the smelting process, and exactly the same remark will apply to H. & H. agglomerated material. (Of course, the D. & L. sintered ca. es must be broken to the proper size and the H. & H. material must be crushed suitably small, or distinctly bad reduction will ensue.) That both of these products of modern roasting development help the speed of furnaces enormously is certainly a fact. The final roasters of modern smelters, in supplanting the old hand roasters and fine-ore producing mechanical furnaces, have very naturally served to increase blast-furnace tonnages to a remarkable extent.

As to which product is the better physically, that is to say, which will produce the heavier tonnage at blast furnaces, a first-class D. & L. sinter does not excel a first-class H. & H. agglomerated product. Moreover, given an inferior quality of both, it would seem that the admittedly cellular or at times fragile D. & L. can hardly equal the more firm and stable H. & H. Here, again, however, real experience at blast furnaces may outweigh mere conjecture or theorizing, so the following data are submitted with the idea of showing that in this instance at least the physical character of the D. & L. produced no better tonnage at blast furnaces than did the physical character of the H. & H. On Aug. 12 and 13, 1912, the following two charges were smelted side by side with the same coke percentage, the same blast pressure and as near like conditions in other respects as it was possible to obtain:

	Furnaces 1, 3 and 5 (H. & H.)	Furnaces 7 and 8 (D. & L.)
Coke, 920 (11½%).....	1400	2060
Bed 37, bin 4.....	3000	3000
H. & H. roast.....	400	400
D. & L. roast.....	1140	580
Hand-roasted matte.....	1960	1860
Iron ore.....	100	100
Limestone.....	8000	8000
Scrap iron.....	294	287
Total.....	Per Cent.	Per Cent.
Average tons per furnace per day.....	0.81	1.03
	13.47	13.0

#### CONCLUSIONS

It is believed that a fair summary of the actual experience set forth in this paper would be as follows:

	Advantage in Favor of
Cost of installation.....	D. & L.
Cost of roasting.....	H. & H.
Adaptability of charge.....	D. & L.
Metal losses.....	Doubtful
Physical condition of product.....	H. & H.

This article is unable to point out any overwhelming advantage of the D. & L. over the H. & H. system, although continued progress may upset the balance at any time. If history repeats itself some new roasting system will take rank over both within a few years.

### Mineral Production of Hungary in 1912

The mineral production of Hungary in 1912, as officially reported, was as follows (*Oest. Zeit. f. B. u. H.*, June 13, 1914), the items being arranged in order of descending values: Lignite, 8,131,307 metric tons; pig iron, 552,838; salt, 309,758; coal, 1,079,096 metric tons;

gold, 2851 kg.; iron ore for export, 591,585 metric tons; coke, 149,912; briquettes, 118,505; pyrites, 103,809 metric tons; silver, 10,781 kg.; lead, 1605 metric tons; bitumen, 4459; copper, cement and ore, 2433; antimony, crude and refined, 857; copper, 241; quicksilver, 85; ammonium sulphate, 1009; petroleum, 2793; coal tar, 2736; manganese ore, 8235; zinc ore and residue, 777; sulphuric acid, 1310; sulphur, 83; antimony ore, 65; silver ore, 10; alum stone, 600; quicksilver ore, 10 metric tons.

### U. S. Geological Survey Organization

The following is the organization of the U. S. Geological Survey, as of July 27, 1914.

Director, George Otis Smith.

Administrative geologist, George H. Ashley.

Chief clerk, Henry C. Rizer.

Geologic branch: Chief geologist, David White.

Geology division, David White.

Eastern areal geology, Arthur Keith.

Western areal geology, F. L. Ransome.

Metalliferous deposits, F. L. Ransome.

Nonmetalliferous deposits, H. S. Gale.

Coastal plain investigations, T. W. Vaughan.

Western mineral fuels, M. R. Campbell.

Eastern mineral fuels, David White.

Glacial geology, W. C. Alden.

Paleontology and stratigraphy, T. W. Stanton.

Mineral resources division, E. W. Parker.

Metallic resources, H. D. McCaskey.

Nonmetallic resources, E. W. Parker.

Alaskan mineral resources division, A. H. Brooks.

Chemical and physical research division, G. F. Becker.

Chemistry, F. W. Clarke.

Physics, C. E. Van Orstrand.

Topographic branch: Chief geographer, R. B. Marshall.

Atlantic division, Frank Sutton.

Central division, W. H. Herron.

Rocky Mountain division, Sledge Tatum.

Pacific division, George R. Davis.

Northwestern division, T. G. Gerdine.

Water resources branch: Chief hydraulic engineer, N. C. Grover.

Surface water division, J. C. Hoyt.

Water utilization division, N. C. Grover.

Ground water division, O. E. Meinzer.

Land classification board: Chief, W. C. Mendenhall.

Coal, C. E. Leshner.

Phosphate, A. R. Schultz.

Metalliferous, A. R. Schultz.

Oil, M. W. Ball.

Power, Herman Stabler.

Irrigation, W. B. Heroy.

Administrative branch:

Disbursing office, J. D. McChesney.

Accounts division, Ben S. Favorite.

Executive division, Guy E. Mitchell

Library, Miss J. L. V. McCord.

Publication Branch:

Editor, G. M. Wood.

Distribution of documents, James P. Benfer.

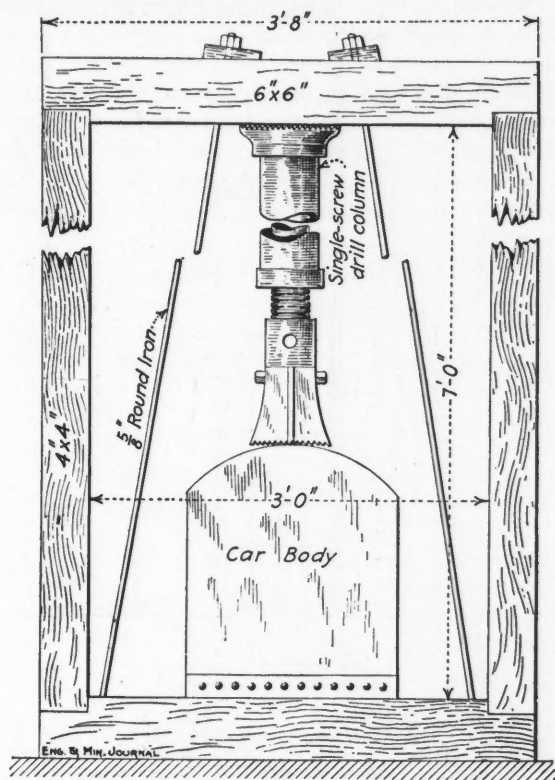
Chief engraver, S. J. Kubel.



# Details of Practical Mining

## Car-Bottom Straightener

In loading cars from stope chutes, especially where stoping is done by the shrinkage system, the falling of large pieces of ore batters the bottoms of the car boxes out of shape. These car bottoms must be straightened from time to time, and in the accompanying illustra-



SINGLE-SCREW COLUMN IN FRAME FOR STRAIGHTENING ROUNDED CAR BOTTOM

tion is shown a device which works much better than the time-honored sledging method. A frame, 3x7 ft. in the clear, is constructed of a 6x6-in. sill, two 4x4-in. posts and a 6x6-in. cap, the whole held securely together by two 5/8-inch tie-rods, and firmly braced. The car box, the bottom of which needs straightening, is removed from its truck and placed under the frame, bottom side up. A single-screw drill column is then set up as shown, and pressure brought to bear on the box. By applying this pressure in two or three places, if necessary, the bottom is pressed back into shape without the denting and local strains which sledging would cause.

## Feed Pressures in Stopers

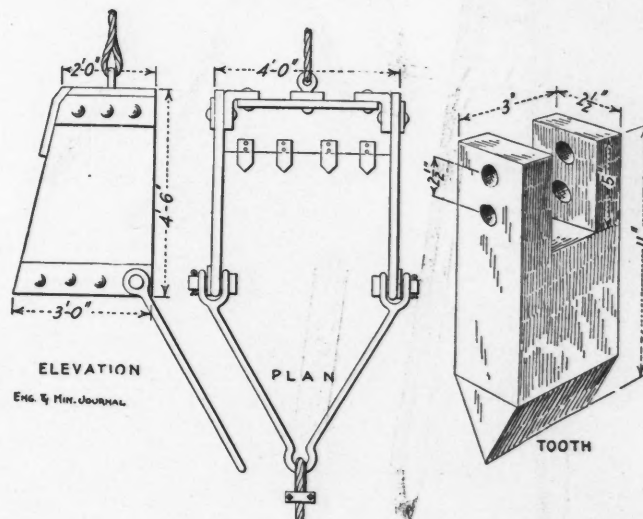
The Paynter rock-drill tester was described in the JOURNAL, Nov. 1, 1913. The machine is proving of the greatest value in several ways and is disclosing many interesting points bearing on the design and operation of rock drills. One of these is described by the North Star mine management in a recent A. I. M. E. paper.

It has regard to the effect of feed-barrel pressure. It is found that if the feed-barrel packing is slightly defective, the drill does not hold against the ground hard enough, causing as much as 30% decrease in drilling speed. And in the 16-V Waugh stopers, used at the North Star, wear in the barrel bushing after about 250 drill-shifts causes cushioning due to leakage of air, with reduction in the strength of blow, amounting to as much as 20%. In the 17-V type, at pressures below 85 lb. per sq.in., the strength of blow drops rapidly. Plugging some of the exhaust ports causes the strength of blow to decrease less rapidly. This makes the drill more effective at low pressures.

## Drag Scraper for Handling Dump

BY FREDERICK W. FOOTE\*

The Portland mill, at Victor, Colo., was erected to treat the low-grade dump material from the mine. The dump contained about 2,500,000 tons with an average value of about \$3 per ton. It was found advisable to



CONSTRUCTION OF SCRAPER AND-DETAIL OF TOOTH

take the supply from the top of the dump. A cheap and efficient means was devised and put into operation whereby the material was elevated to the top of the dump.

It consists of a drag scraper connected to a 1 1/2-in. endless cable, which runs through a pulley fastened at the bottom of the dump and around the hoist drum at the top. An electric hoist of 112 hp. is used and the cost is about 1c. per ton of material raised.

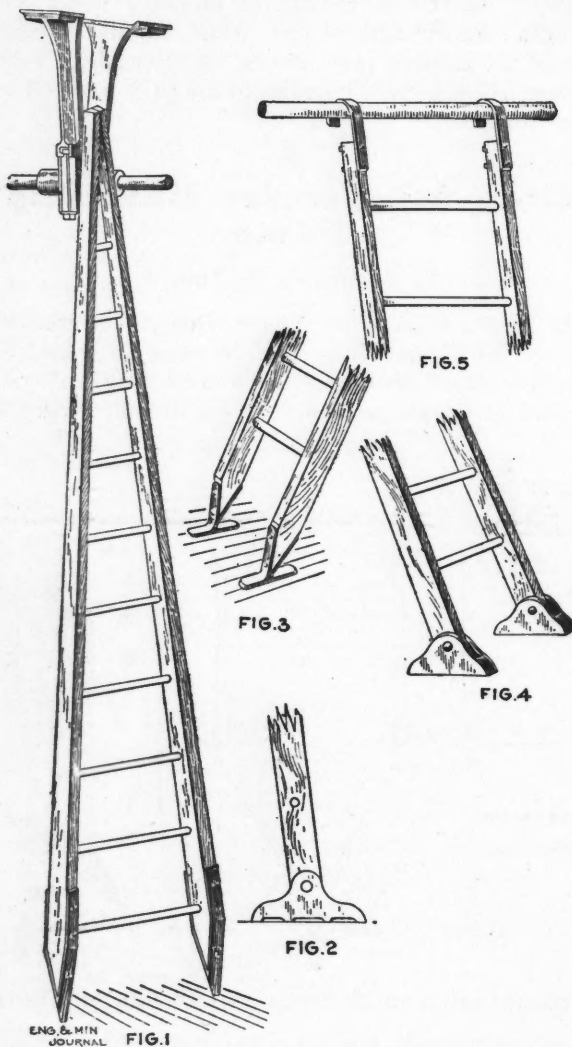
The scraper requires about two days for its construction. The body is of 1/2-in. boiler plate and the teeth are of cast iron. The life of the scraper depends on the character of the material handled and the speed of

\*Britannia Beach, B. C.

handling. The one described handles loose rock, is operated almost continuously and lasts from two to three weeks.

### Some Safety Devices for Ladders\*

The accompanying drawing shows some safety devices for application to portable ladders such as are used around the mine shop or mill. Fig. 1 represents a ladder with a tapered top, particularly adapted for use around shafting, where it can be supported against a narrow hanger. Steel points on the bottom are intended to prevent slipping. Fig. 2 shows a shoe for the ladder up-



SAFETY HOOK AND SAFETY FEET FOR MILL AND SHOP LADDERS

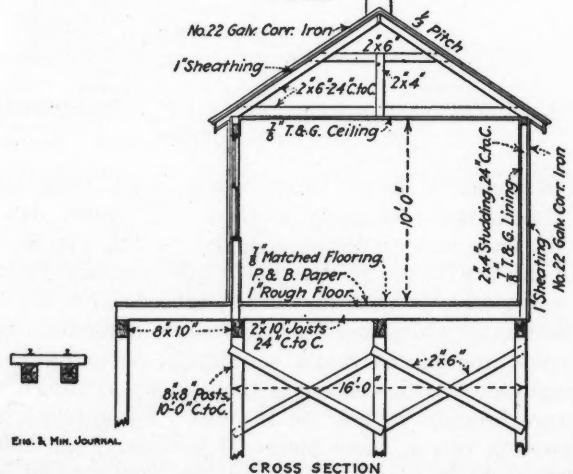
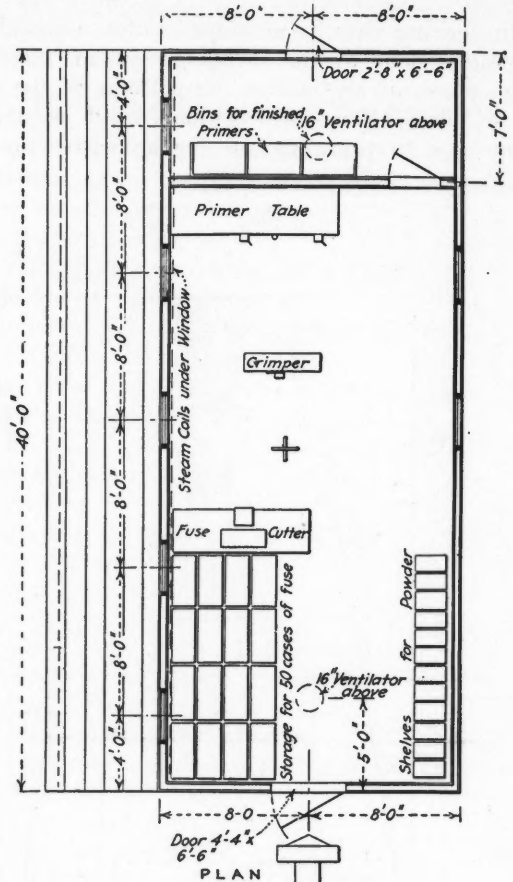
rights; it is pivoted so that it always rests flat on the floor, and it has a corrugated bottom. Fig. 3 shows another nonslipping shoe, the bottom having steel points. Fig. 4 shows a pivoted shoe with sides of metal and a center of wood. The bottom may be of some such adhesive material as basswood, carborundum, lead or corrugated metal. Fig. 5 represents a method of supporting a ladder securely on shafting by hooks at the top.

\*From Inland Steel Co. Safety Bulletin No. 15.

### Heating a Powder House by Electricity

BY E. P. KENNEDY\*

At the Treadwell mines on Douglas Island, southeastern Alaska, it has always been the custom to make up the primers in houses on the surface. There were three such primer houses, all heated by steam. Last summer



PLAN AND ELEVATION OF ALASKA TREADWELL POWDER HOUSE

a central primer house was built in which the primers of all the mines are made. This primer house is situated 1600 ft. from the nearest boilers and about one mile from the Treadwell mine.

Four sectional steam radiators were installed, but in-

\*Assistant superintendent, Alaska Treadwell Gold Mining Co., Treadwell, Alaska.



stead of connecting with steam, a 3000-watt Westinghouse bayonet heater was screwed into the bottom of each radiator. A short pipe was tapped into the top of the radiator and connected with a small covered tank, which was kept full of water, a small amount being added when necessary to take care of the evaporation.

All leads entering the building and connecting with the bayonet heaters are in conduit and all switches are situated outside the building. The four radiators proved ample for our coldest weather and the amount of radiation can be regulated by opening the switch for one or more of the radiators. The installation has proved most satisfactory. From the point of safety it appears to be above criticism and as there is no loss of energy it would probably prove more economical for an isolated place than a long steam line from which there is continual waste of energy.

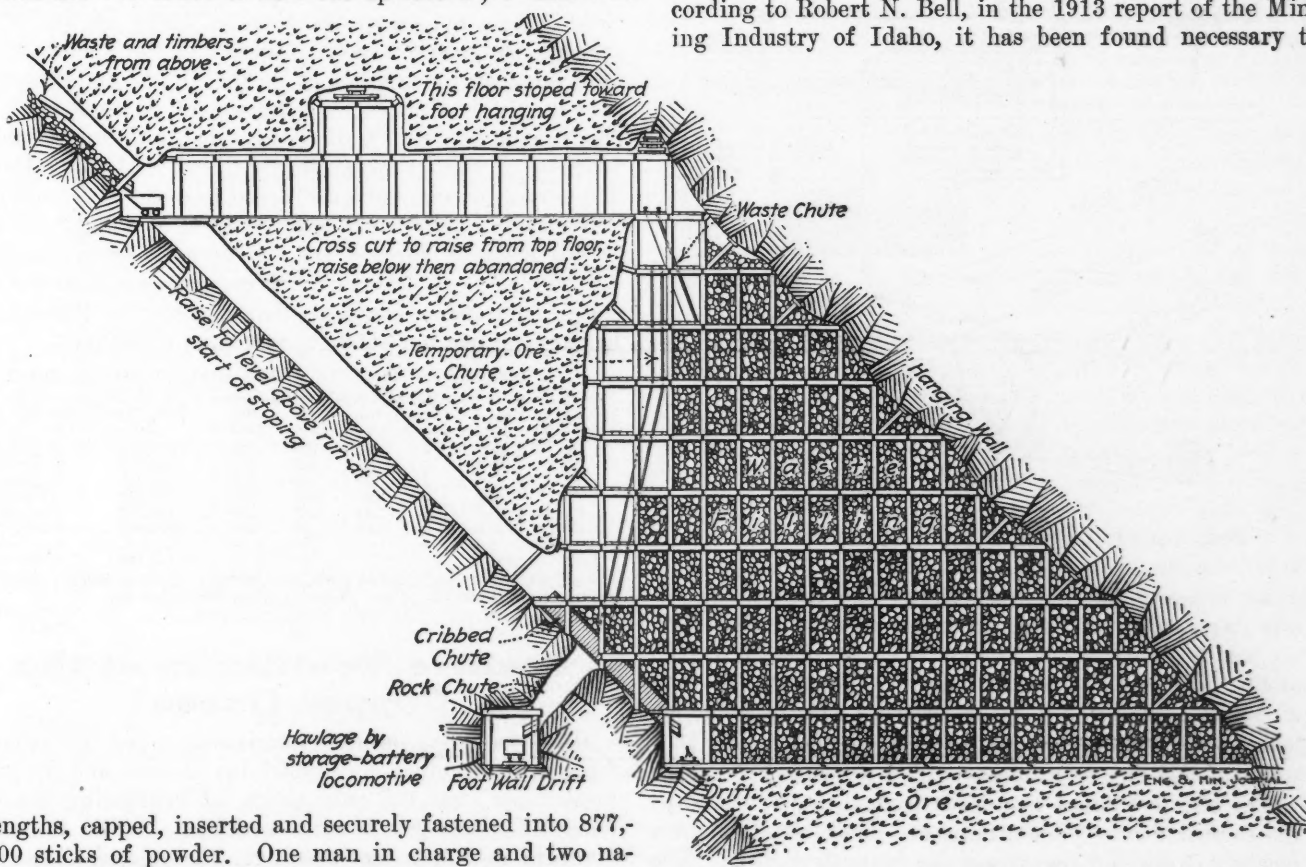
Each primer consists of a 4-in. stick  $1\frac{1}{4}$  in. in diameter of 70% nitroglycerin powder, into which is inserted the end of a fuse on which is crimped a 6X cap and securely tied to the stick of powder. In the course of one year there are 875 miles of fuse cut up into 2-, 6- and 9-ft.

We hung 34 ft. of 6-in. pipe in the shaft from a point one set below the station and blanked the lower end except for a 1-in. drain with a gate valve. Within 4 in. of the end of some 2-in. pipe, we drilled several  $\frac{3}{4}$ -in. holes, and just above this tapped in a  $\frac{1}{4}$ -in. nipple with an ell on each end. In the outside nipple we screwed a  $\frac{1}{4}$ -in. pipe. The  $\frac{1}{4}$ -in. and the 2-in. pipes bound together, we lowered into the 6-in. pipe. The  $\frac{1}{4}$ -in. was connected to the compressed-air line, compressor pressure being 100 lb.; the 2-in. pipe was connected to an old 2-in. air line, which led to the winze. At about 100 ft. in we put in a tee on the 2-in. line and a valve to relieve the air pockets. The flow of water was directed into the 6-in. pipe. With the air-inlet valve open about one-sixth of a turn, the water kept about 14 in. below the top of the 6-in. pipe, except when the miners turned on the air to blow smoke from the shaft bottom.



### Vertical-Face Stopping

In mining the Bunker Hill & Sullivan orebodies, according to Robert N. Bell, in the 1913 report of the Mining Industry of Idaho, it has been found necessary to



lengths, capped, inserted and securely fastened into 877,000 sticks of powder. One man in charge and two natives can keep all the mines supplied with primers.



### Six-Inch Pipe for Air-Lift Sump

By M. J. McGILL\*

While sinking at the Silver King Consolidated, we were troubled by a small flow of water, about 15 gal. per min., from the 1100-ft. station and about one set below. Instead of installing a pump, I decided to rig an air lift. The water had to be pumped to a winze about 1800 ft. in from the shaft, the winze collar being about 20.5 ft. above the station level.

\*Shop foreman, U. S. Smelting Co., Midvale, Utah.

SECTION OF A STOPE SHOWING MEANS OF COMMUNICATION, TIMBERING AND FILLING

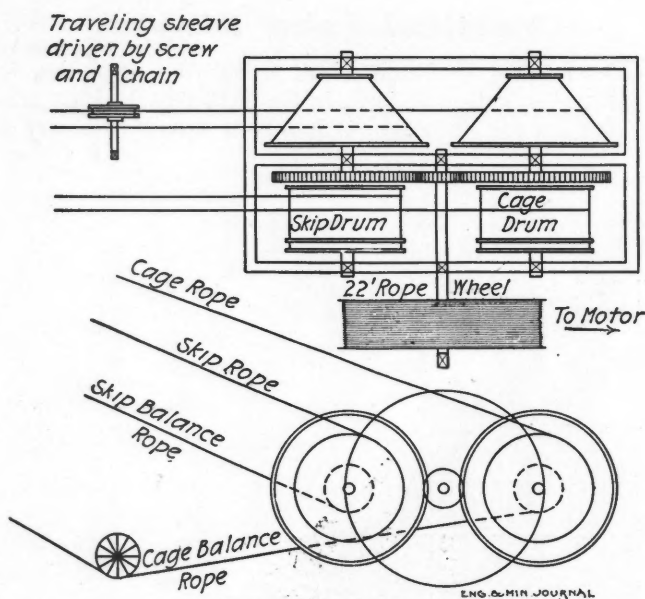
maintain a nearly vertical stoping face, working from hanging to foot, instead of carrying the usual horizontal step-down stopes.

By this method the weight of the more or less shattered mass of ore is carried on the foot wall, while the square sets and waste filling afford a more direct brace to the heavy hanging. The accompanying cross-section of one of the stopes excellently illustrates the method employed in extracting the ore and handling the timber and filling material.

## Counterbalance and Rope Drive for Electric Hoist

When the Penn Iron Mining Co. installed electric power at its mines, the first hoist built especially for motor drive was that at the Brier Hill shaft (*Bull. A. I. M. E.*, February, 1914).

The arrangement of this hoist is shown in the illustration. It consists of two cylindrical hoisting drums set tandem, and two conical drums for the counterweights. One hoisting drum is used for the cage and one for the skip; they are 12 ft. in diameter with 5-ft. 9-in. face, built of steel plate, set in tandem and on the shaft of each is a cast-iron conical drum with a small diameter of 4 ft. 6 in. and a large diameter of 17 ft. Each cylindrical drum, with its conical drum, is keyed to the shaft and is driven by clutching to a spur gear which is driven by a pinion, the gear ratio being 3.13 to 1. The pinion



ARRANGEMENT OF BRIER HILL BALANCE DRUMS

is set between the two drum shafts and carries a 21-ft. 6-in. rope wheel on the other end of its shaft. This pulley has 24 grooves for 1 1/4-in. rope, the pulley on the motor shaft being 48 in. in diameter. The motor is rated at 450 hp., makes 300 r.p.m., handles a 12,000-lb. skip load over a maximum length of travel of 989 ft., at a speed of 600 ft. per minute.

The counterbalance rope leads from the smaller end of the conical drum. The strains are much less than in a hoisting drum and the drums can be made lighter. The sides of the cone are straight, which is not theoretically correct, but the difference in counterbalancing effect at different points in the shaft can usually be kept within 200 pounds.

A perfect counterbalancing of the skip dead load is not possible. The empty skip must be capable of descending the shaft by its own weight and of raising the counterbalance, while requiring little application of the brakes; the necessary excess weight is about 800 lb. For a 2000-ft. shaft, where the ore load weighs 12,000 lb., the skip 7400 lb., the rope 4900 lb., neglecting the friction losses, the loss without counterbalancing would be about 50.6%; by counterbalancing to 800 lb., the loss is only 6.6%.

The design of the conical drums is such that the total travel of the counterweight is less than that of the shaft conveyance and it never comes to the surface, thus freezing of the counterweight to its guides in severe winter weather is avoided.

In operation, the motor and transmission mechanism are brought up to speed before the hoisting drum is clutched in. The design is based on the requirement that the stored energy be sufficient to accelerate the load without reducing the speed below the slip speed of the motor. This method of reducing speed requires no resistance, as does the Ilgner system. The flywheel effect is not intended to permit hoisting when power is shut off. Hoisting is intermittent and the motor is not constant running, but is started on receiving the hoisting signal; about 20 sec. is required to get up to speed. Under such conditions, the saving over the Ilgner system in not having to spin the flywheel between trips, is considerable. There is also an appreciable saving in the mechanical control with brake and clutch, over the Ilgner control, by the omission of the direct-current generator and motor. The loss in the mechanical appliances for braking and clutching do not equal the rheostat losses of the other system. No power can be returned to the system from lowering men or supplies as in the Ilgner or Anaconda compressed-air systems, but the weight of material lowered is only 5% to 6% of that hoisted, and only a small fraction of this is saved in the other systems. About 250 tons is lowered per week, a distance of 750 ft. and the power thus wasted costs only \$0.47 to generate.

The hoist in three years and seven months handled 500,000 tons of ore and still uses the original set of clutch frictions. It appears that it consumes 2.256 kw.-hr. to hoist one ton 1500 ft., and costs 0.764 cent.

RESULTS OF TEST ON BRIER HILL ELECTRIC HOIST

Date Nov., 1911	Kw.- Hr.	No. of Tons Hoisted from—				Live Ton- Ft.	Kw.-Hr. per Live Ton-Ft.
		5th Level	6th Level	8th Level	9th Level		
6	503	6	24	195	228	371,424	0.001515
7	578	3	33	183	249	384,579	0.001505
8	558	3	30	180	240	372,480	0.001497
9	597	9	36	168	270	396,162	0.001507
10	615	6	30	183	279	410,853	0.001496
11	287	0	12	75	141	190,671	0.001510
Total	3198					2,126,169	0.001504

From 5th level to dump, 480 ft.; 6th level, 592 ft.; 8th level, 780 ft.; 9th level, 887 ft. Load, 12,000 lb. of ore. Hoisting speed, 600 ft. per min.

## Positive Ventilation at the Copper Queen\*

Until recently, natural ventilation, aided by exhaust from drill machines; by small 5-hp. blowers and by compressed air, was the only means of ventilating the extensive Copper Queen mine workings. While the temperature in stopes was not high, the relative humidity in most places exceeded 90%, which made the air most oppressive. A mechanical ventilation system was completed in the Gardner during August, 1913. The results thus far attained in improved working conditions and increasing the efficiency of the men have justified the installation of similar systems in the Lowell and Sacramento divisions. The system in the Gardner involves two Sirocco blowers, situated near the 900 station, which deliver a total of 70,000 cu.ft. of air per min. This entire volume of air is so coursed as to ventilate the workings from the 1000 to the 600 levels, whence it exhausts through the Calumet & Arizona shafts.

\*From A. I. M. E. "Bulletin," August, 1914.



# Details of Milling and Smelting

## Relation of Speed to Efficiency in a Trommel

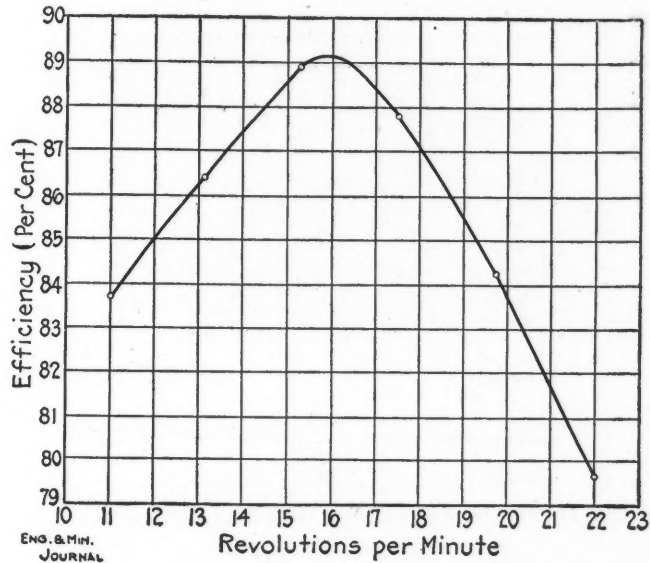
By H. A. ROESLER\*

The efficiency of screening has an appreciable effect upon the efficiency of coarse concentration, because, with poor screening the quantity of material which goes to the recrushing rolls is increased, thus producing more slime.

A series of tests was made to determine the relation of speed to efficiency of screening on the trommel described.

### DESCRIPTION OF TROMMEL USED FOR TEST

Diameter	36 in.
Length	12 ft.
Slope	1 1/4 in. per ft.
Perforations	1/2 in. round holes punched on lines intersecting at 60°.
Percentage of opening	40.3%
Rate of feed	22 to 24 tons per hour.
Speed	11 to 22 r.p.m.



RELATION OF TROMMEL EFFICIENCY AND SPEED

Samples of the feed and oversize were taken at ten-minute intervals for two hours with each speed, and cut down to 25 lb. by the method of discarding alternate shovelfuls. These samples were sized over a hand screen having 1/2-in. round holes. The results are shown in the accompanying table and curve.

Speed, r.p.m.	22.0	19.8	17.6	15.4	13.2	11.0
Size of drive pulley	10 in.	9 in.	8 in.	7 in.	6 in.	5 in.
<b>OVERSIZE</b>						
Per cent. on 1/2 in.	64.3	67.8	74.5	75.3	73.4	66.9
Per cent. through 1/2 in.	35.7	32.2	25.5	24.7	26.6	33.1
<b>FEED</b>						
Per cent. on 1/2 in.	26.9	25.1	26.2	25.3	27.4	24.9
Per cent. through 1/2 in.	73.1	74.9	73.8	74.7	72.6	75.1
Efficiency, per cent.	79.6	84.2	87.8	88.9	86.4	83.7

It is noteworthy that the best efficiency is obtained with a speed of 16 r.p.m. The variation in the percentage over

1/2 in. in the trommel feed probably has a small effect on the figures for efficiency, but this is not sufficient to affect the value of the results.

## Herreshoff Converting Patent

James B. Herreshoff, Jr., has secured a patent (U. S. Pat. 1,103,925) for:

(1) The improvement in the art of bessemerizing matte which consists in introducing siliceous material into a converter upon the molten charge therein, which material thus becomes heated but chemically remains unchanged, removing the charge from said material and utilizing said heated material as a fluxing medium for a subsequent charge of matte.

(2) The improvement in the art of bessemerizing copper matte which consists in introducing siliceous material into a converter upon the molten charge therein, in sufficient amount to form a fixed viscous mass upon said charge, removing the charge from the converter, while allowing said mass to remain therein, and introducing matte into the converter upon said mass.

(3) The improvement in the art of bessemerizing copper matte which consists in reacting upon matte in the converter with a slag composed essentially of copper silicate.

Mr. Herreshoff cites examples—presumably from the converter practice at the Laurel Hill works of the Nichols Copper Co.—in which he introduces the siliceous material into the converter upon the bath or charge therein at a time when it is inert, such as at the finish of the blow so as to utilize the heat of the bath while the copper is being poured. Sufficient siliceous material may be introduced to finish a charge instead of adding it in fractional amounts. The converter slag is skimmed before all iron sulphide is blown to oxide, so that this clean slag may be discarded. No slag is poured from white metal or copper. The viscous slag at the end of a blow is permitted to remain in the converter, and with additional siliceous material, is worked up into clean slag with the subsequent charges of matte. The copper-silicate slag from reverberatory refining furnaces is worked up in a similar manner. Mr. Herreshoff in his patent discusses the subjects of temperature, lining and slag composition, as follows:

"I have found that when I use a converter the lining of which abuts tightly against the inner walls of the metallic converter shell, the temperature of the lining does not rise excessively owing to the excellent path for the conductivity of heat to the shell and the transmission of heat therefrom to the atmosphere. If, on the other hand, the basic or neutral lining is made very thick, and especially if it is also insulated from the steel shell of the converter, the lining will attain the temperature of the charge; the lining must therefore be maintained at a yellow heat to insure a reasonably long life. I have also found that the temperature of the bath can be controlled by forcing varied quantities of steam under pressure, preferably superheated steam, with the air blast into the converter. The temperature can be also controlled by adding siliceous material which contains copper, such as reverberatory slag, to the matte because the reaction between the copper oxide of said material and the matte produces a lowering of the temperature.

\*Mill superintendent, Vinegar Hill Zinc Co., Platteville, Wis.

"I have found that it is advantageous to operate the converters at a temperature corresponding to a cream-white color. If operated at a lower temperature, which corresponds to that of the slag when it presents a yellow appearance, it would be difficult to keep the tuyeres free from accretions without resorting to excessive use of the tuyere rod, resulting in the rapid wearing away of the lining at the zone of the tuyeres and the increase of the blast pressure. If the bath is at a yellow heat, it may be quickly increased to a cream-white heat by the addition of carbonaceous matter, such as coal, preferably in an amount less than 1% of the weight of the charge. This obviously results in a saving of power and in increased life of the lining, especially at the zone of the tuyeres.

"I have found that the temperature of the converter will be higher when the slag is low in silica than when it is high in silica. If the lining is thick and insulated from the steel shell, the bath must be kept at a yellow heat. If now no other means than charging siliceous material into the converter is availed of for controlling the temperature, it will be found necessary to make a converter slag containing about 27% of silica. On the other hand, if the converter is lined with a thin lining of basic or neutral bricks of, for example, 6 to 12 in. in thickness, which are backed up tightly against the steel shell, the charge can be operated at a temperature higher than that of the lining, thus producing a slag low in silica and manifestly resulting in greater economies of operation. In this case the slag may contain 18% of silica or less, such a slag being greatly preferred over one containing 27% of silica because there is a smaller amount to handle and because it is more valuable as an iron flux for the blast furnace or reverberatory smelting furnace. Moreover, in order to bessemerize mattes higher than 60% in copper, the converter slag must not contain more than 20% of silica; otherwise the charge will be too cold to finish properly. It is ordinarily difficult to bessemerize such high-grade mattes which are poured into the converter at a low temperature, without the use of extraneous fuel. My process of preheating the siliceous material, as described above, is therefore of especial importance when high-grade mattes, low in fuel value, are being treated."

## Good Uses for Old Belting

BY L. D. ANDERSON\*

The "bone yard" or scrap heap of every mill usually includes a large amount of worn-out belting. This material can be used to good purpose in several ways.

It makes an excellent cover for wooden stair treads. These treads wear out fast when used constantly by men in hob-nailed shoes. Metal treads last longer, but soon become worn smooth, when they constitute an actual menace. But wooden treads with pieces of old belting nailed to them have their life prolonged to a surprising degree and at the same time afford a secure footing. Canvas belting is better than rubber, as it does not become slippery when wet.

Again, there are many places in wet concentrating mills where the laying of canvas belting on the floor would do much to prevent accidents. Wet slimy ma-

\*Superintendent, United States Smelting Co., Midvale, Utah.

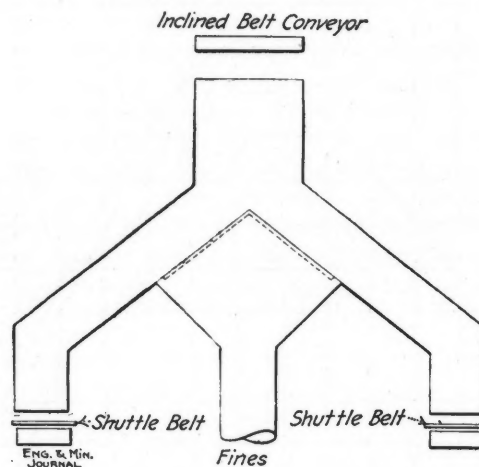
terial, despite the most careful work frequently slips over and runs on the floor. It is easy for a man in a hurry to slip up in a puddle of slime and perhaps fall into a moving machine. The rough surface of old canvas belt would do much to prevent this.

## Rock Breaking at the Dome Mill

The former gyratory-breaker plant at the Dome mill, South Porcupine, Ontario, has been removed and superseded by Blake-type breakers. The gyratory breakers are said to have given a good deal of trouble, particularly in wearing out of bearings.

The ore comes from underground on an incline, trains of cars being hauled up by cable. Hoisting is in balance. As the cars pass over the chute, they are dumped without stopping. The cars are of the side-discharge type. Two men dump every other car as it passes the chute, the others being dumped as they pass on the back-trip.

This chute leads directly into one 24x36-in. Farrell breaker. Passing through this machine, the ore is elevated



DISTRIBUTING SYSTEM FOR BYPASSING FINE

to a trommel with 2-in. holes. The undersize goes directly to the inclined conveyor belt leading into the mill bins. Oversize is passed through two 10x36-in. Farrell breakers, and thence to the belt conveyor. All material going to the mill bins is of a size to pass a 2-in. aperture.

Leading to the mill bins, the belt conveyor is the same as originally installed, except that it has been lengthened, the mill bins having been raised 6 ft. all around. This conveyor formerly dumped into a movable tripper, but this has been displaced, and it now dumps into a fixed chute, in which a 1/4-in. screen separates the fines, bypassing them directly to the tube mills, the oversize going through channels onto two shuttle belts, which distribute the ore in the battery bins.

**Roasting Lead Matte in a Single Operation** has been abandoned at most of the large silver-lead smelting works in this country. Now the matte is given a preliminary roast in mechanical furnaces of the McDougal type and is then sintered with suitable diluents on Dwight-Lloyd straight-line machines or in the Huntington-Heberlein pots. This gives a much improved product for the blast furnaces, increasing the tonnage and the length of the campaigns.

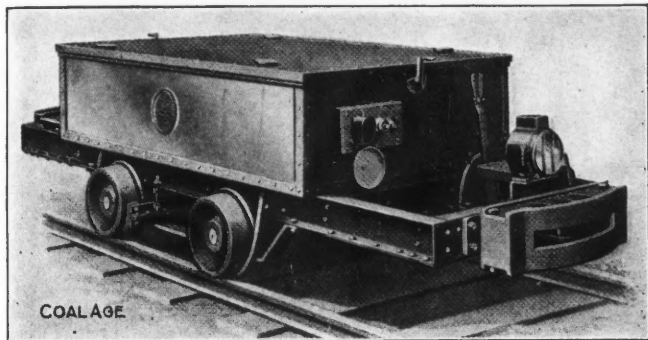


# Mining & Metallurgical Machinery

## A New Storage-Battery Locomotive

Although the storage-battery mining locomotive has been in use for some time, many people are unfamiliar with its characteristics and possibilities. One small machine of this type may readily be made to do the work for which several mules and as many drivers would ordinarily be required.

With the storage-battery type of mine tractor, rail bonds, third rails, trolley wires or other forms of current conductors along the track or of which the track forms a part are obviously unnecessary. At night the machine is merely run to a place where connection with a current supply from outside the mine may be secured. Proper connections with the source of energy are here made and



GATHERING LOCOMOTIVE OF STORAGE-BATTERY TYPE

the machine allowed to charge over night. By morning the battery has become fully charged and is capable of delivering the maximum current required by the motor throughout the entire day.

The Atlas Car & Manufacturing Co., of Cleveland, Ohio, has recently placed upon the market a new line of storage-battery locomotives. These combine the simplicity and reliability of the automobile motor with the durability and ruggedness of the armor plate, trolley type of mine tractor so well and favorably known throughout the country.

These locomotives are built in sizes varying from 2 to 5 tons. Standard track gages range from 36 in. to 48 in., but may be varied to suit conditions. All of the machines are low, the maximum height above the rail being 3 ft. 6 in.

## G-O Riffles

A Monel metal riffle for concentrating tables is being placed on the market by the General Ore Concentrating Co., Inc., of 40 Cedar St., New York. The G-O riffles are die-drawn to the thousandths of an inch; after drawing, the Monel metal strips are punched and broached in automatic presses, producing nail holes that are tapered throughout the entire thickness of the riffle; the attaching nails or rivets are then upset to produce a flush sur-

face. The rivet heads will wear smooth and as long as the riffle itself, and thus have a great advantage over the ordinary riffle with projecting nail heads that serve to produce eddies in the concentrating medium. The G-O riffle is furnished in thicknesses as fine as 0.008 in., and increases in thickness by 0.005 in. up to 0.048 in., so that the metallurgist is able to secure close riffling when desired for minerals having nearly the same specific gravity. The most usual width is  $\frac{3}{8}$  in., but the company also supplies normally a  $\frac{1}{2}$ -in. riffle having a thickness of 0.048 in., and other sizes may be secured on special order. The price for the standard sizes is 5c. per lin.ft., f.o.b. New York. Supplying the riffles with the nails already inserted greatly facilitates application, and as the riffles are made of Monel metal, they have practically the qualities of steel, besides being noncorrosive.

## Rotary Vacuum Pump for Filtration

BY D. W. MINIER\*

The adoption in cyanide mills, of the practice of reducing all the ore to slime for treatment was made possible by the development of suitable filters for the separation of the metal-bearing solution from the treated pulp by vacuum operating through a filtering medium. The efficiency of such filtration depends upon many factors, not the least of which is securing a constant and uniform vacuum.

The machines used to produce vacuum are usually of the reciprocating type, the choice being confined principally to the matter of valves. There is, however, another type, long used in paper making and other industries, that has not received from metallurgists the attention it deserves. The rotary vacuum pump is worth consideration in view of its possible use in metallurgical filtration. The line of motion being rotary, instead of reciprocating, permits using shorter drives and lighter belting, or still better, a direct-connected motor drive; the lesser vibration permits using lighter foundations. The vacuum is constant and is not dependent on the adjustment or condition of valves or packing glands there being but two of the latter sealing the housing, both of which have far greater life than those in reciprocating machines.

The reciprocating machine with its ground cylinder and piston head is, of course, positive in action which cannot be said of the rotary machine with housing and impeller, yet the reciprocating machine must come to rest and reverse twice in a full cycle of operation, while the movement of the rotary is continuous. This offsets the claimed advantage of positive action. On actual test in operating a battery of filters, a reciprocating-type vacuum pump gave 23 in. vacuum, when the valves and machine were in perfect shape, but it required a portion

\*Mining engineer, 330 Central Bldg., Los Angeles, Calif.

of the time of a first-class machinist to keep it in this condition. A slight neglect of adjustment caused a drop in the vacuum. Oil feeders must be kept in good condition to insure good work, and lack of attention for some hours may be disastrous. A rotary vacuum pump on the same battery of filters gave but 20 in. vacuum, but it held that reading. The only attention required was the filling of the lubricating-oil reservoirs. It may be that better than 20 in. vacuum could be obtained by a change of speed or adjustment of the pump itself, although frankly there seems nothing about the machine that needs adjusting.

The condition of machines in a mill is at the mercy of the millman and the millman is best intrusted with a machine that requires little attention. If the metallurgical ideal in milling is uniformity of operation in each step of the process, the mechanical ideal is a constantly operating machine that needs little attention and is "fool-proof."

One of the proofs of a good machine is to be able to forget its existence and consider only its work. The points of advantage to be considered in the use of the rotary-type machine for metallurgical filtration are: Constant uniform service with minimum attention; absence of valves to adjust or replace; simplicity of adjustment, there being only that of replacing the housing packing-glands at long intervals; a lubricating system needing attention only at long intervals; lack of vibration and consequent lighter foundations; small floor space required, a rotary requires 109x44 in., while a reciprocating requires 111x96 in.; machine direct-connected with motor; shorter drive and lighter belt, rotary 14-ft. drive, reciprocating 22½-ft. drive, former belt half the weight of latter; a "fool-proof" machine, impossible to abuse and running long intervals without attention.

### Mold Platform for Tilting Furnace

In the JOURNAL of May 16, 1914, p. 1005, is a description of a mold platform which keeps the mold constantly in place before the lip of a tilting furnace. The illustration

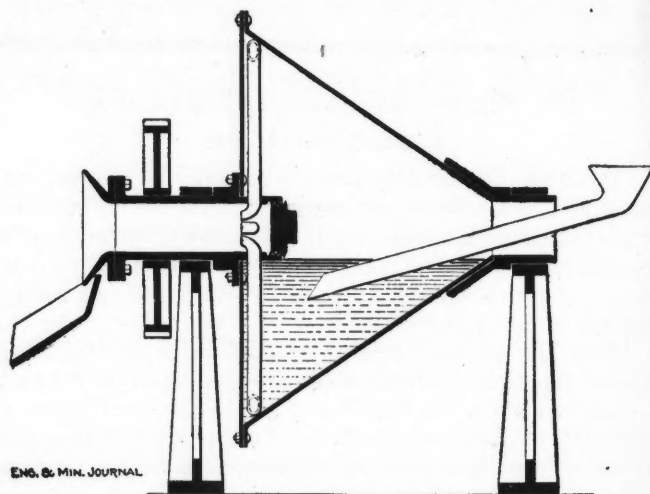


MONARCH POURING DEVICE

tion shows a platform built by the Monarch Engineering & Manufacturing Co., and installed at the Tom Reed mines in Arizona. As can be seen, this device keeps the mold immediately below the crucible lip.

### The Hardinge Classifier

To provide a new classifying machine for handling wet pulps, H. W. Hardinge, of New York, has invented a device, U. S. pat. No. 1,098,497, which in external ap-



THE HARDINGE CLASSIFIER

pearance is essentially like his conical grinding mills. It consists of a cone-shaped barrel, although construction is not limited to the identical specifications, at the vertex of which is an entrance chute passing through an overflow exit. The unclassified pulp enters through this chute, the light slimes overflowing through the trunnion opening, while the sands settle in the angle between the cone sides and the head. There they are elevated by pipes and discharged into the other trunnion, the pipes acting like the spiral in a Frenier pump. The illustration accompanying shows the arrangement of the machine.

### Metallic Tape Threader

The Lufkin Rule Co. has put out a measuring-tape attachment known as a "threader," to be furnished with their metallic woven tapes without extra charge.

The threader is a loop and stud arrangement, by means of which the tape, though securely fastened to the winding drum of the case when in use, can yet be readily detached from it and a new tape as readily attached, without manipulation of the case, case screw or drum.

Woven tapes are sometimes torn by accident or through long use often become soiled and worn in such a way that they must be replaced while the case is yet in fair condition. The case not receiving the same hard use as the tape line usually outwears it, and representing approximately half the value of the outfit it is of considerable importance that it be a simple matter for anyone to insert a new tape in the old case as often as necessary and thus get the fullest measure of use out of the case as well as the tape. Metallic tapes without cases are quite generally stocked by hardware houses, etc., and can always be easily obtained. The attaching is perfectly and easily accomplished by means of the threader.

A New White Metal, containing a large amount of iron, and perhaps therefore unique, is noted by "Metaux et Alliages" as the invention of J. F. Duke, of Manchester. It consists of Fe, 50.3%; Ni, 19.16%; Cu, 29.14%; Al, 1.40%. One to 2% tin decreases its hardness. It is said to resist corrosion by acids and the atmosphere.



# The Chiksan Mines, Chosen--III

BY CLARENCE L. LARSON\*

*SYNOPSIS*—Milling consists of crushing in breakers and stamps, amalgamating both inside and on apron plates. The pulp is then separated and the sand is cyanided by leaching. Concentration is also followed. Total combined extraction is about 96%. Costs in detail are given.

Hand tramping is used entirely, iron cars made at the mine of 1 ton capacity, being used on 12-lb. rails set to an 18-in. gage and on a grade of 10 in. per 100 ft. Where trams are especially long, several cars are run together, one man to each car. Loaded cars are dumped directly over the rail grizzlies covering the station pockets. Thus the breaking up of boulders larger than 8 in. in diameter is enforced. Ordinary wooden slide-board

A 1-ton skip is used for hoisting in Sajunkohl, and a 3/4-ton skip in Tonkohl. Twenty-five-pound rails are used on the footwall for track. Tonkohl shaft being quite steep, about 82°, uses guides of roughly hewn 4x4-in. native timber. But one skiptender is necessary on each of the day and night shifts in each shaft, as he moves from level to level. Rack-and-pinion gates, lifted by hand wheels, are used on all skip pockets. Signaling to the engine room is accomplished by the use of a 3/8-in. wire cable extending up the shaft, which is attached to a triangle gong in the engine room.

### ORE HANDLING AND TRANSPORTATION

Sajunkohl ore is hand trammed from the surface-hoisting bin about 200 ft. to an ore-sorting slide, from which



YANGDEI MINING CAMP

chutes are employed. A bill of material and of labor costs for a 1-ton iron car, manufactured at the mine is shown in the table.

#### COST OF A 1-TON MINE CAR

Carpenter, 4 shifts @.....	\$0.80	\$3.20
Blacksmith, 6 shifts @.....	0.90	5.40
Blacksmith helper, 6 shifts @.....	0.30	1.80
2 pieces 8x8-in., 6 ft.....	0.55	1.10
26 nuts @.....	0.015	0.39
206 lb. 1x2-in. strap iron @.....	0.031	6.69
36 lb. 1x3 1/2-in. strap iron @.....	0.031	1.17
8 lb. 1x1 1/2-in. strap iron @.....	0.031	0.26
26 lb. 1-in. round iron @.....	0.031	0.84
5 lb. 1-in. round iron @.....	0.031	0.17
5 lb. 1-in. round iron @.....	0.031	0.17
18 lb. 1-in. round iron.....	0.031	0.59
8 ft. 1-in. angle iron @.....	0.061	0.50
1 lb. 1x1 1/2-in. rivets @.....	0.071	0.53
770 lb. 1-in. sheet iron @.....	0.031	4.16
128 lb. 3-16-in. sheet iron @.....	0.15	4.16
1 piece 1x8-in. 10 ft. @.....	0.15	12.75
1 set of car wheels.....		12.75
<b>Total cost of car.....</b>		<b>\$45.40</b>

\*Box 24, Moscow, Idaho.

the sorted ore is dropped into the shipping-ore bins below. These shipping bins have a capacity of about 250 tons.

Tonkohl ore is hand trammed from the headframe bin in 1 1/3-ton cars a distance of 300 ft. to the foot of a 750-ft. single-track incline running up at about 24°. The cars are hoisted singly, and trammed to the Sajunkohl shipping bins, down a distance of 1500 ft. on an 8% grade. The cars are dumped on rail grizzlies just over the shipping bins, thus enabling sorting. The track on the incline is of 25-lb. rail, while all the other track is of 12-lb. rail. The cost of hoisting up the incline and tramping to the shipping bins averages 11 1/2c. per ton.

From the shipping bins, the ore is drawn into 1 1/4-ton cars and in them trammed by hand, in trains of 8 to 12 cars, one man per car, a distance of about one mile, down an 8% grade, to the Yangdei mill. Here it is dumped

on triples into two mill-holes through which the ore descends about 160 ft. to a tunnel below, out of which the ore is hand trammed to the mill bins, a distance of about 200 ft. The cost of tramping from the Sajunkohl bins to the tipple, labor, maintenance and repairs, is 7c. per ton (distance, about one mile).

#### POWER PLANTS

Sajunkohl and Tonkohl mines are each equipped with two 75-hp. boilers. Tonkohl, with low-pumping and hoisting duties, requires but one boiler to be fired; when hoisting ore and shipping to Saojunkohl, both boilers are required. Sajunkohl with heavy pumping and hoisting duties requires both boilers all of the time. Mine water is used for steaming.

The smaller mines have an assortment of boilers, some vertical, and others small locomotive boilers purchased from a railway construction contractor. The wide scattering of shafts is a serious handicap to prospecting, as water is always encountered and pumps soon become necessary; electric power is not available and separate steam plants are required for each shaft.

Sajunkohl and Tonkohl mines were recently equipped with compressed-air systems, both alike. The compressors are 12x12x14 in., simple steam, single-stage machines, each providing air about sufficient to operate two Waugh drills and two 2½-in. Siskol piston machines. Receivers, 3-ft. diameter and 8 ft. high, are provided, with two water traps to each installation, these being 2 ft. diameter by 6 ft. long. The total cost of the two compressors, receivers and traps, spare parts for the compressors, and freight through to the mine, was \$3094. A total piping length of 5740 ft. was provided, sizes from 1 to 3 in. The total cost of pipe, fittings and valves, and freight, was \$1726.

Eight Siskol 2½-in. piston drills, together with accessories and a complete list of spares, cost complete with freight \$1915. Six No. 12-A Waugh stopers, with a supply of spares, and two tons of Crescent steel, together with freight, amounted to \$1288. Thus the total cost was \$4011 per installation.

#### VENTILATION AND PUMPING

The various mine headings are driven to connect with each other in such a way as to provide natural ventilation. Topography is favorable and raises to surface provide over 100 ft. of elevation above shaft collars, making good circulation below.

In a few extreme cases, such as the sinking of long winzes, it has been necessary to use hand bellows at times. The recent installation of compressed air now allows its use in the cases mentioned above, and also allows driving blind headings greater distances to connections. Air is now also used to expel dynamite smoke after blasting.

The quantity of mine water, though not excessive, increases considerably with the depth of workings. Standard sinking pumps, of the Cameron type, are used in shaft sinking. Station pumps are installed at alternate levels, thus pumping in stages from sinker to first station installation above, and then in 200-ft. lifts to the surface. In Sajunkohl to No. 1 level only, which is a drainage tunnel.

Levels are graded 8 to 10 in. per 100 ft. away from the shaft stations and drain ditches cut on one side only.

Station pumps are duplex, 10x6x8 in. Winze pumps are 5¼x3½x5 in. and 6x4x6 in.

#### TOTAL MINE-OPERATING COSTS

Six Months Ending June 30th, 1913

	Stoping	Sajunkohl	Tonkohl
Breaking.....	\$0.611	\$0.689	
Mucking and tramping.....	0.097	0.152	
Timbering.....	0.127	0.111	
Hoisting.....	0.128	0.141	
Sorting.....	0.016	0.014	
Development to stoping.....	0.102	0.024	
<b>Total stoping cost per ton.....</b>	<b>\$1.081</b>	<b>\$1.131</b>	
Development			
Shaft.....	\$0.155	\$0.063	
Tunnel drifts.....	0.317	0.349	
Raises.....	0.108	0.079	
Winzes.....	0.219	0.101	
Crosscuts.....	0.038	0.038	
Sub-drifts.....	0.014	0.000	
Stations.....	0.028	0.058	
Gross development, per ton.....	\$0.879	\$0.688	
To stoping.....	0.102	0.024	
<b>Net development cost per ton.....</b>	<b>\$0.777</b>	<b>\$0.664</b>	
Plant and Maintenance			
Buildings.....	\$0.004	\$0.001	
Headworks.....	0.002	0.007	
Rolling stock, track.....	0.024	0.043	
Pipe lines.....	0.013	0.014	
<b>Total plant and maintenance.....</b>	<b>\$0.043</b>	<b>\$0.065</b>	
General			
Pumping.....	\$0.147	\$0.118	
Mine repairs.....	0.057	0.032	
Top tramping.....	0.011	0.015	
Surface expenses.....	0.013	0.008	
Office and general.....	0.037	0.017	
Assaying and surveying.....	0.037	0.024	
Native supervision.....	0.011	0.024	
Foreign supervision.....	0.164	0.126	
<b>Total general.....</b>	<b>\$0.477</b>	<b>\$0.364</b>	
<b>Total mine operation, per ton.....</b>	<b>\$2.378</b>	<b>\$2.224</b>	
<b>Tonnage.....</b>	<b>10,928</b>	<b>6,282</b>	

#### YANGDEI MILL

During the year ended June 30, 1913, 33,827 tons of ore were milled, of an average value \$9.29 per ton. The 35 stamps added to the original battery of 4 Nissen stamps were started in November, 1912, and the full 39 operated to May 1, 1913, when due to catching up on the reserves, it became necessary to shut down 14 stamps. Twenty stamps were operated to August and increased to 25 in September and to 30 later in October. About 80% of the ore is produced by Sajunkohl and Tonkohl mines, and most of the balance from Chungtarrie.

The ore is first passed over grizzlies and the oversize from these crushed in two Blake machines. These run intermittently on day shift only. The ore then drops into the battery bins. Twelve hundred-pound stamps are used, crushing to 40 mesh usually, and their product passes over amalgamation plates. Inside plates are also used and produce a large percentage of the total amalgam, the percentage varying with the temperature of the water during the various seasons. The Pierce type of amalgamators is used, their product passing on to standard concentration tables. Middlings from the first tables are reconcentrated. Tailings are sent to the tailings pile where the drained-off water runs into the settling ponds for removing the slimes, and through a dewatering box, and then is pumped back to the two 12,000-gal. storage tanks above the mill.

#### TABLE OF MILL DATA

Stamp duty averages 4 tons per day  
 Average value of heads—\$9.29  
 Average value of tails—1.80  
 Average recovery, bullion and concentrates—80½%  
 Concentrates average from \$60 to \$200 per ton, and accumulate at an average rate of 22 tons per month.  
 Bullion fineness runs from 500 to 700, averaging about 575.



The mill power plant consists of three 150-hp. boilers. A 300-hp. Ideal compound corliss engine is used to operate the stamps and to drive a 75-kw. generator which furnishes power for motors at the concentrators, machine shop, blacksmith shop, cyanide plant, and assay office. Electric lighting is used throughout the mill, shops, cyanide plant, assay office, hospital, general offices and residences.

The total cost of milling for the year ended June 30, 1913, was \$0.85 per ton, over a gross tonnage of 33,327 tons. This would be on an average of 23 stamps constantly dropping.

CYANIDE PLANT

A standard leaching plant has been in successful operation since September, 1912. There are six leaching vats.



ENG. & MIN. JOURNAL



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NATIVE PLACER MINERS, AND THE YANGDEI REDUCTION PLANT

The mill foreign staff is limited to the superintendent, who remains on day shift, and the night foreman. A Korean is employed on day shift as assistant amalgamator and chief mill-man; he receives \$0.50 per day. A half-dozen other natives complete the staff, being employed about the crushers, batteries and concentrators. These boys receive from 20 to 30c. per day.

22 ft. in diameter and 5 ft. deep, which have a capacity of about 60 tons of dry tailings each. The monthly capacity of the plant is about 2000 tons. During the first six months of 1913, 11,765 tons were treated, having an

TOTAL MILL AND CYANIDE EXTRACTION

Mill extraction—80.5% of total feed value  
 Cyanide extraction—78.3% of mill-tailing assay value—or 15.27% of total feed value  
 Combined extraction—95.77%.

average value of \$2.29. A recovery of 78.3% was obtained, the tailings loss being 50c. per dry ton. The cost of treatment was \$0.464 per ton.

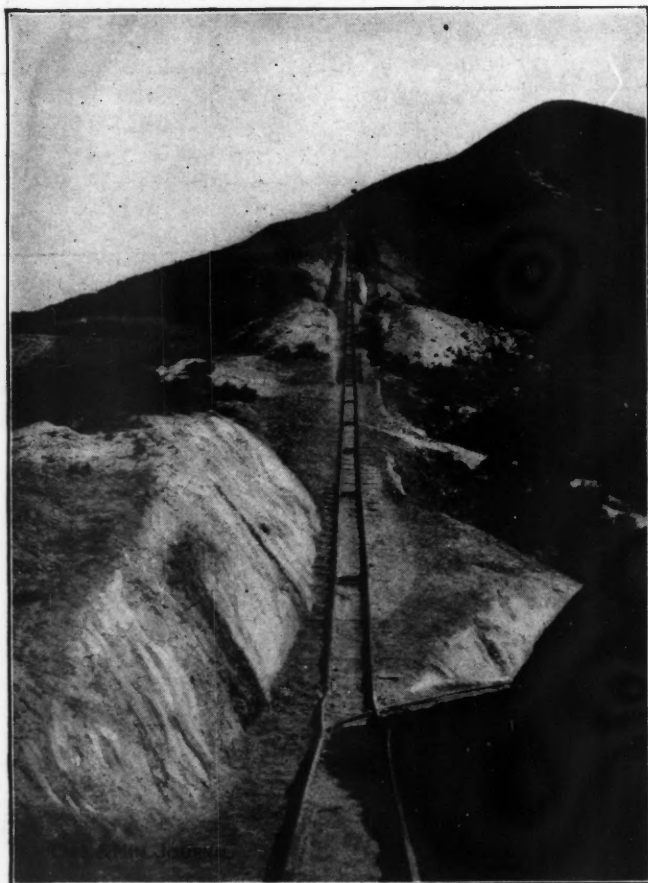
#### SUMMARY OF COSTS PER TON

Mining.....	\$2.30
Transportation.....	0.09
Milling.....	0.85
Cyanide.....	0.46
Superintendence-general.....	0.50 (Estimated, but known to be high)
Total.....	\$4.20

Some 600 acres of ground have been declared dredgeable after a second drilling with Empire drills. Various problems relative to land purchase, and the financing of a dredge installation are now under consideration.

#### ASSAYING AND SURVEYING

A foreign superintendent is provided for the assaying and surveying department. He does all the mine and all



INCLINE AT YANGDEI MINE

the important surface surveying. A graduate of a Chinese mining college, assisted by two Korean coolies, does all of the assaying work. This Chinese receives \$25 per month. During the past year about 11,000 assays were made at an average cost of 18c. Two more of the Chinese students attend to the office work and perform practically all the drafting. About \$400 is the average total monthly cost of the department.

A capable foreign medical officer is provided by the company, and a small but well equipped hospital is available. Service is free to all employees and their families. Outsiders are charged at the nominal rate of 10c. per case. The monthly cost of the department approximates \$250.

The foreign staff now existing consists of the following: the general manager, a superintendent, a foreman and an accountant at the two large mines; a superintendent for each of two prospecting districts, one of them including Chungtarrie mine; a mill superintendent and a night foreman; a superintendent of cyanide plant who also oversees the machine shop; a superintendent of the department of assaying and surveying; a superintendent of transportation, a general storekeeper; the medical officer and the auditor.

## Mining at El Recreo, Colombia

BY J. FRED. DIEROLF\*

The El Recreo gold mine is on the east slope of the central cordillera of Colombia, in the Department of Tolima, 20 miles southwest of the town of Ibagué. The ore is crushed in a wooden stamp mill of 15 stamps, an average of seven tons of hard, brittle quartz being crushed in 24 hrs. The stamps are in batteries of five, and the amalgamation plates for each battery consist of two plates of muntz metal near the battery, and two plates of silver-plated copper below. Each plate is 4x2½ ft., laid broadwise, so as to give 10 lin.ft. of plates below the battery. No inside amalgamation is practicable on account of the wooden mortar-boxes. The mill works 95% of full time, because all parts are of wood, so the worn parts can be made and kept on hand, and the stops to replace worn parts are therefore short. In 1913 the yield was 1531 oz. of gold, worth \$19.20 per oz. The sand, still containing visible gold, partly rusty and partly in the coarser quartz grains, besides all the sulphides, pyrites, some galena and blend, is run into a tailings pond for storage for further treatment later.

A lower adit, cutting the veins 150 ft. below the present working level, which is 130 ft. from the surface, was started in July, 1912, and was recently terminated. All the work was done by Colombian laborers using hand steel. The total length is 1253 ft., of which 800 ft. is through greenstone-schist, the next 100 ft. through green breccia, in which there is much green clay, and through which runs a streak of leached white, sugary quartz, averaging 2½ ft. thick and running with the adit, the whole distance of the breccia. This quartz shows colors in the pan, but not enough to be profitably treated in the wooden mill. The rock beyond the breccia is extremely hard and does not break well. Gelignite, 62%, was used. This rock is compact, dark bluish-green, and becomes schistlike 100 ft. from the veins, but while still of the same color, looks silky. Still nearer the veins this rock turns gray, and ultimately white, when quartz stringers, each a few inches wide, make their appearance. The hanging wall of the main vein is a much-pressed black schist, with well crystallized pyrites, carrying no free gold. The gouge is also black and shows colors in the pan. The quartz of this main vein is ribboned with more sulphides, bluish-black pyrites in stringers between the quartz ribbons, than higher up. The gold is visible, deep yellow in the white quartz and dull yellow in the dark sulphides.

The total cost of this bore, 6½x7 ft., was \$3.96 per lin.ft. Labor was paid at the rate of 70c. to \$1 per shift of eight hours, according to the skill of the workman.

\*Apartado 7, Ibagué, Colombia, S. A.



Dynamite costs \$30 per 50-lb. box; caps, \$1.50 per 100, and fuse, \$1.50 per 100 ft. The work was done without artificial ventilation, and the men did not complain, although the air was rather poor toward the end, but it did not affect their health. Illumination was by acetylene lamps, as tallow candles made locally would not burn well 600 ft. from the portal.

Most of the workmen are Indians from the highlands of the Departments of Cundinamarca and Boyaca, and only a few miners from the Department of Antioquia are employed to teach these Indians. The *antioqueños* are rather unruly, heavy drinkers, and therefore unreliable, but they are fairly good workmen. The Indians, born and bred at high altitudes, are better qualified to work in poor air, without impairment to their health, than Europeans or Americans; besides, they are obedient, reliable, steady, and will do almost any work if treated properly. They are as children.

The mine is situated in a healthful place in a beautiful valley, 6000 ft. above sea level. There are no mosquitos and fever is not prevalent. Each married workman is furnished free of charge with a small hut and a plot of ground where he can raise vegetables. This may account for their cheerfulness and good behavior.

All kinds of vegetables are raised at this mine from imported seeds, and some apple trees have been planted which are doing well. Orange trees are in abundance, planted by a former owner of the land, an Italian, and these provide sweet oranges the year 'round. The only drawback, and rather a serious one for a mine, is the absolute lack of roads. Only one narrow, dangerous mountain trail is available. I am convinced, however, that this will be remedied by the time my mine is ready for a modern plant, because Bogotá, the capital of Colombia, is bound to get in rapid connection with the Pacific Ocean at Buenaventura, sooner or later, as a result of the opening of the Panama Canal, and such a line of communication will pass our valley, because it is the lowest and most easily passed gap in the mountains.

## ❖

### The War and Business

We take the following rational forecast of the effect of the war upon business from the *Evening Post*, which is always intelligent in its commercial and financial views:

The reason why so little has yet been said or written regarding the longer effects of this European war on the economic situation, lies clearly in the extent to which the immediate financial and commercial phenomena absorbed all the thought of the business community. Confronted with the problem of emerging from a state of affairs where international finance and trade had pretty nearly stopped, the one consideration was to restore what could be restored of those relations, and to do it with a minimum of delay. In this, there has been encouraging progress.

The difficulties which last week seemed all but insurmountable are now in a way of being gradually overcome. The British Admiralty announces that the channels of neutral commerce, especially between here and Europe, are "fairly safe." Certain European governments, whose ports are protected by the English fleet, are assuming or guaranteeing insurance against capture, at least on cargoes consigned to such ports. Drawing of exchange, in payment for ocean cargoes, is a slower process; but the international bankers are working along the lines of "clearing" such foreign exchange bills, through offsetting drafts of New York on a given foreign market by bills drawn simultaneously by that market on New York. In general, the trade opinion seems to be that solution of the problem of exchange will proceed with reasonable rapidity as soon as ocean commerce is itself restored.

It is difficult to look very far into the economic future. Some general conclusions will be accepted without debate; among them, the inference that a war whose cost must draw much prodigious sums from private capital, which takes away millions of the most competent European workers from productive industry, and which diverts them to the destruction of property, for the repairing of which, when peace returns, another heavy drain on capital will be necessary, must exert a profound and long-continued influence for the worst on Europe's own prosperity.

The problem of the after-effects in neutral countries—notably the United States—is different. To an extent, we are necessarily involved in the financial derangement which has accompanied the outbreak of Europe's war; the forced suspension of Stock Exchange transactions in this country, the recourse to emergency banknote issues, and the blockade of foreign exchange, show that. We shall hardly be able to rely on European capital for our own affairs during some time to come; and for that reason it is most fortunate that we have for so many months been adjusting our plans to the absence of such capital. But these considerations leave the larger problem open, what the subsequent effect on our home activities is to be.

The central point of high importance in our remarkable situation is the international grain trade. European government themselves are showing how clearly they understand the paramount necessity of obtaining the two or three hundred million bushels of our exportable wheat surplus—the largest available supply in the history of our trade. There are other commodities, chiefly agricultural, of which the foreign need will presently be almost as urgent. Our manufacturers also have before them, in the steel and textile trades especially, the task of meeting requirements of neutral export markets, from which the German producer, lately most active in those fields, is now quite cut off; and the home manufacturer must also fill the void left in supplies for the home consumer by the very general stopping of merchandise imports from the Continent.

This, so far as it goes, is the reassuring side. It is impossible that our producers and merchants should not enjoy again that exceptional advantage which, in the infancy of American industry, they captured during the long Napoleonic wars. But it is not to be overlooked that there are troublesome considerations in the way of the smooth achievement of this task, and that a great deal of unsettlement and diversion of activities will be caused in our industrial affairs. The problem of the supply of shipping is not the least of these. Vessels flying the German flag have been carrying 12% of the tonnage annually entered and cleared at American ports; those vessels are at present quite eliminated. Furthermore, the very supposition of larger American exports to South America and the East puts an obstacle in the way of drawing ships from that service into the transatlantic trade.

The problem of foreign raw material, essential to some of our home manufactures, presents other difficulties; the embargo on ferromanganese for steel manufacture, on dyes for textiles, on crude rubber—and these are a few instances—is being felt already. It is to some extent, exaggerated, because the temporary stoppage of commerce with other neutral states (such as Brazil, with its rubber) is a different matter from the absolute embargo on products of Central Europe. Nevertheless, the problem is one which will greatly perplex our manufacturers, at a time when the call on them for export goods is likely vastly to increase.

In due course, trade will find the way to surmount such of these obstacles as are surmountable. Then we shall begin to measure, against the general derangement of finance and industry, the exceptional advantages which must accrue to a rich and highly productive state which is at peace with all the world while the other richest producers are fighting one another.

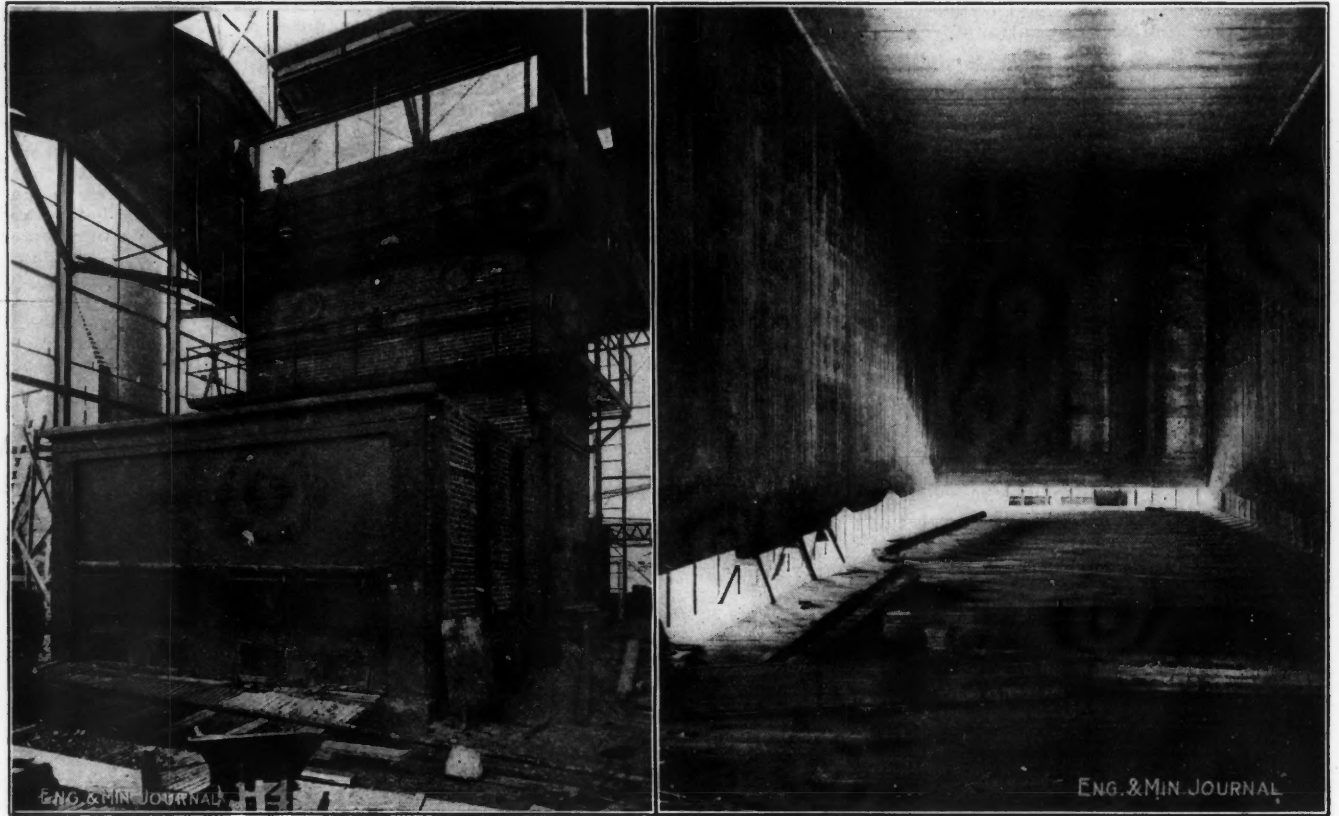
## ❖

### Shannon Copper Co.

The Shannon Copper Co. treated 56,085 tons of Shannon ore and 11,379 tons from company's outside properties during the three months ended June 30. The production was 3,118,156 lb. of copper, 420 oz. gold, and 20,702 oz. silver. The average cost of copper was 12.695c. per lb., and the average price received, 13.908c. per lb.

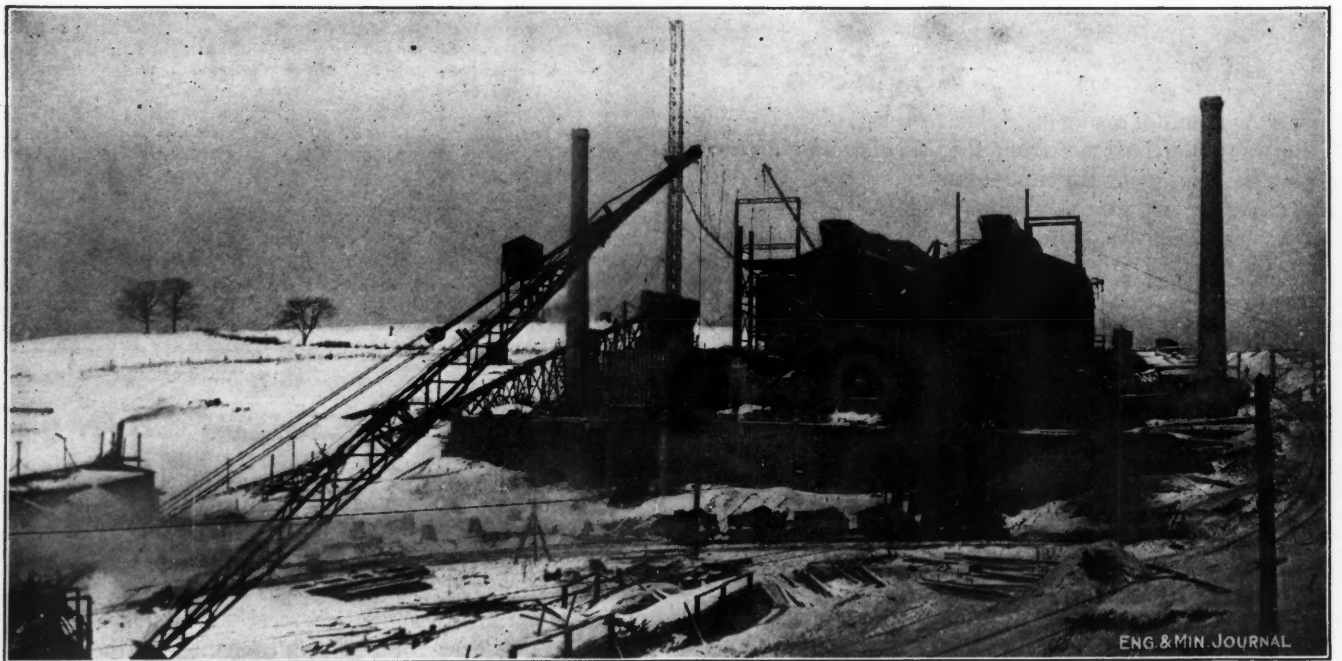
Net income, over interest requirements, of the Shannon-Arizona Ry. Co. was \$3187.77. Consolidated net profits for the quarter were \$40,952, the decrease from the previous quarter's profits being solely due to the lower price received for copper.

# American Zinc & Chemical Co.



## WASTE-HEAT BOILERS AND ACID CHAMBER

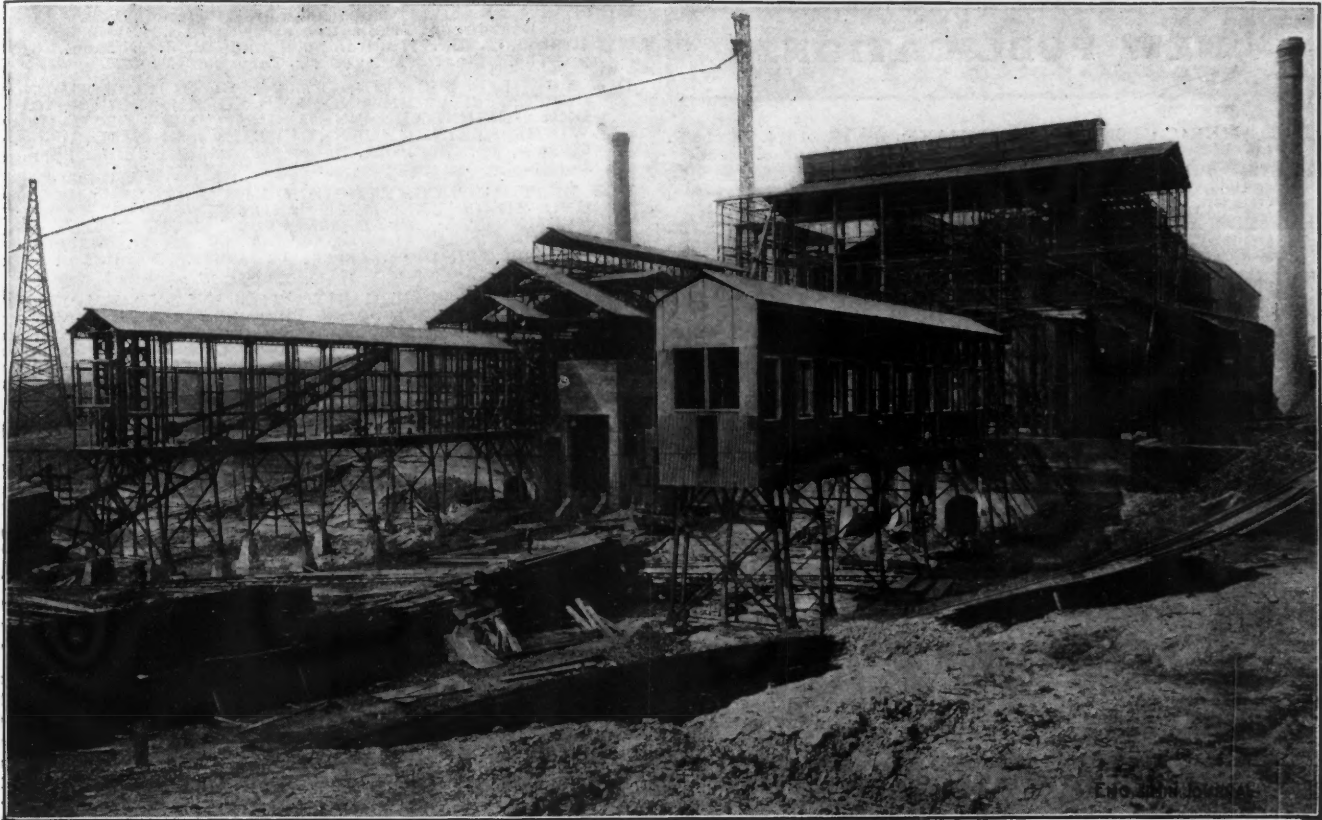
During construction work the boilers were equipped for burning coal, as shown in this view.



## FIRST UNIT OF ROASTER AND ACID INSTALLATION UNDER CONSTRUCTION

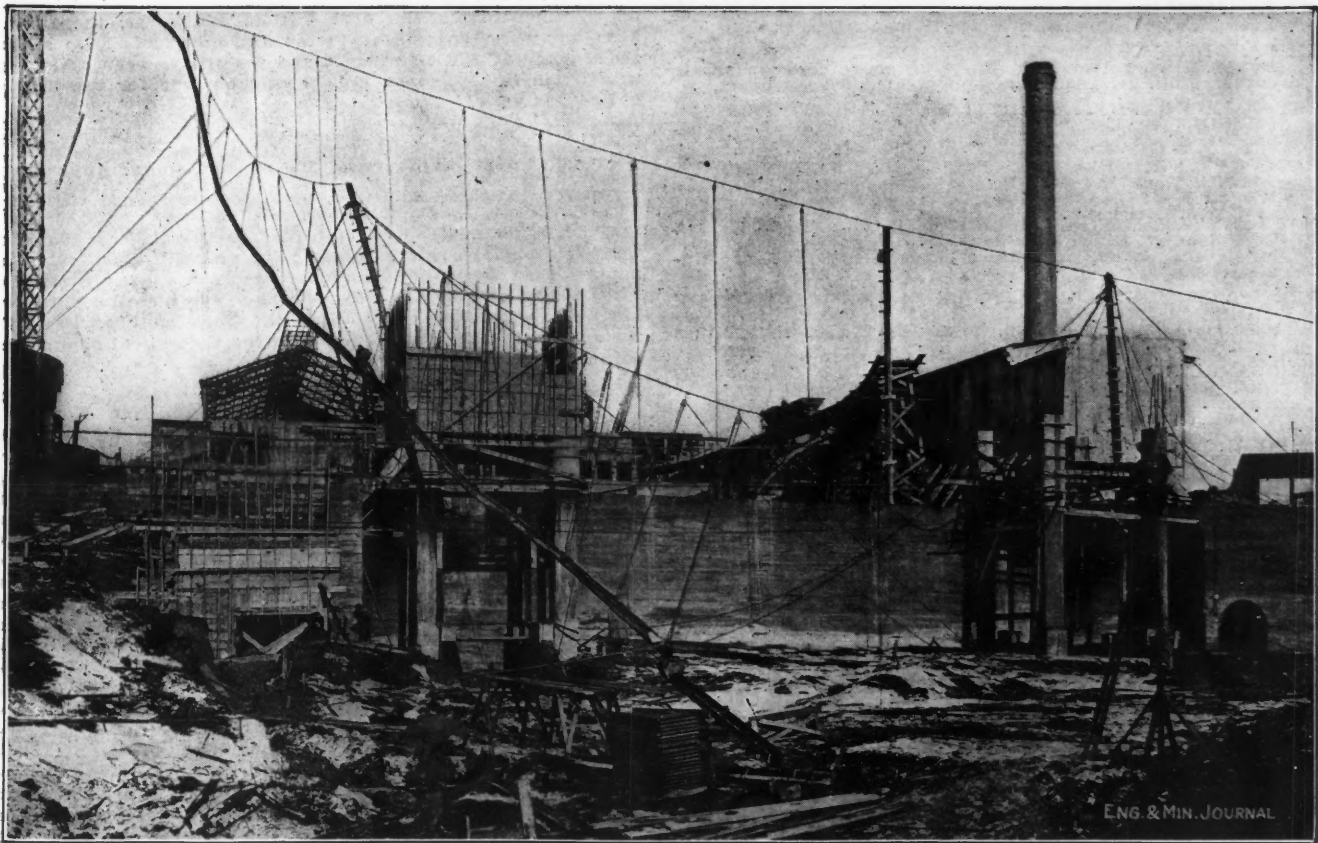
Manufacture of sulphuric acid was started in August at this plant nearing completion at Langeloth, Penn.; spelter production will begin this autumn.





ANOTHER VIEW OF THE ROASTER AND ACID PLANT

The two long, narrow sheds house the rake rods for the Hegeler blende-roasting furnaces.



CONCRETE-POURING EQUIPMENT AND STEEL ELEVATOR-TOWER

A hopper at the top of the tower discharged concrete into the wire-supported inclined trough that could be rigged to convey to considerable radius.

## NEW PUBLICATIONS

- THE AMERICAN FERTILIZER HAND BOOK, 1914.** 8x10 $\frac{1}{2}$ , pp. 122, illus.; \$1. Ware Bros. Co., Philadelphia, Penn.
- FOREST PROTECTION IN CANADA, 1912.** By Clyde Leavitt. 7x10 $\frac{1}{2}$ , pp. 174, illus. Commission of Conservation, Ottawa.
- ELEMENTARY PRINCIPLES OF SURVEYING.** By M. T. M. Ormsby. 4 $\frac{1}{2}$ x7 $\frac{1}{4}$ , pp. 230, illus.; \$1.50. Scott, Greenwood & Son, London.
- KURZER LEITFADEN DER BERGBAUKNUNDE.** By F. Heise and F. Herbst. 5x8 $\frac{1}{4}$ , pp. 247, illus.; 6 marks. Julius Springer, Berlin, Germany.
- REPORT OF THE NOVA SCOTIA DEPARTMENT OF MINES, 1913.** Pp. 235, illus. Commissioner Public Works and Mines, Halifax, Nova Scotia.
- BRASS-FURNACE PRACTICE IN THE UNITED STATES.** By H. W. Gillett. Pp. 298, illus. Bull. 73, U. S. Bureau of Mines, Washington, D. C.
- ESTADISTICA MINERA DEL PERU EN 1912.** By Carlos P. Jimenez. 7x9, pp. 125; paper. Bull. 80, Cuerpo de Ingenieros de Minas del Peru, Lima.
- THE MINING WORLD INDEX OF CURRENT LITERATURE, VOL. IV, 1913.** By George E. Sisley. 6x9 $\frac{1}{4}$ , pp. 190. Mining World Co., Chicago, Illinois.
- TRANSACTIONS OF THE AMERICAN INSTITUTE OF METALS, VOL. VII, 1913.** 6x9, pp. 381, illus. W. M. Corse, Secretary, Buffalo, New York.
- INDIAN GEOLOGICAL TERMINOLOGY.** By Thomas H. Holland and G. H. Tipper. Pp. 127. Vol. XLIII, Part 1, Memoirs, Geological Survey of India, Calcutta.
- VULCAN PROCESS INSTRUCTIONS ON OXYACETYLENE WELDING AND CUTTING.** 6 $\frac{1}{4}$ x8 $\frac{1}{2}$ , pp. 85, illus.; \$1. Vulcan Process Co., Minneapolis, Minnesota.
- ST. HILAIRE (BELOEIL) AND ROUGE MOUNTAINS, QUEBEC.** By J. J. O'Neill. Pp. 108. Memoir 43, Geological Survey, Canada Dept. of Mines, Ottawa.
- USEFUL MINERALS OF THE UNITED STATES.** Compiled by Samuel Sanford and Ralph W. Stone. Pp. 250. Bull. 585, U. S. Geological Survey, Washington, D. C.
- WHEATON DISTRICT, YUKON TERRITORY.** By D. D. Cairnes. Pp. 153, illus. Memoir 31, Geological Survey Branch, Canada Department of Mines, Ottawa.
- ELECTRIC FURNACES FOR MAKING IRON AND STEEL.** By Dorsey A. Lyon and Robert M. Keeney. Pp. 142, illus. Bull. 67, U. S. Bureau of Mines, Washington, D. C.
- SAFETY AND EFFICIENCY IN MINE TUNNELING.** By David W. Brunton and John A. Davis. Pp. 271, illus. Bull. 57, U. S. Bureau of Mines, Washington, D. C.
- THE MIDDLESEX AND MOUNT CLAUDE MINING FIELD.** By W. H. Twelvetrees. Pp. 129; maps under separate cover. Bull. 14, Tasmania Geological Survey, Hobart.
- CRYSTALLOGRAPHY: AN OUTLINE OF THE GEOMETRICAL PROPERTIES OF CRYSTALS.** By T. L. Walker. 6x9 $\frac{1}{2}$ , pp. 204, illus.; \$2. McGraw-Hill Book Co., New York.
- GEOLOGY AND MINERAL DEPOSITS OF THE TULAMEEN DISTRICT, B. C.** By Charles Camsell. Pp. 198, illus. Memoir No. 26, Canada Dept. of Mines, Ottawa, Canada.
- MAPS OF THE MINING DISTRICTS OF MINNESOTA, 1914.** Compiled by E. H. Comstock. 12x17 $\frac{1}{4}$ , 13 sheets; \$1. Minnesota School of Mines, Experiment Station, Minneapolis.
- REPORT ON MINING OPERATIONS IN THE PROVINCE OF QUEBEC DURING THE YEAR 1913.** Pp. 163, illus. Department of Colonization, Mines and Fisheries, Mines Branch, Quebec.
- THE SAMPLING AND EXAMINATION OF MINE GASES AND NATURAL GAS.** By George A. Burrell and Frank M. Seibert. Pp. 116, illus. Bull. 42, U. S. Bureau of Mines, Washington, D. C.
- REPORT ON THE BUILDING AND ORNAMENTAL STONES OF CANADA. Vol. II: Maritime Provinces.** By William A. Parks. Pp. 274, illus. Canada Dept. of Mines, Mines Branch, Ottawa.
- PORTIONS OF PORTLAND CANAL AND SKEENA MINING DIVISIONS, SKEENA DISTRICT, B. C.** By R. G. McConnell. Pp. 107, illus. Memoir 32, Canada Department of Mines, Ottawa.
- PRELIMINARY REPORT ON THE SERPENTINE AND ASSOCIATED ROCKS OF SOUTHERN QUEBEC.** By John A. Dresser. Pp. 105, illus. Memoir No. 22, Canada Department of Mines, Ottawa.
- SUMMARY REPORT OF THE CANADIAN GEOLOGICAL SURVEY, DEPARTMENT OF MINES FOR THE CALENDAR YEAR, 1912.** Pp. 544, illus. Canadian Department of Mines, Ottawa.
- LES POUDRES ET EXPLOSIFS ET LES MESURES DE SECURITE DANS LES MINES DE HOUILLE.** By L. Vennin and G. Chesneau. 6 $\frac{1}{4}$ x9 $\frac{1}{4}$ , pp. 573, illus.; 25 francs. Ch. Berger, Paris and Liege.
- A REPORT ON THE ASBESTOS, TALC AND SOAPSTONE DEPOSITS OF GEORGIA.** By Oliver B. Hopkins, Assistant State Geologist. 7x10 $\frac{1}{2}$ , 310 pp., illus. Bull. 29, Geological Survey of Georgia, Atlanta.
- THE GEOLOGY OF THE AROHA SUBDIVISION, HAURAKI, AUCKLAND.** By J. Henderson and J. A. Bartrum. Pp. 127, illus. Bull. 16, Geological Survey Branch, New Zealand Department of Mines, Wellington.
- HEATON'S ANNUAL.** The Commercial Handbook of Canada and Boards of Trade Register, 1914. Edited by B. A. Heaton, J. Beverly Robinson and W. J. Dobson. 5x7 $\frac{1}{2}$ , pp. 590. Heaton's Agency, Toronto, Canada.
- DIE THEORIE DER BODENSENKUNGEN IN KOHLENGEBIETEN MIT BESONDERER BERUECKSICHTIGUNG DER EISENBAHNSENKUNGEN DES OSTRUKARWINER STEINKOHLREVIERES.** By A. H. Goldreich. 6 $\frac{1}{2}$ x9 $\frac{1}{2}$ , pp. 260, illus., paper; 10 marks. Julius Springer, Berlin.
- DIE BESTIMMUNGSMETHODEN DES ARSENS, ANTIMONS UND ZINNS UND IHRE TRENNUNG VON ANDEREN ELEMENTEN.** By H. Wöbling. XVII./XVIII. Band, Die chemische Analyse, edited by B. M. Margosches. 6x10, pp. 377, illus., paper; 13 marks. Ferdinand Enke, Stuttgart, Germany.
- THE MINING ADVANCE INTO THE INLAND EMPIRE.** A Comparative Study of the Beginnings of the Mining Industry in Idaho and Montana, Eastern Washington and Oregon, and the Southern Interior of British Columbia; and of Institutions and Laws Based upon that Industry. By William J. Trimble. 6x9, pp. 254; 40c. Bull. 638, University of Wisconsin, Madison.
- MINES OF AFRICA, 1914 EDITION.** By R. R. Mabson. 5x7 $\frac{1}{2}$ , pp. 662, illus.; 2s. The Statist, London.
- This is the tenth annual edition of this publication, known as "M. O. A." It gives, in alphabetical order, for ready reference, a list of the mining companies, with details as to their organization, officers, dividends, ore reserves, etc. A number of maps are included, and an introductory chapter gives data of African gold production, labor conditions, mine share valuations, etc.
- COMPRESSED AIR. A Treatise on the Production, Transmission and Use of Compressed Air.** By Theodore Simons. 6 $\frac{1}{4}$ x9 $\frac{1}{2}$ , pp. 173. McGraw-Hill Book Co., New York.
- There is nothing new in this book and none to be expected; novelty is not a characteristic of technical books. Its value lies in its manner of presentation and its arrangement, which are excellent. The material is well selected; the descriptions are clear and are skinned down to essentials. The theory, generation, transmission and use of compressed air are covered. The little volume should prove an excellent textbook.
- CHEMICAL REAGENTS: THEIR PURITY AND TESTS.** Authorized Translation by Henry Schenck of "Prüfung der Chemischen Reagenzien auf Reinheit." By E. Merck. 6 $\frac{1}{4}$ x9 $\frac{1}{2}$ , pp. 199; \$1. D. Van Nostrand Co. New York.
- This is the translation of the second edition of "Prüfung der Chemischen Reagenzien," which does not differ in scheme of treatment from the first edition. However, there have been many reagents added to the list, new tests have superseded some of the older ones, and tests have been added for new impurities. The book is a valuable one for the library of the analytical chemist.
- THE SILICATES IN CHEMISTRY AND COMMERCE.** Including the Exposition of a Hexite and Pentite Theory and of a Stereo-Chemical Theory of General Application. By W. Asch and D. Asch. Translated, with critical notes and some additions, by Alfred B. Searle. 6x10, pp. 456, illus.; \$6. D. Van Nostrand Co., New York.
- This is, as might be imagined from its title, a complete treatise on clays, glass, glazes, etc., regarding silicates as having the power of forming "chains," as does carbon, a view which will, by the way, appeal to the metallurgist from his work with slags. We think the book well worth while for any one greatly concerned with the theoretical side of the ceramic industry.
- A NEW ERA IN CHEMISTRY.** By Harry C. Jones. 5 $\frac{1}{2}$ x8, pp. 326, illus.; \$2. D. Van Nostrand Co., New York.
- As Doctor Jones says, there is a difference between the old and the new chemistry, "not alone of degree, but of kind." This book is the explanation of that difference; using the historical order of growth and development of the new chemistry as its framework. To quote Doctor Jones again, "My apology for adding another book to the literature of chemistry is that I have known well most of the men who have been instrumental in bringing its about, and have been a student of the three leaders—Van't Hoff, Arrhenius and Ostwald." He might too have quoted Aeneas and remarked of the new chemistry, "a great part of which I was."
- His divisions of the subject are: The condition of chemistry in 1887; the development of the law of mass action; energy changes in chemical reactions; the origin of stereochemistry; the phase rule of Willard Gibbs; chemical dynamics of Van't Hoff and chemical equilibrium of Le Chatelier; rôle of osmotic pressure in the analogy between solutions and gases; Arrhenius and the theory of electrolytic dissociation; the solvate theory of solution; the work of Wilhelm Ostwald; investigations by Ostwald's students and coworkers; the electron and radiochemistry.
- All of this is told in Doctor Jones' usual clear style, known already to readers of the "Journal," which, those of us who know Doctor Jones, is simply the Doctor sitting down and telling us about it.



## Correspondence and Discussion

### Table Concentration vs. Flotation

I would like to say a few words on the subject of the concentrating table *versus* the flotation process. In these days of enthusiasm over the flotation process, it may be well to analyze the problem of the proper application of either. While I am one of the originators of the flotation methods, perhaps particularly for this reason, I am not inclined to see in the flotation methods a process so fully applicable as it is now thought to be and hoped for.

The cost of fine grinding must be considered. For instance, in the case of the Miami ores, there are over 15% of carbonates and oxides. This portion of the ore is not at all subject to flotation, while tests show that the concentrating table will extract a large percentage of these carbonates and oxides.

The cost of the flotation process is in all cases much higher than the table treatment. The pyrite is not so well recovered as in the table process, and the silica is usually rather high in the flotation concentrates.

I cite as an example the results obtained in a test at Humboldt, Ariz., where the table made concentrates running 7% insoluble and 38% iron, as against the flotation process making concentrates running 27% insoluble and only 25% iron. Crediting the iron with the usual 6c. per unit and penalizing the silica with 10c. per unit gives a showing strongly in favor of the table process. So far as extraction is concerned—if the ores are crushed in steps so as to eliminate slimes as much as possible, and the mineral is extracted between each step of crushing, a great deal of unnecessary crushing can be eliminated, and an extraction of 80% to 90% is possible. If the flotation process is then applied, a nearly complete extraction can be obtained.

ALFRED SCHWARZ.

New York, Aug. 3, 1914.

### Running Joint to Replace Unions

I notice in the March 21, 1914, *JOURNAL* an article entitled "Running Joint to Replace Union." It brought back to my mind the experiences I had with running joints and unions some years back. We used a great many running pipe joints, believing them better than the various type of unions that we had tried.

I was not satisfied, however, that a running joint was the ideal joint, so set about to try out every type of union I could lay my hands on. The principal fault with the unions was that they would rust together (and the running joint had this fault), and then, too, the gaskets needed replacing in the unions.

At last I tried out a gasketless union, with brass-to-iron seat and brass-to-iron thread connection. After that I found that my troubles were solved, for the union held up splendidly, and on several occasions when I had

to take the line apart, I had not the least bit of trouble disconnecting this union. After that I used no more running joints.

I do not think a running joint is economical. Considering the cutting of the long thread, providing the lock nut, caulking the thread with oakum, painting the thread, and so forth—I think the cost of labor and material exceeds that of a good union.

As to durability, I always found trouble with the pipe rusting at the thread. When you stop to think that you are cutting away about half of the thickness of the pipe wall for 5 or 6 in. at one end, and exposing the weakened section to corrosion, it can be seen why there is trouble with the joint rusting out. All in all, there may be certain places where a running joint is an advantage, but I think a union such as I have been using and describe above will make a stronger and more durable connection, and without any increase in cost.

A. P.

Pittsburgh, Penn., July 31, 1914.

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### What Becomes of All the Mining Engineers?

J. I. Blair's article in the *JOURNAL* of May 30, 1914, is questionable in certain respects and the figures he uses are purely fictitious.

He should qualify the term "mining engineer" when arriving at conclusions as he has. In one of our leading mining schools, less than 66% of the graduates can be called mining engineers because the rest graduate in "general science." It is a fact that 35% of all the graduates of this school are actively engaged in mining, metallurgical, geological or chemical work. Therefore, of the mining engineers that this school has put out, 53% are now "in the ring" and practicing their profession. That differs radically from Mr. Blair's figure of 1 per cent.

Furthermore, of the mining engineers who started into the practical work after graduation, 85% stayed in, instead of 75% dropping out, another error in the article.

Mr. Blair should visit other operations than zinc-oxide plants, of those that come within the field of the mining engineer, before generalizing so broadly, and a few more districts than New York, Illinois, Missouri and the "West"—and preferably a few other continents.

Moreover, a mining engineer has a little higher ambition than to run a Joplin mill. While his farmer friends can probably "strong arm" a bit better in the start, the technical man can learn more in one day than one of them can in a week. He makes mistakes, but with a few weeks of oiling, belt lacing and repair work, he excels the farmer in getting results.

If a man has an ambition, he is foolish not to get his education in the easiest manner. In the absence of a college, he must burn his midnight oil at home. This was the method followed by the older men in the profession,

for the mining school is a relatively new institution. But, nowadays, these schools are provided to educate efficiently; everything is arranged and provided to encourage and guide study; and a person can get his education there infinitely more easily and rapidly than in the old-fashioned way. He must be educated some way; if by years of hard knocks he has succeeded, he ought to welcome a more rapid, modern manner of accomplishing the same thing, instead of shutting his eyes to facts and being a doubting Thomas. If a man has it in him to succeed, he surely will succeed much more quickly and easily via the "mining engineer" route than in the old-fashioned way.

In following Mr. Blair "across the continent," did we follow him in a covered wagon as we would have years ago? No, we both took trains. Why? For the same reason that a young man goes to college to study mining, that is, to "get there." Why not the modern way?

C. C. CONOVER.

Springfield, Ill., June 2, 1914.

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### Tailing Samples

The criticisms offered by W. H. C. Jerome in the *JOURNAL* of July 4 on the "Simple Sampling Device," illustrated on page 1052 in the issue of May 23, seem not altogether fair.

The inequality of the cut, due to the fact that a sampling trough actuated by a falling weight moves with accelerated speed, is for the most part compensated by the condition that each alternate cut is in the opposite direction.

The second objection, that the area of the orifice changes in accordance with its position, does not apply if the cutting trough is wider than the pulp stream. However, the trough should usually be much narrower than the stream, for the reason later noted, and hence theoretically this objection is well taken. While it is only a question of what length of arm is necessary to make the arc of oscillation near enough to a straight line for practical results; yet this defect can be removed by introducing a level guide track for the collecting trough, the oscillating arm of the water box working in a slot to actuate the collector.

Neither the Elmore sampler nor the "Reformed" sampler illustrated on page 19 of the *JOURNAL* of Jan. 3, 1914, nor any other form of sampler which uses a horizontal revolving collector will take a correct sample unless its cutting trough is patterned from a sector. In other words, the cutting sides of the collecting trough must be radial to the center of revolution. In no other form will every point of the falling stream be taken for the same period of time. This most important fact has been overlooked in many samplers otherwise mechanically perfect. As far as can be judged from the cuts on pages 19 and 1017, Vol. 97, both of these samplers are defective in this particular; but the defect is easily corrected by a new cutting trough. Further, it should be noted that with an adjustable extension arm, like the Elmore, whenever the length of the arm is changed a new cutting trough is required in order to take a correct sample.

One of the principal uses of these devices is the sampling of tailings. As the tailings are usually even in grade and regular in flow, only a small per cent. is required to secure a correct sample. Moreover, the large

quantity of water with which they are commonly discharged prohibits taking a large sample. This applies especially to samples of slimes which are at once the most essential to secure and the most difficult to handle because they require much time and space to dewater. In most cases from 1 : 1000 to 1 : 10,000 is as much as it is practicable to handle.

The best possible sample from a pulp stream consisting largely of water is secured by making a quick cut with a narrow trough, taking the smallest practicable amount at each cut, and thus allowing more frequent cuts without getting a sample of impossible size to handle. Indeed, the crude device taking frequent small cuts may return a more correct sample than the more perfect machine acting at less frequent intervals. Without going into details, I should say that the Elmore sampler and others of this type, even with the narrowest allowable collector, normally give too slow a motion across the stream for good results with highly diluted pulps. That is to say, that while the machine can be adjusted to cut any percentage required it must be difficult, if not impracticable, in its present form to adjust it to, say 1 : 10,000 without making too long a period between cuts. The desired motion can doubtless be secured by a reconstruction of the Elmore pattern, introducing a new train of gearing from the pulley shaft to engage the toothed segment *N*, independent of the worm, leaving the worm gear solely to operate the slow-motion ratchet. This would make a machine somewhat similar to the Scobey tailings sampler, which by a few interchangeable intermediate gear wheels is made to take different ratios between 1 : 500 and 1 : 10,000.

Passing to the strictly practical side of the subject, with ordinary even-grade tailings, and with a rather long oscillating arm in relation to the diameter of the pulp stream, I believe that the error in the sample taken with the "Simple Sampling Device" would be smaller than would be disclosed by the assay balance. Under certain conditions, as before noted, its sample might be more correct than one taken with a more perfect machine. In any case I submit that it is so much better than the old millman with his tin cup once every half hour that it should be encouraged rather than decried. That is, better have one of these home-made samplers than none.

One of the main advantages of the water-box samplers, and one which must not be overlooked, is that they can be put in places where it would be impossible to operate a belt-driven machine. The tailings-discharge launder is frequently outside and at some distance from the mill building, where a small water pipe can be run for its operation, but where it would be impracticable to extend a shaft or belt.

V. G. HILLS.

Denver, Colo., July 11, 1914.

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### Radium Output of the Standard Chemical Co.

I regret to note a typographical error in the *JOURNAL* of July 4, in the percentage of radium contained in pure crystalline radium bromide. This figure should be 53.6% instead of 63.6% as it appears on p. 25.

CHARLES H. VIOL.

Pittsburgh, Penn., July 14, 1914.



## Editorials

### The War

It is Germany and Austria against the world. Actually fighting with England, Belgium, France, Russia, Montenegro and Serbia, with Japan ready to join them in the Far East if necessary; deserted by Italy and without sympathy even in neutral countries, the Germanic people are marked in their isolation. How long will it be before the Slavs of Austria turn against them and the Magyars separate themselves? Not long if victory fails Germany's banners.

At present we know but little of what is going on. After the veil is drawn, what shall we see? And in the end what will there be? German victory means hegemony of Europe, and probably hegemony of more. German defeat may mean disarmament, a relief from staggering burdens, and a republican Europe. There will not be another Armageddon.

### The Paralysis

Some people have sought to draw a parallel between the situation of the metal markets in 1907 and at present. There is no parallel. In 1907 the trouble was essentially financial and was especially confined to the United States. Even in the United States consumption was well maintained while in Europe it continued large. The liquidation in copper, for example, was bound to strike a reasonable level at which all that anybody wanted to offer would be absorbed. In fact, when the price dipped under 12c., there were such large purchases that the market steadied and soon rallied.

In 1914 there was the sudden elimination of customers who had been taking 50 to 60% of our production, which naturally paralyzed the market. Of course, the producers might have flung their supplies upon the domestic market, unloading them down to 5 or 6c., say, and bankrupted themselves, but there would have been no good in having a market on such terms. In 1907 there was a live market even at the crisis. In 1914 there is paralysis.

A similar paralysis affects the silver market, the larger part of which product is marketed through London without any means for getting it there at present. Since July 31 there have been no official quotations from London, although within the last few days some unofficial quotations have been cabled over. The bullion brokers, who handle the American output report, however, that the situation is in no wise helped inasmuch as they cannot sell over there. Mine owners at Cobalt who turn out fine silver find themselves in the same predicament. The U. S. Mint has been buying a little silver, but its purchases are too small to make a market.

In our other great export commodities—wheat, cotton and petroleum—there are analogous conditions with differences in degree and prospects. The wheat market is mainly domestic, but this year we have an unusually large surplus to export and it is recognized that it is going to be wanted badly and consequently it is being

held at a rising price in anticipation thereof. The petroleum refiners promptly refused to buy any more crude or enforced a curtailment of production of the domestic market and the consumption of its products being a day to day matter there appears to have been in this case a rather quick adjustment to the new conditions. The cotton crop not yet being grown is not yet on the market. The disposal of it excites much concern and there is talk of Governmental or banking assistance. However, the cotton will be needed abroad once the high seas are open for commerce. We wish we could be equally confident about the need for copper.

Looking at the things that we need, we see an absence of tin, ferromanganese and chemical products among the essentials. All of our tin supply comes from abroad and just at present we cannot get any and there is no commodity market for the reason that there is no supply. The extravagant quotations for this metal that are talked about represent transactions in trifling lots that happened to be in the hands of dealers here, which are very interesting and profitable to the lucky holders, but are without any broad commercial significance.

Summing up briefly, what we have witnessed during the first fortnight of August, 1914, is a stoppage of international commerce, and to a considerable extent of domestic also, just as we have had a stoppage of trading in securities on the stock exchanges. Such a thing has never happened before in the history of modern civilization. With regard to domestic trade we shall soon have an adjustment to the new conditions. Foreign trade will improve when ships can freely sail the sea. In the meanwhile the stoppage is so physical that our railways are beginning to feel it.

### Thoughts about Copper

The situation that has arisen is so unprecedented, so infinitely complex, so fraught with surprises that no man knows enough to foresee what is going to happen. At the moment, business has come to an absolute standstill. From 50 to 60% of our refined product heretofore has been marketed abroad. With that outlet entirely closed, the situation is too confused to permit of anything but sporadic domestic business being done.

All that occurs to anybody are random thoughts, such as these:

Most of the big mines have curtailed about 50%, thinking so to reduce their output to about the expected domestic requirement.

The refiners are curtailing; with no market for silver, there is no use in incurring expense in turning crude copper into refined. For the same reason some of the mining companies will pile up blister copper at their smelteries rather than at the refineries.

The absence of a market and the disruption of the ocean-carrying trade will keep a good deal of foreign copper at home.

Some new producers that were coming into the market next year will be checked.

Were the huge exports of copper to Germany last spring, which excited so much discussion at the time, for stocking up in anticipation of this war?

The shock struck the copper market when it was in the best possible condition, the price being low and there being no bull position, there having been a sweeping liquidation of accounts early in July.

### Workmen's Compensation Law

W. L. Saunders, president of the Ingersoll-Rand Co., is authority for the statement that studies of the National Civic Federation revealed that something like eighty millions of dollars was paid annually by American industries on account of accidental injuries and deaths of workmen before we had any compensation laws, and of that sum not more than 20% went into the homes of the injured, the rest of it having been eaten up by agents, lawyers, and through expenses. This is a mighty good justification of the compensation laws that the states have been adopting in recent years. The lawyers get less and the workmen or their families get more. If the compensation remained at the previous rate, the cost to the employer would be no more.

However, the rates that have lately been put in the laws increase the cost without doubt. One big mining and metallurgical company, whose accidents cost about \$250,000 per annum, estimates that if the law of a neighboring state be adopted in its own, the cost of its accidents will be about \$800,000 per annum. In such circumstances an Irishman might say that the cheapest way to pay for accidents is not to have them. This is the economic basis of the "Safety-First" movement. Of course, there is also the humanitarian basis.

Those compensation laws, like New York's, which permit an employer to insure himself, give an incentive to him to eliminate accidents. He is trying to do this by making his machines, etc., as nearly fool-proof as possible. It will be only the square deal if the state steps in and helps him to enforce discipline. If an employee who engaged in a dangerous practice contrary to the law of the state could be summoned before a magistrate and fined, as in Great Britain, there would be a powerful stimulus toward discipline, but in this country, unfortunately, such laws are only for the employer. He may not even discharge an unlawfully acting employee without risking offense to the labor unions and perhaps experiencing a strike.

### The Federal Trade Commission

The bill creating a Federal Trade Commission having now become a law, it is the duty of the President to appoint the five members of the commission. They will take over the duties now performed by the Commissioner of Corporations, but will have enlarged authority, having pretty full powers to investigate the business, financial condition, conduct and management of corporations doing an interstate business, and to issue and enforce orders against unfair competition by corporations. It is authorized to require corporations to open their books, disclose their records and produce documents, contracts, memoranda, etc. The inquisitorial powers of the commission are very large.

Whether the adoption of this radical measure was wise or not is no longer a subject of useful discussion. It has become the law, and doubtless will so remain. The

important thing is to have a competent administration of it. The sweeping power conferred upon the commission demands that its members be men of a high order of intelligence. They must partake equally of the qualities of administrators of business, of economists, and of judges of the law.

Equally important is it that they should be acquainted with the great branches of industry upon which the prosperity of this country is based, such as mining, milling, manufacturing and merchandizing. It is our special purpose in this article to bespeak a representation of the mining and metallurgical industry, one of the great basic industries, upon which more than any other is the manufacturing industry based. The U. S. Steel Corporation, for example, is the greatest of all of our corporations, and it is a mining and metallurgical enterprise. Many are our mining companies that are concerns of huge capitalization, many are they that individually employ thousands of men, and many are they upon which entire communities solely depend. With them link hands the smelters, and with them again the rollers of sheet metal and the drawers of wire, and so on down the line to the makers of all kinds of finished products, ranging from the heavy steel rails of Pennsylvania to the complicated clocks and watches of Connecticut.

In this complex industry, whose raw ores alone represent an annual value of upward of one billion dollars, there are conditions and problems peculiar to itself. No one man may hope to be familiar with all of them, but in the study of them a man who has lived in the atmosphere of the mining and metallurgical industry can enter more intelligently and more sympathetically than one who has not had such training; and for this reason we hope that one of the new commissioners may be such a man.

### The Zinc Smelters of Europe

The military operations around Liège are taking place in the very heart of the zinc-smelting district of Belgium. Angleur, Ougrée, Engis, Hermalle sous Huy and Sclaigneaux, all of them important smelting towns, are stretched along the Meuse, above Liège, right on the route that the Germans are trying to travel. Presumably all of these works have been, or will be, affected.

In Upper Silesia, the mines and smelteries, which cluster around Beuthen and Kattowitz, are only five or six miles from the Russian frontier. Just over the boundary are the Polish works at Bendzin and Dombrowa. The main line of railway from Warsaw to Vienna passes through this part of Poland, and there are connections with the German lines in Silesia, wherefore there are probably military operations going on in this region.

In Rheinland and Westphalia and elsewhere in Germany, the smelters are probably called to the colors and the working forces decimated, and many of the plants are no doubt closed.

It was estimated that the International Zinc Convention had a stock of 90,000 long tons of spelter at the mid-year. How much of this was in England is unknown. The British zinc smelters are unable to supply the spelter requirement of the United Kingdom. It is likely therefore that England will take spelter from the United States if she succeeds in clearing the ocean of hostile cruisers. In the meanwhile, Canada will have to get her supply from the United States.



## BY THE WAY

The conditions of petroleum production are similar to those prevailing in copper production. A very large part of the American petroleum is normally exported, and for the moment there is no export market. Consequently the refiners have notified the producers that they will take only 50 or 60% of the ordinary deliveries of crude, and in some cases they will take none at all.

Wheat and cotton are our other great commodity exports, but it is anticipated that the blockade in those essential bases of food and clothing will soon be raised.

A new use for a Ford is reported from Nevada. The gravels of Tule Cañon are difficult to work through a shaft because of the heavy flow of water. The owners of one property possessed a Ford, known locally as a "road louse," which they thought ought to work for its board. They jacked up the rear axle, took off the tires, hitched the machine to their pump with a rope drive, and started her on the high. By this means they are handling 500 gal. per min. in the 35-ft. shaft and are going to find nuggets as big as pullets' eggs—so they say.

When a metallurgical plant is dismantled it usually has only a scrap value which may be 5 to 10% of its original cost. If our recollection be correct the experience in scrapping the old Anaconda smelting works at Anaconda, Mont., was about like that. The Calumet & Hecla company is about to dismantle its smelting plant at Black Rock, N. Y., a suburb of Buffalo, and we hear that it is going to reverse most previous experiences, the present market value of the smelting site in this case being in excess of the sum for which the smelting works have been carried on the books of the company.

At the Tamarack mine, on the Upper Peninsula of Michigan, there toiled a Cornishman, who was very economical with his supplies; reducing his charges of explosive to a minimum when drifting on contract at so much per lineal foot. The shattering effect being diminished, there was less muck-stick work and George had a nice tight little drift, which harmonized perfectly with his diminutive and thrifty self. One day the superintendent, making his rounds of inspection, had the misfortune to bump his head rather severely when nearing the face of George's drift. Recovering himself, he indignantly stammered: "P-p-pretty low roof, G-g-george, p-p-pretty low roof. "No, no, Cap.," George soothingly replied, "roof's on a perfect grade, but I expect mebbe the track's a bit 'igh."

There has been a platinum excitement in Colombia, near the mines of the Frontino & Bolivia Co.'s properties, in the vicinity of La Salada. This is not the recognized platinum area of Colombia, but after having heard of some platinum being shipped out by the company, some of the natives employed at the property began denouncing mines in this vicinity. The facts of the case are as follows: Many years ago this company sent out to Colombia a platinum parting dish. Someone in the London office happened to remember that this was pur-

chased when platinum was low, and as the small number of bullion assays made by this company did not necessitate the use of it, it was decided that the platinum should be returned and sold at the fancy prices now offered. It was therefore ordered that the manager at the mine should return it in the next bullion shipment. It was the declaration of this shipment that caused the natives to reach the conclusion that the company was obtaining platinum from its mines; they proceeded to denounce the surrounding territory, but have not yet produced any platinum.

The Congressional Committee was investigating alleged cases of assault on the Copper Country strikers. Mrs. Boris Fodor was testifying regarding a little run-in she had with officers of the law:

Attorney for Sheriff. Did you get a kettle of boiling water and attempt to scald him when he asked for your husband?

The Witness. No; I didn't do anything with him.

Attorney for Sheriff. Didn't you attempt to throw some red pepper in his face?

The Witness. No; I didn't attempt.

Attorney for Sheriff. You didn't do a thing, and he simply grabbed you by the hair and pulled you out in the yard; is that right? Is that what you want this committee to understand?

The Witness. Yes; he grabbed me and pulled me out because I stood in the door and didn't want to let him in.

Attorney for Sheriff. Did you have a club in your hand?

The Witness. No; I had a club, but that is not the club what they call it here. We used them to make noodles.

Attorney for Sheriff. About how large a club was it?

The Witness. A roller, they call it.

Congress Taylor of Arkansas. Explain what it is.

The Interpreter. They use them to make noodles—home-made noodles. It makes a roller. That is what they call it. It would be about that long [indicating].

Congressman Howell. We all know what it is.

Sure, we do, Congressman; they use 'em to make pie-crust and cookies, too. The rolling pin and the flatiron—woman's time-honored weapons! Small wonder the deputy felt constrained to resort to means of self-defence.

## Chronology of Mining for July, 1914

July 1—Anaconda Copper Mining Co. closed down the concentrator at Great Falls, Mont.

July 2—Cananea striking miners returned to work.

July 3—Suit brought against the American Smelting & Refining Co. by Sidney Norman and others, representing minority stockholders of the Federal Mining & Smelting Co., was dismissed by Justice Philbin. Railroad strike in the Cripple Creek district, Colorado.

July 6—Circuit Court of Appeals at San Francisco reaffirmed its decision in case of Mineral Separations, Ltd., vs. James Hyde.

July 15—Seven miners were killed by a rush of sand into a raise at the Vulcan mine at Alpha, Mich.

July 18—Announcement made that Phelps, Dodge & Co. had taken over the Tombstone Consolidated mines in Arizona.

July 29—Twelve miners were killed by an explosion of dynamite in sinking a shaft in the Krajaii potash mine, near Cassel, Germany.

July 31—Anaconda Copper Mining Co. closed down the Great Falls smelting plant and also seven mines in the Butte district, because of impending war in Europe.

## PERSONALS

F. W. Guernsey is in Nevada.

W. A. Dunn is at Lead, South Dakota.

Pope Yeatman sailed from New York, Aug. 10, for Chile.

E. W. Talbert is manager of Oro Hondo property, Lead, S. D., succeeding J. E. Carr, resigned.

H. W. Seaman, of Chicago, president of the Trojan Mining Co., recently visited the property, at Deadwood.

H. S. Vincent, general manager of the Trojan Mining Co., has returned to Deadwood, S. D., from a visit to Denver.

B. R. Shover has resigned as general superintendent of the open hearth plant of the Brier Hill Steel Co., Youngstown, Ohio.

Edgar Huntley has been appointed general mine foreman of the Homestake mines, Lead, S. D., succeeding W. S. O'Brien, deceased.

John Tait Milliken recently visited the Oro Hondo property, at Lead, S. D., and is now enjoying a brief vacation in Yellowstone Park.

B. J. Falkenburg of the firm of Falkenburg & Laucks, Seattle, Wash., will be in California for several weeks on professional business.

Lloyd B. Smith of the Associated Geological Engineers has returned to Pittsburgh after seven months' geological work in the Oklahoma oil fields.

F. E. Lasier, of Detroit, Mich., after attending the American Institute meeting at Salt Lake City, will go to the Cripple Creek district in Colorado on business.

W. F. Stevens is at present engaged in making preliminary examinations in Southern Siberia and his address is c/o Russian & English Bank, St. Petersburg, Russia.

H. L. Waste, for a number of years superintendent of the Midas mine in Shasta County, Calif., will continue in that position under the Victor Power & Development Co., the new owner.

C. T. Griswold of the Associated Geological Engineers, Pittsburgh, Penn., has returned from Newfoundland, where he spent July examining copper mines and prospects around Notre Dame Bay.

J. T. Smith of New York, president of the Argonaut Consolidated Gold Mining Co., recently attended a meeting of stockholders and directors at San Francisco, and in company with W. J. McGee, assistant U. S. treasurer at San Francisco, visited the Argonaut mine in Amador County.

Judge Elbert H. Gary, chairman of the United States Steel Corporation, was among the Americans abroad at the opening of the war. He took a prominent part in the organization of the committee to look after Americans detained by the financial confusion arising from the sudden outbreak of hostilities.

W. J. Loring, of Eewick, Moreing & Co. of London, was in San Francisco Aug. 4, and then visited the Plymouth Consolidated Mine in Amador County, now operated by the London Consolidated Gold Mines. The new reduction plant, recently installed, began operation on July 30. Mr. Loring was superintendent of these mines during their production period about 25 years ago.

H. C. Hoover is always interesting and useful. According to a press dispatch from London he opened an office on Aug. 5 in the American consulate and advanced sums of \$25 and upward to stranded Americans who were unable to get money by other means. On that day Mr. Hoover rendered assistance to about 300 Americans who were without cash and announced that he would continue to give aid as long as his currency lasted.

## OBITUARY

Captain Elija Toms, one of the best-known mining captains on the Marquette range, was killed at the American mine at Diorite on July 24. He was descending the shaft on the ball of the skip, when, in some unknown manner, he fell to the bottom, the 16th level. For 11 years he was employed as underground captain at the Hartford mines at Negaunee, later being the superintendent. Prior to going to the Hartford he worked at the Queen mine at Negaunee. He was a native of Cornwall, England, and was considered a first-

class mining man. He was 52 years of age. His wife and one son survive.

Chief Justice William H. Beatty of the California Supreme Court died at San Francisco, August 4. Mr. Beatty was born in Ohio in 1838. He went to California at the age of fifteen, and at seventeen returned East to the University of Virginia, where he remained until 1858. Although he did not graduate from the university, he returned to Sacramento and read law with his father, being admitted to the Bar in 1861. In 1863 he went to Nevada and for nine years was a district court judge. In 1875 he was elected associate justice of the Nevada Supreme Court, serving until 1878 when he became chief justice, serving two years. He returned to California and in 1889 was elected to the Supreme Court, and has served as chief justice of the California Supreme Court for twenty-five years. Both in Nevada and California, Justice Beatty was famous for his decisions in mining cases. One of the most important was that which concerned the Hale & Norcross Mining Co. His standing in his profession was high, and as a citizen he was in great esteem.

William S. O'Brien, for 15 years general foreman of the Homestake mines, died at his home at Lead, N. D., Aug. 1, from a hemorrhage induced by miners' consumption. He was born at Calais, Washington County, Maine, Feb. 25, 1846. With his parents he moved to St. Anthony, now East Minneapolis, Minn., in 1855. In 1863 he enlisted in the 9th Minnesota infantry, serving three years; after the close of the civil war he was in Indian campaigns in the West. In the early seventies he removed to Montana, and followed mining in that state, Utah, Nevada, Idaho and California for 20 years. Going to the Black Hills of South Dakota during the gold rush, he remained for two years, when he left, returning in 1884 to remain. He was a delegate from Lawrence County to the state constitutional convention, which organized the states of North and South Dakota from the Territory of Dakota, in 1889. He was a member of the first three state legislatures of South Dakota, was state mine inspector and at the close of his incumbency of the latter office entered the employ of the Homestake Mining Co., remaining until his death as one of that company's valued employees. He leaves three daughters, residents of Lead, two of them married.

Donald M. Philbin, prominent railroad and mining man of Minnesota, died at his home in Duluth on Thursday, Aug. 6, after an illness lasting about a year. Until the first of this year he was the general manager of the Great Northern Ore properties, resigning to take a trip abroad in the hope that his health would improve. He returned to Duluth five weeks ago. He was born in Montreal, Canada, 56 years ago. At the age of 17 he entered the employ of the Chicago & Northwestern line as a clerk. In 1876 he was made assistant superintendent of the company's ore docks at Escanaba, remaining there 10 years. For three years he was in the West for the Northwestern, and in 1889 he went with the Duluth, South Shore & Atlantic as superintendent, with headquarters at Marquette. In 1893 Mr. Philbin went with the Duluth, Missabe & Northern as general manager, and in 1896 was appointed superintendent of the Duluth & Winnipeg. When that road was absorbed by the Great Northern he went with the latter company, holding several different offices. Three years ago he was placed in charge of the ore properties of the company in Minnesota, an important position. He was considered an expert in ore transportation, as well as a first-class mining man, and was well known throughout the middle west. Mrs. Philbin survives him.

## INDUSTRIAL NEWS

The Ball Engine Co., Erie, Penn., recently let a contract for the construction of an addition, 150x203 ft., to be used for the erecting of the company's new line of steam shovels.

The Central Iron Works, Quincy, Ill., which makes a variety of foundry equipment, has recently developed a line of concrete mixers, which it intends to place on the market in the fall. The first machines will be power mixers, of 5 and 10 cu.ft. capacity, but these will probably be followed later by a hand mixer.

Orders for the following tube mills have been received recently by the Chalmers & Williams Co., Chicago Heights, Ill.: One 5x16-ft. mill for the Tonopah Extension Mining Co., at Tonopah, Nev.; one 5x22-ft. mill for the Cordova Mines, at Cordova, Ont.; and two 5x20-ft. mills for the St. John del Rey mine in Brazil. The two latter mills are to be made entirely of manganese steel.



## Editorial Correspondence

**SAN FRANCISCO—Aug. 6.**

**Government Suits Against the Southern Pacific** and the subsidiary oil companies will not be dismissed in consequence of the recent decision in the Burke case in the U. S. supreme court. The technical ground upon which the suits will be further prosecuted, is that the maps made by Jerome Madern, Southern Pacific land agent, were known to be false at the time they were made.

**Suspension of Work on the Comstock Lode** at the Consolidated Virginia, Ophir and Sierra Nevada mines in the north end was ordered by the several companies Aug. 3. The temporary closing of the mines is due to the effects of the European war on the stock exchanges. The San Francisco stock exchange is closed and will not reopen until the New York stock exchange reopens. The Mexican and Union mines will continue work, although the shutting down of the others may cause some change in the plans of the Mexican and Union. The Crown Point, Belcher and Yellow Jacket at Gold Hill, and the Overman and Caledonia are working. All the mines at Gold Hill are in fine shape, increasing extraction and shipping bullion. It is expected that the north end mines, now closed will reopen as soon as the financial situation clears. The Comstock Pumping Association has completed the concrete bulkhead and door in the north lateral of the Sutro tunnel, and has begun construction of a similar bulkhead and door connecting the Union and the Ophir on the 1600-ft. level. The pumping plans worked smoothly during the week.

**Work of the Petroleum Department** of the U. S. Bureau of Mines recently established with W. A. Williams, as chief, has been outlined. The application of the plan of work to the oil fields of California will prove beneficial. The plan contemplates four general features. The actual and comparative composition and other qualities of the various types of crude petroleum, a comparison of the petroleum in the United States with that of other countries, and the study of the methods and facilities of production, transportation, storage and refining of crude petroleum will prove very useful in California. The department will investigate technologic and economic conditions affecting not only petroleum, but natural gas. The prompt publication of data obtained in connection with these inquiries and investigations, together with such conclusions and recommendations as may be most useful to persons engaged in the development of the petroleum industry will bring the work of the department before the operators and investors and serve a useful purpose. The lack of prompt publicity regarding conditions in the California oil fields has been a great detriment to the industry, and though the State has increased its production each year, and has always had a surplus in recent years, there has been lack of opportunity for study and comparison of methods employed and suggestions of improvements that would have followed regular investigation and prompt publication of conditions and suggestions. The State Mining Bureau has issued several bulletins on the oil industry and these have been very useful, but the bureau has never been supplied with sufficient funds to make its work in this line of such value as the industry is entitled to. The Bureau of Mines will be assisted by the State Mining Bureau in the work to be undertaken, and the two will work in harmony to the advantage of each and to the benefit of the industry in general.

**DENVER—Aug. 6**

**New Schedule of Prices for Tungsten Ores** and concentrates has been announced in the Boulder County districts by the Wolf Tongue Mining Co., a prominent purchaser of these products. In general, this schedule means a 10% reduction from the prices that have prevailed for several months and which were printed in the "Journal" of Jan. 10, 1914. This cut is explained on the basis of over-supply in the Eastern steel manufacturing plants through curtailment in the market demand for tool steels and heat-resisting products.

**Drainage of Downtown Mines at Leadville** was finally assured by ex-Gov. Jesse F. McDonald a short time ago, when his newly organized company let contracts to the Colorado Power Co. for electrical service and to Sulzer Brothers Co., of Switzerland, for powerful centrifugal pumps to be

installed in the Penrose shaft. In view of European conditions, the project is now doubtful. Should delay in delivery of the machinery prove indefinite, it is probable that the Swiss orders will be cancelled and some type of domestic pump be selected.

**A Prospectors' Partnership Suit** was settled recently in district court at Leadville. The suit was brought June 22 by Al. G. Borah against J. O. Kempf et al., owners of the Lady Belle mine, near Eagle. Decision was handed down Aug. 3, when Judge Charles Cavender rendered his opinion denying the plaintiff's claim to an undivided half interest. This case has been watched with interest among prospectors because it involved the contention of a tacit partnership such as occasionally prevails between prospectors. The opinion recites: "He (the plaintiff) asks the court to find that such a contract was made by reason of the fact that at several times during the period of four or five years they had been together for a day or two prospecting or examining properties owned by others. The court cannot make a contract between parties; it can only declare the contract found from evidence to have been entered into between the parties." Costs were charged to the plaintiff and the case dismissed.

**BUTTE—Aug. 7**

**U. S. Commission on Industrial Relations** came to Butte Aug. 6 to make inquiry into local conditions, and had as witnesses some representative men for the mining corporations, but failed to call anyone who could speak for labor and citizens in general. They had several Socialists and a noted personal-injury damage-suit lawyer. C. F. Kelley, managing director of the Anaconda company, was on the witness stand nearly the entire first day and gave the commissioners some interesting facts and suggestions that had not occurred to some of them before. Only four members of the commission came to Butte. The others were otherwise engaged. Commissioner Austin B. Garretson could not understand why miners' wages in Butte were on a sliding scale, governed by the price of copper, and the dividends were not. Mr. Kelley said that in some years the dividends have been cut off entirely, but the wages of miners never. Mr. Garretson also thought the Anaconda company might sell its product if it cut its price, but Mr. Kelley explained that just then there was no market at all, and drafts for copper already delivered were coming back from Europe, and that not a pound of copper had been sold within 10 days. In 1913 the Anaconda company paid \$2,000,000 more in wages than in 1912, the aggregate being higher but the individual wage lower, due to the difference in the price of copper. The Anaconda company introduced the "rustling card" system, about which the commissioners inquired, because 25% of the miners employed are "floaters," and through them a great deal of trouble is experienced because of their character and the fact that they work under many different names. The information required from the applicants for work is just such information as the government asks of the company. Mr. Kelley said underground mining conditions were better in Butte than anywhere else in the world; 1,000,000 cu.ft. of fresh air is pumped into the mines every minute, and the cost last year for this item alone was \$275,000. He also observed that in no community is organized labor more consistently recognized than in Butte.

**SALT LAKE CITY—Aug. 6**

**Tintic Mines Are Operating as Usual**, with a small decrease in the working forces at one or two properties, or by reducing operations to one shift. At Park City, the Daly Judge, Silver King Coalition and the Silver King Consolidated have been operating, but may curtail the shipment of their high-grade silver-lead ores. The Utah Copper proposes to cut down its output. The Arthur mill will be closed, but outside of this, operations will be continued, and arrangements will be made to take care of employees as far as possible under the present market conditions. Those who remain with the company will be given employment half of the time. This will mean half of the regular output of 23,000 tons of ore per day. The Utah Consolidated at Bingham has laid off some men, and the Yampa, Bingham-New Haven and Ohio Copper are expected to reduce forces. Under normal conditions, between 4000 and 5000 men are em-

ployed at Bingham, 2500 in Tintic, 1000 in Park City and 1000 in smaller camps. The mills at Garfield and the four smelters in the valley and at Tooele bring the number of men employed in the mining and smelting industry of Utah to between 12,000 and 15,000.

**Smelter Settlements** on ores will be made in Salt Lake valley and vicinity, due to be paid for after July 31, by a provisional arrangement going into effect Aug. 7. The following basis is proposed: Gold will be paid for as usual. Silver will be paid for at the rate of 25c. per oz. until further notice, and the smelters will give the shippers their pro rata proportion of the first sales of silver, made at the prices then obtaining, in final settlement for the shipment on which the advance of 25c. per oz. has been made, or on some other equitable basis, as may be agreed upon between the shippers and the smelters. Advances on copper will be made at the rate of 10c. per lb., the final settlement to be made when market conditions right themselves, adjustment to be made to each shipper on the actual sales prices, giving him his pro rata proportion of all sales up to the total amount of copper against which advance at the rate of 10c. per lb. has been made, or on some other fair and equitable basis or agreement as above. At present no change will be made in arriving at the price to be paid for lead. For the last six months 8 to 10% of the lead production of the United States has been exported. This is now impossible, and even if domestic business were not affected by the war in Europe, there would be an excess production. It is suggested that it might be advisable for the large shippers of lead to consider curtailing their output. It is impossible for the smelters to indicate when quotations will be available on silver and copper, but shippers are advised to get in touch with their respective smelters to learn more in detail in regard to this matter, or to make special arrangements in particular cases as to settlements. The proposed settlement plan as outlined by the smelters may relieve to some extent the closing down of various mines; briefly, it means that silver and copper will be settled for with the difference paid as soon as quotations are made in New York.

#### CALUMET—Aug. 8

**Calumet & Hecla Has Stopped All Construction Work** with the exception of the work on the hydraulic dredge which is to be used on the tailings piles. This work will be completed within the next three weeks, when the dredge will probably be tried out, but will not go into commission. This company will continue with the erection of the stamp mill at the White Pine property. All other construction work at the subsidiary companies has been stopped. The large work under way was the completion of the addition to the Ahmeek mill, the building of a rock house at No. 3 Osceola mine, excavating for the leaching plant at the Calumet & Hecla, and finishing up the No. 2 regrinding plant with its equipment for the working of the tailings piles. The Tamarack had started excavating for a regrinding plant at the stamp mills. The men employed at this work have been laid off indefinitely, as well as a number in the various shops where new work was being handled. Men have been laid off from the underground force. The conditions in the copper country threaten to be worse than they have been for many years, if not for the entire history of the district.

#### HOUGHTON—Aug. 13

**Suspension at the Winona** is most unfortunate, coming just at a time when the large rock tonnage made it seem possible that Winona would solve the problem of making ends meet and when concentrating experiments were being conducted with a view of securing better copper extraction. The Winona will continue its experiments with leaching processes during the suspension of mining operations. Manager Seeber regretted the necessity for suspension at this time because he believed that he had the most capable and efficient underground working force that the Winona ever had been able to secure. Furthermore, all of the underground openings at the mine were in good-looking rock, quite the equal of the best average of any of the shafts at any time in the history of the property.

**Effect of the European War**, while less damaging, perhaps, on the Lake Superior copper region than upon other copper-producing districts, will be to put many copper mines of this region out of business. Managers of mines here are hoping for the best, but fearing orders for suspension or curtailment or wage reduction at any time. At this writing the effect has not been serious, less than 1000 men having been laid off because of the war. The Hancock mine, employing 200, suspended. This mine operated on borrowed capital, pending the sale of its product. With no market for copper, further financing was out of the question. Winona likewise shut down, laying off 450 men. At the

Ahmeek, Isle Royale, Osceola, La Salle and other Calumet & Hecla subsidiaries, all exploration and construction work has been suspended for the time being, but there are as yet no curtailment orders, and production of copper will be maintained as long as the companies can finance the pay-rolls. The lumbering interests will take care of a good many of the men thrown out of employment. Mines that contemplated increasing their working forces and adding to their production have suspended such plans for the time being.

#### MARQUETTE—Aug. 8

**No Hope of Improvement in Iron Trade** during the closing months of the season of navigation is entertained by the average Lake Superior operator. It was expected that with the decision in the Eastern freight rate cases announced by the Interstate Commerce Commission, the industry would benefit, in common with others, but no sooner had the uncertainty confronting the railroads been removed than there arose the European war, a result of which has been the stoppage of American exports of steel. The ore shipments from the Lake Superior region to date aggregate only 60% of the amount forwarded in 1913, approximating on Aug. 1, 14,500,000 gross tons, as against 23,000,000 a year ago. The operators will be satisfied if only this ratio will be maintained the rest of the season.

#### LEAD—Aug. 8

**U. S. Commission on Industrial Relations** was in Lead last week, taking testimony. Supt. T. J. Grier, of the Homestake, was on the stand several hours, answering questions regarding conditions of labor, attitude of company toward unionism, politics, etc., card system, employment office and numerous benefices of company. Bishop Joseph F. Busch, of the Roman Catholic church, on the stand told of his endeavor to have company make Sunday a compulsory day of rest. Supt. Grier later stated men did not desire to lay off; that all who wished to do so were given privilege by shift bosses. Some petty grievances were aired by individuals. In closing hearing, Prof. Commons, acting head of commission, highly praised Supt. Grier and Homestake management for work done for employees. He believed conditions of laboring men in this mine to be better than at any mine commission had yet visited. He praised recreation hall, free hospital, employees' aid fund, hours of labor and efforts of company to maintain cost of living at low figure. He stated that he was pleased with practically everything except lack of compulsory Sunday observance, and gave his hearers impression that he would recommend Congress to pass laws compelling it. He also referred to control of city of Lead by Homestake company as a "benevolent despotism."

#### SILVER CITY—Aug. 10

**The El Paso Smelter** has a large quantity of ore in bins awaiting treatment and it is understood that it will not close down. However, it is believed it will be forced to slightly curtail operations until there is a turning point in the European situation and a rise in the price of copper.

**Chino Production Has Been Reduced** by half. The entire night shift of eight shovels has been discharged and the operation of the concentrator at Hurley reduced to five days, being idle Saturday and Sunday. The number of men laid off at Santa Rita will not exceed 500 out of a total of 1500 employees. It is reported that the company took into consideration efficiency and seniority of service, also the fact of employees having families in making discharges. Situation has been brought about by the general demoralization of the copper market developing from the European crisis. It is the opinion of men in charge of Chino Copper Co. operations that these conditions will not last over three months, when the usual capacity of the company will be resumed. The Burro Mountain Copper Co., subsidiary of Phelps, Dodge & Co., operating in the Burro Mountains, has laid off all mill-construction-work employees. The company, however, has not curtailed mine development. Reports come from Mogollon that forces in the gold and silver mines have been lessened owing to the stringent money market.

#### TORONTO—Aug. 8

**Effect of the War on Silver Mining** at Cobalt has been seriously felt, due to the decline in the price of silver. The last settlement made by the smelters for the month of July was on a basis of 52½c. per oz., being 7c. lower than the average for 1913, and since then the American Smelting & Refining Co. has notified producers that owing to market uncertainties it will advance only 25c. per oz. on silver, and settle by arbitration later when conditions have become stable. As a consequence, some mines which have been operating on a narrow margin will close down until the market becomes normal again. Among the mines which have already shut down are the Beaver and the Timiskaming.



# The Mining News

## ARIZONA

### Cochise County

**COPPER QUEEN (Douglas)**—A reduction of 10% in wages of 2000 men employed by Copper Queen and Calumet & Arizona smelteries was put into effect last week; 500 men were laid off. Similar reductions in the Bisbee mines of the two companies were made.

### Gila County

**MIAMI COPPER CO. (Miami)**—Wages have been reduced 10% in the case of the men who continue to work full time. However, a large part of the force is now engaged only part time in view of the company's curtailment of production.

### Pinal County

**RAY CONSOLIDATED (Ray)**—As a result of conditions caused by European war, mines have reduced working forces to half time; 2000 men are affected.

## CALIFORNIA

### Amador County

**CENTRAL EUREKA (Sutter Creek)**—Thirty stamps are now dropping. Mine is looking better than for some time. Work will be resumed on 700-ft. level.

**PLYMOUTH CONSOLIDATED (Plymouth)**—New 30-stamp mill and Hardinge mills were in commission July 30. Mine was developed by California Exploration, and has now been turned over to the London Consolidated Gold Mines. Mine is an old one, a large producer in early days, but had been idle for 24 years before present operators took it over.

### Butte County

**PENNSYLVANIA DREDGING CO. (Oroville)**—Purchase of 40 acres of prune orchard on Feather River near Oroville is reported. Land on all sides of this 40 acres has been dredged.

**FORBESTOWN CONSOLIDATED GOLD MINES (Forbestown)**—It is reported that negotiation for sale of property to Minissing Mining Co. of Canada, has been practically completed. It is understood that company will develop mines on a large scale. Scarcity of water for power has interrupted operation of 20-stamp mill but development has progressed. Shoots of good ore have been recently developed by crosscuts.

### Calaveras County

**MELONES (Melones)**—Leaching plant is being installed to treat tailing from 100-stamp mill.

**CALAVERAS COPPER CO. (Copperopolis)**—Reopening of mine is delayed it is reported by lack of funds, but mine water is being treated for copper.

**ARGONAUT (Jackson)**—A good orebody has been disclosed on 4050-ft. level, showing same width and grade as in upper level. The 40-stamp mill is running full capacity. Preparations are being made for removal of mill and probably addition of 10 stamps.

### Eldorado County

**PACIFIC (Placerville)**—Diamond drilling is in progress at lower stations. Old shaft had been deepened to 2000-ft. Diamond drilling had been done previously, but results have not been made public.

### Inyo County

**TECOPA**—This property owned by Graves lead interests of Philadelphia, is shipping 50 tons of ore per day over Tonopah & Tidewater R. R.

**CERRO GORDO (Bishop)**—Financial affairs and litigation are said to have been satisfactorily settled. Mine is in good working order. Regular shipments of 15 tons per day of high-grade gold-silver-copper-lead ore are being made.

**WILSHIRE BISHOP CREEK (Bishop)**—Arrival of tube mill completes shipments of machinery for new plant. Mine is now clear for inspection. Development of orebody is in progress. Recent careful sampling showed minimum low-grade ore at \$3.60 and minimum high-grade at \$24.60 per ton.

### Modoc County

**HESS (Canby)**—A 12-hp. engine, pump and 1200 ft. of pipe are being installed. Development has disclosed ore in west shaft.

### Nevada County

**HENKS (Nevada City)**—This property in Secret Cañon, including Bull Moose placers and Squires claims are reported to have been leased to Western States Mining & Development Co.

**GOODWIN (You Bet)**—Anti-Débris Association has secured an injunction in superior court of Sutter County to restrain dumping of hydraulic tailing in Yuba River. Mine was recently reopened and said to be especially equipped to avoid damage to water of river, but association claims that damage is being done.

### Placer County

**NEW YORK MINING CO. (Auburn)**—Preparations are being made for developing Trinidad mine on north fork of American River. New water flume is being built.

**DAIRY FARM (Sheridan)**—Narrow-gauge railroad will be built between Sheridan and the mine seven miles, for transportation of materials and hauling out ore to Southern Pacific R. R. for shipment. Mine, which has been a producer of

both gold and copper, has been taken over and is under development by Guggenheim interests.

### Shasta County

**MILKMAID (French Gulch)**—Lower levels will be explored with diamond drill. Results will determine whether or not shaft will be deepened.

**MIDAS (Harrison Gulch)**—First payment is reported to have been made by Victor Power & Development Co. on purchase price of mine, purchaser to take over property Aug. 1.

### Trinity County

**DEMOCRAT (Weaverville)**—A 60-ton crushing plant and other machinery is contemplated by owner E. E. Harrigan.

## COLORADO

### Boulder County

**BLACK CLOUD (Boulder)**—Local men are remodeling plant with view to doing custom milling. Seaman & Girard are in charge of work.

**WHITE HAVEN (Ward)**—Since L. A. Ewing secured this mine in March, 1913, he has shipped 1875 tons of ore. Present production is three carloads per week. Ore contains silver and lead.

**YELLOW PINE (Crisman)**—Trio Mining Co., successor to late George R. Williamson, owner, struck lens of ore above 8th level, 1000 lb. of which ran over 300 oz. silver per ton. Shipments of good grade continue. Property is credited with total production of \$750,000 and an output, so far this year, of \$100,000.

**CARIBOU (Caribou and Cardinal)**—Norton H. Brown, superintendent for new company is directing reconstruction of old mill at Caribou, and is unwatering Caribou and Poorman shafts. No Name shaft will be used as mouth of mine for proposed new operations. Company is also re-timbering long Boulder County tunnel and fixing up Cardinal mill at its portal. Electric power will be used throughout.

### Clear Creek County

**ONEIDA-STAG MINING & MILLING CO. (Freeland)**—Two companies, the Oneida and Old Stag, have consolidated. Properties are near the Lamartine mine and are credited with a production of \$40,000. New 50-ton mill will be erected to treat ore by continuous decantation.

**HUBERT (Black Hawk)**—Stroehle concentrator treated lot of ore from this mine, recovering first-class concentrates assaying 60% lead, 30 oz. silver and nearly 3 oz. gold. Second-class concentrates ran over 1 oz. gold. Same mill has recently treated shipments from Homer, Bonanza, Senator and Argo mines.

### Gunnison County

**LEXINGTON MINES CO. (Crested Butte)**—Company was recently incorporated to operate Hope group in Italian Mountain district.

**MONTE CRISTO (Crested Butte)**—C. C. Bruner, manager, is preparing to install mechanical equipment to handle placer heretofore washed by primitive methods.

### Lake County

**WALKER TUNNEL (Leadville)**—Compressor has been installed and electric transmission line is nearly completed. This bore is being driven into Mosquito range at eastern margin of Leadville district to intercept a known mineralized fault. A large, low-grade orebody is anticipated.

**TENDERFOOT (Leadville)**—Some weeks ago a serious cave-in occurred along a drift leading to principal stopes. As ground is treacherous and caves through to surface, it was deemed necessary to drive a long curving drift around the bad ground. This is nearly finished and shipping will soon be resumed. The ore is high-grade lead. Same shoot extends into Antelope property where J. B. Stewart is driving to reach it.

**YAK TUNNEL (Leadville)**—John Moyle, foreman, was killed by a blast after all miners had left Silver Cord mine July 31. He entered a stope to post instructions for next shift regarding placing of timbers. When he did not come from tunnel in due time, some of his men began a search and found him badly injured and covered with ore. A delayed round of shots had caught him just as he entered. He was taken first to a local hospital, then to a Denver hospital where he died next day without regaining consciousness.

### San Juan County

**SLIDE (Silverton)**—Contractors driving new crosscut adit into this group on Stony Pass reached Slide vein 700 ft. below its outcrop and found it 6 ft. thick.

**SILVER LEDGE (Silverton)**—Lessee Louis Bonavedi who, some time ago, constructed a cement wing-dam to divert a creek from seeping into his workings, now has unwatered to fourth level and, while continuing this work, will begin mining in upper levels.

### San Miguel County

**TOMBOY (Telluride)**—Building of new cyanide mill is proceeding since delivery of lumber, and management expects plant will be completed in time for winter operation.

**SUFFOLK MILL (Ophir)**—Reinohl cyanide mill is completed and has been tried commercially. Equipment includes crusher, stamps, plates, tube mill and agitator; capacity is 70 tons.

## IDAHO

## Bonner County

**BONNER MINING CO.**—Contracts for 200 ft. of development on Marguerite property on Trestle Creek, two miles from Pend Oreille Lake, in northern Idaho, have been let. Considerable work has been done on the claim and gold-silver ore has been opened in upper workings, according to Chester C. Robbins, secretary-treasurer, and work will be an extension of a lower tunnel, which should open oreshoot at a depth of 500 or 600 ft., when company expects to commence shipping ore to smelter. Present work will be done with machine drills, with current furnished from power plant owned by Black Bear Mining Co., a short distance from the Marguerite. Bonner Mining Co., owning Marguerite and other valuable claims, is a reorganization of old Marguerite Gold Mining & Milling Co. The stock is assessable and four assessments a year will be made to continue development. Idaho Power & Construction Co. has under construction a power plant on Trestle Creek, 1½ miles below mine, with view of furnishing it and other properties in that district with electric power for development and milling purposes.

## Coeur d'Alene District

**CALEDONIA (Kellogg)**—At a recent meeting, directors decided to carry but a comparatively small amount in treasury and to disburse remainder of earnings in monthly dividends of 1 to 1½c. per share, and that if nothing unforeseen arises, payments will be begun in 60 days. Earnings in July, when 700 tons of concentrates were shipped, were 1½c. per share on entire outstanding capitalization of 2,600,000 shares. One unit of Bunker Hill & Sullivan mill that has been set aside for treatment of Caledonia ores has a capacity of 300 tons, but has been working but one shift to date. When operating at full capacity it will handle three times amount of ore being put through it now. All workings connecting Caledonia with lower main tunnel of Bunker Hill & Sullivan have been completed, and Caledonia company contemplates operating at capacity as soon as possible.

**IDORA HILL (Wallace)**—Operations were resumed July 30 at mine on Sunset peak, which has been closed down since Apr. 10. For present but a small force will be employed, and later it will be increased. Just before property was shut down, an 80-ft. stope was opened in No. 2 level. Ore is high grade, and engineers who have examined mine, report that there is between \$8000 and \$10,000 worth of ore ready for immediate extraction. This will be shipped at once and profits applied on company's outstanding indebtedness. Last assessment levied, 1c. per share, is being paid into treasury rapidly, and there is no doubt that funds on hand will be sufficient to retire \$13,000 second mortgage, due in September. Affairs of company are being slowly straightened out, arrangements having been made that are satisfactory to all claimants, except a few who have small labor liens and are endeavoring to mulct heavy penalties.

## Shoshone County

**MONTANA-IDAHO (Adair)**—This company, owning a group of eight claims near Adair station, on Chicago, Milwaukee & St. Paul R.R., in northern Idaho, has been perfected and the following officers and directors elected: H. F. DeBowers, Chicago, president; W. J. Kirby, Spokane, vice-president; John L. Dirks, Spokane, secretary-treasurer, and Otis Hall, Spokane, formerly president of the Monitor Consolidated Copper Mining Co., general manager. Company was organized to purchase and develop group above mentioned and Monitor Consolidated copper mine, which it owns, to furnish an outlet to railroad for ores of adjoining properties, among which may be mentioned Richmond, St. Lawrence, Copper Age & Edison and Wampum. It is proposed to drive a 7500-ft. tunnel to and under 700-ft. shaft on Monitor.

## MICHIGAN

## Iron

**BAKER (Iron River)**—This property has been closed, management deciding not to mine any more ore until market improves.

**MILLIE (Iron Mountain)**—Dessau Mining Co. has closed this mine and all hands have been discharged. Property has been active but a few months and a small force was employed. Company's lease expires within a few years and it was believed that operations would continue until that time, but trouble was experienced in selling product.

**OLIVER IRON MINING CO. (Ishpeming)**—This company has started to pay its employees with scrip on Marquette range, and it is thought that same policy will be adopted other places where mines are being worked. It is believed that money is going to be tight and officials deem it advisable to take precautionary measures. Miners do not object, as they know that scrip issued by Steel Corporation is good, and no comment is heard. The last time that scrip was seen on iron ranges was in 1907.

**CLEVELAND-CLIFFS IRON CO. (Ishpeming)**—This company is now shipping in a satisfactory manner from most of its properties, and a number of big stockpiles will be cleaned up by fall. However, there are some places where it is moving little ore and arrangements are now being made for more stocking room. A large part of ore in stock at Ishpeming will go forward, but there are several large piles in Gwinn district and at Negaunee. Shipments from Marquette during July were close to 300,000 tons, most of which was sent out by Cleveland company. A total of 1,500,000 tons will be shipped by this concern during season.

## MINNESOTA

## Duluth

**MINNESOTA STEEL CO.**—All construction work has been discontinued and approximately 600 men have been laid off.

## Cuyuna Range

**COMPARATIVE VALUATIONS OF CUYUNA PROPERTIES**—As to comparative valuations, in eyes of tax assessor, of different Cuyuna range mines, following valuations for current year's taxes have been fixed, subject to change by state tax commission: Rowe mine (pit), \$3,000,000; Armour No. 2 (underground), \$1,000,000; Thompson (pit), \$1,000,000; Iron Mountain (underground), \$25,000; Duluth-Brainerd (underground), \$15,000; Kennedy (underground), \$200,000; Wilcox

(underground), \$200,000. All ore in stockpile was valued at 75c. per ton.

**SEVILLE (Virginia)**—Will begin shipments from stock pile Aug. 3. Property will ship but 8000 tons this season.

**KENNEDY (Cuyuna)**—Has started shipping from its 90,000-ton stockpile at rate of 2500 tons daily. Also shipping its daily product of 500 to 600 tons.

**ARTHUR IRON MINING CO.**—Leasing of another 160 tract in Sec. 11, 57-21, by this company to Tod-Stambaugh company indicates policy of Great Northern Ore Securities Co. in regard to its Mesabi range iron ore properties, this being second lease given within last month. New property adjoins Morton mine of Tod-Stambaugh Co., and it is stated that property will be mined through that shaft.

**BRAINERD-CUYUNA (Brainerd)**—Considerable difficulty is being experienced in getting down second shaft, due to sand and water troubles. It was planned to drive sheet piling through quicksand strata to ledge from inside the lath shaft, but this has been unsuccessful, and operations are now at a standstill until other methods can be devised. First shaft, also a lath shaft, was temporarily abandoned because of sand and water boils.

**ROWE (Riverston)**—County board of equalization recently placed a valuation, for taxation purposes, of \$3,000,000 on this property, being highest valuation on any mining property on Cuyuna range. Deposit is variously estimated from 25,000,000 to 100,000,000 tons, latter figure being that given by operators themselves. Shipments are going forward to dock daily, but output is leaner than it will be later on, when better grade portion of deposit is reached. Hydraulic stripping apparatus continues at work enlarging pit.

**BARROWS MINING CO. (Barrows)**—Company just organized, \$250,000 capital, shares par \$1, for purpose of exploring property in Sec. 16, 44-31, controlled by Northern Pacific interests. Property is near town of Barrows. It is planned to sink a three-compartment concrete shaft, under direction of C. B. Rowley, who has recently patented a number of improvements especially adaptable to shaft sinking under Cuyuna range conditions. Directorate of new company is practically same organization that has developed Cuyuna Iron & Manganese Ore Co. property, adjoining Pennington pit, on which property Jones & Laughlin now have drills checking up tonnage.

## Mesabi Range

**MESABI RANGE INJUNCTION SUITS**—At both Mountain Iron and Buhl, Minn., where mining companies have enjoined village officials for alleged extravagance, efforts are being made to compromise matters. At Buhl, proposed tax levy has been reduced for 1915 by \$40,000, and at Mountain Iron 200 men previously employed on concrete street work have been shifted to other work.

## MONTANA

## Silver Bow County

**BUTTE & SUPERIOR (Butte)**—During July, zinc tenor of concentrates, produced at company's mill, reached 55%. In first quarter of 1914, in spite of low price of spelter, company's earnings were nearly twice as large as in first six months of 1913.

**CHICAGO, MILWAUKEE & ST. PAUL RY.**—C. A. Goodnow, assistant to President H. B. Earling, of the company, announced, July 31, that contemplated work on electrification of road will be stopped for an indefinite period. No work has been done for past few weeks. It was stopped when railroad company refused to treat with labor organizations made up of men not actually in employ of company. Result was a strike. Electrical workers made demand for an 8-hr. day at \$5. Controversy centered on right of electrical workers to set poles for transmission lines.

**SALE OF PARROT MINING CO.'S PROPERTY**—Judge Bourquin, in Federal court, July 31, ordered decree to be entered to effect that sale of Parrot company's property to Anaconda company, which took place in 1910, was valid and legal. Suit to have sale set aside and for an accounting was brought against Anaconda company by W. E. Wall and others as minority stockholders of Parrot company. Plaintiffs alleged that in 1899, A. C. Burrage, William Rockefeller, H. P. Rogers and 15 others purchased controlling interest in Parrot stock and thereafter conspired to dispel assets, acquiring them at less than their real value and finally selling them to Anaconda company. Decision says that two-thirds of Parrot stockholders consented to sale, that plaintiffs had secured an appraisal of Parrot property in court, that no fraud was shown, and that Parrot company probably got a better price from Anaconda company than it could have gotten from any other purchaser.

**BUTTE MINES AND GREAT FALLS SMELTER CLOSED**—Down Aug. 1, according to announcement by Anaconda Copper Mining Co. that Great Falls smelter, reduction and refining plant and seven of company's Butte mines would close down immediately to curtail present production, made necessary by demoralization of export trade to Europe. In selecting mines to be closed those were chosen where production costs averaged highest, viz.: Mountain Consolidated, Pennsylvania, High Ore, Badger State, Poulin, Tropic and Ella. Shutdown will result in laying off of 2000 miners in Butte and 700 smelter men in Great Falls. Daily output of closed mines was 3000 tons of ore, corresponding to amount of ore shipped daily to Great Falls. Washoe smelter at Anaconda will continue to handle usual amount of Butte ore, approximately 11,000 tons per day, and all other Butte mines of Anaconda company will be kept going unless future developments in political and industrial conditions make further curtailment necessary. C. F. Kelley, of Anaconda company, states that shutdown of company's mines has no reference to local conditions. Butte & Superior, North Butte, East Butte and other smaller independent companies in Butte camp will continue operations and maintain normal output for the time being. Opinion prevails that larger companies, such as Amalgamated, Phelps-Dodge and others, would reduce copper output sufficiently to take care of decreased demand. News of shutdown was received with tranquility in Butte. It is generally believed that trouble in Europe could not last many weeks because of tremendous cost of a war between nations involved.



## NEVADA

## Elko County

ELKO PRINCE (Gold Circle)—Option held by Goldfield Consolidated has been relinquished after thorough examination.

## Esmeralda County

JUMBO EXTENSION (Goldfield)—During July, 2550 tons of ore was milled at Goldfield Consolidated plant and four cars shipped to Miller's plant of Western Ore Purchasing Co. Ore is being stoped above 921-ft. level in Velvet claim, and southeast crosscut on 1017-ft. level is being driven in shipping-grade ore.

SILVER PICK (Goldfield)—Winze is being sunk from 500-ft. level on 2-ft. shoot of good-grade ore; other development work is being done on this level. North drift toward Red Ton property of Goldfield Consolidated, is being driven on 3-ft. shoot of ore assaying \$5 to \$7. Total of 352 ft. of development work was done in July.

## Lincoln County

AMALGAMATED PIOCHE (Pioche)—Increased volume of water is entering workings. Water in Black Ledge winze has been lowered 3 ft. Pumps at No. 4 shaft have been giving some trouble.

## Lyon County

MONTANA-YERINGTON (Yerington)—Option has been granted on this property which was recently relinquished by Mason Valley Mines Co., and work will commence at once.

## Mineral County

ROCKLAND MINE (Rockland)—Installation of new mill is under way. Power line of Truckee River General Electric Co. is being extended from Pine Grove.

## Nye County

MINE RESCUE AND FIRST AID TO TONOPAH is being taught by Government rescue crew. Six teams have been organized and drilled. A team will be drilled in Round Mountain; car will then go to Blair.

TONOPAH MIDWAY (Tonopah)—Work through No. 1 shaft will be discontinued and property will be developed through new main working shaft.

HASBROOK (Tonopah)—This mine, south of Tonopah, is shipping ore to McNamara mill. Development work is progressing with satisfactory results. A 10-stamp mill may be built.

MANHATTAN CONSOLIDATED (Manhattan)—Mill is being overhauled and will be ready for operation Aug. 1. Ores from Consolidated company, Consolidated Leasing Co., and White Caps lease will be treated. Water supply will be obtained from Earl workings of Consolidated company and White Caps. A large tonnage of low-grade ore has been developed.

## Storey County

UNION CONSOLIDATED (Virginia City)—Triplex, electric pump has been installed underground, preparatory to commencing work on 2650-ft. level.

## Washoe County

ARKELL (Reno)—Good-grade lead-zinc ore is being opened in development work. Shipments have been made. A mill may be built, it is stated.

## White Pine County

WILLOW CREEK GOLD MINING CO. (Ely)—Drifting on main vein and sinking below tunnel level are under way. Both faces are in good-grade ores.

WIDE WEST (Cherry Creek)—Right to work through tunnel of North Mountain Mining Co. has been obtained and tunnel will be driven into Wide West ground. North Mountain mine will be put in condition to operate, by Wide West Co., which is part of agreement.

## NEW MEXICO

## Grant County

NOVEMBER MINING & MILLING CO. (Granite Gap)—Tram is being built from upper workings to ore bins at No. 3 workings. Crushing plant is under consideration. Five exploration drills are in operation.

C. & O. MINING & MILLING CO. (Pinos Altos)—Company continues to mine bankable ore from Langstone mine, Pacific vein. Over \$60,000 now deposited in Silver City American National Bank. Ore is richest in gold ever mined in Southwest in recent years.

## Sierra County

SILVER MONUMENT MINE (Chloride)—Property has closed down indefinitely.

## Taos County

CARIBEL (Red River)—Underground development is being hastened. Experimental cyanide treatment is being done.

ANACONDA (Red River)—Orwig & Farris are experimenting with leaching process for treatment of low-grade carbonate-copper ore.

## OREGON

## Baker County

AZURITE—(Homestead)—Company is considering building a mill for this mine on Snake River.

CAÑON MOUNTAIN—Mine, which has been closed for some time, is to be reopened, and men are retimbering main tunnel.

LAST CHANCE—(Sumpter)—A 20-stamp mill has been purchased and is now being installed. Other improvements are contemplated.

MOON ANCHOR—This property in the Cable Cove district has been purchased by Anthony Mohr and others of Portland. It is intention of new owners to increase scale of operations.

## SOUTH DAKOTA

## Lawrence County

CUSTER PEAK (Roubaix)—Reported this company will resume development of its copper property.

JUNGLE (Roubaix)—Work of erecting copper leaching plant is progressing. Portion of machinery has been secured second hand, in this district.

ORO HONDO (Lead)—Shaft has been deepened 100 ft. since J. T. Milliken authorized work commenced. This makes shaft 1150 ft. Three shifts of miners, using jackhammer drills, are employed.

HEIDELBERG (Two Bit)—Announced that state securities commission, which enforces South Dakota's "blue sky" law, has authorized company to sell to public block of treasury stock for development purposes. Proposed to sink shaft to quartzite, following ore. Planned to raise to surface, about 100 ft., from incline tunnel. Steam machinery will be used.

HOMESTAKE (Lead)—Recreation Hall gradually is being opened to public as various departments are completed. Swimming pool, billiard rooms and Hearst library have been opened. Other features will be opened as soon as finished. Building, with equipment, including large theatre, cost over \$250,000, and is gift of company to employees. Courtesies of building are extended to all residents of Lead, Deadwood and other towns.

## CANADA

## Ontario

NORTH THOMPSON (Timmins)—Satisfactory results have been obtained by diamond drilling. A surface vein has been cut at 200 ft. indicating good milling ore over a width of 16 feet.

VIPOND (Schumacher)—Underground development has been resumed at this mine, which has been closed down for nearly two years. Mill is expected to be in running order in September.

COBALT LAKE—(Cobalt)—At a meeting held in Toronto on Aug. 5, shareholders formally adopted resolutions passed by directors for winding up of the company involving distribution among shareholders of 750,000 shares of Mining Corporation of Canada, the English company with which the Cobalt Lake has been merged.

LA ROSE (Cobalt)—Company has taken an option on Kensity claims in Boston township. This is first outside property La Rose has shown any disposition to acquire. Surface showing is small but grade of ore reported satisfactory. Financial statement sent out with June dividend shows that surplus has been reduced to \$1,359,920 from \$1,528,776, at which figure it stood Dec. 31, 1913.

HOLLINGER (Timmins)—The 20-stamp addition to mill has been completed. Next month foundations will be laid for the 20 stamps to be reserved for ore from the Acme gold mine, which has already enough ore blocked out to keep it going for some time. The main vein of the Hollinger has been cut at the 675-ft. level, where it is 12 ft. wide and carries usual grade of ore. No. 41 vein has been picked up on the 200 ft. level.

## MEXICO

## Sonora

MINNEAPOLIS COPPER CO. (Cumpas)—J. W. Christy who has been in charge of affairs of company since former manager retired has shipped six cars of ore to Douglas smelteries. Christy has put different departments on a strictly business basis and as a result property is being developed, back bills are being paid off and future outlook is better than it has been for many years.

GREENE-CANANEA (Cananea)—Furnaces are again running normally and camp would be as quiet as ever if it were not for the fire which was started by some dissatisfied strikers in the Oversight and Veta Grande mines. Both are now reported to be under control without having bulkheaded the shaft. Fourteen of the ringleaders were recently deported and sent to Naco and on being refused admission to the United States were sent to Agua Prieta where they were photographed and their pictures sent to the different camps so that if they were in the camps they could be watched.

NACAZARI CONSOLIDATED COPPER CO. (Nacozari)—New mill is making a much better saving than was expected and production is increasing. At present mill is making 3 tons of lead concentrates and 6 tons of zinc concentrates per day. Tables are being added as gray copper in ore has been sliming and a large part of it has been lost. Company has secured leases on several other properties close by and will start to work on them at once and mill ore from these mines as until now this ore could not be handled as it was too low a grade to ship and there is no other custom mill in the district.

## PERU

CACHI-CACHI—These placer gold mines, not far from the Apurima mines, in the Province of Sandia, Department of Puno, at an elevation of 5000 ft., are planning to begin operations and it is stated that a majority of the stock has been subscribed in Chile and the United States. It is proposed to organize the company with a nominal capital of \$250,000 U. S. currency, under Delaware charter. All the equipment and supplies will be shipped from points of purchase to Tirapata station of the Peruvian Southern Rys. From there such supplies and equipment as conform to the limitations of llama transportation will be so shipped, and the rest will be shipped in on mules, except a few pieces too heavy for mules, which will be carried to Anoccala by wagon and then carried by Indians to Cachi-Cachi.

## CHILE

CHILE EXPLORATION CO. (Chuquicamata)—Production will not be delayed by European war; what little machinery—principally for power plant—not yet arrived from Europe has been reordered in U. S., and no delay is expected. Reorders of machinery placed before war was declared.

# The Market Report

## METAL MARKETS

NEW YORK—Aug. 12

A daily trade paper, which is identified with a metal brokerage firm, finds fault with us for suspending our quotations of the copper market, ignoring our very plain statement regarding it; and also ignoring its own remarks, on Aug. 3-5, which were in harmony with the statements of the agencies that there was no market at that time. The precisely similar situation in silver was also ignored. A reprinting of the previously published remarks of this paper, if they were worth the space, would show the maliciousness of its subsequent criticism, just as a comparison of its quotations in the past with the average of the sales effected by the producers would show how ridiculous they often are. We do not quote the markets on the basis of carload business or of the relatively small transactions among speculators but we record on the basis that the great bulk of our copper output goes into consumption, which business is done directly by the producers and selling agencies, without the intermediary assistance of speculators and brokers.

### Copper, Tin, Lead and Zinc

**Copper**—In the early part of our review week, one producer sold 500,000 lb. of electrolytic copper to a consumer at 12½c., delivered, usual terms; another sold 500,000 lb. at 12½c., delivered, usual terms; another sold 300,000 lb. of a special brand at 12½c., delivered, usual terms; other producers and agencies report no sales at all during the week. The daily papers have been quoting copper all the way from 12¼ to 12¾c. The fact is that wire drawers, rollers and brassmakers at present are inert in the market. Those needing copper can obtain it at prices somewhere within the range mentioned, but producers cannot find customers for what they would naturally want to sell, and pending readjustment from the paralysis there is no market, properly speaking, and consequently we do not quote. The situation in silver is exactly the same.

Smelters and refiners who have heretofore been settling for receipts of copper on quotations are making advances upon consignments with the understanding that final adjustment of accounts is to be made when there is once more a market; and intend so to continue until further notice. In the meanwhile, shippers have been urged to curtail their production as much as possible, and in conformity with the steps that have been taken by other producers. Smelters buying ore from Colorado, Utah and elsewhere are for the time being, or until further notice, advancing 10c. per lb. on copper and 25c. per oz. on silver, final adjustments to be made when there is a market; in other words, when the metals can be freely sold.

Base price of copper sheets is now 18½c. per lb. for hot rolled and 19½c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 14¼ @ 14½c. per lb., carload lots at mill.

Copper production of the Phelps-Dodge companies in July was: Copper Queen, including custom ores, 7,817,318 lb.; Detroit, 1,966,526 lb.; Moctezuma (Mexico), 2,866,527; total, 12,750,371 lb. blister copper.

**Tin**—Sales of small quantities are made at fancy prices, but there is no wholesale market for the reason that there is no wholesale supply.

**Lead**—A scattering business in moderate tonnages was reported right through the week. There was considerable confusion respecting prices reported, and on the face of things this market looks rather paradoxical. The explanation is that there is a wide difference of opinion among sellers. At the close of last week there was some emphatic pressure to sell. During the week of Aug. 6-12, some sellers were anxious to dispose of their supplies and were willing to accept relatively low prices, being of the opinion that the outlook for this metal is not good. Other sellers thought that the trouble in the silver market would cause a curtailment of the lead output in Idaho and Utah and have consequently been stiffer in their position. Exponents of both views made sales, what buyers had to pay being governed

apparently by the extent of the "shopping" that they did or did not do.

**Spelter**—A large business has been done at steadily advancing prices, the governing condition being the anticipation that England will shortly have to buy large quantities of American spelter. At the close of the week there were rumors, which we were unable to confirm, that sales for export had actually been made. However, it was certain that producers and agencies here had been in receipt of inquiries from abroad, and export sales will probably happen shortly if they have not already been made. The market advanced from day to day, but especially on Aug. 11, when there was a sharp rise from the opening to the close of business. Sales of a large tonnage on that day, divided among numerous transactions, as reported to us, averaged about 5.15c., basis, St. Louis. At the close of the day 5.25c. was realized, at which price there were sellers on Aug. 12 at St. Louis.

### Other Metals

**Aluminum**—Very little new business is reported. Transactions in imported metal are at a standstill. What business is being done in domestic aluminum is chiefly on contract. The quotation today is 19@20c. per lb. for No. 1 ingot, but is entirely nominal.

**Antimony**—The market has advanced rapidly during the week. Stocks here are small; it is estimated that there is not more than a month's supply on hand, and it is impossible to say when any new supplies will be available. Quotations today for ordinary brands—Chinese, Hungarian, etc.—are 16@18c. per lb.; some special brands can be had at 20c., but 22c. per lb. is paid for Cookson's.

**Quicksilver**—The price of this metal has advanced sharply but without checking sales. The advance is due to the war, which has made this country the only present available source of supply. Quotations have more than doubled during the week, and sales have been made at \$90@100 per flask. No London quotations are available.

### DAILY PRICES OF METALS

NEW YORK								
Aug.	Sterling Exchange	Silver, Cts. per Oz.	Copper		Lead		Zinc	
			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.
6	*	*	*	*	3.80 @3.90	3.70 @3.72½	4.90 @5.00	4.75 @4.85
7	*	*	*	*	3.80 @3.90	3.70 @3.72½	4.95 @5.00	4.80 @4.85
8	*	*	*	*	3.80 @3.90	3.70 @3.72½	4.95 @5.05	4.80 @4.90
10	*	*	*	*	3.80 @3.90	3.70 @3.75	5.05 @5.15	4.90 @5.00
11	*	*	*	*	3.80 @3.90	3.70 @3.67½	5.20 @5.40	5.05 @5.25
12	*	*	*	*	3.80 @3.90	3.67½ @3.70	5.37½ @5.42½	5.22½ @5.27½

\*No market.

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

The quotations for electrolytic copper are for cakes, ingots and wirebars. Electrolytic copper is commonly sold at prices including delivery to the consumer. To reduce to New York basis we deduct an average of 0.15c. representing delivery charges. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. Quotations for lead represent wholesale transactions in the open market for good ordinary brands. Quotations for spelter are for ordinary Western brands. Silver quotations are in cents per troy ounce of fine silver.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16 @ 17½c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Trieste, 22c.



**Nickel**—Quotations for ordinary forms—shot, blocks, or plaquettes—are 40@45c. per lb., according to size of order and quality. Electrolytic nickel is 5c. per lb. higher.

**Gold, Silver and Platinum**

**Gold**—The open market in London is at an end for the present, and the position of gold is too indefinite to permit more to be said than that there is a demand for it everywhere.

The \$10,600,000 taken out by the "Kronprinzessin Cecille" from New York two weeks ago and brought back to Bar Harbor last week, has been transferred by train to New York and lodged in the Subtreasury there.

Gold in the United States Aug. 1, as estimated by the Treasury Department: Held in Treasury against gold certificates outstanding, \$1,024,046,869; in Treasury current balances, \$230,891,204; in banks and circulation, \$632,332,591; total, \$1,887,270,664, a decrease of \$3,407,640 during July.

Gold production in the Transvaal in July was 732,485 oz., being 14,559 oz. more than in June, and 77,096 oz. more than in July, 1913. For the seven months ended July 31 the total output was \$109,464,393 in 1913, and \$99,429,562 in 1914; a decrease of \$10,034,831, or 9.1%, this year.

**Platinum**—There has been an advance in price, which is variously gaged at \$10@15 per oz. for refined platinum, making quotations \$55@60 per oz. Dealers are reluctant to quote, however, expecting a further advance, as supplies from Russia are cut off entirely.

**Silver**—Messrs. Handy & Harman issued the following statement on Saturday, Aug. 8, regarding the situation of the silver market: "From cables received today we learn that the official price of silver was established in London yesterday at 26d., covering spot transactions only. News items state all silver in London has been taken over by the English Government. Due to delays in cable transmission, we do not know whether there was any market established in London today or not. An official quotation in London of 26d. would warrant a New York quotation of 52c., as the cost of freight and war insurance, with usual charges, at the present time amounts to 6¼c. per ounce. We are not, however, able to sell in London even if a market is established there owing to delay in the transmission of cables and difficulties of transactions in foreign exchange. A New York market, therefore, cannot be established until cables can be transmitted promptly and transportation can be made safe and the financial condition clears up."

The suspension of silver quotations produced a critical condition among silver miners, although the facts of the situation were promptly and fully recognized. Pressure was immediately exerted from Colorado, Utah, etc., upon Washington to induce the U. S. Mint to buy silver. The Mint authorities consequently entered into negotiations with the smelters, as a result of which the Mint on Aug. 11 agreed to take 1,175,000 oz. at 52c. per oz., delivered at the Eastern mints, on condition that the smelters would agree to liquidate all silver that would have to be settled for up to the end of that day (Aug. 11) at the same price. To this the smelters and refiners immediately agreed, being desirous of assisting the situation, notwithstanding the fact that the quantity they had to take at the Mint price was greatly in excess of what they were selling to the Mint.

Shipments of silver from London to the East, Jan. 1 to July 30, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India.....	£4,251,500	£4,351,500	I. £100,000
China.....	462,000	42,000	D. 420,000
Total.....	£4,713,500	£4,393,500	D. £320,000

Coined silver in the United States Aug. 1 is reported by the Treasury Department as follows: Standard dollars held against silver certificates, \$487,157,000; in Treasury current balances, \$8,701,521; in circulation, \$69,981,742; total dollars, \$565,840,263; subsidiary coins, \$182,447,443; total silver, \$748,287,706, an increase of \$177,573 during July.

**Zinc and Lead Ore Markets**

**JOPLIN, MO.—Aug. 8**

The high price of blende is unchanged at \$42.50, the assay base being \$38@40 and the metal base \$36@38 per ton of 60% zinc. Calamine sold at \$20@21.50 per ton of 40% zinc. The average selling price of all grades of zinc is \$36.50 per ton. The highest price paid for lead ore was \$47, the base continuing at \$46 per ton of 80% metal content, and the average of all grades is \$45.96 per ton.

Some producers declined to sell on the midweek drop to

a \$39 base and received later an advance to a \$40 base, the market strengthening notably at the close.

**SHIPMENTS WEEK ENDED AUG. 8**

	Blende	Calamine	Lead	Values
Totals this week	9,958,700	1,084,330	1,709,420	\$240,860
Totals 32 weeks	327,592,620	23,781,180	55,870,780	\$7,977,800
Blende value, the week, \$189,260; 32 weeks, \$6,396,440.				
Calamine value, the week, \$12,310; 32 weeks, \$268,795.				
Lead value, the week, \$38,290; 32 weeks, \$1,332,565.				

**PLATTEVILLE, WIS.—Aug. 8**

The base price paid this week for 60% zinc ore was \$38 per ton. The base price paid for 80% lead ore was \$44 per ton.

**SHIPMENTS WEEK ENDED AGU. 8**

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week .....	3,229,720	204,000	506,100
Year .....	92,590,950	2,520,500	23,162,670
Shipped during week to separating plants, 3,969,020 lb. zinc ore.			

**IRON TRADE REVIEW**

**NEW YORK—Aug. 12**

The market preserves a conservative front, with signs of increasing strength, as is well shown by our Pittsburgh report, which follows. Opinion differs as to the effect of the war upon trade, the more general belief being that it will be beneficial, at least for a time.

Steel Corporation unfilled orders on July 31 were 4,158,589 tons, an increase of 125,732 tons in July.

**Pig Iron Production in July** was on about the same scale as in June. The reports of the furnaces, as collected and published by the "Iron Age," show that on Aug. 1 there were 188 coke and anthracite stacks in blast, having a total daily capacity of 63,950 tons; an increase of 250 tons over July 1. Making allowance for the charcoal furnaces, the estimated make of pig iron in the United States in July was 1,985,500 tons; for the seven months ended July 31 it was 14,350,700 tons. Of the total 10,114,050 tons, or 70.1%, were made by the furnaces owned or operated by steel companies.

**PITTSBURGH—Aug. 11**

Following their adoption of a conservative attitude in naming prices, as noted in last report, the steel manufacturers have advanced prices in several important products, bars, plates and shapes having been advanced \$1 a ton, to 1.20c., and sheets about \$2 a ton, to 1.90c. for black and 2.90c. for galvanized. An advance in wire products, following that of three weeks ago, is expected within a week.

The steel manufacturers do not ascribe these advances wholly to the European war, as they insist that an advancing tendency had already distinctly manifested itself and that the market was on the road to recovery after having been for more than six months on the basis of practically profitless prices. At the same time the war is a direct influence in that it has made ferromanganese very scarce, with a possibility that some works will have to close before imports of the alloy or of manganese ore can be resumed. It is also an influence in that it promises, even according to the most conservative reasoning, a very large expansion in iron and steel exports from the United States. Hitherto these exports to neutral markets have been about 2,500,000 tons annually, while the countries now at war have had exports of fully three times this amount to the same markets. For the moment exports are almost entirely shut off, except to Canada, but it is understood that arrangements have been practically concluded whereby upon the passage of the pending Underwood bill, permitting American registry to American owned but foreign built vessels, a number of vessels will be purchased. It is also felt that English naval supremacy will soon be established.

The Steel Corporation's gain of 125,732 tons in unfilled tonnage in July was less than expected, a gain of 200,000 tons or more having been predicted, but still it makes a very favorable comparison with preceding months, June having shown a gain of 34,697 tons and May a loss of 278,908 tons. Bookings in July appear to have been at about 75%, shipments having been close to 65% of capacity.

Shipping orders received for finished-steel products have been running thus far this month at about the July rate, or at an average of 65 to 70% of capacity, and production in averaging the same rate. Orders placed always require

prompt shipment and thus the mills are unable to accumulate at a rapid rate if they desired, but they are anxious to keep down obligations of this sort, because contracts do not insure specifications of this sort, because contracts do not insure specifications unless the market rises and in that event contracts at low prices are a liability rather than an asset. Prices now quoted are as a rule only for specifications through September, fourth quarter deliveries being quoted \$1 to \$2 higher than prompt.

The advance in sheets, being to 1.90c. for black and 2.90c. for galvanized, involves a greater advance in galvanized than in black, the present differential being \$1 per 100 lb. against 95c. formerly, the divergence being attributed to fears of a rapid advance in spelter.

**Pig Iron**—The market is very quiet, generally speaking, showing much less activity than in July. Prices are steady, but stationary. The Standard Sanitary Manufacturing Company has bought 5500 tons of foundry iron, for August and September delivery, at approximately \$13 at furnace for No. 2. Basic and bessemer are very quiet. We quote: Bessemer, \$14; basic, \$13; No. 2 Foundry, \$13@13.25; forge, \$12.50@12.75; malleable \$13@13.25, at Valley furnaces, 90c. higher delivered Pittsburgh.

**Ferromanganese**—It is rumored that a minor steel plant in Ohio is closed through having run out of ferromanganese already. A similar rumor regarding a large eastern steel interest is regarded as incredible. The steel works in general are supposed to have a supply sufficient for two or three months off operation. The Steel Corporation, making its ferromanganese from imported ores, is believed to have a fairly good supply of the latter. It has been importuned to sell or loan ferromanganese but absolutely refuses to do so and it is doubted that it will become a seller until the situation clears up. The probability is that manganese ore imports will be resumed before ferromanganese is imported, as India and Brazil have been large sources of supply and the only desideratum is transportation facilities. There are small transactions in re-sale ferromanganese at fancy prices, one lot of about 200 tons having gone late last week at \$100 a ton while later another lot, 100 tons, went at \$120.

**Steel**—Late last week the Youngstown producers advanced their quotations \$1 a ton on billets and 50c. on sheet bars, making the Youngstown market \$20 on billets and \$21 on sheet bars, at maker's mill. Pittsburgh producers, who had not been actively in the market, are now naming similar prices, f.o.b. maker's mill, Pittsburgh. Rods are quotable at \$25, but consumers are well covered by contracts at lower prices.

**IRON ORE**

Shipments of iron ore from the Lake Superior region in July were 5,784,514 long tons, being 2,419,902 tons less than in July, 1913. For the season to Aug. 1 the total shipments were, in long tons:

Port	1913	1914	Changes
Escanaba.....	2,659,299	1,740,741	D. 918,558
Marquette.....	1,556,501	681,361	D. 875,140
Ashland.....	2,264,031	1,416,825	D. 847,206
Superior.....	7,073,413	5,690,413	D. 1,383,000
Duluth.....	5,934,664	2,949,286	D. 2,985,378
Two Harbors.....	4,841,552	2,930,004	D. 1,911,548
Total.....	24,329,460	15,408,630	D. 8,920,830

The total decrease this year was 36.7%. The smallest proportional decrease was in the shipments from Superior.

**COKE**

Coke shipments from the Connellsville region for the week are reported by the "Courier" at 269,591 short tons. The production was 269,575 tons. Output of the Greensburg and Upper Connellsville districts was 39,578 tons.

**Connellsville Coke**—The market continues altogether stagnant. There are no serious negotiations for contract furnace coke, and practically no demand for prompt. Foundry coke is also quiet, about 95% of the shipments being on contracts recently made for the twelve-month to June 30 netx. Prompt furnace coke can readily be had at \$1.75, while some sellers on contracts to the end of the year could probably be found at this same price, though there are a few operators who still maintain that \$2 is their minimum. Foundry coke is quotable at \$2.25@2.35 for prompt and at \$2.35@2.50 for contract, per net ton at ovens.

**Anthracite Shipments in July** were 5,391,857 long tons, being 738,339 tons less than in June and 96,005 tons less than in July, 1913. For the seven months ended July 31 the total shipments were 40,339,706 tons in 1913, and 38,337,646 in 1914; a decrease of 2,002,060 tons, or 5%, this year.

**CHEMICALS**

**NEW YORK—Aug. 12**

The general markets have been active and disturbed. There have been some extraordinary advances in articles which are chiefly imported, but no changes or only moderate ones in staple chemicals. A disturbed point is in potash sales, the supplies having been cut off by the war.

**Arsenic**—The market is quiet, with only a moderate demand. The producers' agreement still holds and there is no change in prices, \$3 per 100 lb. being named for both spot and futures.

**Copper Sulphate**—Business is on a fair scale with steady sales. Prices are unchanged. Quotations are \$4.50 per 100 lb. for carload lots and \$4.75 per 100 lb. for smaller parcels.

**Potash Salts**—Exports of potash salts from Germany half-year ended June 30, in metric tons:

	1913	1914	Changes
Crude salts potash.....	768,895	727,042	D. 41,853
Potassium chloride.....	192,059	159,348	D. 32,711
Potassium sulphide.....	68,234	50,062	D. 18,172
Pot.-magnesium sulphide.....	41,859	37,702	D. 4,157
<b>TOTAL.....</b>	<b>1,071,047</b>	<b>974,154</b>	<b>D. 96,893</b>

Of the total this year 406,675 tons, or 41.8% of the whole, were sent to the United States.

**COPPER SMELTERS' REPORT**

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.

	March	April	May	June	July
Alaska shipments.....	2,069,960	1,279,537	585,387	1,114,758	.....
Anaconda.....	23,800,000	22,900,000	23,500,000	23,800,000	.....
Arizona, Ltd.....	3,286,000	3,570,000	3,092,000	3,742,000	.....
Copper Queen.....	7,637,042	7,502,723	8,388,203	7,613,719	7,817,318
Calumet & Ariz.....	5,875,000	5,450,000	5,495,000	4,630,000	5,940,000
Chino.....	5,399,814	5,926,591	5,496,875	5,486,419	.....
Detroit.....	1,973,725	1,700,926	2,105,034	2,129,100	1,966,526
East Butte.....	1,546,130	1,178,000	1,179,702	1,215,323	.....
Giroux.....	1,257,980	45,948	429,553	425,000	.....
Mason Valley.....	1,250,000	862,000	916,000	950,000	.....
Mammoth.....	1,800,000	1,850,000	1,750,000	1,725,000	1,950,000
Nevada Con.....	5,218,257	4,880,043	4,959,589	4,483,175	.....
Ohio.....	597,520	610,518	625,000	605,000	.....
Old Dominion.....	2,997,000	2,779,000	3,302,000	2,937,000	2,962,000
Ray.....	6,036,908	6,089,362	6,300,847	5,947,567	.....
Shannon.....	1,082,000	1,012,000	1,056,000	1,049,227	.....
South Utah.....	406,381	247,641	55,394	84,000	.....
Tennessee.....	1,262,184	1,370,800	1,336,950	.....	.....
United Verde*.....	3,100,000	3,000,000	3,100,000	2,900,000	.....
Utah Copper Co.....	12,323,493	12,739,757	13,208,483	12,870,063	.....
Lake Superior*.....	11,000,000	13,000,000	12,500,000	16,000,000	.....
Non-rep. mines*.....	8,200,000	8,000,000	8,200,000	8,000,000	.....
Scrap, etc.....	2,500,000	2,500,000	2,500,000	2,500,000	.....
<b>Total prod.....</b>	<b>109,649,444</b>	<b>108,644,846</b>	<b>110,082,077</b>	<b>.....</b>	<b>.....</b>
<b>Imp., bars, etc.....</b>	<b>22,676,605</b>	<b>17,043,191</b>	<b>19,081,487</b>	<b>.....</b>	<b>.....</b>
<b>Total blister.....</b>	<b>132,326,049</b>	<b>125,688,037</b>	<b>129,163,564</b>	<b>.....</b>	<b>.....</b>
<b>Imp. ore &amp; matte.....</b>	<b>7,029,646</b>	<b>10,400,122</b>	<b>10,586,506</b>	<b>.....</b>	<b>.....</b>
<b>Total Amer.....</b>	<b>139,355,695</b>	<b>136,088,159</b>	<b>139,750,070</b>	<b>.....</b>	<b>.....</b>
<b>Arrivals—Europe†</b>	<b>17,572,800</b>	<b>17,299,520</b>	<b>13,558,720</b>	<b>19,040,000</b>	<b>.....</b>

† Does not include the arrivals from the United States.

**Assessments**

Company	Delinq.	Sale	Amt.
Andes, Nev.....	Aug. 10	Aug. 31	\$0.03
Aurora-Sampson, Ida.....	July 18	Aug. 18	0.002
Buffalo, Mont.....	Aug. 2	Sept. 2	0.004
C. & R., Ida.....	July 14	Aug. 18	0.001
Emerald, Utah.....	July 15	Aug. 18	0.0033
Enterprise, Ida.....	July 31	Aug. 17	0.002
Evergreen, Utah.....	July 23	Aug. 22	0.01
Exchequer, Nev.....	Aug. 13	Sept. 3	0.02
Federal-Ely, Nev.....	July 20	Aug. 21	0.005
Four Timbers, Wash.....	July 29	Aug. 29	0.0015
Franklin, Mich.....	.....	Aug. 26	2.00
Great Western, Nev.....	Aug. 10	Aug. 31	0.01
Huron, Mich. (Iron).....	.....	.....	3%
Jack Waite, Ida.....	July 21	Aug. 18	0.01
Macnamara, Nev.....	July 27	Aug. 17	0.03
Maryland, Ida.....	Aug. 5	Sept. 5	0.003
Moonlight, Ida.....	July 13	Aug. 20	0.005
Nabob, Ida.....	July 20	Aug. 17	0.005
North Bunker Hill, Ida.....	July 18	Aug. 22	0.002
North Star, Ida.....	Aug. 8	Sept. 10	0.0015
O. K., Utah.....	Aug. 17	Sept. 2	0.005
Old Evergreen, Utah.....	July 23	Aug. 22	0.01
Oreano, Ida.....	July 24	Aug. 24	0.002
Rockford, Ida.....	Aug. 14	Sept. 4	0.0015
Sierra Nevada, Nev.....	Aug. 18	Sept. 8	0.010
Spider, Utah.....	July 21	Aug. 18	0.0025
Sunrise, Ida.....	July 14	Aug. 24	0.002
Tuscumbia.....	July 10	Sept. 8	0.003
Wasatch, Utah.....	July 27	Aug. 31	0.05
Wasatch-Utah.....	July 13	Aug. 17	0.01
West Century, Utah.....	Aug. 2	Aug. 24	0.005