

MINING WORLD

AND
ENGINEERING

With which is Incorporated The Mining World Index of Current Literature

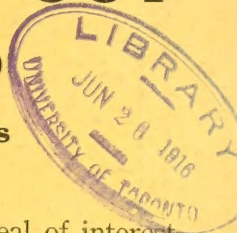
No. 26. Vol. 44.

JUNE 24, 1916.

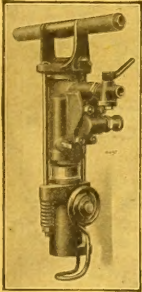
10 cts. a Copy; \$3 a Year.

KNOCKING THE BOTTOM OUT OF DRIFTING COSTS

In January of this year we published this "JACKHAMER" advertisement



The Work of the "JACKHAMER" Drifting in the Mines of a Large Lake Superior Mining Company



Size of Drift 6'-0" x 6'-0"
 Character of Ground Sufficiently free to require no timbering
 Shifts Per Day 2-8-Hour
 Men Per Shift 2

Each shift drilled, blasted, mucked,—and trammed an average of 700 feet, including one transfer, laid track, switches, etc.

SEPTEMBER PERFORMANCE

Total Advance 349 Feet
 Removed 762 tons of ore.

OCTOBER PERFORMANCE

Total Advance 379 Feet
 Removed 837 tons of ore.

COST

The average cost of drifting for the two months was
\$1.425 Per Foot of Drift
 This included the men's wages, powder and drill repairs. The average wage paid was almost \$4.00 per day, per man.

The above record covered normal work, no endeavor being made for speed. The two month's work includes eight working places and had speed been the primary consideration, two-shift-gangs could have been employed.

Ask for Bulletin 4121

INGERSOLL-RAND COMPANY

NEW YORK

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 TUNEAU
 DULUTH
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 LOS ANGELES
 NEW ORLEANS

PHILADELPHIA
 SAN FRANCISCO
 SALT LAKE CITY
 SCRANTON

LONDON

76-1D

It aroused a great deal of interest among mining men.

The Manager of this Lake Superior Mining Company has since sent us the data covering the operations during March, 1916, from which it will be noted that **there was a material increase in progress and reduction in cost.**

MARCH PERFORMANCE

Size of Drift Same
 Character of Ground Same
 Shifts Per Day Same
 Men Per Shift Same

Each shift drilled, blasted and mucked—and trammed an average of 155 feet.

Total Advance - 424 feet

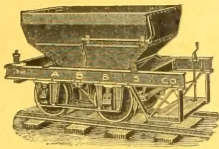
Removed 1062 tons of ore.

Cost - \$1.25 Per Foot of Drift

The cost per foot includes labor and supplies, drill repairs, drill steel, pipe and fittings, in fact, anything directly chargeable to the work. The average wage paid per man was \$3.95 per day.

THE ATLAS CAR & MFG. CO.

Dept. B. 1275 Marquette Road CLEVELAND, OHIO

MINE and SMELTER CARS

No. 150-A.—Bottom Dump Ore Car.

Experience counts—and we have had years of it in building cars. What is needed can be quickly told by us. Let us design your

CARS and ELECTRIC LOCOMOTIVES

This service costs you nothing.

3

ALBANY GREASE

All of the bearings on your compressors should be lubricated with Albany Grease. A reduction of as high as 80% in lubrication costs is secured and the efficiency of the compressor is maintained. A liberal supply of Albany Grease and an Albany Cup will be sent you for test. No charge. Write—now.

ALBANY LUBRICATING CO.
708-10 WASHINGTON ST., NEW YORK

Write for
Catalog
M-4,
prices and
references.

**CYANIDE PRECIPITATES,
GOLD and SILVER**

and for Melting Gold, Silver, Nickel, Cobalt, Brass, Copper, Aluminum, Etc.

We guarantee a saving of 60% using oil and gas instead of coal or coke, in the

**Steele-Harvey
Crucible Tilting
Melting Furnace**

now in use in the largest wide-awake plants of the United States, Canada and Mexico. Various sizes.

We manufacture the Rockwell Double and Single Chamber Cyanide Bullion Melting Furnaces for oil or gas.

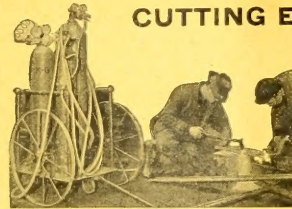
The Monarch Engineering & Manufacturing Co.

1200-6 American Bldg., Baltimore, Md., U. S. A.

We also
build
Tilting
"Coal and Coke"
Crucible Furnaces.

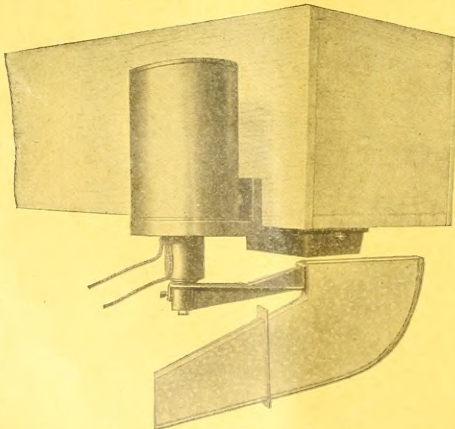
**K-G WELDING & CUTTING CO., Inc.**

556 West 34th Street, New York City

**OXY-ACETYLENE WELDING and
CUTTING EQUIPMENT**

This apparatus is particularly adapted to the mining and engineering field and no mine should be without one.

Write for Book!

Flood Automatic Sampler

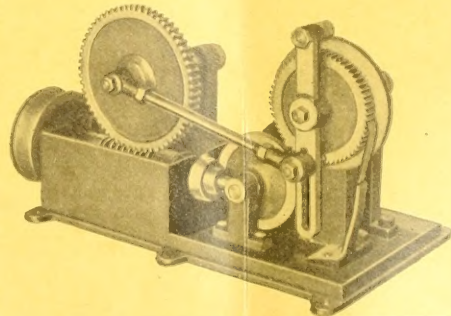
Sampler Attached to Bottom of Launder.

Will find where the losses are in your mill. You should take samples at regular intervals at various points.

By means of the Belt-Driven Timing Device shown below, the FLOOD SAMPLER automatically samples your ore or tailings at any predetermined intervals.

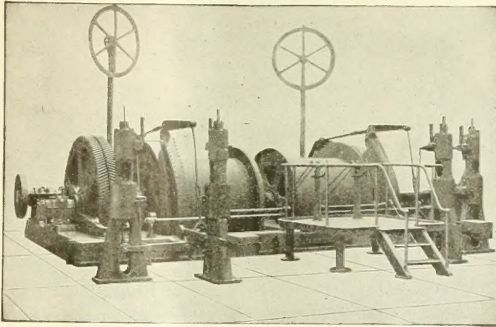
Electrically operated. Simple and accurate. No trouble to install. No attention required to operate.

Send for a copy of our "FLOOD" Catalog.



**The Hendrie & Bolthoff
Mfg. & Supply Co.**

DENVER



Wellman-Seaver-Morgan Double-Drum Electric Hoist at Empire Mines
Grass Valley, Cal.

The Empire Mines & Investment Co.

Selected this Double-Drum Electric Hoist from a Wide Range of Competitive Types

It handles 4 tons of ore per trip at 1200 ft. a minute and is designed for a maximum depth of 7000 ft. on the incline.

The steel drums, 6x5 ft. with steel clutches and brakes, are connected through Wuest single reduction herringbone gears and flexible coupling to a 500-hp. motor. There is Liquid Rheostat control, and safety appliances to prevent over-winding.

For operating the clutches and brakes air cylinders, with cataract attachment, are installed.

Massive Bed Plates Support the Unit.



THE WELLMAN-SEAVAR-MORGAN CO.

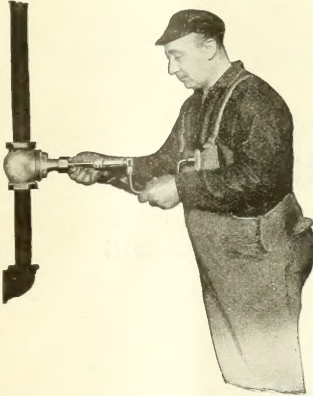
General Offices: CLEVELAND, OHIO

NEW YORK OFFICE: 50 Church St.

DENVER OFFICE: 611 Ideal Bldg.



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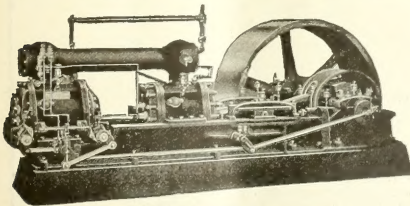
How much is a "Junk Valve" worth?

To answer that Yankee fashion we say, "Are you sure it's Junk?"

Often a worn out flat seat valve will take a splendid taper seat, and then, with a new taper disc you get a good practical sound valve that will give you many years of service.

The Skinner Valve Reseating Tool reseats both flat and taper seats. Inexpensive. Ask for our catalog.

M. B. Skinner & Co., 562 Washington Blvd., Chicago



Modern Air Compressor

Variable Capacity

Constant Speed

Uniform Pressure

Starts with no load. Regulated by hand. Runs full load, part, or no load, according to the demand. Regulated automatically by air pressure. Unloads both stages of a compound compressor in same proportion, thus preserving at all degrees of load the proper division of work in the air cylinders. Not a superheating Squeeze-Off or By-Pass, but an entire dropping of load, running light, free and cool with no fuse-blowing or belt-breaking labor in resuming work. Picks up load progressively.

THE NORWALK IRON WORKS COMPANY

SOUTH NORWALK CONNECTICUT

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Lead & Smelting Company

Executive Offices: 55 Congress St.,
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Operating Offices: 1012 Pierce Bldg.,
St. Louis, Mo.

Sales Offices :

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Producers of

“Mascot” Spelter

for cartridge and other high grade brass. Also all intermediate grades of Spelter and “Caney” Prime Western; Zinc Ores, Lead Ores and Sulphuric Acid.

Purchasers of

Zinc Ores

AMERICAN ZINC, LEAD & SMELTING COMPANY

Mines in Joplin District, Missouri, Carterville, Missouri.
Zinc Smelters at Caney and Dearing, Kansas.
Address, 1012 Pierce Building, St. Louis, Missouri.

AMERICAN ZINC COMPANY OF TENNESSEE

Mines at Mascot, Tennessee.

AMERICAN ZINC COMPANY OF ILLINOIS

Zinc Smelter and Sulphuric Acid Plant at Hillsboro, Illinois. Address, 1012 Pierce Building, St. Louis, Missouri.

WISCONSIN ZINC COMPANY

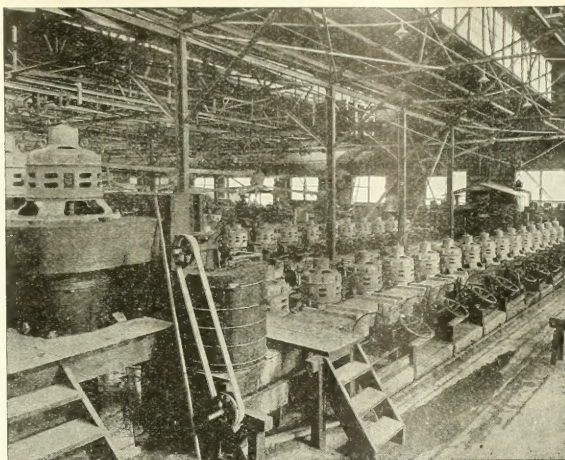
Mines in the Wisconsin District, Platteville, Wisconsin.

AMERICAN ZINC ORE SEPARATING COMPANY

Huff Electrostatic Separators and Plumb Jigs for the Treatment of Complex Zinc Ores. Address, 1218 Foster Building, Denver, Colorado.

AMERICAN BALLAST COMPANY

Producers of Crushed Rock for Road Making and Railroad Ballast. Producers of Powdered Lime Stone for Fertilizer Purposes. Address, Holston National Bank Building, Knoxville, Tennessee.



Westinghouse Agitator Motors driving Janney Cells at Arthur Plant, Utah Copper Co.

For Individual Drive In Flotation Plants

The Westinghouse "CS" Agitator Motor

Is Best

Designed from carefully conducted investigations in commercial service and proven by continued success under every day operating conditions in producing mills.

They are best because—

The construction is sturdy and extra heavy to resist vibration.

The rotor can't burn out.

The stator is wound with formed coils in open slots.

The bearings have a special oiling system insuring adequate lubrication at all times.

The shaft and guide bearings are proportioned to withstand the thrusts that are apt to be encountered.

The lower bearing sleeve is of non-corroding alloy.

The electrical efficiency and power factor is higher than any similar motor on the market.

The insulation is of the highest type.

These motors are produced especially for this service and every detail in the construction is provided with the service in mind.

The use of Westinghouse "CS" Agitator motor is a guarantee against electrical failures which interfere with continuous production.

Westinghouse Electric & Manufacturing Co.

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San Francisco, Cal.
Seattle, Wash.
Syracuse, N. Y.
Toledo, Ohio
Washington, D. C.

*W. E. & M. Co. of Texas

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THE "STOPEHAMER"

There is great satisfaction in knowing—that when an Ingersoll-Rand "Stopehmer" goes underground, the next trip of the cage will not find it on top for repair—nor many trips to come.

The many records of sustained efficiency and economy being made with Ingersoll-Rand "Stopehamers" by many users are possible, because—

THE "STOPEHAMER" IS BUILT RIGHT

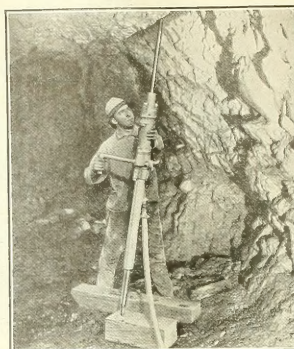
Bolted Construction
Correctly Balanced
Extra Long Chuck
Simple Air Strainer

Minimum Number of Parts, all easily accessible
Drop Forgings and High Grade Steel Throughout

Single Throttle Control
Easily Rotated
Renewable Anvil Block
Bearing

When you buy a "STOPEHAMER," you reimburse yourself the purchase price in a very short time, in the attainment of more efficient service and greater economy.

Bulletin No. 4036 sent upon request.



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11 Broadway, New York

Offices the World Over
For Canada address Canadian Ingersoll-Rand Co., Montreal

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Air Compressors

Leyner-Ingersoll Drills

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SUPERLA BRAND *Represents New Process Friction Reducing Oils*

Superla Brand
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the Highest Degree
of
Lubrication
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Minimum Cost.

SUPERLA CYLINDER OIL
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Their Adoption
by Leading Industrial
Works
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is the Strongest Proof
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Their Lubrication Value
and
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Every Drop Counts

Also
Polarine
FRICTION REDUCING MOTOR OIL

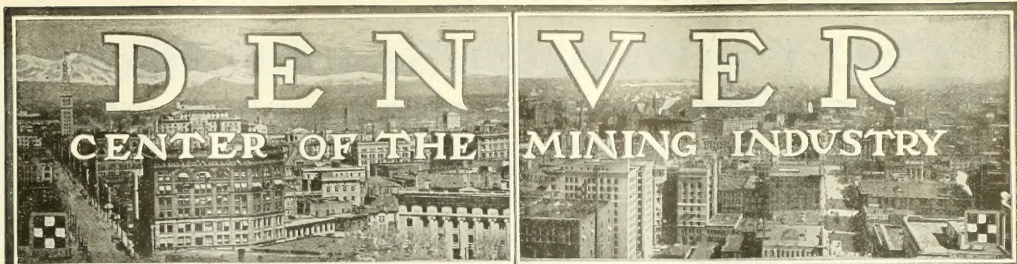
The Standard Oil
for
Motors

Manufacturers of MINING AND DOMESTIC CANDLES
and MINER'S SUNSHINE

STANDARD OIL COMPANY

(AN INDIANA CORPORATION)

CHICAGO, ILLINOIS



For more than half a century DENVER has been the Leading Mining Machinery Center; and a very large number of the most important mines, mills and smelters of the continent have been equipped with complete outfits coming from DENVER.

The companies named below can furnish everything needed for the modern mining and metallurgical plant; such as compressors, drills, cars, skips, hoists, crushers, screens, elevators, conveyors, rolls, stamps, tube mills, ball mills and other fine grinders, concentrating tables, pneumatic jigs, classifiers, dewaterers, thickeners, agitators, vanners, pumps, sampling and laboratory plants, mechanical roasters, electrostatic separators, assay and chemical supplies, smelting and bullion furnaces of all types, converters, ladles, slag pots and all accessory apparatus, including power machinery, pulleys, gears, shafting etc., rails, screen bars, riveted steel pipe, electrical apparatus and supplies.

The largest and only complete stocks in the West are carried in DENVER.

With railroads radiating in all directions, delivery on orders can be made promptly.

Save Money and Time, insure the efficiency of your plant and Secure Repair Parts immediately, when needed, by ordering from DENVER.

**American Zinc Ore Separating Co., Foster Bldg.,
 Colorado Fuel & Iron Co., Boston Building,
 Denver Engineering Works, 30th & Blake Sts.,
 Dillon Box Iron Works, 19th & Blake Sts.,
 Hendrie & Bolthoff Mfg. & Supply Co., 1621-39 17th St.,
 Mine & Smelter Supply Co., 17th & Blake Sts.,
 Morse Bros. Machinery & Supply Co., 1721 Wazee St.,
 Samson Crusher Mfg. Co., 33rd and Blake Sts.
 The Dorr Company, 1009 17th St.
 The C. H. Shaw Pneumatic Tool Co., 35th & Wazee Sts.,
 The Stearns-Roger Mfg. Co., 1718-20 California St.,
 Truax Manufacturing Co., 1117 Wazee St.,
 Weigle Riveted Steel Pipe Works, 30th & Larimer Sts.**

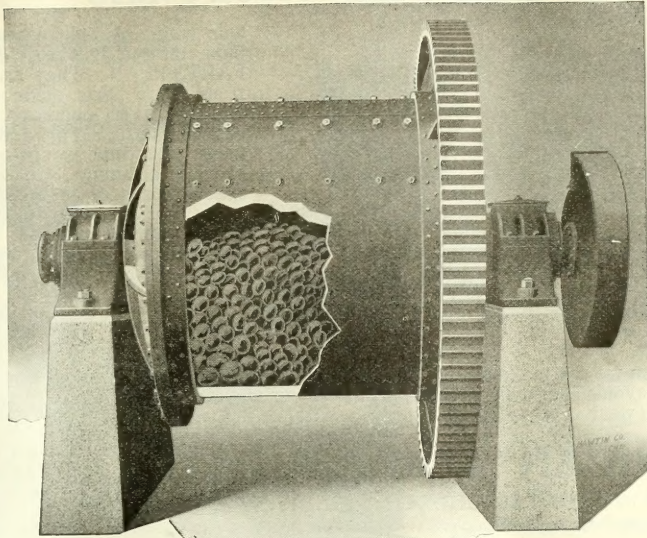
DO You Want the Benefit of Competition in Purchasing Supplies for Your Mine, Mill or Smelter?

If so, let us quote on your requirements. We buy from mill or factory on the best possible terms and can have direct shipments made to you, in large or small lots, at prices below what you are probably paying. Our sales include:

Air Tanks and Cylinders	Couplings—Flange and Pipe	Hammers	Punching and Shearing Machines
Alloys	Cranes—Hand Power, Locomotive and Portable	Hangers	Pyrometers
Anti-friction Metals	Crank Shafts	Hoists—Chain, Rope and Portable	Rail Bonds
Anvils	Crossed Timbers	Horse Shoes and Calks	Rails
Axles	Cross Ties—Steel	Hose and Tubing, Rubber and Flexible Metallic	Railway Equipment and Supplies
Babbitt Metal	Cutters—Gear Pipe and Wire	Hydrants	Ratchet Drills
Balls—Steel, Brass and Bronze	Dies—Drop Forge, Gripping and Heading, Pipe Threading and Screw and Thread Cutting	Indicators—Steam or Gas Engine	Reamers
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Bearings	Emery Wheels	Lathes	Roofing and Siding
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Belt Fasteners	Exhaust Fans	Lathing Metal	Rope Dressing and Preservative
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Belt Tighteners	Expansion Bolts	Lockers	Saws
Bending Machines	Eye Bolt Machinery	Lubricants	Scales
Boiler Compound	Eye Protection Glasses	Mechanical Draft Apparatus	Screws
Boiler Plates	Fans—Ceiling	Metal Checks	Separators—Steam and Oil
Boiler Shop Tools	Feed Water Heaters and Purifiers	Metals—Bearing, Brass and Bronze	Shafting
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Brick—Chrome, Heat Insulating, and Magnesia	Flanges	Oil Filters	Steam Traps
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Chasers—Threading	Frogs and Switches—Railway	Picks	Tires—Truck
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Clutches	Gauges—Machinists, Pressure and Vacuum	Pipe Covering, Asbestos and Magnesia	Transmission Machinery
Coils of Pipe, Iron, Copper and Brass	Grate Bars	Pipe Cutting and Threading Machines	Tubing
Concrete Machinery	Greases	Pipe Fittings	Turnbuckles
Concrete Reinforcement	Grinding Machines and Wheels	Plates—Iron and Steel	Twist Drills
Condensers	Guards—Machinery	Pneumatic Shop and Structural Tools	Unions
Controllers—Electric	Guard Saws Machines and Blades	Powdered Coal Plants	Vises
Corundum Wheels		Pulleys and Idlers	Washers
Cotter Pins		Punches and Dies	Water Softening and Purifying Apparatus
			Water Towers
			Wheels
			Wrenches

We can furnish supplies for the company store or commissary and can undertake orders for the purchase of anything needed in a mining community. *Get in Touch with Us.*

M. B. Skinner & Co., *Distributors,* 558-562 W. Washington St., **Chicago, Ill.**



TRAYLOR 7'-0" x 6'-0" TUBE MILL.

The Short Tube Mill

AS DEVELOPED BY US

is without question the best machine for medium fine grinding, with a large capacity and high efficiency. These machines are built in sizes ranging from 4'-0" to 7'-0" in diameter by 6'-0" long, with heads of dished type, strongly ribbed, that allow for pebble lining if necessary.

WE BUILD, however, all standard sizes of Long Tube Mills from 4'-0" x 12'-0" up to 6'-0" x 24'-0", which are fitted with improvements of the most modern design, such as large spiral scoop feeder with a manganese steel lip allowing pebbles to be fed to mill while in operation. Spur gear in sections made reversible and so designed that can be easily removed from shell without interfering with any other part of mill. Feed and discharge trunnions equipped with spiral liners to facilitate the feeding and discharging of material.

OUR TUBE MILLS are noted for the small amount of power consumed and elimination of the breakage of the heads on account of the mill being always in perfect alignment. This is obtained by placing the entire mill, after it is completely riveted up, in a large lathe and machining both bearings at the same time. Our machines are built on honor; they are thoroughly inspected and must be right before they leave our shops.

We also make Jaw Crushers, Rolls, Screens, Elevators, Centrifugal Solid Lined Sand Pumps, Blast Furnaces, Water Jackets and Complete Mill, Smelter and Stone Crushing Equipment.

Send for Our Bulletins—They Are Worth-While.

Traylor Engineering & Mfg. Co.

New York Office:
34 Church St.

Main Office and Works:
ALLENTOWN, PA.. U. S. A.

Western Office:
Salt Lake City, Utah

LOCOMOTIVES FROM INTERCHANGEABLE STOCK PARTS



Our standard light locomotives are built on the INTERCHANGEABLE PARTS PLAN. They are assembled from stock parts made to accurate gauges. Every operation is done in a carefully designed jig, and neither expense nor time is spared to insure absolute accuracy. On completion, a special corps of inspectors measure every part by means of gauges which are constantly checked up, and no part can be placed in stock until it has received the inspector's stamp.

With this system every part must be accurately made as to fit every other locomotive of the same size and type.

For this reason we can make prompt shipment of either a complete locomotive or of any part. This method avoids long delays when parts wear out and also enables a user to keep on hand parts liable to wear in service with positive assurance that each part will fit.

AMERICAN LOCOMOTIVE COMPANY

30 CHURCH STREET, NEW YORK

McCormick Building, Chicago, Illinois.

A. Baldwin & Company, New Orleans, La.

Dominion Express Building, Montreal, Canada.

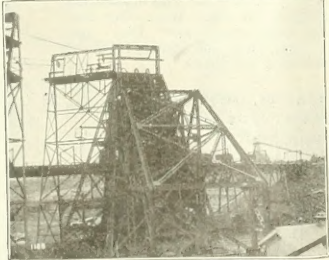
N. B. Livermore & Company, San Francisco and Los Angeles, California.

Northwestern Equipment Company, Seattle, Wash., and Portland, Oregon.

AMERICAN BRIDGE COMPANY

HUDSON TERMINAL-30 CHURCH STREET, NEW YORK

Manufacturers of Steel Structures of all classes particularly BRIDGES AND BUILDINGS



Headframe showing Cantilever Support and Idler Stands for Pioneer "A" Mine, Ely, Minn. (End View).

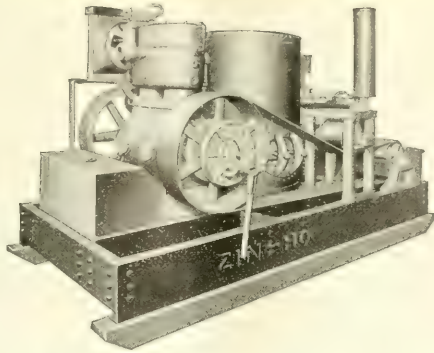
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NEW YORK, N. Y., 30 Church Street	CHICAGO, ILL., 208 South La Salle St.
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Boston, Mass., . . . John Hancock Bldg.	Denver, Colo., First Nat'l Bank Building
Baltimore, Md., Continental Trust Bldg.	Salt Lake City, Utah, Walker Bank Bldg.
PITTSBURGH, PA., . . . Frick Building	Duluth, Minn., . . . Wolvin Building
Rochester, N. Y., . . . Powers Block	Minneapolis, Minn., 7th Ave. & 2nd St., S. E.
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Cincinnati, Ohio, Union Trust Building	Pacific Coast Representative:
Atlanta, Ga., . . . Candler Building	U. S. Steel Products Co. Pacific Coast Dept.
Cleveland, Ohio, Rockefeller Building	SAN FRANCISCO, CAL., Rialto Building
Detroit, Mich., Beecher Ave. & M. C. R. R.	Portland, Ore., . . . Selling Building
	Seattle, Wash., 4th Ave. So. Cor. Conn. St.

Export Representative:

United States Steel Products Co., 30 Church St., N. Y.

Continuous Service—



24 Hours Per Day—25% Overload

This is what some of the ZIN-HO Portable 4-cylinder, 4-cycle, gasoline-driven air compressor plants are doing.

May be you have exceptional requirements—if so write us for information.

We don't recommend overloading any machinery, but the rugged construction of these plants permits them to run continuously.

ZIN-HO Manufacturing Co.
1326 So. Michigan Blvd., Chicago, U. S. A.



It's the Grip That Counts

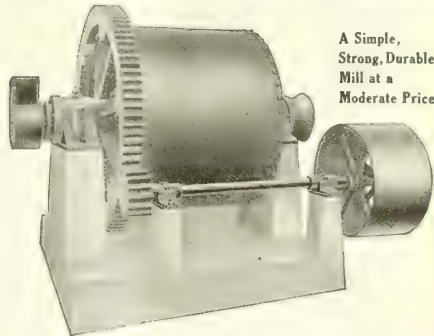


The B. & B. Patented Screw Type Friction Grip automatically adjusts itself to any variation in the diameter of the pulling rope. It's enormous gripping power prevents runaways, even on the steepest grades. B. & B. Aerial Tramways transport all kinds of material—with a saving. What do you transport? How much? How far? Send data and we will gladly tell you cost of an Aerial Tramway to meet your requirements, and the cost at which it will transport your material.

Ask for Catalog No. 36.

Broderick & Bascom Rope Co.
Manufacturers of High Grade Wire Rope
St. Louis, Mo.

Standard Ball Mills



A Simple, Strong, Durable Mill at a Moderate Price

Lining made of spiegelized iron, self-locking, no bolts through shell. Scoop feed, trunnions, equipped with spiral feed and reverse spiral on discharge end.

The capacity and horsepower can be varied from above, depending on the steel ball charge, and is based on 1½ to 2-inch feed, and product 12-mesh and finer.

Capacity, Tons per Hour	Diameter Mill, Feet	Width Mill, Feet	Revolutions per Minute	Horsepower	Balls to Charge, Pounds
20.....	6	6	25	65	9,000
13.....	6	4	25	45	6,000
17.....	5	6	27	55	7,000
15.....	5	5	27	45	6,500
12.....	5	4	28	40	6,000
10.....	4	5	29	38	5,000
5.....	4	4	32	15	2,500
3.....	4	3	32	12	2,300

The Morse Bros. Machinery & Supply Company
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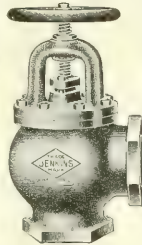
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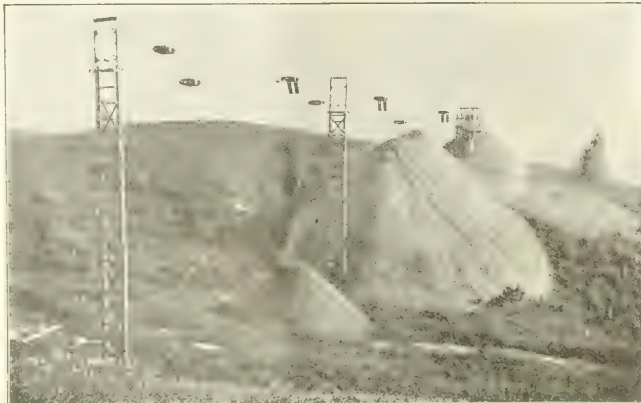
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No. 26. Vol. 44.

CHICAGO

June 24, 1916.

Mill Equipment of the Engels Copper Mining Co.

By W. A. SCOTT.

A feature of the mill equipment of Engels Copper Mining Co., operating 26 miles from Keddie, Cal., consists of the Allis-Chalmers adjustable ball granulators, which have been in service several months, and the "ball peb" grinders now being installed. This system of pulverization follows initial crushing and grinding by Power & Mining Machinery Co.'s gyratory crusher and rolls, and precedes treatment by Minerals Separation flotation process. The ball granulators vary in size and capacity, the size in use here being 6 ft. diameter and 5 ft. in longitudinal section. Forged steel balls, 2 to 5 in. diameter, are used. The material from the rolls, reduced to about $\frac{1}{2}$ -in. size, passes into the ball granulator at the open end by means of a combination feeder; it has an outside scoop for returning the oversize from a Dorr classifier with which the mill operates in closed circuit. The overflow from the classifier passes direct to the flotation machine; then the classifier oversize from ball granulator passes to a 7 by 10 tube mill, working in closed circuit with classifier. A 5 by 16 tube mill is used as a grinder of middlings. The 7 by 10 tube mill is to be replaced by a ball-peb mill; and the 5 by 16 tube is to be divided into separate compartments—one for ball-peb and the other for regular tube grinding.

The granulator mill has a lining of manganese steel, with stepped corrugations. These machines are adjusted with regard to the level of the pulp in the mill. In practice, the grinding efficiency is increased by lowering the pulp level; and the point to which pulp level should be lowered to secure the maximum of efficiency varies according to fineness of product and nature of ore. The mechanism of the machine includes a diaphragm near the discharge end, having a number of concentric holes, which may be closed by wooden plugs. With all holes open the mill will discharge within 3 to 4 ins. of the periphery, and by closing the outer holes the discharge is raised accordingly. By this means the pulp level is regulated to suit the material crushed, and to effect the ratio of crushing for fineness of product that may be required.

The wear of balls and lining is influenced by the adjustability of the granulator.

The mill was originally designed for a capacity of 150 to 200 tons of ore per day; and the mill record shows an increase to 400 or 450 tons by the use of the



200-250-TON, 12-COMPARTMENT MINERAL SEPARATION
EQUIPMENT MACHINE

ball granulators. With the completion of the ball-peb installation a further increase of capacity is anticipated. The ball-peb method of pulverizing was developed in cement-making practice. The ball used is of special metallic composition, has a low wear per ton of

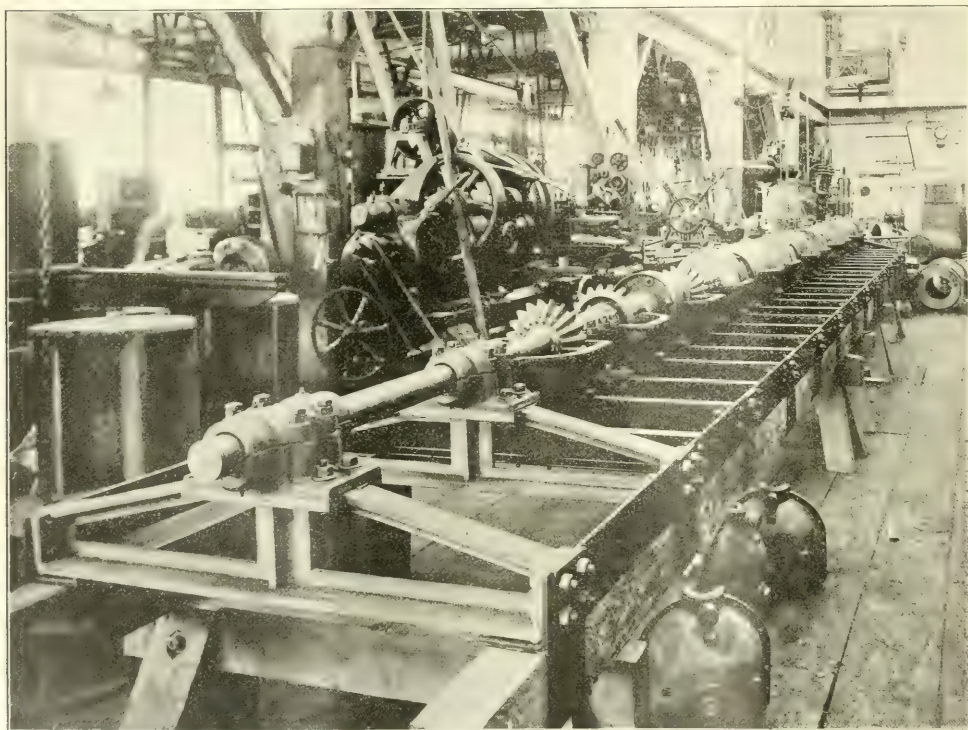
ore, and is $\frac{7}{8}$ -in. diameter. The peb-mill lining is of an alloy similar to that in the balls. The ore treated consists of bornite and chalcopryrite, carried in a quartz and diorite gangue, and samples about $3\frac{1}{2}\%$ copper.

By means of the complete system of pulverization and classification the pulp is reduced to the degree of fineness required by the 12-cell standard Minerals Separation flotation machine in use here. Only 5% of the pulp will remain upon a 100-mesh screen, and 65% will pass 150 mesh. The oil required is close to 0.4 lb. per ton of ore. The froth accumulating in the

which the same systems of pulverization and flotation concentration will be adopted. The building of a railroad branch, either from the Western Pacific or Southern line, is a project now under consideration. The mines are developed and operated through tunnel levels. New work now in progress consists of driving a 4000-ft. tunnel level which will cut the ore bodies at a depth of 750 ft. below existing workings.

Gold Output on the Rand.

The production of gold on the Witwatersrand for



GEARING FOR 200-250-TON, 12-COMPARTMENT MINERAL SEPARATION FLOTATION PLANT OF THE ENGELS CO.

first three cells is drawn off as a marketable concentrate, running 40% copper; the froth from the other cells is returned to the first cell for reconcentration. The froth concentrate is passed to a settling tank, and the thickened froth is then handled by an Oliver continuous filter whereby it is reduced to a cake averaging 10 to 12% moisture. While the capacity of the plant is being greatly increased, the extraction averages 85% for the sulphide ores, which comprise the bulk of the mine output.

Elmer E. Paxton, the company's manager, states that future plans contemplate the construction of a new mill of the capacity of 1500 to 2000 tons, in

May and previous months is given in the following table in fine ounces:

	1916.	1915.	1914.	1913.
January	787,000	714,984	651,000	789,330
February	777,000	476,000	626,000	734,122
March	720,000	753,000	686,000	790,000
April	741,000	684,000	784,000	784,000
May	777,000	763,000	720,000	794,000
June	755,000	755,000	717,000	517,000
July	770,000	770,000	732,000	655,000
August	778,000	778,000	711,000	728,000
September	776,000	776,000	702,000	706,000
October	797,000	797,000	733,000	718,000
November	781,000	781,000	715,000	673,000
December	781,000	781,000	672,000	776,400
Total	8,888,984	8,590,512	9,124,296	

Zinc oxide is the most important of the zinc pigments.

Mexico's New Mining Law in Effect July 1

Mexico's new mining law, made effective by decree issued by Señor Venustiano Carranza, first chief of the Constitutionalist Army, and in charge of the executive power of the de facto government, on May 1 last, stipulates the taxes to be paid on gold, silver and other metals exported, and also provides for a number of exemptions.

The decree, though effective from the date of promulgation, May 1, 1916, states that the new annual taxation on mining claims will not be in force until July 1, 1916.

The law puts no limit on the number of claims that may be held by any one company or person, but provides for a graduated tariff, payable according to the number of claims denounced.

The first class, comprising gold and silver mines, will be taxed at the rate of \$6 annually for each pertenencia up to 10; from 11 to 50, \$12 annually per pertenencia; from 51 to 100, \$18 per pertenencia annually, and from 101 and upwards at the rate of \$24 per pertenencia annually.

The second class comprises mines other than gold and silver and are taxed at the rate of \$6 annually per pertenencia from 1 up to 50; \$12 annually per pertenencia from 51 up to 200; \$18 annually from 201 up to 500 pertenencias; and \$24 annually per pertenencia from 501 and upwards.

Payments are to be in national gold currency with an exception in favor of certain overdue taxes unpaid at the end of February, 1916.

The decree is as follows:

Article 1.—All metals for exportation, whether the product of the country or previously imported, remain subject to the provisions of the Interior Stamp Tax, no further exemptions being granted beyond those specified by law. This tax will be levied in future according to the manner determined in the articles following:

(a)—Metals exported in the form of quartz, rock or crushed cyanides, or sulphides, residues of smelters, or in any other form in which they may be combined or mixed with substances which are not metals, properly so-called, as follows:

Gold and silver, at the rate of 10% ad valorem

Other metals, at the rate of 5% ad valorem.

The minister of hacienda, taking into consideration the metal quotations in foreign markets, at the proper time will determine the rate which will be in force monthly, for the payment of the aforesaid tax.

(b)—Metals smelted in the republic, to such a standard where no foreign substances remain, and unmixed, except with other metals, whatever the final product may be, will be entitled to a reduction of 20% on the rates fixed in previous paragraph.

Article 2.—Exemptions from the payment of the

Interior Stamp Tax will be granted in the following instances:

(a)—On refined gold brought in by the Mint for the purpose of coinage, also gold offered at the government offices in exchange for silver currency, at the rate of 75 centigrammes of pure gold for one peso.

(b)—On gold or silver currency, whether national or foreign.

(c)—On silver exported in the form of ore, quartz rock, crushed, or otherwise, whether in its natural state or mechanically concentrated, and in sulphides, cyanides, or residues of foundries, when the quantity of silver contained in any one or other of the substances mentioned does not exceed 250 grams per ton.

(d)—On gold or silver which had been imported into the republic in any of the forms described in the last paragraph, or had been treated in part in smelters, and exported within the four following months, in bars or other shapes, after having been treated metallurgically in Mexican works.

(e)—On gold or silver to be utilized in national industries.

(f)—On samples of native ore exported under conditions as fixed by the government.

(g)—On copper ore, when the proportion of metal contained is less than 3%; lead ore when the proportion of metal is less than 10%; and zinc, when the proportion of metal content is less than 15%.

Article 3.—Assays will be permitted on the petition of interested parties, by order of the law, or on the demand of the government; the privilege of melting will be granted when the faulty homogeneity of the bars or pieces of metal necessitate melting in order to determine the assay and value; the right of refining or smelting will be granted at the request of interested parties. These operations as mentioned are to be performed in the government establishments provided for that purpose.

The cost of the operations mentioned in the preceding paragraph will be according to a scale of charges to be drawn up in the department of hacienda and public credit, on the basis of the cost of the respective operations.

Article 4.—All metallurgical concerns will be subject to the treasury legislation concerning their production operations.

Article 5.—The amount in special stamps, which in conformity with existing laws, must be affixed to the title deeds of mines, will be \$10 in national gold currency for each pertenencia or claim protected by the title deeds concerned, whatever may be the nature of the mineral to be exploited.

Article 6.—The annual taxation on mining properties will be as follows:

Gold and Silver Mines.

(a).—From 1 up to 10 pertenencias, at the rate of

\$6 annually, per pertenencia, or \$2 for each third portion of a year.

(b)—From 11 up to 50 pertenencias at \$12 annually per pertenencia, or \$4 for each third portion of the year.

(c)—From 51 up to 100 pertenencias at the rate of \$18 per pertenencia, annually, or \$6 for each third portion of the year.

(d)—From 101 pertenencias and upward at the rate of \$24 annually per pertenencia, or \$8 for each third portion of the year.

Mines Other Than Gold or Silver.

(a)—From 1 up to 50 pertenencias at the rate of \$6 annually, per pertenencia, or \$2 for each third portion of the year.

(b)—From 51 up to 200 pertenencias at the rate of \$12 annually per pertenencia, or \$4 for each third portion of the year.

(c)—From 201 up to 500 pertenencias at the rate of \$18 annually per pertenencia, or \$6 for each third portion of the year.

(d)—From 501 and upwards at the rate of \$24 annually, per pertenencia, or \$8 for each third portion of the year.

Article 7.—The progressive increase in the tariff scale will be applicable whenever the pertenencias are held in one ownership and situated in the same mining district.

Article 8.—Taxation on mines by the various states in the republic will be limited to 2% on the value of the mineral products, with the exception of iron and quicksilver.

Article 9.—Exemption from the payment of import duties will be granted the following, when imported to be utilized in the treatment of ores: Zinc in ingots, filings, and in a granulated form or in a filiform state; sulphur, cyanide alkaloids, hyposulphite of soda, saltpetre or nitrate of potash or soda, and zinc, when in sheets of small size.

Article 10.—All taxes paid into the treasury under the provisions of this law must be in national gold currency.

Transitory Articles.

Article 1.—This law will come into force from the date of its promulgation, but the tariff fixed as stipulated in Article 6 will take effect from July 1, 1916.

Article 2.—The following laws are hereby revoked: The law of March 25, 1905; the decree of March 1, 1915, articles 2, 4, 10, 11 and 12 of the law of March 27, 1897, and all other laws and ordinances which are opposed to the subject matter of this law.

Article 3.—Owners of mining claims or pertenencias who have tax payments pending will adjust the same as follows:

(a)—Payments pending and dating to a period previous to March 1, 1915, will be liquidated in accord with the tariff in force before that date, with a surcharge of 200%.

(b)—Payments pending and corresponding to the period March-June, 1915, will be liquidated at the rate of \$6, in national gold, for each pertenencia of the first 25, and at the rate of \$3, annually, for the pertenencias exceeding 25, whatever may be the total number owned, with an additional tax of 100%.

(c)—Payments pending for the period July-October, 1915, will be adjusted at the rate of \$6, in national gold, annually, for each pertenencia, whatever may be their number, with a surcharge of 50%.

(d)—Payments pending corresponding to the period November 1, 1915, and the last day of February, 1916, will be liquidated at the rate of \$8, national gold, annually, for each pertenencia, with a surcharge of 25%.

(e)—Payments corresponding to the period March-June, 1916, will be liquidated during the period named in accordance with the rates stipulated in the decree of March 1, 1915, without any surcharge.

Article 4.—All taxation due up to the date of February 29, 1916, in accordance with the terms of the previous article, must be paid before June 30, 1916, the limit of the period of grace for such payments. This period under no consideration whatever will be extended. Failure to pay will cause the annulment of the property rights.

Article 5.—For one time only and solely for the liquidation of the payments of taxes due up to February 29, 1916, debtors will have the option of making their payments in national gold coin, or its equivalent in fiduciary money, at a rate to be quoted by the Monetary Commission.

Article 6.—Payments of taxes that had been made later than March 1, 1915, and which exceed the rates as determined by the transitory articles of this law, will be entitled to a refund of the overpayments, which will be applicable for the making of subsequent payments of taxes.

Article 7.—The tax of 5% on metals other than gold or silver, referred to in section "a," article 1, will be imposed on copper when the price of this metal is less than 25 cts., U. S. currency, per pound immediate delivery, in the New York market. When the value of copper exceeds 25 cts., U. S. currency, and not above 30 cts., the tax will be 6%. Should copper exceed 30 cts., U. S. currency, the tax will be 7%.

Article 8.—Gold and silver metals on which the taxes had been paid in conformity with the decree of March 1, 1915, and had not been exported, will, on passing through the maritime or frontier ports, pay the difference between the previous tax and the tariff stipulated by this law.

The cost of churn drilling in the Wisconsin lead zinc district varies from 50 to 75 cts. per foot, depending on whether the work is being done by contract, or by companies owning their own drills. The holes vary in depth from 100 to 200 ft., the average depth being about 150 ft.

Mining Possibilities in Colombia, S. A.—III

By MATT. W. ALDERSON.

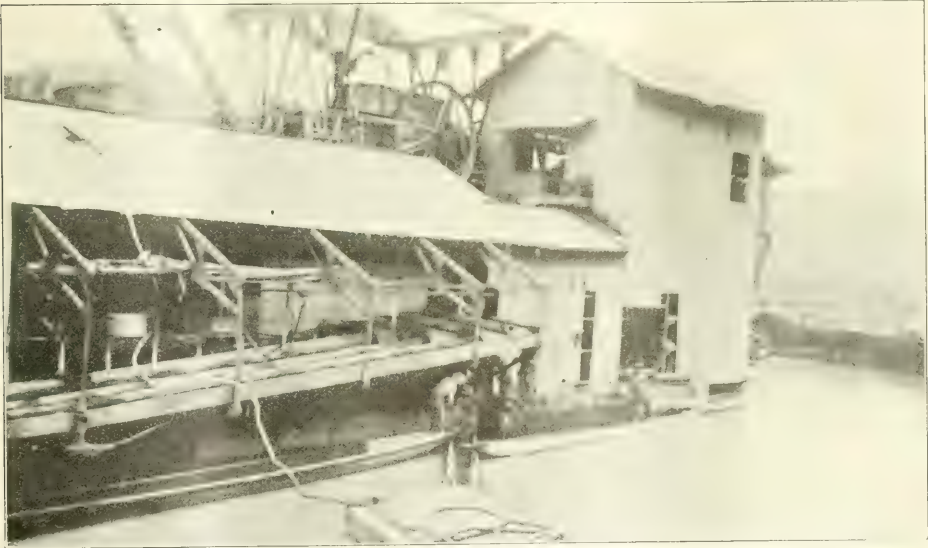
The Department of Antioquia, which is the portion of Colombia where the most extensive placer deposits have been found, is a section where there has been very extensive volcanic activity of the explosive type. Very large areas of the country are granitic in character, but they are not granitic in the sense that we apply this word to the granite mountains of New England, or to some sections in the western part of the United States.

The granite in some places presents an appearance quite similar to that at Butte, Mont., but generally, in the vicinity of placer mines, it presents evidence of having been more extensively leached. On the

from them, but the greater part of our wealth has been taken from our quartz veins, and it is to them that we must look as our great source of supply for the future.

In Colombia we have almost the reverse of what is observable in Nova Scotia. Here nature's leaching process was carried on more extensively, and for longer periods, with the result that quartz veins are few and far between, and the gold obtained from them insignificant in comparison with what has been obtained from placers. And the future is practically all on the side of the placers.

Quartz ledges are not only few, but those being



THE YUCA DREDGE OF THE PAGO MINES, COLOMBIA

surface there may be large showings of schist, or of a reddish or yellowish clay.

In articles in the Mining World a number of years ago I explained at length how quartz deposits were formed. In Colombia there are numbers of properties which offer clear proof that the same agencies that made the gold veins also made the placer deposits. In Nova Scotia the making of precious metal deposits was carried on to the vein-forming stage only, and all the gold recovered in that province has been from quartz veins. In Montana and some other portions of our United States the process was carried on for a longer period, and we have had both quartz veins and placer deposits. We obtained many millions from our placers, and are still recovering gold

worked are generally very narrow, glassy in appearance, and very hard; opposite in character to the kind that make the best quartz veins with us. A mine credited with having been operated for over 40 years, and still employing hundreds of miners, is unable to mine its ore at less cost than \$12 a ton. In the same section I found a property being run by a French company with two stamp mills crushing the product. Both were Colombian mills, one a 4-stamp and the other a 6-stamp mill, with two batteries of 3 stamps each, only one of which was running. Both mills were being run by overshot water wheels about 20 ft. in diameter. The stamps in these mills are of wood, shod with iron. They are very light and make about 25 drops a minute. I don't think either mill could crush to exceed

a ton of ore a day, and over 10 men were being employed at the mine to get this out. In neither mill was there a reserve of one ton of ore. I asked the employes if the ore was rich, and with characteristic honesty they said: "No, very poor." How was that for a property being run by a foreign syndicate?

In the section where I remained for several months the most prominent quartz mine was employing 150 men. On this property is a 10-stamp mill, made in the United States. The stamps weigh 650 lbs. The battery is fed by hand and crushes an average of 21 tons a day. The saving on the plates averages about \$12 a ton; concentrates amounting to about 1½% of the amount of ore milled are saved in sluice boxes having zig-zag V-shaped grooves on the board bottoms. The concentrates are run through an arastra, where about \$20 a ton is taken from them. As they still carry values of \$100 to \$150 a ton, they are cyanided. The tailings from the ore go about \$5. These are cyanided in a small percolation plant, the dissolving fluid carrying 3 lbs. to the ton, and the loss being less than 1 lb. to the ton. The saving is about \$3 a ton. The entire plant is run by a 3½-ft. Pelton wheel under 55 meters pressure.

The country rock and the vein matter itself are both very hard and the pay dirt of the vein is narrow. With labor at 75 cts. for a 10-hour day, it costs this mine \$10 a ton for every ton milled. In the United States I would hesitate to report favorably on a milling proposition where one could not depend on obtaining at least one ton of ore per day per man. In Colombia labor conditions are so exceedingly favorable that an exception should be made accordingly. But I was unable to find a mine in this country where less than seven men a day were required to produce a ton of ore.

My idea of a real good quartz mine is one where the low-grade ore can be handled at a small profit, or at least be made to pay its way. In the territory I visited in Colombia I was unable to find a quartz mine where the low-grade ore could be mined and milled at less cost than four times its content. This means that the success of operating the properties depends on finding high-grade ore, and the high-grade is thus made to pay for mining such low-grade ore as is necessarily encountered in finding it and getting it out. In any other country I would call this the reverse of correct business principles, a risk no prudent mining man would run. It works here, however, and so some persons will say my ideas on this question are all wrong.

While, however, my observations of the quartz mining industry in this country are not such as to make me form a favorable impression, I realize that there is a possibility that the next mine found here, in some other portion of the country, may be entirely different in character. I speak from impressions formed in observations of territory 150 miles in length only.

The section I was in is a placer country, and its

excellence in this respect cannot be questioned. It is easy to name properties where millions of dollars are being taken out every year, and which one may feel every assurance will continue as splendid producers for years to come; and it is easy to name places where other millions may be taken out if endeavor to obtain them is gone about in the right way. These millions, however, are quite thoroughly locked up in nature's fastnesses, and it will require more than ordinary engineering skill, backed by necessary capital, to get hold of them.

There are many millions of placer gold in Colombia where operators have never looked for them, possibly because they felt that if they really knew the gold was there they would not know how to get it out.

There are properties that would make ideal dredging ground, but possibly the total amount in them would not justify. It would not pay to install a dredge costing \$200,000 on a property carrying from a quarter to half a million dollars in gold.

There are other properties containing several millions that may not be worked as dredging propositions because of a certain number of boulders of unusual size on bedrock. Possibly these propositions would be ideal for a hydraulic elevator, if the river could be turned from its channel, or there was a nearby water supply for the elevator.

Every mine requires the fitting of a way to work the property to its peculiarities. Splendid work has been done with dredges and with hydraulic elevators in a number of places in Colombia, and money has been taken out to remunerate those who have had the enterprise to put these properties in producing condition.

The most prominent of the placer mining companies operating in Colombia is the Pato Mines, Ltd., operating what is known as the Pato and Nechi properties. Twelve months were given to the examination of the Pato mines before they were purchased, 291 Empire drill holes and six shafts being put down. A block of 530 acres was found to have gravel 26.3 ft. deep, with an average recoverable value of 31.6 cts. per cubic yard.

An investment of over a million dollars was made in this property before there were any returns. In 1914 the recovery was \$508,000 and in 1915 \$508,883. The company has over 21,000,000 cu. yds. yet to work, having an estimated value of over 30 cts., or a total of about \$6,500,000. In 1915 it tested and took over a nearby property of 80 acres, 48 ft. in depth, and averaging 71.86 cts. per cubic yard. This is the Nechi property, having in round numbers 7,000,000 cu. yds., with gross value of nearly \$5,000,000. A Yuba dredge works the Pato and an English dredge the Nechi. Power for these is supplied from a plant nearby generating electricity with the aid of three 600-hp. Pelton-Francis turbines.

The best work done thus far has been an average of 100,442 yds. per month for 1915 with the Pato

dredge at a cost of 11.4 cts. per yard. The company's new manager, W. A. Prichard, is determined to better this record, and he expects to handle 150,000 to 200,000 yds. a month at not to exceed 7.5 cts. Like all good placer ground I have seen in Colombia, there is considerable clay in the Pato properties. This makes it necessary to have much more than the usual amount of clear water to do good work. Some stoppages have been on account of clay choking hopper and stacker, and in extra dry seasons the number of possible working hours have been curtailed.

Not every undeveloped placer mine in Colombia equals these two owned by the Pato company. But there are others of like good character awaiting some one to take out the money locked up in them. Some of these are dredging propositions and some, equally valuable, are not.

There is demand for a way to work some of these properties that is not met by any of our present methods. The dredge will not do because of the presence of an occasional boulder of unusual size. Splendid work has been done with hydraulic elevators on

possible to get thousands of horsepower at no great distance that may be easily and economically harnessed.

The common sense to prove the value of gravel under water, financial resources to meet the demands



TOP OF DAM AT PATO POWER PLANT.

of the situation, engineering skill to plan wisely and the courage to go up against unusual conditions are needed for the working of thousands of acres of valuable placer ground in Colombia.

I do not expect to see this work undertaken in my lifetime. It seems too formidable to the average investor. But there is ground of this character in Colombia that will produce millions upon millions every year, so much of it that I am confident it will not all be worked out in 100 years from now.

In saying this I do not wish anyone to form the opinion that I think where gold is found in paying quantities in a stream it may be depended on to continue upstream, or downstream, for any distance. I do not think so. Because gold is found on the headwaters of a stream, and also at its mouth, does not mean that pay may be found between. It may or it



VIEWING DEPARTURE OF STEAMBOAT.

the Porce by the McGuire brothers—Ernest, Willis and Henry—all three of whom are practical men, and by Mackay Smith, who is managing a property on the Rio Grande with exceptional business ability. But the hydraulic elevator can only work where everything can be elevated, so as to expose bedrock. This is all right where a river can be turned from its bed, but there are places known to be rich where streams carrying large amounts of water flow between high banks and occupy practically all the intervening territory. There is no possible chance for diversion except at prohibitive cost. What is needed is a machine that will commence at the lower end of the pay and go upstream, taking in everything it comes to, undeterred by boulders or an occasional reef of hard bedrock, leaving a ridge of tailings behind as is done by a dredge. It is not hard to imagine a practical machine for this work. It will come some time, and there is millions in it for the persons who install it.

Where machines of this kind are needed it isn't always possible to get water under high pressure for the operation of a hydraulic elevator, but it is always



QUARTERS OF NATIVE WORKERS AT PATO.

may not. Almost without exception the gold in Colombia will be found to be local in character. Sel dom has it traveled any distance. The wise man knows where the gold is before he goes after it, and then he goes after it in a safe and sane way, a way that will bring him profitable returns for his work.

California's Unique Safety-First Movement.

An organization unique in the annals of safety movements has been perfected in California under the auspices of the Industrial Accident Commission of the state of California. The membership has for its control a constitution which embraces only "Safety First" and for its by-laws "Think Before You Act." The title of the organization is the "Miners' Safety Bear Club" and has a present membership of 4500 and is rapidly increasing. Edwin Higgins, chief mine inspector of the commission, who is responsible for the great interest taken, has incorporated some unusual and original features in the work, among which are the qualifications ascribed to a Safety Bear:

A SAFETY BEAR IS A MAN—

Who knows the value of perfect health and a sound body.
Who has a wholesome respect for physical suffering.

Who realizes the mental anguish and suffering that will result to those who love him and depend on him, if he is killed or injured.

Who realizes that his fellow workmen also have those at home who love and depend on them.

Who knows that he will be safer at his work if he is careful.

Who knows that he can prevent injury to others if he will but make the effort.

Who believes that by his actions he can help to reduce misery and suffering and do much to prevent the growth of the list of widows and orphans.

Who knows that he is a worthless citizen who passes through life without doing something to help his fellow man.

Every normal man is a Safety Bear, who needs only to devote thought to the subject in order to develop himself along these ideal lines.

In addressing the miners of the state Mr. Higgins discusses the safety situation in the following:

Compensation.

You have all heard of the great safety wave that has been sweeping over this country of ours. You know that the Federal and State governments, various societies and many mining companies are putting forth efforts to reduce accidents in the mines. In many mining districts this safety wave has already drowned out a large per cent of accidents, and that is good for the miner.

In talking about safety with men in the mines I have often heard the remark: "What's the use? What do we get out of it? The company is the only one that is benefited." Now, right here is where a big mistake is made. I submit that the miner is far and away the greatest gainer from safety work.

Here are the facts: The governments and societies spend large sums of money every year in trying to make the mines safe, but there is no way for them to get a cash return for their effort. Mining companies also are spending many hundred of thousands of dollars each year for the same object. Those that carry casualty insurance have little to gain. It is true, however, that those companies carrying their own insurance do save money by reducing accidents to employees. What if such companies do save a little money? It is not a drop in the bucket when they are able with the reduction of money and suffering to the miner and those who depend on him.

What is compensation? You who have a family, is there anything that can compensate you for the loss of your life, for the loss of a leg, or a hand, or the mutilation of any other part of your body? Is there anything that can com-

pensate you for walking around on a wooden leg, or for having to stand on a corner with a tin cup tied around your neck asking for help because you are blind? You who have not yet married, what chance have you to secure a loving wife with your looks spoiled by a blasted face, or by the loss of half of your teeth, or an eye, or an ear? Believe me, there is no money compensation for such injuries.

Help the Mine Inspectors.

The day is coming soon when the mines in this state will be made as safe as possible. The work may be slow—but it is sure. Now, while I believe it is a great thing to have the mines put in a safe condition, I am a firm believer in the fact that safety in mines can not be had without the active help of you miners. What good are safety devices if men will not take care of themselves? I hold that almost the whole problem is up to you boys. Don't take this for criticism, for it is not meant that way. The average miner is careful, but you know, as I know, that there are many careless miners.

I want you to know that all of the deputy mine inspectors and I have served time below the collar, and that the business end of a muck stick is no stranger to any of us. It follows that we should "savvy" many things from the standpoint of the miner. As a matter of fact, we not only know what you are up against, but we have a most earnest desire to make things better for you and we are working faithfully toward that end. In other words, we are for you. Without a shadow of a doubt, however, unless you assist us, all of our efforts will avail but little. It would be a great pleasure for me to know that every miner of this state is in sympathy with the work of this office, and I can promise you that the result of such a condition will be a reduction of accidents such as no state in the Union can show. Let us do this thing. The benefits and the credit will be yours.

An attractive and suggestive emblem has been adopted in the shape of a pin, which bears on its face a brown bear hugging a red danger signal, having a green safety arrow projecting through it, and underneath this the legend, "I am a bear for safety."

Mr. Higgins is to be commended for his work in popularizing this safety movement which should be adopted by other states which seek the prevention of mine accidents.

Zinc Smelter to be Built by Steel Company.

A zinc smelter is to be built by the Trumbull Steel Co., of Warren, Ohio, at Fort Smith, Ark., and is to be operated by a subsidiary company, the Fort Smith Spelter Co., incorporated for that purpose. The officers of the new company are: D. W. Kerr, president, and H. S. Buck, vice-president and general manager. Mr. Kerr is vice-president of the Trumbull Steel Co., while Mr. Buck, who will be in active charge at Fort Smith, was formerly associated with the Warren company.

The plant will have four blocks, its capacity being about 1000 tons of spelter a month. Zinc ore will be purchased in the open market. The Fort Smith Co. will also sell spelter. At first it is expected that the company will have about 500 tons of spelter for sale monthly.

This is the first attempt of an independent galvanized sheet manufacturer to control the sources of its supply of spelter.

The King Process of Refining Copper

The introduction of hydrocarbon oil under suitable pressure into the body of a bath of molten copper for the purpose of successfully refining or eliminating impurities therefrom is the claim made by Edward C. King of Cananea, Mex., for his invention (U. S. patent 1,183,736). It is claimed that apparatus of various kinds can be used in connection with the present process, as it can be applied effectively to the molten copper in furnaces or vessels of any construction which afford sufficient space for the escape of the gases evolved during the purifying operation, the molten copper during this operation being protected as far as practicable from oxidizing influences. As the impurities in the copper have a greater affinity for the carbon in the oil than they have for the copper, they immediately combine, the combined carbon and impurities rising to the surface of the bath owing to their lower specific gravities. The volatile gases or substances pass off, while the solids form a slag on the surface of the bath and may be readily skimmed off by the operator when the hydrocarbon oil has eliminated all impurities from the copper, except the oxygen. The final stage of the first operation may be determined by taking samples from the bath during the treatment and testing such samples by splitting them and examining the nature of the fracture, the skill and experience of the operator indicating when all impurities, except the oxygen, have been eliminated. However, according to claims for the present invention, it is not so essential to determine the point where all impurities, except the oxygen, have been eliminated as is the case when the common method of oxidizing the impurities is employed for the reason that copper has a very strong affinity for oxygen, oxygen being the last impurity to be eliminated from the copper and therefore the oxygen injected into the molten bath of metal for the purpose of eliminating the impurities in the copper is taken up largely by the copper itself and oxides and sub-oxides are formed. The presence of oxygen in copper is objectionable for the reason that it destroys its ductility and tensile strength, making the copper in such condition unmarketable. In order to properly refine the copper, all the oxygen injected into the copper for the purpose of removing the impurities must be eliminated from the copper, and this has been accomplished heretofore by the only method of de-oxidizing copper now in use on a commercial scale, that is to say, the insertion of poles of hard or soft wood into the bath of molten metal.

According to the present invention hydrocarbon oil, preferably crude petroleum, is introduced directly into the body of the copper while in a molten condition, and this hydrocarbon oil not only acts to eliminate gaseous or metallic impurities without injury to the copper, but after all impurities, except the oxygen, have been removed and the bath is protected

from all oxidizing influences by covering the bath with carbonaceous material not containing impurities that could be taken up by the metal, continuation of the operation of introducing hydrocarbon oil directly to the body of the molten copper forming the bath expels the last impurity, namely, oxygen, and when the oxygen has been expelled, the purifying operation is at an end. The carbon being injected, according to the present invention, before any oxidizing operation, and being a substitute for the universal practice of oxidizing the copper for the purpose of removing other impurities, it avoids the serious disadvantage arising from the fact that oxygen injected into copper has the effect of destroying the tensile strength and

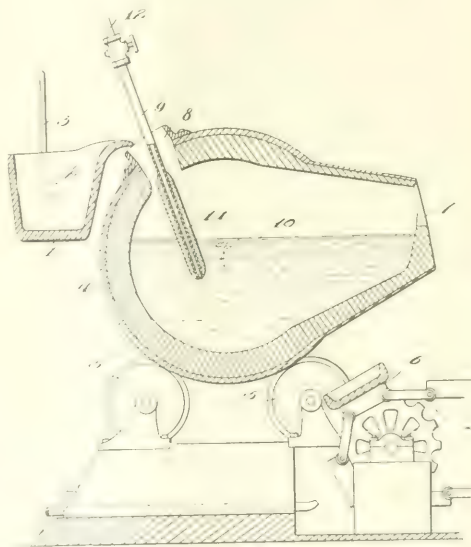


FIG. 1.

conductivity of the copper which defect has to be remedied in order to render the copper marketable.

One of the many impurities contained in copper, and, as copper has a stronger affinity for oxygen than it has for all other impurities which it commonly contains, oxygen is retained after the other impurities have been eliminated. Heretofore carbon in different conditions has been used in the process of refining copper solely for the purpose of de-oxidizing or expelling oxygen that has been introduced into the copper mostly by the operator for the purpose of expelling other impurities contained in the copper. According to the present invention, however, oxygen is treated as other impurities and its contact with the copper is avoided as much as possible, the carbon then serving an entirely new function.

Various kinds may be used in con-

nection with the present invention, it being understood that the invention is not limited to any particular kind of apparatus.

In the accompanying drawing is shown an apparatus as an example of one capable of use in connection with the invention. In this drawing is shown a ladle, 1, which receives the molten metal from the converters wherein the metal has been converted into metallic copper. This ladle is provided with trunnions, 2, and a hanger, 3, co-operates with the trunnions and is swung from an overhead crane, this arrangement enabling the ladle to be readily charged with molten metal from the converters and to be conveyed to the refining vessel, 4, which has a brick or other refractory lining and may be rotatably supported on rollers, 5, whereby it may discharge refined copper into suitable molding devices, 6, which are indicated conventionally in the present instance. For this purpose the refining vessel is provided with a pouring spout, 7, and it also has an opening, 8, through which the molten copper from the ladle is introduced into the vessel. This opening, 8, also serves in the present instance for the entrance of a tube which introduces hydrocarbon oil into the body of the bath of molten metal contained in the refining vessel.

The hydrocarbon oil, preferably crude petroleum, may be introduced by any suitable means into immediate or direct contact with the bath of molten copper, it being important, however, that this hydrocarbon oil should be introduced to the bath of molten copper at a point below its surface so that the hydrocarbon oil will come in direct contact with the molten copper and consequently this hydrocarbon oil will associate with as much oxygen and other impurities contained in the metal as the carbon contained in the oil is capable of absorbing. In the present instance is shown a tube, 9, for introducing the hydrocarbon oil into the body of the bath of molten metal. The lower end of this tube is submerged for a suitable distance below the surface, 10, of the bath of copper, and this end of the tube may be protected by a refractory covering, 11. The tube communicates with a pipe, 12, which may be connected to a suitable source of hydrocarbon oil under pressure sufficient to cause the oil to flow from the tube into the body of the bath of molten copper. The hydrocarbon oil may be supplied to the tube by a pump or from a tank by gravity, the pressure under which oil is fed being governed by the depth of immersion of the tube and the temperature of the charge, but this pressure should always be sufficient to avoid carbonizing of the oil within that part of the tube which is submerged in the bath.

By introducing hydrocarbon oil into the body of the bath of molten copper as indicated above every atom of carbon contained in the oil is utilized in accomplishing the desired result of eliminating the impurities contained in the copper. The amount of oil

used is controlled largely by the size of the charge in the refining vessel, the depth of immersion of the tube, and the degree of pressure under which the oil is supplied. A true condition is indicated by the absence of smoke on the surface of the charge, a bubbling of the metal and burning of the gases evolved.

After the bath of molten copper in the refining vessel has been refined, the vessel is tilted so as to discharge the refined copper into suitable casting means whereby it is cast into anodes, cakes or other forms, these being preferably passed through a tank of water which removes any oxide scale formed and avoids any further oxidation of the copper. The copper is then ready for shipment to an electrolytic refinery for the extraction of precious metals.

There are certain processes which have been heretofore proposed for the refining of copper by using hydrocarbon oil as a fuel to generate de-oxidizing gases. Such processes, however, are not known to have proved commercially successful for the reason that in generating the gas by the burning of the oil, oxygen is absorbed from the atmosphere and this oxygen contained in the gases upon coming in contact with the copper defeats to a considerable degree the refining action, as oxygen is one of the impurities to be eliminated from the copper. According to the present invention on the contrary, a hydrocarbon oil, preferably in the form of crude petroleum, is brought under pressure into immediate or direct contact with the molten metal by submerging the crude petroleum beneath the surface of the bath of metal so that the amount of crude petroleum which enters the bath will come in direct contact with as much oxygen contained in the metal as the carbon contained in the oil is capable of absorbing and there is no oxygen introduced into the bath with this oil that would neutralize or defeat in part the purifying operation. Moreover, the present invention is very efficient, as every atom of carbon is utilized in the operation of eliminating the oxygen contained in the copper. Furthermore, according to the present invention, the combustion of oil takes place not in the atmosphere or before the oil reaches the bath of metal, but occurs owing to the heat of the molten metal and upon the moment of contact of the hydrocarbon oil with the metal below the surface of the bath.

Copper and Silver Production in Michigan in 1915.—The production of copper from the mines of Michigan in 1915, as reported by B. S. Butler, of the U. S. Geological Survey, amounted to 265,283,378 lbs., against 164,344,058 lbs. in 1914. The production of silver in 1915 was 585,933 ozs., against 413,500 ozs. in 1914. The value of the copper produced by the mines was \$46,424,591 in 1915 and \$21,857,759 in 1914. The value of the silver output was \$297,068 in 1915, against \$228,000 in 1914. The production of refined copper in 1915 was 238,956,410 lbs., compared with 158,000,748 lbs. in 1914.

Comparative Friction Test of Two Types of Mine Cars

By P. B. LIEBERMANN.*

When it was decided some time ago to start a thorough investigation into the merits of flexible roller bearings in comparison with ordinary plain bearings for mine-car use, it was clearly seen that it would be very desirable to design a special testing device for that purpose. A device has been designed by the author in the form of a dynamometer car. This car is absolutely self-contained and is intended to be placed in front of the cars that are to be tested and behind the locomotive.

The dynamometer car was built according to the author's specifications and under his supervision. A number of tests have been made since it was put into commission late last summer. The test described in this paper, while the least favorable for the roller bearings, is of considerable interest due to the fact

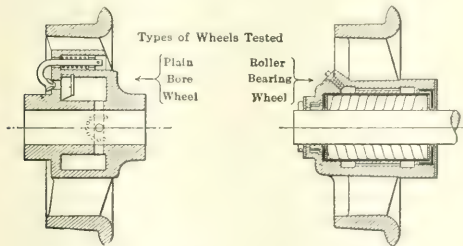


FIG. 1. TYPES OF WHEELS TESTED.

that it was witnessed by a large number of mining engineers and other critics.

It should be remembered that as far as the running gear of mine cars is concerned there are wheel-hub bearings, bearings in outside boxes, and bearings in inside boxes depending on the location of the bearings in relation to the wheels. Besides this there are axles with two loose wheels, axles with one tight and one loose wheel, axles with two tight wheels and axles split in the middle with one wheel on each half. These different arrangements of bearings and axles will undoubtedly affect the train resistance and while a plain axle with bearings in inside boxes like the Anaconda type represents the best engineering practice, it is obvious that for a particular investigation only such an arrangement can be considered as is representative of the conditions existing in the respective territory. In the bituminous coal mines wheel-hub bearings are used almost exclusively and therefore a comparative test conducted in a bituminous mine should be based on bearings located in the wheel hubs. Such a test is described in this paper.

This particular test was made at the Greensburg Coal Co.'s mine at Greensburg, Pa., in co-operation with the H. C. Frick Coke Co., which was represented by its Chief Mechanical Engineer, C. E. Huttelmaier. The test was run on the main haulage road underground to determine the saving in tractive effort of mine cars equipped with roller bearings as compared with mine cars equipped with plain bearings under identical conditions of operation.

The following types of mine cars were tested:

Type of wheel	Location of bearing.	Diameter of axle in bearing, ins.	Length of bearing.	Track gage, ins.	Diameter of wheels, ins.	Wheel base, ins.	Drawbar to top of rails, ins.
Roller bearing	Wheel hub	2 3/8	8 in. length of rollers	40	18	27	15 1/2
Plain bore	Wheel hub	2 3/8	8 in. length of hub	40	18	27	15 1/2

These are steel cars built by the Hockensmith Wheel & Mine Car Co., and are identical in every respect except bearings. The roller bearings have a planished outer race with the flexible rollers running directly on the axle. The plain bearings are formed by the hub of the cast-iron wheels (Fig. 1). The end thrust in each case is taken care of by the wheel hub rubbing against the cast-iron axle box on the bottom of the car. The cars equipped with roller bearings had been in service about 2 years before this test was made. As there are no plain-bearing cars in the Greensburg mine, the wheels of 20 roller-bearing cars were removed and replaced with plain bore wheels. The plain bearings were run for some 3 weeks before this test was made; this was considered a sufficient length of time to wear these bearings down to a good bearing seat. As the hub of the plain bore wheels was somewhat shorter than the hub of the roller-bearing wheels, a washer of proper thickness was inserted between the hub and the plain bore wheels. All roller bearings were filled with fresh grease before the test. The roller bearings were not drawn off nor was any cleaning or grinding done. The lubricant used was a thin grade. The plain bearings were lubricated with ordinary grease prior to this test.

For the actual test two different trains of 20 cars each were used, one train being made up of cars with roller-bearing wheels, the other train consisting of cars with plain bore wheels. The cars of the two trains were loaded as uniformly as possible with coal, just as obtained in every-day practice. The brake was set the same on all cars as nearly as could be judged. Each car weighs loaded 7150 lbs.; therefore

*Member of Test Unit of Roller Bearings, paper read before A. S. M. E.

each train of 20 cars weighs 143,000 lbs. or 71.5 tons. One train at a time was tested by pulling it by means of an electric locomotive over the 4116 ft. of track whose profile is shown on the charts; the dynamometer car was inserted between the locomotive and the train in such a way that its own resistance is not indicated on the record charts. The test of each type of train was repeated three times.

The rails of the track weigh 40 lbs. per yard. They were dry and in good condition when these tests were made. A careful calibration of the dynamometer car before and after the test showed all instruments indicating correctly.

The results of the tests are recorded on the charts, two copies of which are shown in Figs. 2 and 3. In-

pull. For the train weight of 71.5 tons and the average grade of 2.4% the correction amounts to 3432 lbs. for each train.

The corrected tractive effort for the roller-bearing cars therefore amounts to:

4347 — 3432 = 915 lbs. at 5.98 miles per hour and for the plain-bearing cars:

5170 — 3432 = 1738 lbs. at 5.59 miles per hour.

Expressed in pounds per ton this means for the roller-bearing cars 12.8 lbs. per ton and for the plain-bearing cars 24.3 lbs. per ton.

Disregarding the slight difference in speed, the saving in drawbar pull in favor of roller-bearing cars therefore amounts to 47.25%. In other words, a locomotive of a certain size would be able to pull the fol-

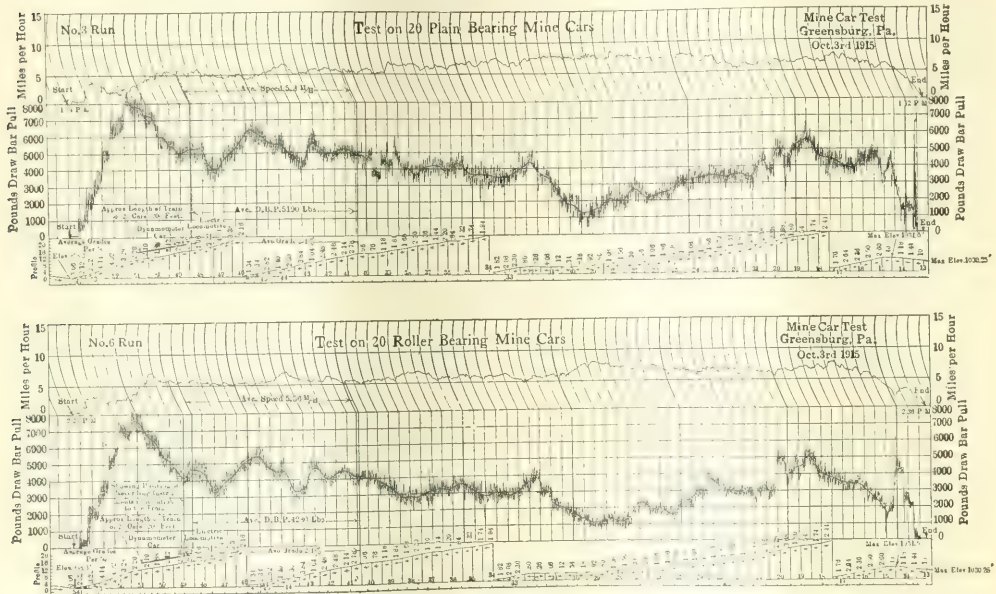


FIG. 2-3. CHARTS OF TEST RUNS.

stantaneous values of drawbar pull and speed for any place on the track can be seen on the charts at a glance. For average values a piece of tangent track of sufficient length and of nearly uniform grade and over which the speed was fairly uniform was selected. The average drawbar pull and speed were obtained from the charts by the use of a planimeter.

The following average values were found:

Type of bearings, per cent	Average grade, per cent	Test No.	Average drawbar pull, lbs.	Average speed, miles per hr.
Roller	2.4	1	4,410	5.75
		5	4,350	6.56
		16	4,280	5.56
Plain	2.4	1	5,250	5.70
		12	5,070	5.78
		13	5,190	5.30
AVERAGE OF TESTS 1, 5 AND 6			4,347	5.98
AVERAGE OF TESTS 1, 2 AND 3			5,170	5.59

To correct these figures for grade, 20 lbs. per ton per 1% must be subtracted from the above drawbar

pull. For the train weight of 71.5 tons and the average grade of 2.4% the correction amounts to 3432 lbs. for each train.

Grade, per cent	Level	Per cent more roller-bearing than plain-bearing cars.
1		90
2		35
3		22
4		16

Although considerably greater differences between the flexible roller bearings and the plain bearings have been obtained by tests with the dynamometer car in other mines, the above figures mean reductions in operating expenses or an increase in production large enough to command attention. Inasmuch as the coefficient of friction of different types of rollers of the same dimensions will not vary over wide limits the present investigation clearly demonstrates the possibilities of a low-friction bearing compared with a plain bearing.

Besides the motor haulage (the size of the loco-

motives, transmission line and power house) one important additional point should not be lost sight of, the gathering of the cars by hand. Actual experience has shown that a certain size car when equipped with plain bore wheels needs 3 men for starting and running while the same car when equipped with flexible roller bearings needs only one man for starting and running. While no starting tests have been made during the above described tests at Greensburg, sufficient information has been obtained at another mine to show the starting pull of plain-bearing cars to be about 150% higher than for flexible roller-bearing cars. It was found that starting tests require a great amount of care to obtain reliable results and such tests will be the special subject of a later investigation.

It will be noticed that for all running tests a piece of track with a pronounced grade was selected. This was done purposely as it was found that the effect of the pull on the instruments was far more uniform and steady on a grade than on the level; this, in turn, means that the results after being corrected for grade are more certain. To be sure a number of tests have been run on level track and the results obtained check in every instance with the corrected results of tests made on a grade.

It is intended to keep the dynamometer car in commission until the various conditions existing in the different coal and metal mines all over the country have been thoroughly investigated. An analysis of these various tests will be the subject of a later paper. At that time it is expected that sufficient material will be available to form definite ideas about the relation between drawbar pull and speed, the effect of car weight, the effect of different track gages, of curves, of different weights of rails, of different wheel diameters, of different lengths of trains, the difference between empty and loaded trains, the effect of weather, etc.

Tin Mines in Austria May Resume.

An imperial decree of 1915 recommends resuming work at the numerous tin-ore mines in Austria, according to a consular report. Many of the mines had suspended work because of small profits; some had never been exploited, since in normal times copper, zinc, and lead are imported in large quantities into Austria, copper in particular being supplied in better quality and more cheaply from abroad. Tin was scarcely mined in Austria, at the most 1% of the annual consumption of 3000 to 4000 tons. This metal, however, is found in Austria in considerable quantities. Austria possesses tin deposits under favorable geographical conditions, and experts have declared these to be large. According to reliable estimates the three principal mines in Bohemia can supply annually about 2500 metric tons for some years, or about three-fourths of the country's needs.

Coal-Mine Fatalities in the United States, 1870 to 1914.

By ALBERT H. FAY.

Detailed information concerning coal-mine fatalities in the United States from 1870 to the close of 1914 is given in Bulletin 115 just issued by the Bureau of Mines, Department of the Interior. In this bulletin more than 52,000 fatalities at coal mines have been classified by cause of accident, state, and calendar year. For the first time all of the states are placed on a calendar-year basis from the beginning of inspection in each state to the close of 1914. This report is a diagnosis of the mine-accident hazard and contains information that will be used as a basis of the study of accident prevention by operators, state and federal officials and insurance companies.

Part I of the bulletin is devoted to the coal mines of the United States, in which the United States is treated as a unit by calendar years and by causes. It contains detailed information concerning accidents due to falls of roof, haulage, explosives, and electricity; a complete list of mine disasters in which five or more men have been killed since 1839; complete production figures, number of men employed and data relating to mining methods. There is also a study of mine accidents as related to machine mining, in which four groups of mines are maintained, namely: those in which 1 to 20% of the coal is machine mined; 20 to 40% machine mined; 40 to 60% machine mined, and 60% and over machine mined. These groups are tabulated by states and by years covering a period of 18 years, and include the number of men employed; number killed and fatality rates per 1000 employed for each group of machine mines according to the foregoing classification.

The bituminous coal mines of the United States are treated independently of the anthracite so that fatality rates for the bituminous mines may be obtained.

Part II takes up the mine-accident question by states. Under each state is given a brief paragraph on the area, and distribution of the coal fields; character of the coal beds; mining methods; reportable accidents and the organization of the inspection service. Data are given showing the production, number of men employed, number killed, number of machines in use in each state, and the percentage of coal mined by hand or shot off the solid, as well as the amount of coal mined per man, per day and per year. There is also under each state a list of the mine disasters that have occurred therein.

Experience in doing particular things contributes very materially to one's store of knowledge. In mining, men may become very efficient workmen and learn a great deal through no other medium than mere practical experience.

Gas in the Cripple Creek Mines of Colorado.

George A. Burrell and Alfred W. Ganger, of the Bureau of Mines, recently examined a number of Cripple Creek mines to gather data regarding the composition of gas that issues from the rock into the mines of that district.

In summing up their observations they say that the escape of gas from the rock strata into the mines of the Cripple Creek mining district is a menace to life and to mining. The outflow of this gas, supposed by Lindgren and Ransome of the Survey to represent the last exhalations of the extinct Cripple Creek volcano, is largely influenced by outside atmospheric pressure, because it is confined in the rocks under very low pressure.

At a few mines a pressure system of ventilation has been installed to assist the ordinary natural circulation. Under this system air is blown into the mines by a fan placed at the top of the shaft, thereby placing the mine workings under a little pressure, at some places equivalent to 6 or 7 ins. of water (about 0.5 in. of mercury). This method assists very materially in keeping the gas forced back in the rocks.

All told, 32 samples of mine gas were collected from four mines.

It was impossible to secure samples of pure rock-strata gas as it issued from the rocks during inspection of the mines, hence entrance was made as far as it was possible to penetrate into some of those drifts that were most contaminated with the gas. A sample containing 2.69% of oxygen (sample 760, Cresson mine) was obtained and was the sample containing the largest percentage of the rock-strata gas. Undoubtedly if one had been able to penetrate 15 or 20 ft. farther into the drift a sample practically devoid of oxygen would have been secured.

A number of samples that contained the smallest percentages of oxygen was recalculated air-free, in order to determine the actual composition of the gas as it issued from the rocks. This calculating showed that the gas contained between 12.03 and 18.37% of carbon dioxide and 81.63 and 87.97% nitrogen. The average of all the results was 13.87% of carbon dioxide and 86.13% nitrogen, or, in round numbers, 14% of carbon dioxide and 86% of nitrogen.

The gas, then, as it occurs in the rocks is a mixture of carbon dioxide and nitrogen with the latter much in excess.

The bad effects on life and lights are principally due to the fact that the rock gas so dilutes the air of the mines that the oxygen therein falls to a point where lights will not burn or so low that life is endangered.

Symptoms of distress in men do not usually begin to appear until 3 or 4% of carbon dioxide is present, when the breathing becomes affected. Men can go

on working for a considerable time in such an atmosphere although they will certainly become more quickly fatigued. Carbon dioxide affects the so-called respiratory center in the brain and makes a man breathe a larger volume of air over a given time than if no carbon dioxide were present. While air with so small an amount of carbon dioxide as 2% may be breathed with comparative safety and no great discomfort, at the same time the efficiency of the workmen is lowered. In addition to the work a man may be doing in such an atmosphere he is handicapped to this extent: He is forced to breathe a larger volume of air over a given time, a feat that consumes energy just as his work of drilling a hole in the rock or loading ore consumes energy. In England the Coal Mines Act requires that the carbon dioxide shall not rise above 1.25% in any part of a mine.

When the oxygen in air is gradually reduced very little effect may be noticed before the occurrence of impairment of the senses and loss of power over the limbs. If the reduction is gradual and the symptoms carefully watched it will be noticed that at about 12% of oxygen (that is, with a reduction of about 9% from the composition of atmospheric air) the respirations become just perceptibly deeper and more frequent, and the lips slightly bluish. Distress increases with continued decrease of the oxygen until with 6 or 7% there is marked clouding of the senses and loss of power over the limbs, which would end sooner or later in death. In a test similar to the above that the senior author participated in, a man lost consciousness when the oxygen dropped to about 7%.

As the oxygen in air decreases the illuminating power of lights diminishes, until in the case of the ordinary oil-fed lamp wick such as a candle or miner's oil torch or safety lamp, the flame becomes extinguished at about 17% of oxygen, and the acetylene flame at between 12 and 13% of oxygen, *i. e.*, if a candle flame goes out the oxygen content of the air is less than 17%, and if the acetylene flame goes out the oxygen content is less than between 12 and 13%. This effect is almost entirely due to the oxygen content and even in the Cripple Creek mines where the carbon dioxide may be from 5 to 10%, in atmospheres that extinguish flames, it exerts only a minor effect.

Men should not work where candles will not burn, and should not be solely reliant upon the acetylene flame for guidance regarding bad air. The acetylene flame will burn in air where the oxygen is only a few per cent above the proportion that is very dangerous to life, hence only a small margin of safety is assured.

Eight of the samples contained traces (0.01 to 0.03%) of combustible gas, apparently methane (CH_4). The proportions were so small, however, as to be insignificant.

The authors are indebted to several mining men in Cripple Creek for generous assistance in collecting data, especially to Messrs. Suydam, Allen and Arthur.

Semi-Centennial Celebration of Calumet & Hecla Mining Co.

By HOMER GUCK.*

At Calumet, Mich., on July 15 will be celebrated the semi-centennial of the Calumet & Hecla Mining Co. It is going to be one big family gathering of all the Calumet & Hecla folks, the officers and directors and their families from Boston, the local officers, office employes, foremen, captains, underground workers, surface men, mill men, smelter employes and all their families.

There are 5500 of these Calumet & Hecla employes. And most of them have large families; all will be at the party. The impossibility of handling a crowd three times as large as the 20,000 people of the main Calumet & Hecla family, prevented the extension of invitations to all of the employes of the subsidiary companies.

While the task of entertainment is a large one, the committee is not objecting to the public participation in the events of the day. Only they desire to impress the fact that in every feature of the entertainment the Calumet & Hecla employes are to be given the best consideration.

There will be a parade of all of the employes. There will be half a dozen bands, headed by the Calumet & Hecla band. Every employe of the company will march in the parade, excepting some of the older employes, who will ride in automobiles. Following the parade there will be a review in the new Calumet & Hecla park. There will be a brief address by Rodolphe Agassiz, the president of the company, and another address by a speaker of national renown.

Fifty Years and Six Months.

The most interesting man to take part is Timothy O'Shea. He has worked for this company continuously for 50 years and 6 months, taking a job in the original pit. He now is employed at the Hecla, a fine specimen of manhood, enjoying good health despite his age and assuming no attitude of importance because of the unusual distinction of loyalty and continuous service.

Another employe who has been in the service continuously for 48 years is George Johnson, the negro doorkeeper at the Boston office of the company, Ashburton place, Boston. He is coming to Calumet to participate in the family party.

There are 1355 men out of the 5500 now employed by the Calumet & Hecla who have worked steadily for this company for more than 20 years, 815 who have worked from 20 to 30 years, 377 who have worked steadily from 30 to 40 years and 163 who have been employed more than 40 years.

Such a large force of loyal, steady, competent workmen attests the fact that the Calumet & Hecla is a pretty good family, looking at it from the standpoint of employer or employe.

Gold Medals to Oldest Employes.

Following the parade there will be fitting recognition of these men of long time service. President Agassiz will present Timothy O'Shea and all of the 140 men who have worked for the company for over 40 years with a gold medal. This medal contains on one side a beautiful replica with the faces of the late Quincy A. Shaw and the late Alexander Agassiz, the two men who were responsible, above all others, for the success of the Calumet & Hecla as a great copper mine and a great company to work for. On the same side of these gold medals will be dates 1866-1916. And on the other side the name of the employe and length of his service. These medals were designed by V. D. Brenner, the man who designed the Lincoln coin. The employes whose terms of service is from 30 to 40 years will receive silver medals—the silver coming from the Calumet mine—and the employes whose terms run from 20 to 30 years will receive bronze medals. The medals are 2½ ins. in diameter and are intended not to be worn but as a keepsake. The gold medals contain 6½ ozs. of gold.

All the details for the day's entertainment have not as yet been worked out. In case of rain or unpleasant weather another program, suitable for indoor observance, will be followed. There will be no cost for entertainment to any of the Calumet & Hecla workmen, nor to any of their families. It is interesting to observe, too, that every man will receive his full day's pay for the celebration and the most expensive item of all to the corporation probably is the loss in copper production by the shut-down for a single day with the present high price of copper.

Discovery of the Mine.

While the year 1916 is the 50th birthday of the Calumet & Hecla, that being the year when the organized work actually started on the conglomerate formation, the fact remains that the discovery was made in 1865 and a little work was done late in the fall of that year. The Calumet & Hecla Company was organized in 1871 as a consolidation of the Hecla, Calumet, Scott, Portland and other companies.

The first newspaper notice of the discovery of the Calumet conglomerate appeared in the Houghton Gazette of November 11, 1865. It reads as follows:

"Strange Discovery. A party exploring on the

*Editor Houghton Gazette.

Calumet property, in cleaning out an old Indian pit in the conglomerate, on Sec. 14, found an old wooden shovel, in a very good state of preservation. It being made of hickory shows that it was brought from some distant region of the country, as none of that species of wood is to be found here. A birch bark pail has been found in the same pit, also a piece of copper showing distinct marks of being cut with some sharp instrument. The ancient workings on this property are very extensive and now bid fair to be the most interesting of any yet discovered. They are the first we have ever heard of being found on any of the conglomerate lodes."

On Dec. 2, 1865, this paragraph appeared in the Gazette:

"Calumet.—Reports are current of another and more extensive ancient workings has been discovered at or near the property, but its exact locality has not come to light. The property will doubtless be sold ere long."

In the Gazette of Jan. 7 there is quite an elaboration of the opening work done by Edwin J. Hulbert, then in charge for Quincy A. Shaw, at the Huron mine, now part of the Isle Royale and likewise in charge of the Calumet developments. Much space is given to the story of the remains of a bear found in the workings and to various large pieces of copper, evidently "tooled" out by ancient workers in the metal.

In the Gazette of Feb. 3, 1866, is recorded the meeting of the Calumet Co. and the election of directors as follows: Samuel P. Shaw, E. J. Hulbert, John Leighton, Alexander and Quincy A. Shaw. The geological theory and plan for development is elaborated in this issue of the Gazette as follows:

"The policy of this company, for this winter, is to conduct only a careful exploration of the conglomerate belt, for the purpose of ascertaining whether or not its unparalleled richness is continuous in length, and also to reopen to its original extent the celebrated 'Ancient Pit Works.' It is the expressed opinion of Wm. B. Frue and Mr. Hulbert that this pit occupies a position over a rich copper-bearing belt lying about 50 ft. to the westward of the conglomerate lode, since all rock developed from the pit is different in character from the conglomerate and its associate underlying amygdaloid; and that the frequent nuggets of native copper found in these old workings have no representation in any workings on the conglomerate to exemplify the richness of this lode. The work is now being carried on by means obtained from the rock brought in by sleighs and smelted. A house 28x35 has been erected over this great pit and it appears does not even, at that size, embrace the entire extent of the ancient work. We hope to be able within 3 weeks to give to our readers an idea of the object for which the old miners worked so extensively.

"In addition to the specimens found and described in the Gazette, we have been shown by Mr. Hulbert a section of a drill hole in a piece of conglomerate,

the diameter of which is about 1¼ ins. and presenting about the same appearance that the drill hole of today would. On reaching the bottom of this work tools may be found that will shed additional light on this interesting subject.

"Thus far the list of specimens exhumed (which may eventually give the basis for an article to establish the identity of the race who worked on our copper lodes, and to show with what tools they worked), consist of a piece of native copper, with a cut made by some sharpened edge tool; a piece of conglomerate rock containing 50% copper perforated by a drill, several pieces of native copper, pounded and cleansed from all superfluous rock, fragments of birch bark baskets or water buckets, with spruce root stitching, a wooden shovel, pieces of tanned beaver skin with the fur and hair in good preservation, a buckskin string knotted, a piece of buckskin tanned, charred coal, a tooth of some carnivorous animal, skull of a land turtle, fragments of a hoof, pieces of hard wood pointed by the cutting of some sharp axe or knife, leaves of the trees of the date of the original workings, consisting chiefly of birch and maple, and a stratification of fine sand and carbonate of copper, showing conclusively that the ancients did wash out fine copper particles from previously pounded rock.

"Great care is being taken by those exhuming this pit, to preserve all the indications of the work of those who preceded us, and we sincerely hope that an entire chain of evidence may be thus made out that will be of service determining at what time and by whom these excavations were made."

Copper and Zinc in Japan.

The output of copper in Japan during 1915 is estimated at between 70,000 and 75,000 tons, an increase of about 15% over the 1914 output. Exports of copper were as follows (long tons):

	1914.	1915.
China	13,850	1,136
Hongkong	2,500	96
British India	2,420	1,220
United Kingdom	6,790	12,200
France	3,170	3,940
Germany	2,100	—
United States	4,800	7,500
Asiatic Russia	5,000	29,000
Other countries	2,110	320
Total	43,000	56,000

Prior to the war the zinc-smelting industry in Japan was a very small one, the output for 1914 being estimated at 5000 tons. Cessation of competition, however, gave a great impetus to the industry, and the production in 1915 amounted to 16,000 to 18,000 tons, while it is expected to reach 25,000 tons in 1916. Exports of refined zinc from Japan in 1915 amounted to 5300 tons, mainly to the United Kingdom, France and Russia. Zinc concentrates were obtained from China and Siberia.

The clay deposits of the southern Atlantic coast states are of great extent and variety.

Some Hydraulic Mining Problems.

In a recent paper (Proc. A. I. M. E.) Chester F. Lee, engineer, and T. M. Daulton, general manager of the Placer Gold Mines Co., describes many of the obstacles met with in developing and operating a placer property in the Atlin Mining district, on Ruby creek, British Columbia, one of the principal ones being equipment of sluice boxes:

The gold-saving sluice boxes, 42 ins. wide, were originally paved with spruce blocks 8 by 8 ins. by 10 ins. long, spaced 2 ins. apart longitudinally, but the excessive wear on them entailed frequent stoppages for renewals which was both annoying and expensive as the season is short and it is imperative to get the maximum use of the water during the open period. The steepest grade obtainable was 3½%, which seriously limited the amount of gravel handled. In 1914, therefore, 2400 lineal feet of high-carbon steel plates (0.9% carbon) were bought from the Carbon Steel Co. of Pittsburgh, and substituted for wood blocks for this distance. The grade of the flume was changed to 2.77%, which gave 20 ft. additional dump at the lower end of the sluice.

The plates cost \$45 per ton at the mills, \$108.80 per ton laid down at Ruby Creek. Plates of this sort were first used by the McKee Creek Mining Co. in this district in 1909. The plates are 12 ft. long, 38 ins. wide and ½ in. thick and are placed 2 ins. apart as to their ends with a drop of ½ in. from one plate to the next. Fig. 1 shows how they are supported and held in position; 6 to 8-in. logs are sawed flat on two sides to a thickness of 4 ins. and made ½ in. thicker on the downstream end than on the upstream in each 12 ft. of length. The plates are supported by these and held down by the edges of the 3 by 10-in. lining boards.

The space between plates makes an excellent riffle. The use of the plates increases the capacity of the sluice about 40% and enables angular pieces of blasted boulders 30 ins. in their longest dimension to be put through as against 20-in. pieces with block riffles. Occasionally extra large boulders get into the sluice, and 5 by 2½-ft. ones have gone through without trouble. All trouble from jammed sluices and overflows has thus been obviated.

After a season's wear and carrying 67,940 cu. yds. of gravel, the plates showed an abrasion of 1-32 in. At the end of the 1915 season, after transporting a total of 130,380 cu. yds., holes developed at some points. The surface skin of the plates is harder than the interior and where the surface becomes slightly worn deterioration is more rapid. A steel equally hard throughout is desirable for this use and the question of its production has been taken up with the manufacturers.

In 1915, 6380 boulders were drilled and blasted and 21,955 "bulldozed" without drilling; in 1914, 23,832 were blasted, which, taking the 2 years together, is a boulder for each 2.5 yds. of gravel worked. The practice is to "bulldoze" the flatter and smaller boulders without drilling, and block-hole the larger

ones and pipe all the pieces through the sluice. For drilling, two Sullivan DA-19 40-lb. hammer drills are used with air pressure at 90 lbs. at the compressor. The air line is 2 ins. in diameter and 1000 ft. long; three lines of 50-ft. hose ½ in. in diameter connect directly with the drills. In 1915, explosives cost 26 cts. per boulder.

In part of the ground an additional obstacle must be overcome. On the east side in pit B a dark basaltic dike about 13 ft. thick lies on top of the 21 ft. of pay gravel and is itself overlaid by 6 ft. of waste gravel. This basaltic flow is lenticular and thins out both in the upstream direction and from the center toward the east rim. It pinches out entirely 250 ft. upstream.

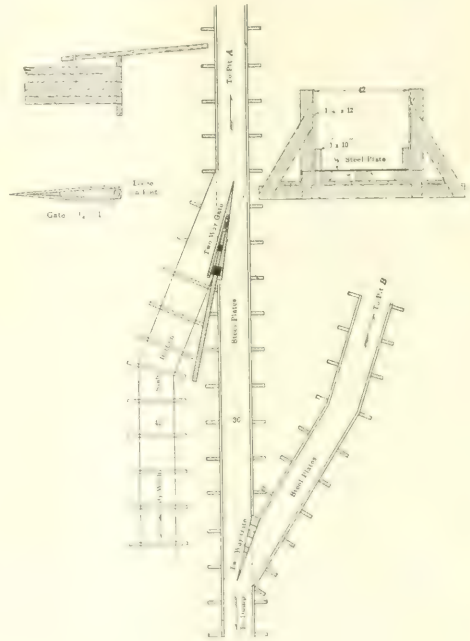


FIG. 1. ARRANGEMENT OF SLUICES.

Fortunately the basalt is friable and fairly soft, so that by putting gopher holes under it and shaking up with powder it is gradually broken through, and can be washed away by ground sluicing and hydrauliclicking.

In 1915 the following results were obtained:

Amount of gravel in season employed	30
Amount of gravel in season worked	978
Amount of gravel in pay gravel	16,862
Total amount of gravel handled	18,140
Amount of gravel in pit B	1,338
Total amount of gravel handled	19,478
Number of men employed	\$0 900
Expenses	0 110
Expenses	0 007
Expenses	0 000
Expenses	0 005
Expenses	0 011
Expenses	0 007
Expenses	0 007
Expenses	0 007
Total	\$0 150

The property belongs to the Placer Gold Mines Co. of Seattle. G. W. Fischer, president; T. M.

Daulton, general manager; the latter has planned the work and conducted the operations since the company took over the property from the original locators in 1908, and is still in charge.

The World's Pig Iron Production.

Substantially accurate figures of pig iron production in 1915 are available for the following countries, the figures, those advanced by the American Metal Market, referring to gross tons in the case of the United States and Great Britain, and to metric tons of 2,204.6 lbs. in the case of other countries:

United States	29,916,213
Germany	11,790,199
Great Britain	8,793,859
Russia	3,535,000
Sweden	767,600
Italy	379,909
Total	55,182,580

The output of Austria-Hungary, France, Canada, Spain and the miscellaneous producers is estimated at about 7,200,000 tons, so that the total production would be about 62,400,000 tons, or say an even 62,000,000 gross tons if the metric statements were reduced to gross tons as should be done when final figures are available.

This output compares as follows with records for previous years, all reduced to gross tons:

1850.....	4,401,415	1912.....	72,719,002
1890.....	26,994,904	1913.....	77,832,412
1900.....	46,181,865	1914.....	59,804,897
1910.....	65,267,994	1915.....	62,000,000
1911.....	63,342,901		

Production at the present time is larger than the average in 1915. The United States is producing 10,000,000 tons more, Germany about 1,100,000 tons more, and there have probably been increases elsewhere enough to make the total increase about 2,000,000 tons, which would give a present rate for the world of about 74,000,000 tons. That, however, would be a rate 4,000,000 tons less than in 1913, while the United States is 9,000,000 tons ahead of its output in 1913, so that the rest of the world is 13,000,000 tons behind. The proportion of the American output has increased from a shade under 40% in 1913 to fully 54% at the present time.

Assuming that no capacity has been destroyed, or that enough new capacity has been developed outside the United States to make up, the present production of the United States plus the production in 1913 in the rest of the world makes a total of 87,000,000 tons, which is 20 times the output of 1850.

World's Silver Supply Low.

Commenting on the large increase in demand for silver, owing to war exigencies and advanced cost of labor abroad, the London Statist says the demand is coincident with a decreased world's supply. Precise estimates are difficult, as countries in which silver is chiefly produced, Mexico and the South American republics, keep no statistics. In the United States the metal is chiefly obtained as a by-product. Production

in the United States was approximately 5,000,000 ounces less in 1915 than in 1914.

Canada, the United States and Australia normally produce nearly 68% of the world's silver. Allowing for a substantial reduction of output of Mexico, the Statist estimates world's production of silver in 1915, contrasted with 1914 and 1913, as follows (ounces):

	1915.	1914.	1913.
United States	67,485,600	72,455,100	66,801,500
Canada	28,401,735	27,544,231	31,845,800
Australia	7,316,875	14,177,492	18,469,516
Mexico	55,000,000	60,000,000	70,703,828
Central and S. America..	15,355,000	15,355,327	15,262,131
Japan	5,000,000	4,649,910	4,649,910
Other countries	17,118,271	17,118,271	16,837,189
Total	196,677,869	211,200,241	225,696,804

There seems little doubt that in 1915 there was a reduction in world's output of 15,000,000 ounces compared with 1914 and 28,000,000 against 1913. A contrast of silver production of the world since 1860 is shown below:

	Oz.	Value.	Oz.	Value.	
1860....	29,095,000	\$ 39,337,000	1906....	165,054,000	\$111,721,000
1870....	43,051,000	57,173,000	1907....	184,206,000	121,577,000
1880....	54,795,000	83,958,000	1908....	203,131,000	108,655,000
1890....	129,095,000	87,705,000	1909....	221,149,000	110,364,000
1900....	173,591,000	107,626,000	1910....	221,715,000	119,727,000
1901....	173,011,000	103,806,000	1911....	226,192,000	122,143,000
1902....	162,763,000	86,284,000	1912....	224,310,000	137,883,000
1903....	167,089,000	90,652,000	1913....	224,569,000	135,246,000
1904....	164,195,000	95,233,000	1914....	211,200,000	116,849,000
1905....	172,317,000	105,113,000	1915....	196,677,000	97,355,115

Properties of Concrete.

The Bureau of Standards, Department of Commerce, has just issued Technologic Paper No. 58, dealing with the properties of concrete and Portland cement mortars, under the title "Strength and Other Properties of Concretes as Affected by Materials and Methods of Preparation." It includes the results of about 20,000 tests on about 300 aggregates consisting of limestone, granite, gravel, and trap rock which are used for concrete materials in various sections of the United States.

The results are of especial interest to contractors, engineers, architects, and others who use concrete, since it points out that with the same aggregates a variation in strength of as much as 100% may result owing to the lack of proper precautions in mixing and placing the material. The effect on the compressive strength of each of the factors, such as type of aggregate, method of mixing, method of molding, the consistency, the density, the method of storing or curing conditions, abnormal methods of curing, characteristics of the aggregate, proportions of cement to aggregate, age, etc., are studied separately and the results are shown in tables and diagrams.

One of the most important conclusions to be derived from the results is that the use of too great an amount of mixing water, which is common in present day construction, accounts for many concrete failures. The use of an excessive amount of mixing water may result in a reduction in strength as great as would result from a reduction of 50% in the amount of cement used. The results indicate that proper methods of mixing and fabrication are as important as good cement and aggregate in producing a concrete of the best quality.

What the Mining Companies are Doing

Yellow Pine, Nevada.

The Yellow Pine Mining Co., Nevada, has published a report which gives a detailed distribution of costs for the year 1915, including all disbursements. These costs include all construction work and purchase of new equipment, also the sum of \$587,650 bonus distributed during the year to employes and a Christmas present to employes amounting to \$1175.

Distribution.	Total.	Per ton shipped.
Assaying	\$ 1,450.00	\$ 0.04
Stoping	55,610.65	1.48
Timbering	5,095.96	0.288
Development	22,114.36	1.22
Milling	7,736.42	1.19
Transportation to Jean	14,674.36	0.829
Loading at Jean	4,140.65	0.233
Office (L. A. and mine)	67,888.82	0.78
Taxes and insurance	11,241.97	0.46
Construction	5,213.68	0.294
Miscellaneous	7,000.00	0.45
Total costs	\$153,588.53	\$ 6.82
Balance—Profit	689,611.21	39.516
Gross receipts	\$853,199.74	\$48.148

Operating disbursements were as follows:

Assay laboratory	\$ 1,450.00
Labor, mill	18,543.50
Labor, mine	68,379.45
Labor, railroad	7,803.70
Loading at Jean	3,538.61
Los Angeles office	1,726.00
Construction	4,014.20
Mine office	5,058.42
Christmas gift	1,150.00
Supplies, mine	11,885.29
Supplies, mill	9,822.06
Supplies, railroad	6,617.59
Taxes and insurance	10,345.52
Total	\$14,880.07
Dividends disbursed	450,000.00
Bank balance, Jan. 10, 1916	112,187.55
Special reserve fund, cash	50,000.00
Petty cash, Jan. 10, 1916	75
Store house, Jan. 10, 1916	3,081.02
	\$765,066.19

American Zinc.

The American Zinc, Lead & Smelting Co. reports to the New York Stock Exchange for the 4 months ending April 29, 1916, as follows:

Total net earnings	\$2,478,225
Administration and general expenses, including taxes	75,651
Balance	2,770,582
Interest received on bank deposits, etc.	7,025
Net profits before depreciation	2,770,607

The report of the American Zinc, Lead & Smelting Co for 4 months ended April 29 showing net profits of \$2,770,607 would indicate some recession in earnings for the month of April as compared with the months immediately preceding.

Profits for the fourth quarter of 1915 were \$2,344,072; for the first quarter of 1916, \$2,255,000. If from the 4 months earnings we subtract those for 3 months there is indicated a profit of \$515,607 for April. This compares with monthly earnings at the rate of \$781,300 for the last 3 months in 1915 and \$750,000 for the first 3 months of 1916.

Utah Securities Corporation.

The combined net income account of the Utah Securities Corporation and its subsidiary, the Utah Power & Light Co, including subsidiaries of the latter, for the 12 months ended March 31, 1916, compares as follows:

	1915.	1915.
Earnings, including surplus of subsidiaries	\$1,230,000	\$1,111,000
Expenses	208,000	211,000
Net	\$1,022,000	\$899,000
Profits on redemption 6% notes during the year	400,000	—
Less underwritten, common	34,112	—
Income from all sources	1,514,900	1,111,000
Interest on 6% notes	888,000	—
Surplus	\$626,900	\$899,000
*Including taxes.		

and net earnings from operations of all controlled properties for 12 months ended March 31, 1916.

	1916.	1915.
	\$5,914,725	\$4,000,000
	1,100,000	1,000,000

President Mitchell says in part: "The aggregate gross earnings of the operating subsidiaries increased 9%, and the net earnings 22% during the year, despite the unfavorable business conditions prevailing during the first 3 months of the 12 months' period. Of the year's total gross increase of \$426,160, all but \$81,720 was made in the last 6 months, and of the year's total net increase of \$482,135 all but \$151,280 was made in the last 6 months."

Tennessee Copper Co.

The Tennessee Copper Co. produced 12,750,418 lbs. of fine copper in 1915, or an extraction of 26.83 lbs. per ton. The total cost per ton of ore was \$2,352.1, equal to \$89.08 per pound of fine copper, subdivided as follows:

	Cost per lb.	Cost per ton.
	\$0.0001	\$0.0001
	(1000)	(1000)
Mining	\$0.03190	\$0.93623
Smelting	0.00002	0.00055
Transportation	0.00001	0.00025
Marketing	0.00001	0.00025
Construction	0.00001	0.00025
Total	\$0.03205	\$2,352.10

The cost of producing and marketing per pound of fine copper was as follows:

Cost of production	\$8.90623
Transport, insurance, refining, selling expenses, less gold	0.00055
Marketing	0.00025
Construction on new bond expenses, including taxes	0.00025
Total	\$9.19228

New York & Honduras Rosario.

The New York & Honduras Rosario Mining Co. made a production in 1915 as follows, as compared with 1914:

	1915.	1914.
Total production	117,000	200,000
Cost of production	1,748,800.48	1,800,000.00
Cost of marketing	16,200.00	16,000.00
Cost of construction	\$1,175,011.48	\$1,111,000.00
Total	\$3,039,812.96	\$3,027,000.00

Operating costs were as follows:

	Total cost	Cost ton.
	1914.	1914.
Mining	1,087,271.44	5.43635
Smelting	1,124,200.48	5.62100
Transportation	248,328.56	1.24164
Total	2,459,800.48	12.29900

The combined net income amounted to \$236,111.84; dividend and surplus balance Dec 31, 1915, was \$3,174,704.98.

Con. Arizona Smelting Co.

The following condensed statement of operations for the Consolidated Arizona Smelting Co. is given by the Consolidated Arizona Smelting Co.:

Total production	7,618 tons
Cost of production	1,100,000 tons
Cost of marketing	200,000 tons
Cost of construction	1,600,000 tons
Total	2,900,000 tons

The operations of the company during the months of January and February were seriously interfered with by

weather conditions. Severe snow and rain storms made it impossible for the company to maintain regular shipments.

Tonopah Belmont Co., Nevada.

The company's report for the fiscal year ended Feb. 29, 1916, shows as follows:

	1915.	1914.
Tons shipped to mill.....	164,972	181,370
Average gross value per ton.....	\$11.11	\$16.74

Operating expenses compare as follows:

	1915.	1914.
Mining expenses.....	\$474,961.27	\$507,870.77
Depreciation of mining equipment.....	7,511.22	15,028.14
Development work.....	165,630.76	207,546.88
Total.....	\$648,103.25	\$730,445.99
Mill operating expenses.....	\$413,122.73	\$465,185.53
Tons treated.....	165,157	181,424
Direct cost per ton.....	\$2.506	\$2.536
Indirect cost per ton.....	\$0.216	\$0.408
Total cost per ton.....	\$2.682	\$2.564

Naumkeag Copper Co., Michigan.

The balance sheet of the Naumkeag Copper Co. as of Dec. 31, 1915, shows as follows:

Assets—	
Mine property.....	\$ 767,000.00
Development expenditures.....	\$84,031.83
Less rentals received.....	1,739.09
General and administrative expenses.....	\$25,181.39
Incorporation expense.....	6,221.72
Total.....	\$31,807.11
Less interest.....	30,148.21
Investments in bonds and notes.....	1,654.86
Cash in New York and at mine.....	112,251.28
Total.....	\$1,026,000.00
Liabilities—	
Capital stock issued.....	\$1,026,000.00

Magma Copper Co.

The following statement of the operations of the Magma Co. for the first quarter of 1916, comparing with the preceding quarter, is given:

	Quarter ended March 31.	Preceding quarter.
Copper produced.....	2,043,784 lbs.	1,833,453 lbs.
Cost of copper per pound.....	9.13 cts.	8.78 cts.
Average price copper.....	22.39 cts.	18.10 cts.
Operating profit.....	\$279,261.29	\$155,761.72
Average monthly profit.....	93,087.07	51,253.90

Miscellaneous Company Notes.

A. Shaw McKean was elected a director of the LaSalle Copper Co. at the annual meeting of the company, succeeding George A. Flagg.

The Greene-Cananea Copper Co.'s report of production in May shows as follows: Copper, 5,948,000 lbs.; silver, 183,809 ozs.; gold, 1199 ozs.

Laraines of the Arizona Commercial Co. are running from \$70,000 to \$75,000 per month, or over \$3 per share, on the company's 265,000 outstanding shares. The company has more than \$500,000 working capital.

The Beaver Con. Mines, Ltd., reports as of May 31, 1916, as follows: Bullion in storage, 186,433.19 ozs.; ore at smelters, 39,350.03 ozs.; ore bagged at mines, 68,700 ozs.; total, 204,183.22 ozs.; cash on hand, \$92,483.68.

During 1915 the Right-of-Way Mining Co. had mine expenses of \$22,963.55; concentrator expenses of \$17,033.83; other expenses of \$445.36; total expenses, \$44,582.74. Sales of ore netted \$56,835.59. The company has assets of \$1,690,894.67.

The Washoe smelter of the Anaconda Copper Co. broke all previous records in the production of copper last month with a total output of 26,900,000 lbs. The Great Falls reduction works, however, showed a large falling off from the production of April, the May production was in the neighbor-

hood of only 4,000,000 lbs. of copper, against nearly double that amount in April. The total production of the two smelters for May was about 31,000,000 lbs. of copper, as against a production in April of 33,600,000 lbs.

Utah Metal Corporation has let a contract for the immediate installation of a flotation process for treating tailings, to cost \$18,000. The company reports its product well sold ahead and has quick assets amounting to over \$1,250,000. The question of dividends is soon to be considered.

The Tanganyika Concessions, operating in the Congo district of Africa, is steadily increasing its production, April output having been at the rate of over 60,000,000 lbs. per annum. The following gives results for the first 4 months of 1916: April, 5,013,120 lbs.; March, 3,010,560 lbs.; February, 2,296,000 lbs.; January, 1,650,880 lbs. In the 3 years ended Dec. 31 last the company produced 68,875,000 lbs., of which 28,000,000 lbs. represented the 1915 output.

The Kennecott Copper Corporation has sold its possible production for the remainder of the year at prices which assure profits far in excess of dividends at rate of \$6 a share. Report of Engineer Henry Krumb of Braden property is highly pleasing to the management of Kennecott. Braden has ore reserves far in excess of original estimates. Alaska properties of Kennecott are also showing up well, and it is expected that development work over the next 12 months will add largely to known reserves.

The Kennecott Copper Corporation has issued the following statement: "The president submitted to the board a statement showing cash and copper on hand June 3, 1916—all of which copper has been sold—in excess of \$18,000,000. As Kennecott Copper Corporation will receive on its holdings of 404,504 shares of Utah Copper Co. \$1,213,512, it is estimated their cash and copper on hand at date of payment of Kennecott dividend will be in excess of \$21,000,000. Above figures do not include Kennecott's interest in cash and copper on hand of Braden Copper Mines Co. or Utah Copper Co."

The report of the Barnes-King Co. for May shows receipts of \$38,000, an increase of \$3100 over April. At the North Moccasin 3779 tons of ore yielded \$28,000, or \$7.41 per ton, against \$6.34 in April. At the Piegan-Gloster 2178 tons of ore yielded \$10,000, or \$4.59 per ton, against \$4.09 in April. The power plant at North Moccasin will be shut down for repairs and improvements part of June, and the Piegan-Gloster mill will close down for part of June to install new equipment for treatment of Shannon ores. Foundations for loading terminal, ore bin and crusher at Shannon have been completed.

The net earnings of the Standard Silver-Lead Mining Co., which owns and operates the Standard mine and mill at Silverton, B. C., were \$86,773 in April. This was \$50,170 less than in March, when the net profits were \$136,943, the largest monthly earnings in the history of the corporation. The operating expenses practically were the same in both months, and the decrease in April is due to the smaller output of lead-silver ore and concentrates. Smelter settlements for March were based on 1295 tons of lead ore and concentrates and amounted to \$172,347, while the April settlements were \$95,115 for 729 tons of lead ore and concentrates. Zinc sales in April were \$26,847, as compared with \$5432 in March, and the cash balance April 30 was \$320,936, as against \$284,163 on March 31.

Application has been made to list stock of the Consolidated Interstate-Callaban Mining Co. of Idaho on the New York stock exchange, and it is anticipated that the issue will be called early in July. During May the company mined 12,801 tons of ore, which produced 1,080,000 lbs. of concentrates that averaged 54% lead and returned 10,080 ozs. of silver and 12,292,000 lbs. of concentrates that averaged 19% zinc. Mill recovery for the period averaged 90.5% of the metal content of the ore, and the smelter returns were \$40,089. The 3-compartment shaft from the main tunnel workings was sunk 405 in May, and connection has been established with the undergrounds of the Amazon-Manhattan group, adjoining, acquired several months ago by the company. The shaft will be sunk still further, to connect with the 600-ft. tunnel of the Amazon-Manhattan, which is being advanced to meet it.



Published every Saturday by MINING WORLD COMPANY, Monadnock Block, CHICAGO Phone Harrison 2893

New York: 35 Nassau Street. Phone Cortland 7331.

Entered as Second-Class Mail Matter at the Post Office at Chicago, Illinois

LYMAN A. SISLEY President K. P. HOLMAN Vice-President C. A. TUPPER Secy. and Treas.

SUBSCRIPTION PER YEAR United States and Mexico, \$3.00; Canada, \$5.00; By Check, Draft, Post Office or Express Order

ADVERTISING COPY Must be at Chicago Office by 10 A. M. Monday to insure publication same week

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*Illustrated.

American Intervention the Salvation of the Mexican Republic.

As you may write it would appear as though the crisis had been reached in our relations with Mexico and the nation is preparing to meet the situation in a manner that will impress on our southern neighbor that there will be no lack of energy in bringing a deplorable condition of affairs in Mexico to a determined conclusion.

That conditions have become extremely grave is evidenced by the orders for the mobilization of the National Guard and the ordering of a large naval force to Mexican waters.

There are conflicting opinions as to whether this should not have been done at an earlier date, but now that the United States will resort to force—the only argument that our turbulent and misguided neighbors seem to be able to understand—a large majority of the people of the United States are well satisfied.

But the task will be no easy one, for the average Mexican has never believed that our interests in their behalf have been because we loved them, and when it comes to opposing the United States, all interests will combine against us. This, too, despite the fact that no nation the world over has displayed so much patience, suffering under continued ruthless injury and provocation, as has the United States.

The Mexican people as a whole have fully demonstrated that they are not morally strong enough to govern themselves in a stable manner, and now that intervention seems the only salvation of the Mexican people, let us see to it that its government shall henceforth be conducted for the best interests of their people and others who may be doing business there.

And let it be done thoroughly!

The mining industry in Mexico, particularly, has been a great sufferer from the continued revolution. The great majority of the mines were compelled to close down, from various causes, and those that operated labored under great difficulties as railroad and mail service were impossible at times, being subject to frequent interruptions. Transportation has been practically at a standstill in many districts, and not regular or rapid anywhere. Labor is scarce, as most of the laborers are in the armies, or have fled the country. Imported supplies have been hard to obtain and very expensive.

Butte, Mont., Labor Troubles Settled.

Butte handles labor troubles in its own peculiar way, just as it meets all other problems and issues differently from any other community on earth. A band of two labor unions for an increase in wages of 50 cts. per day, affecting about 500 out of 16,000 men employed in Butte, tied up practically everything in the city, and shut the mines for a period of 10 days.

The Anaconda Copper Mining Co., which was not directly interested in the controversy, fought the demands through an organization known as the Employers' Association, whose membership is governed by the amount of money paid for wages which, of course, puts the Anaconda in control of it. The Wilson system of watchful waiting was adopted, and day by day there were new lockouts, and finally the labor leaders came off their high horses and consented to recognize the Employers' Association and do business through it. Then a joint committee of arbitration was appointed, and all the men went back to work. The committee is working on the controversy, and it is rumored that the Anaconda representatives on the committee are in favor of paying the demands of labor. There was some opposition on the part of small employers to the orders to stop work, but it is understood that they were guaranteed against loss, and the achievement of the Employers' Association is that the labor unions have consented to "recognize" the association and hereafter the employers of many thousands of men will be on the same plane as the thousands of employes themselves—they may do business through a union and walking delegates.

Two years ago "Muckie" McDonald led a revolt against the Butte Miners Union which resulted in the disruption of that influential labor organization. Through the influence of "King Muckie," who reigned supreme in Butte for some weeks, there was some dynamiting of property and a reign of terror prevailed. There was a killing or two, men were driven out of town, and finally the military came and restored order, and "King Muckie," under whose reign some property of the Anaconda was dynamited, went to the penitentiary for a term of 3 years. "King Muckie" has just been paroled. He came back to Butte and the Anaconda has given him a job in one of its mines. There are hundreds of other men in Butte who never harmed any one, never destroyed property, have never been in the penitentiary, have always respected law and order, but who are unable to secure employment in Butte.

Cost of Safety Work in Mines.

There is, of course, a limit to the amount of money that can be expended effectively on safety work. Doubtless it is best to make a modest beginning, increasing the scope of the work and the financial expenditure as information is gained as to the best procedure. Edwin Higgins, State Mine Inspector of California, had occasion recently to secure figures relative to the cost of safety work from 17 mining companies. The number of men employed ranged from 38 to as high as 2178 men per day, the total number of employes of the 17 companies being 5480. The amounts expended yearly for safety work ranged from \$230 up to \$15,000. The total amount expended yearly was \$55,356. Figured out on the

basis of the amount expended yearly for each man employed, the range was from \$1 to as high as \$48. The average for the 17 companies was \$10.10 per man per year. That average was much higher than it should have been, as the companies considered included many that were just beginning their safety work.

One company, employing over 2000 men, and having a well organized and efficient safety system, spent approximately \$6 per year per man employed. It is probable that a fair average for maintaining safety work, after the preliminary work has been done, would be in the neighborhood of \$5 per year per man employed. This does not mean that effective work can not be done for less than this amount. Some companies that are only spending \$1 per year per man are getting good results.

The American Smelting Co.'s Construction Program.

The year 1916 will witness the greatest construction program in the history of the American Smelting & Refining Co. Additions to plants, enlargements, etc., necessitating an expenditure of fully \$6,000,000 are planned.

The most important work, now under way, is the enlargement of its Baltimore plant, and which will be completed some time in August. The company's Tacoma extension is completed and that plant is now running to about capacity.

The company's tin smelter and refinery at Perth Amboy is now turning out about 250 tons of electrolytic tin monthly. Just when the capacity of 500 tons monthly will be reached is problematical as increasing tonnage has been found slow work. There is a ready market for all its production and a steady supply of tin concentrates is being received from Bolivia.

The failure of the expected foreign buying movement in copper to materialize is said to be due to a price difference. Negotiations, however, have reached a state suggesting that orders will be placed in the near future. Estimate of the amount of copper involved in the negotiations range from 300,000,000 to 500,000,000 lbs. New commitments in copper last week were not of an important character. The market was quieter than for any similar period since the lull in heavy buying set in.

The great diversity of the products of American mines is well shown in the 1915 report of the South Hecla Mining Co. operating properties at Alta, Utah. The report shows a production as follows: Gold, 160,903 ozs.; silver, 144,066 ozs.; lead, 914,491 lbs.; zinc, 507,842 lbs.; copper, 33,151 lbs.; iron, 399,905 lbs.

PERSONAL.

A. E. Carlson, mining engineer, is now with Shannon Copper Co.

Courtland Young of Pasadena, Calif., is inspecting properties near Courtland, Ariz.

J. K. Turner has been appointed manager for the Arabata Mining Co. at Union Pass, Ariz.

C. W. Nicholson has joined the engineering staff of the Cleveland-Cliffs Iron Co. at Ishpeming, Mich.

W. R. Foster, consulting engineer, Boston, has been examining the Lion Hill property, Ophir, Utah.

J. R. Wilkinson, mining engineer, is in the testing department of the Washoe smelter at Anaconda, Mont.

R. S. Pratt, superintendent of the Iola zinc mine at Iola, Kas., has been visiting in the Copper Country.

Charles S. Haley of Atolito, Cal., will make an extended inspection of Alaska properties for California clients.

W. H. Manning, mining engineer, Spokane, Wash., has been making examinations in the vicinity of Oroville, Wash.

Ray Sperr, mining engineer, is with the Keweenaw county road commission in the Lake Superior copper district.

O. B. Perry, consulting mining engineer, New York, for the Yukon Gold Co., Alaska, is at present in San Francisco, Cal.

George A. Morrison, for several years past in Mexico, has returned to the United States and at present is at Nevada, Mo.

H. W. Nichols, assistant curator of geology at the Field Museum, Chicago, has recently returned from a trip to Porcupine, Ont.

W. H. Manning, mining engineer of Spokane, Wash., has been inspecting mining proprietor in the Oroville section, Washington.

Lewis Merriman has been retained by the Lehi Tintic Co. to take charge of developing its property in the Tintic district, Utah.

C. C. Brayton and E. R. Richards have opened offices as consulting mining and metallurgical engineers in San Francisco, Cal.

Thomas Kearns, vice-president, and B. F. Edwards, general manager of the Halifax Co., Tonopah, Nev., have left for Oakland, Cal.

A. E. Custer, chemist and assayer of Salt Lake City, Utah, has made a visit to the oil and gas district surrounding Billings, Mont.

Harry Lefkovits and John S. Cook, former Nevada operators, now interested in copper properties at Miami, Ariz., are in New York on business.

Thos. F. Cole, the well-known operator in the Lake Superior iron and copper districts, has decided to change his residence from Duluth, Minn., to New York.

C. T. Sokup and Carl King, Kansas City, Mo., have completed investigations for the United States Smelting & Refining Co., in the Joplin district, Missouri.

O. G. Engelder, for some time with the Calumet & Arizona Co., Warren, Ariz., and recently in Sardinia, Italy, with a zinc mining company, is now in Hoboken, N. J.

Harrison A. Dumm, Michigan College of Mines, and recently on the engineering force of the Pennsylvania Engineering Co., which controls the street railways of the Mexican capital, is reported to have been arrested by the Mexican government and lodged in jail for alleged political reasons.

His efforts to friends to have him released through Mr. R. B. Brinsmade, the American representative, have not as yet been successful.

R. B. Brinsmade, who has for the past 5 years resided in Mexico, has returned to the United States. His temporary address will be 4429 Morgan street, St. Louis, Mo.

Lyons Smith, formerly metallurgical engineer for the Pittsburgh-Silver Peak Gold Mining Co. in California, is now with the Snyder Electric Furnace Co., Chicago, in the same capacity.

A. G. Gullberg, superintendent of construction and motive power at the Tamarack, is leaving Calumet, Mich., this week for a recreation trip to Norway, Sweden and Russia and will return the last of August.

Prof. F. W. Sperr, at the head of the mining department at the Michigan College of Mines, has gone to the University of Virginia for the annual meeting of the Society of the Promotion of Engineering Education.

S. S. Jones, assistant superintendent of the Tom Reed mine, Oatman, Ariz., has resigned and a complete change has been made in the management. Most of the new officials were formerly at the Gold Roads mine in the same district.

E. B. Cross, consulting engineer, who developed the White Pine Extension and other properties on the Nonesuch formations in the Michigan copper district, is making a trip on professional business to New York and other eastern points.

Assistant Professor W. E. Hopper of the geological department of the Michigan College of Mines will spend his vacation in professional work in the Oklahoma oil districts and in adjacent states, making his headquarters at Oklahoma City.

Albert E. Hall, Columbia School of Mines graduate, and for some time connected with the Canadian Copper Co., Copper Cliff, Ont., who has recently been in New York, returned to Masset, Ont., where he is in the employ of the Sable River Copper Co.

William A. Richards, mining engineer, who for some years past has been in charge of various work at the iron mines about Crystal Falls, Mich., has been named general superintendent of mines for the Crystal Falls Iron Co. and Edison Mining Co., which belong to the Corrigan-McKinney interests.

G. H. Stephens, until recently vice-president and eastern manager of Stephens-Adamson Mfg. Co., Aurora, Ill., has retired from active business on account of ill health. Mr. Stephens has been prominent in the conveying industry for 25 years and has enjoyed a wide acquaintance among machinery users of the east.

Gilbert Rigg, who recently resigned from the New Jersey Zinc Co., has sailed for Australia, where he will become associated with the Broken Hill Associated Smelters Proprietary, Ltd. He has been engaged to establish a zinc smelting industry in Australia on a large scale and is to furnish an outlet for Australia's zinc concentrates within the British Empire to take the place of the German market, which has been given up for all time.

OBITUARY.

James E. Phillips, a mining captain on the Lake Superior, was recently passed away recently at the age of 48 years. He was born in Helston, Cornwall, England, and at the age of 14 years came to Ishpeming, Mich. He worked in the iron mines of that section for many years and about 1880 went to Virginia, Minn., on the Mesabi range, where he served as superintendent and captain of several properties. He later returned to Ishpeming, Mich., to act as mining captain for the Davidson Iron Mining Co.

SCHOOLS AND SOCIETIES.

Lake Superior Mining Institute.—The next annual meeting of the institute will be held Jan. 20, 1917, instead of in the late fall, as formerly. This change was made so more members will be able to attend, as most of them are too busy later in the year. This year's meeting will consist mostly of trips, Birmingham, Ala., and New Orleans, being two of the cities selected.

Colorado School of Mines.—The following appointments are announced by President Phillips: George J. Young, now Professor of Mining Engineering, University of Minnesota, to the Professorship of Metallurgy; Claude C. Van Nuy, now Professor of Physics, South Dakota School of Mines, to the Professorship of Physics; Carroll G. Dolman, now principal of the high school at Monte Vista, Colorado, to the Assistant Professorship of English and Foreign Languages; Fred. G. Carter, University of Wisconsin, to be athletic director.

American Mining Congress.—A chapter has been instituted at Silver City, N. M., with approximately 100 members. Officers were elected as follows: John M. Sully of Santa Rita, first governor; Thos. H. O'Brien of Dawson, first vice-governor; George H. Utter, Silver City, second vice-governor; E. M. Sawyer, Tyrone, third vice-governor; T. L. Lowe, Silver City, treasurer; Don Lusk, Silver City, secretary. The directors for the first year are: C. T. Brown, T. H. O'Brien, E. D. Tittman, W. G. McDonald, Gregory Fage, L. B. Prince, John M. Sully, A. T. Kirk, J. A. Mahoney, E. Fraser-Campbell, Geo. A. Kaseman, J. L. Lawson, J. M. Palmer, J. M. Vigil, E. A. Miera, Chas. A. Spiess, Geo. H. Utter and E. M. Sawyer.

NEW PUBLICATIONS.

Effects of Atmospheres Deficient in Oxygen on Small Animals and on Men. By George A. Burrell and G. G. Oberfell. Washington, D. C., U. S. Bureau of Mines. Technical Paper 122; pp. 12. For sale by Mining World Co., 15c.

Details regarding tests made on many animals are given and deductions in many cases have been made as to the probable effects on man. In making some of the tests they were actually performed on men. The nature of the test and effects are given.

The Lure of Cripple Creek Gold. By W. Y. Seaman, Denver, Colo. Booklet; pp. 48. For sale by Mining World Co., 25c.

It has been the intention of the author in this booklet to arouse the enthusiasm of the people towards the possibilities of mining and the rightful money which can be obtained by such pursuits. He gives a vivid and interesting history of the discovery of the mines in the Cripple Creek district and the money realized by their discoverers and operators. In doing this the separate mines are considered and the description follows it from infancy to the present.

The Analysis of Permissible Explosives. By C. G. Storm. Washington, D. C., U. S. Bureau of Mines. Bulletin 96; pp. 88; illustrated. For sale by Mining World Co., 25c.

Tests are made by the U. S. Bureau of Mines to determine the permissibility of explosives for certain uses. For example, an explosive giving up poisonous gas on combustion could not be used in a mine or tunnel, but might be used in open pit or quarry work. The nature of different classes of explosives is given. There is but little said in regard to the characters and ingredients which go to make up explosives for certain uses, though in some instances the same is given brief mention. The contents of this bulletin has been in-

tended to bring out methods of testing for the physical properties and chemical methods of analysis for their ingredients, which properties and ingredients are spoken of in other publications as regards their relation to the permissibility of the explosive.

Geology and Coal Resources of Castle Valley, in Carbon, Emery and Sevier Counties, Utah. By C. L. Lupton. Washington, D. C., U. S. G. S. Bulletin 628; pp. 88; illustrated. For sale by Mining World Co., 30c.

Primarily this investigation was made because the land had been withdrawn from entry and it was desired to prove it up and thus restore it to the possibility of entries. A thorough study was made of the geological formation and fossils in attempting to make a better knowledge and correlation of the geology of which heretofore but little was known. Some properties have been opened in this section and the coal has heat values varying from 9000 to 14,000 B.t.u.

Financing an Enterprise. By Francis Cooper. The Ronald Press, New York. Book; pp. 524. For sale by Mining World Co., \$3.

The subject is dealt with in a practical way and is published as a guide to the promoter in the direction of success. One of the six parts of the book is given over exclusively to the proper methods and common mistakes made in presenting an enterprise. It includes methods of advertising, getting up the prospectus and ways of meeting parties interested. Three chapters are given to a review and discussion of ways employed for personal presentations. The remaining pages of the book which are given the most consideration deal with the investigation, protection, capitalization, and special features of promotion.

The Mining Manual and Year Book for 1916. By Walter R. Skinner. Financial Times, London, E. C. Book; pp. 957. For sale by Mining World Co. \$6.

This is the thirtieth yearly edition, and being so well known needs but little in the way of explanation. The larger companies located in all parts of the world have been arranged alphabetically. There are also tables giving the crushed ore and gold production of various countries and a glossary of mining terms. This information is followed by a list of companies, which is the principal part of the book. A complete yet brief history of the company and its officials is given and is followed by separate lists of mining company directors, secretaries and consulting and mining engineers. Each year some of the companies of the previous year become extinct or of very little importance. To make room for others which have come into prominence, the description of such a company has been left out and the company referred to in the supplementary index included specially for the listing of such companies.

Ore Deposits of the Beaverdell Map-Area, British Columbia. By Leopold Reinecke. Ottawa, Ont., Canada, Department of Mines, Geological Survey. Memoir 79; pp. 178; illustrated.

The area covered by this survey is one relatively unknown. It is situated on the Westkettle river and brought to attention principally because of the finding of a few good prospects showing silver, lead, gold and copper in about 1897. Further development showed many good deposits of lead-silver ore, though these were small. In the first part a general geographic description of the country, its nature and resources is given. This is followed by a detailed and lengthy description of the geology of the formation. Here each formation is dealt with separately and in each case the distribution, lithology, metamorphism, structure, relation to other formations and age and correlation is given. Under economic geology a table gives the deposition of various minerals, according to the zone in which they occur. The genesis of the ores is given and further details on some of the geologic forms found. A review is also here made of the mines and prospects either being developed or in the producing stage. These descriptions, though brief, give a concise review of the claim's location, mode of ore occurrence and the grade found.

TRADE PUBLICATIONS.

Belting. Gandy Belt Co., New York. Circular; illustrated.

In this advertising circular letters regarding the company's belting as received from companies using the same, are reproduced.

Pneumatic Tie Tampons. Ingersoll-Rand Co., New York. Form 9023; pp. 24; illustrated.

The tamper is similar in many respects to the hammer drill used in mining. They are here briefly described, as are some types of portable air compressors adaptable for use in supplying compressed air for them. The advantages and other uses to which the machine may be put are spoken of and many illustrations are given showing the appliances in practical use.

Steel Dry-House Lockers, Shelving and Sundries. The Hart & Hutchinson Co., New Britain, Conn. Catalog C; pp. 39; illustrated.

In view of the fact that many companies are coping with the subject of sanitation about the mines, smelters and plants, this catalog will be found of exceptional interest. Many different styles of steel lockers are shown and in the description of the same much valuable information on the design of the locker rooms is given. Besides the separate lockers many views are given of complete sets of lockers in various places which will be found suggestive in the original designing of locker-room arrangements. Prices and details of the different types are given.

Multi-Stage Centrifugal and Other Types of Pumps. The Goulds Mfg. Co., Seneca, N. Y. Bulletin 120; pp. 20; illustrated.

A complete and detailed description is first given in regard to the construction of the pump and includes separate descriptions of the detailed parts. A table of sizes and capacities is given and also sectional drawings in which the separate detailed parts are listed. Information on the installation and operation of the pump is given, with tables of detailed dimensions. On the last pages the company's testing plant is briefly described and a table giving the friction of water in pipe is reproduced. A slip is attached giving a list of the bulletins published by the company to date, and it is suggested that users not having a complete file of the bulletins may obtain the same by request. The list is as follows: Single cylinder, double-acting piston pumps; triplex plunger pumps, outside guided and trunk plunger types; vertical, single-acting, outside guided triplex plunger pumps; double-acting triplex piston pumps; single-stage, single suction centrifugal pumps, open impeller type; vacuum and stuff pumps; deep well triplex pumps; deep well working heads; portable mine pumps; single stage, double suction centrifugal pumps; centrifugal sump pumps; handy data on power pumping; vertical, single-stage, centrifugal pumps; double-acting plunger pumps, horizontal type; single-acting triplex pressure pumps; air pressure and vacuum pumps; centrifugal fire pumps; single stage, single suction centrifugal pumps, enclosed impeller type, multi-stage centrifugal pumps, and diaphragm pumps.

INDUSTRIAL AND TRADE NOTES.

J. W. Thompson, semi-vest representative of I. M. C. I. Co., Salt Lake, for the installation of flotation machines at Superior, Ariz.

John A. Roebling's Sons Co., Trenton, N. J., are now publishing a bulletin entitled, "Roebling Wire Ropes," which is issued at regular intervals and will be mailed free of charge on request of any wire rope user. Its purpose is to give general information of value to wire rope users. Special

attention is given to the company engineers on various subjects of interest in up-to-date wire rope practice.

Edward E. Bennett has accepted a position as sales engineer with the Colorado Iron Works, Denver, Colo. He was formerly sales manager for the Denver Engineering Works and for the past 3 years has been engineer with the Mine & Smelter Supply Co., Denver.

A booklet entitled "Dupont Products" has just been issued by the E. I. DuPont de Nemours & Co. The booklet is bound in artificial leather called DuPont fabrikoid and is an excellent substitute for leather for book-binding and allied uses. There are 251 different commodities described in a brief way. Some details are given regarding each under its separate heading, as also are the classes and varieties of work for which they are particularly adapted. The table of contents includes: Explosives, miscellaneous, blasting supplies, fabrikoid, chemicals, pyralin and customers. Under the last heading a list is given of different industries and vocations and under each of these the products they may find useful and which are included in the booklet, are given.

PATENTS RELATING TO MINING.

Rock Drill. George R. Bennett, Denver, Colo. (1,182,846; filed Oct. 15, 1912.)

Melting Furnace. Alexander W. Carroll, Elizabeth, N. J. (1,182,893; filed July 7, 1915.)

Manufacture of Steel. Harry E. Sheldon, Pittsburgh, Pa. (1,185,252; filed March 30, 1912.)

Hand Mining Machine. Nicola Pedulla, Macdonaldton, Pa. (1,184,265; filed Sept. 24, 1915.)

Process of Treating Ores. Edward Harrison Snyder, Pioche, Nev. (1,184,585; filed March 31, 1915.)

Mine-Car Wheel. Warren V. Johnson, Bloomsburg, Pa., assignor to American Car & Foundry Co., St. Louis, Mo. (1,183,984; filed Nov. 22, 1915.)

Mining Machine. Harry A. Kuhn and Walter W. Macfarren, Pittsburgh, Pa., said Macfarren assignor to said Kuhn. (1,184,358; filed March 27, 1915.)

Mining-Machine Truck. Edward L. Hopkins, Columbus, Ohio, assignor to the Jeffrey Manufacturing Co. (1,184,453; filed Sept. 12, 1915; renewed Oct. 13, 1915.)

Ore Concentrator and Classifier. Frederick N. Hubbell, San Francisco, Cal., assignor to David R. Carrier, San Francisco, Cal. (1,184,963; filed Sept. 8, 1914.)

Roller-Bearing Mine-Car Wheels. Victor Willoughby, Jefferson, Mo., assignor to American Car & Foundry Co., St. Louis, Mo. (1,183,941; filed April 16, 1915.)

Roller-Bearing Mine-Car Wheel. William J. McDonald, Huntington, W. Va., assignor to American Car & Foundry Co., St. Louis, Mo. (1,183,994; filed Dec. 1, 1915.)

Process of Making Cement. Ray C. Newhouse, Milwaukee, Wis., assignor to Mills Chalmers Manufacturing Co., Milwaukee, Wis. (1,184,656; filed Aug. 31, 1914.)

Dump-Car. Frederick Seaberg, Chicago, assignor, by mesne assignments, to National Dump Car Co., Chicago, Ill. (1,184,947; filed March 12, 1908; renewed July 15, 1912.)

Process of Treating Ore. Max McMurray, Cleveland, Ohio, assignor to E. Mollen and Harry Poppel, Lexington, Ohio; and M. Poppel and Poppel assignor to United Iron & Steel Co., Cleveland, Ohio. (1,187,891; filed Oct. 14, 1913.)

Electrochemical Treatment of Metal-Bearing Material. Wilhelm Johann James, Johannesburg, Transvaal, South Africa, assignor, by mesne assignments, to New Refractory Ores Co., Johannesburg, Transvaal, South Africa. (1,184,456; filed Sept. 29, 1915.)

Electric Furnace Permitting the Extraction in a State of Fusion of Zinc from Its Ores. Eugene François Côté and Paul Robert Flourens, Lyon, France, assignors to Société Métallurgique et Electrometallurgique du zinc, Procédes Côté et Flourens, Lyon, France. (1,184,520; filed July 24, 1914.)

Late News From the World's Mining Camps

Editorial and Special Correspondence.

ALASKA.

Susitna.

Northeast of here in the Willow Creek district the Talkeetna Mining Co. has been formed. E. H. Bartholf and R. L. Hatcher are principal owners. They will drive a 300-ft. tunnel this summer and erect a mill this fall. The Talkeetna vein is a continuation of the Mabel and shows the same grade of ore. Present indications are promising. B. Hatcher will have charge of the work.

Assessment work will be done this season on the Alaska Quartz, Arch Angel No. 1, Fair Angel No. 1 and the Matuska Co.'s property. F. McCoy will develop the McCoy-Martin group. L. S. Robe, manager of the Independence mine, has established a reading room and a number of baths for his employes.

Way and Charles Bowker, with J. Coffey, will work until late in September on an extension of the Mabel vein in Willow Creek district. At the Martin mine 30 men are working under Foreman Bert Stewart. A force has been working all winter. They have 17,000 tons of ore blocked out and ready for delivery to the mill by tramway. One mill started on May 20 and the other one June 1. R. C. Goheen has charge of the cyanide plant and is getting things in shape to handle tailings, which are being stored at present. Martin will employ in the neighborhood of 80 men this summer, and is making arrangements to run the mill after the water freezes in the fall.

Dawson.

According to their 1915 report the Yukon Gold Co. acquired additional properties in California and Alaska. Seven dredges here were operated for 88.1% of the season of 147 days, mining 5,041,075 cu. yds. and recovering gold to the value of \$2,456,597, or an average of 48.73 cts. a cubic yard. The average cost, including depreciation, was 26.46 cts. a cubic yard, which was less by 16 cts. than the cost for 1914. Expenditures totaled \$1,333,908. As compared with 1914, there was a reduction in value of the ground dredged amounting to 5.48 cts. per cubic yard. During the season a total of 380,340 sq. yds., or 64.7% of the ground handled, had to be thawed by steam. By hydraulicizing in this district, 3,031,647 cu. yds. of gravel were washed, this yielding \$412,535, or 13.60 cts. a yard. Expenditures on this account totaled \$243,247. The water duty was 6.13 cu. yds. per miner's inch.

At Iditarod the season lasted 196 days, and there were dredged 926,956 cu. yds., producing gold to the value of \$358,407, an average of 38.7 cts., which was lower by 11.5 cts. than that of 1914. As a result of better dredging conditions and the installation of sand elevators, the dredge handled 4717 cu. yds. of gravel which was a gain of 1216 yds. over the daily quantity for the 1914 season.

Port Wells.

Earnings of the Granite Gold Mining Co. increased during last March and April. During May a total of 300 ft. was opened in ore. There are 430,000 of their 500,000 shares, par \$1, now outstanding. Four tunnel levels have been opened laterally from 300 to 300 ft. and stopes are now producing at each of the four levels. The ore assays from \$6 to \$50 and the average has been placed at \$12. Its financial conditions are: Total capital invested in development and equipment, \$330,000; total production to date, \$277,000; average production, 60 to 70 tons per day, making about \$20,000 gross monthly; monthly expenses, from \$8,000 to \$10,000; present surplus, \$21,000; dividend requirements, on basis of 2 cts. monthly, \$8600.

ARIZONA.

Morenci.

Detroit Copper Mining Co., Morenci, is milling 1500 tons per day of sulphide ore, mostly chalcocite. The mill product amounts to 200 tons per day of concentrates from vanners, tables and flotation machines. In the coarse crushing department rolls are used mostly, though lately a Marathon mill was put in to replace one set of rolls. The fine pulverizing is performed largely by Monadnock chilian and Hardinge mills, but recently one chilian mill was replaced by a Marathon, to regrind Witley 4-mesh tailings. The work of vanners is important here. They take the coarse slimes from the Dorr classifiers, the finer slimes passing to the flotation machines. In connection with the vanner and table work, a Senn panmation vanner is running in comparative test with Frue vanners and Witley tables with Butchart riffles, in which some interesting results are being worked out. E. H. Shackelford of the Senn Concentrator Co. is carrying on these tests. The Senn vanner is said to handle 45 to 60 tons of material in 24 hours. The Rork 3-cell machines, developed by Detroit Copper Co., are used in flotation work. The Detroit Copper Mining Co.'s smelting plant, containing one blast furnace and three converters, is handling the mill concentrates, and in addition to them a small tonnage of ore direct. A. V. Dye is acting manager during the absence of M. H. McLean, general manager, who is taking a vacation.

Globe.

Arizona Asbestos Association, operating an asbestos property on Watton's plateau, 40 miles northeast of Globe, has installed a hoist and air compressor, of Chicago Pneumatic Tool Co. make, both oil driven. A force of 75 men is employed, the operations being under the management of C. W. Barnard of Globe. The product of the mine consists of 60 tons per month of the long-fibered chrysotile, which is shipped east, with the exception that one carload recently was shipped to Japan.

The Warrior mine, owned by the Warrior Copper Co., is being operated by the Southwestern Leasing & Development Co., Globe. The latter company is controlled by H. V. Snell, W. D. Fisk and Geo. F. Wilson. The ore being mined consists of copper carbonates and oxides, running 4½% copper, the shipments, to El Paso, amounting to 200 tons per day. The workings are both above and below a main haulage level, the deepest level being 125 ft. below the latter. About 10,000 gals. of water per day are being pumped and baled. The ore is hauled in ore wagons 3 miles to the railroad. John Horgan is superintendent; A. J. Bennett, foreman. The surveying and engineering is handled by K. J. Szyperski.

Parker.

A district which is beginning to show much activity after 2 or 3 years of quiet but steady development is the Vidal-Parker district on the Colorado river. The district is divided by the Colorado river and is on an average of 1 to 10 miles from the Santa Fe railway. Vidal is the railway station on the California side of the river, while Parker is the railway point on the Arizona side of the river. A number of the old silver-copper-gold producers on the Parker side are being revived and are sending heavy shipments to the Hayden smelter. On the Vidal side a number of new properties are being opened up, mainly by prospectors, and as a rule these operators are making small but steady shipments of ore from development work.

One of the companies, the Bendigo Mines Co. of Los Angeles, has already shipped 450 tons, which has netted the company, after paying transportation and reduction

charges, an average of \$45 per ton. Other properties are yielding ore of like value. During the last 10 days a number of fair-sized deals have been made in this district, the men who purchased the properties doing so with the idea of extensively developing them. New development work has also resulted in a number of discoveries of new deposits of rich silver, copper and gold ore. The ore is found in fissure veins of great extent which traverse a low mountain range extending along the Colorado river for some miles. Easy grades may be secured to practically all of the properties in this section, making transportation very easy indeed.

Miami.

Inspiration Needles Copper Co. has a group of 525 acrelyng 2 miles west of Miami, on which prospecting with two Star churn drills will be carried on during the next 3 months. Drill holes to prospect for copper ore probably will be sunk to 650 ft. depth. The work is in charge of H. C. Mallory, Miami. This ground was purchased some time ago by Harry Lefkovits from D. R. Williams and others, prior to organizing the company, the stock in which is held in Miami and Phoenix. The group contains an outcropping lode 2000 ft. in extent, the ores of which run well in copper.

The Inspiration Copper Co. milled 475,000 tons of ore in May and produced 18,000,000 lbs. of copper, the mill concentrates, comprising table and flotation products, being smelted at the plant of the International Smelting Co. at Miami. The copper oxides, sent to the smelter without concentrating, amount to a comparatively small tonnage.

CALIFORNIA.

Downieville.

A company is being formed to merge the Slate Creek, Scales, Sierra Union, Hounds Flat, and other hydraulic mines, with Karl Brehme, president. Several of these mines were worked over 40 years ago and have yielded splendid profits. It is planned to operate the merged group along broad lines, and permission has been asked of the California Debris Commission for authority to construct a massive restraining dam on Slate creek. Large quantities of cement and other material are already on the ground. The work will require an expenditure of \$100,000.

Angels Camp.

A rich strike is reported from the Gold Cliff mine, one of the properties controlled by the Utica Mining Co. The discovery was made on the 1600 level and shows a shoot of bonanza 18 to 20 ins. wide. It is said to average around \$1200 per ton, with much free gold visible. The company has built a fence across the drift leading to the shoot and guarded to prevent high-grading. Drifting from the 1800 level has begun with a view to opening the possible extension of the shoot.

The Ozark gravel mine has been taken under lease and option by C. Fishman, R. E. Herndon and D. Headington, and new ground is being opened. Unwatering and retimbering of the old workings was recently completed and a small hoist and rotary mill installed. All machinery is electrically operated. The lower channel is showing excellent gravel and the mill will soon be running on material from this deposit. R. E. Herndon is manager.

French Gulch.

A 3-ft. shoot of quartz averaging \$170 gold has been uncovered in the Sybill mine, operated under lease by Clinton L. Watson and associates of French Gulch. The 5-stamp mill is running steadily and the vein is said to be improving in size as work advances. The property is owned by A. F. Ross of Redding, and San Francisco interests.

The 20-stamp mill is running steadily at the Gladstone mine, and the property is again the leading gold producer of Shasta county. Much new work is going on below the 1200 level with satisfactory results. I. O. Jillson is manager.

Spenceville.

The California gold-copper mine has been taken under bond by the Johnson-Partridge interests and preparations are

being made to ship to the small smelter operating on ores from the Queen Regent Merger property. The California produced some rich quartz from the upper workings, but increasing copper content with depth rendered operations unprofitable. Over 500 tons of good ore are available for immediate extraction.

Harrison Gulch.

High-grade chromite ore has been discovered 2 miles west of here and arrangements are being completed for heavy shipments to San Francisco. The holdings comprise 15 claims, owned by C. H. Philpott of Harrison Gulch and a group of San Francisco people. The ore commands \$15 per ton at Redding, the nearest railroad point.

Sutter Creek.

Persistent reports are in circulation to the effect that the Wildman-Mahoney group of gold mines has been sold to eastern capitalists closely related to that owning interests of the Old Eureka mine. The property embraces 383 acres and extends for approximately 5200 ft. along the Mother Lode. Four shafts are on the property, of which the 2000 ft. incline line leads to the deepest.

Taylorville.

The Engels Copper Co. is completing a survey for a railway from its mine in Lights canyon to Keddie, a station on the Western Pacific line. Construction work will be rushed as soon as final arrangements have been made. At present concentrates are transported to Keddie by caterpillar tractor and motor trucks. In the wet season 10 and 12-mule teams are employed. The company has recently made numerous additions to the plant and opened ore in territory outside the main workings.

Redding.

The American Metals Co. has ceased work at the Afterthought mine, near Ingot, and laid off the force of 35 men. It is understood the option for purchase of the property has been given up. An examination of the property has been going on for several weeks. Representatives of the American Metals Co. refused to make any statements concerning future relations with the property.

Greenwood.

Operations are proceeding at the Bunker Hill copper mine, under the management of D. L. Shepherd. Mine equipment has been installed and a large auto truck purchased. The mine was worked in the early days of the civil war and produced some good ore. A large tonnage of shipping material is exposed.

A number of gold properties in this district are attracting attention. Work has been resumed at the Cedarburg, which has been idle for 5 years. The Argonaut, Greenwood Seam Belt, and other old-time producers, are being examined.

Esmeralda.

The Standard Amalgamated Exploration Corporation is installing a 100-hp. compressor at the Economic mine and expects to place the 20-stamp mill in commission within a few days. The shaft is 1100 ft. long, and two long crosscuts and several raises have been extended in ore. L. Robin is manager.

Magalia.

Henry A. Thompson and associates are operating the Spring Valley mines with a steam shovel having a capacity of 1000 cu. yds. per 10 hours. The gravel is broken in a crusher, run through a set of rolls, and then passes to a table which catch the coarse gold. If the tailings are not satisfactory they will be reduced in tube or ball mill and passed to concentrators. A concentrating plant is being constructed.

The Watson and associates are operating the Robinson and Lake Hill mines on Butte creek. From adits on both properties tunnels are being extended to open old river channels; 20 men are employed.

Clipper Mills.

A new lode of manganese has been discovered near this place by A. Davis of Oroville and T. F. Horning of Marysville. Samples carry high-grade values. The Woolley

manganese mine is being energetically worked by the Noble Electric Steel Co. and preparations made for shipments to the Heroult electric smelter. The search for new deposits is proceeding.

COLORADO.

Georgetown.

Crevette & Co., leasing on the Seven Thirty mine, shipped 40 tons of ore which netted \$210 a ton. Other lessees on this mine are working in good ore. The Burleigh tunnel, the main entrance to the property, is to be lighted by electricity all the way, as also is the underground engine chamber, where a new hoisting plant has been installed. A contract has been let to sink a winze to 100 ft. below the tunnel level.

At the Onondago mine work has begun on the loading trestle, ore bins and sorting house, the material for which is now on the ground. The company has 30 men employed doing development work only. A car of ore is being shipped daily, which is broken in the development levels and raises that nets about \$10 a ton.

All lessees at the Capitol mine are in ore and 500 tons are now waiting treatment at the company's mill. Twelve tons of smelting ore shipped by Johnson & Co. last week returned \$50 a ton.

Eight men have been at work on development at the Josephine mine since the road was closed to wagons in early winter. Ore broken has been stored at the mine until now. All storage room is filled, so an effort will be made next week to open the road. The ore is heavy lead.

Thirty-five men are at work on the old Colorado Central mine sampling the various dumps and underground workings, and more men are needed. Up to date the samples taken have been satisfactory.

The old Whale mine, operated many years ago by Colonel Jarius W. Hall for an English company, has been sold to an eastern syndicate for \$70,000. The Whale was known as one of the best lead veins in the state.

Four feet of ore carrying 45 ozs. silver, 4½% copper, 40% lead and 30% zinc has been encountered in the McClellan mine on Leavenworth mountain. The mine was recently leased by A. L. Stevens & Co.

Leadville.

Under Manager G. O. Argall of the Iron Silver Mining Co., the Mikado shaft is to be reopened. The shaft is 1206 ft. deep and at present it is equipped with an inferior plant of machinery, old head frame, and is filled with water to the 800 level. Argall proposes to retimber all three compartments throughout their entire depth, to drain the water from the property and the surrounding basin, and sink the shaft an additional 100 ft. In behalf of this a new head frame is now under construction at the property under the direction of Kenneth McLean. The frame is to be modern, with an elevation of 60 ft. and spanning 31 ft. at the base. It is being constructed from Oregon fir, 12 by 14 ins. and 60 ft. in length. The caps are 14 by 16 ins. and about 18 ft. long. It is intended that the frame shall be completed by June 26, when erection of other buildings will start. Heavy hoisting machinery has been ordered for July delivery. Electrically driven pumps have also been ordered and will be placed on the 800 level.

The Albert Beacon Gold Mining Co. has been incorporated for 2,500,000 shares at 10 cts. each. The directors and officers are Frank Vetter, president, treasurer and general manager; F. W. Revoice, vice-president; H. Taylor, secretary. These, with Y. Seaman, A. McVicar, D. W. Kilpatrick and Frank McLaughlin will make the directorate. The lease and bond or option to purchase the Prince Albert mines, aggregating 76 acres, patented and lease running for 3 years dating from January, 1916, has been conveyed to the company. The bond calls for \$200,000 and the company starts

with 1,750,000 shares in its treasury. All preliminary expenses have been met. They have some good subscription contracts for shares, it is said, and this money will be used for operating. General Manager Vetter has contracted for the immediate installation of a hoisting and air compressor plant at the Beacon shaft. The shaft will be at once sunk 300 ft. to tap the junction of the Beacon vein and Gold Dollar flat. There will be no lateral work, but stations will be cut at each 100 ft., for later development. Under the option to purchase, the royalties will apply on the purchase price of \$50,000. Six lessees are now shipping a good grade from the property. Assays on picked samples have returned from \$145 to \$729, while a sample from a streak assayed \$4530. It is the belief of the new company that royalties paid will reach the purchase price before the option expires.

IDAHO.

Murray.

An important new strike has been made in the Jack Waite mine. The winze sinking on the new ore body is down 10 ft. and is all in ore. The winze is 6 ft. sq. Samples of the clean ore went 81½% lead and 15 ozs. silver. The ore shoot was struck about 2000 ft. from the portal of the No. 2 or lower tunnel, and at a depth from the surface of about 1000 ft. Much of the ore is clean galena and the rest will average better than 15% lead, the gangue being quartz.

Burke.

The Marsh Mining Co. closed down 2 weeks ago, is to be reorganized as the Consolidated Marsh Mines Co., capitalized for 2,000,000 shares at \$1 each, as against the 1,500,000 shares at \$1 for which the old company was capitalized. The new corporation will take over all the holdings of the Marsh Mining Co., the Green Mountain Mining Co., of which the Marsh has control, and probably some adjoining properties, the extent of which has not been decided upon. The following officers were elected at the adjourned annual meeting of the Marsh Mining Co. in Spokane recently, and they also will be the officers of the new corporation, which probably will be completely organized and ready to take over the Marsh interest before July 1: W. M. Lee, Duluth, Minn., president; Edward Pohlman, Spokane, vice-president; W. T. Smith, Duluth, treasurer; Joseph McCarthy, Spokane, secretary, and W. Earl Greenough, Wallace, superintendent. These men will compose the directorate, and Lee, Pohlman and Greenough will be the executive committee. Stock of the Marsh will be exchanged share for share for the issue of the Consolidated, and the 50,000 shares of unissued Marsh stock and the increased capitalization of 500,000 shares will be offered to present stockholders pro rata. Any part not subscribed for will be taken over by a syndicate that is being formed to underwrite the entire issue among stockholders. The Marsh mine has been closed down for nearly 3 weeks, and the workings to a point above the 700 level have been flooded because of a break in the Washington Water Power Co.'s transmission line furnishing current to drive the machinery and pumps. The new directors announced after the meeting that operations would be resumed at the property just as soon as the submerged workings could be unwatered. The outstanding indebtedness of the Marsh amounts to about \$27,000, but the reorganized company is arranging to finance payment of these obligations and to defray the expense of thorough exploration and development of extensive ground that has not been opened. The Marsh mine and mill, according to the report of Manager Greenough, were operated for 4 months and one week in 1916, and the ore mined amounted to 17,828 tons, which produced 1699 tons of concentrates, yielding net smelter returns of \$96,399.

The Hecla Mining Co. has declared a 15-ct. dividend, or \$150,000, payable June 20 to stockholders of record June 4. This will make the disbursements for the current year \$650,000 and will increase the grand total \$4,405,000 on the issued capitalization of 1,000,000 shares at 25 cts. each. In other words, the Hecla by the end of the first half of 1916 will have apportioned \$4.405 a share to its stockholders, almost 18 times the entire outstanding capitalization of \$250,000.

The Hecla recently leased the old Union mill from the Federal Mining & Smelting Co., and will have the plant in operation as soon as new power equipment can be installed. The Union mill, of 500 tons' daily capacity, formerly was leased by the Stewart Mining Co., but when the latter acquired the holdings of the Coeur d'Alene Development Co. several months ago, including a concentrator of sufficient capacity to treat the Stewart output, the Union plant was surrendered to the Federal. The electric motors that actuated the machinery were the property of the Stewart and were removed, which necessitates installation of new motors before the Hecla can put it in operation. The Hecla mill at Gem has a normal capacity of 350 tons daily, but in recent months the plant has been crowded to the limit, and it is said that the output has been approximately 400 tons. It is anticipated that when the Union mill is in service that the production of concentrates will be practically doubled, and it is predicted that dividend payments after that will be not less than 15 cts. monthly for an indefinite period, and there is a possibility of the disbursements reaching 20 cts.

Wardner.

Several parties are said to be considering a deal on the old Butler property and a resumption of operations on this silver vein may be expected at an early date. The mine has been idle for 20 years, owing to litigation and other difficulties. With silver advancing the old mine may again get into action and become a producer. Several long tunnels have been driven on the property and a winze sunk 400 ft. in one of the drifts. From this a car of high-grade ore was shipped about 20 years ago. Some of the men who worked there at the time state that picked samples ran as high as 1000 ozs. silver. The vein is narrow at the top but in the bottom was steadily growing wider. A lower crosscut tunnel was started for the vein but was not projected far enough to cut the lead when operations were suspended and litigation started.

Kellogg.

Reports are current here that operations will soon begin on the milling plant for the Interstate-Callahon Co. on the site secured some months ago at Enaville. According to announcement it will have a daily capacity of 1200 tons and when completed will be one of the most modern zinc concentrators in the world. The North Fork site is said by engineers to be one of the finest obtainable in the Coeur d'Alenes with ample water for every need and with sufficient yard room to permit extensive track systems. It is rumored that another big zinc property of the Nine-Mile district is investigating sites along the North Fork with a view of erecting a concentrator as soon as the Beaver Creek branch of the O. W. R. & N. line is completed, which it is thought will be this fall. The Beaver Creek section, according to mining men, promises to become one of the great mineral producing sections of the Coeur d'Alenes within the next few years and with a railroad outlet down Beaver creek will develop rapidly.

Wallace.

As the long tunnel which is being driven to jointly work the Bullion and Copper Chief properties approaches the point at which it is expected the ore will be found, the Bullion is preparing to issue the stock which is to go to those holders who have been paying the assessments. They will receive in all 650,000 shares of the Copper Chief and 229,000 shares of Bullion. This agreement between these two companies was made Jan. 12, 1914. The Copper Chief agreed to turn in to the stockholders of the Bullion 650,000 shares of stock of the Copper Chief, which should compensate the Bullion people for the cost of the tunnel. The Bullion agreed under this arrangement to drive the tunnel. James H. Taylor, manager of the Bullion Mining Co., has issued a letter to the stockholders of that company saying that stock will be issued to those who have paid these assessments. Next they will do these stockholders receive the stock set aside for that purpose by the Copper Chief Mining Co., but they also receive the stock from the treasury of the Bullion, which was to have been sold to pay for the Bullion's share of the expense of driving the tunnel. Each Bullion stockholder who has paid these assessments since March 9, 1914, will receive for each 1000 shares of Bullion stock upon which he has paid these assessments, 555 shares of the stock of the Copper Chief and

1100 shares of the stock of the Bullion. Distribution will be made by the Interstate-Callahon Co. at record Aug. 31. It will be made Sept. 15, and the books will close for transfers on Aug. 31 and will remain Sept. 15.

Kingston.

The mill on the 1100 level at the Hypotheek mine has broken into the ore, exposing one of the best prospects ever encountered at the property, according to Otto A. Olson, assistant general manager, who states that the entire face of the 10111 crosscut, and that 18 ins. is solid galena, while the remaining 1000-grad mill feed. The exposure was made 100 ft. east of the crosscut from the main shaft, and is the first shoot discovered on the ledge on the 1100 level. "The ore shows a 500-oz. vein, which we now have traced 100 ft. on the ledge. The vein has been opened on the 700 and 800 levels and 100 ft. from the 900 workings that we are taking out the ore that supplies our new 125-ton mill," said Olson. "Since the mill began operating last week we have shipped 100 tons of concentrates and are loading a second. We are producing daily from 6 to 8 tons of clean shipping ore and 125 tons of concentrates, or a gross of 100 tons and 2 cars of concentrates weekly. Owing to an inadequate water supply, which is being remedied by the construction of a second flume, which will be finished in a few days, we have been unable to operate the mill so far at all, and one-half its capacity. When the new flume is completed we shall increase our production to at least 2 carloads of crude ore and 4 carloads of concentrates weekly. Though it was our intention to produce a low grade of concentrates in order to reduce losses in milling because of low freight and treatment rate offered by the Northport smelter on the lower grade concentrates, we have found it impossible to hold the mill down and are turning out concentrates which average between 69 and 79% in lead. The silver values in the ore are low, the concentrates averaging from 12 to 15 ozs., but the ore carries gold values and the concentrates in carload lots will average between \$4 and \$5. Our current concentrates average 81% in gold."

The new 125-ton mill at the Hypotheek mine will be completed and ready to operate in a few days, according to J. H. Kern, president of the Hypotheek Mining Co., who was in Spokane Thursday, returning from a trip of inspection to the property. "The main milling ore reserves of the mine are on the 500, 700 and 900 levels, and contain enough material to keep the plant operating at full capacity for 2 years," said President Kern. "The ore is of a grade that after a considerable quantity has been sorted for shipment crude, the remainder of the product will make a mill feed averaging 10% lead. The crude ore averages about 10 ozs. of silver. We have contracted with the Northport smelter for our output. As the market seems to that point is low and the smelter people prefer a low-grade product, we shall aim to produce concentrate ranging from 75 to 10% lead. We should be able to grade the concentrates of this grade to the amount of 15 to 20 tons a day. The stringer of ore which we encountered on the 1100 level has now been followed to the 100 ft. and continues on the face of the drift. It has varied in width from a few inches to 2 ft. and is composed entirely of galena of shipping grade. It has no connection with any of the ore shoots developed in any other of the mine workings, having been an entirely unlooked for discovery. We are now dipping on the vein to tap the downward extension of the ore shoot, and we have developed extensively on the vein on the 700 and 800 levels. The company is capitalized at 2,000,000 shares and has an authorized bond issue of \$500,000. The company is now in the process of issuing one-half has been issued. It has no other prospects, and will, etc. for the current month and has no other prospects of such habits."

Shipments have been begun from the Hypotheek mine, under the management of Otto A. Olson, secretary, and assistant manager. A car of concentrates was forwarded to the smelter Wednesday and the management anticipates being able to maintain regular consignments. The new mill began operating with one shift last Sunday, but it probably will be running full time and treating 100 to 125 tons of ore daily the week. The output of the property, both crude ore and concentrates, have been contracted to the Northport Smelting & Refining Co. of J. H. Kern of Moose Jaw, Saskatchewan.

president of the Hypotheek, states that the management plans to operate the plant to full capacity, as it is not intended to attempt to produce an exceptionally high-grade concentrate, owing to the short haul to the smelter and the satisfactory treatment rate that has been secured for the low-grade output.

LAKE SUPERIOR.

COPPER.

Houghton.

At Calumet July 15 will be celebrated the semi-centennial of the Calumet & Hecla Mining Co. There will be a gathering of all the employes, both local and Boston, to the number of about 5500, making with their families about 20,000.

Hancock shipped from the workings on its property at Quincy No. 7 shaft about 3000 tons, which figure it will raise to nearly 7000 this month, and probably in August will come pretty close to 15,000, provided that the men can be obtained. This increase comes from the ability to open up stopes in the ground just passed through by drifts. At its own shaft, No. 2, there will be a much slower rise in the shipments, but it will be steady. This mine is really on the threshold of a profitable career, as now its five lodes have been sufficiently explored to ascertain their averages, and also to begin stoping, which from now on will grow rapidly. One head at the Centennial-Allouez is running wholly on Hancock rock and the increase can be taken care of there when it comes. The rock from No. 7 Quincy goes to the Quincy mills, and that from its own shaft, No. 2, to the Centennial-Allouez.

New Arcadian's showing in the lode, encountered 265 ft. in west of the hill shaft, located 1800 ft. south of the first shaft, is certainly remarkable, as there is out of a width of 24 ft. lying next to the hanging wall that is full of large shot copper, the remaining 14 ft. disclosing much of light grades. The vein rock is of an exceptionally good character and the color is of that dark chocolate that gladdens the eye of the miner, and which indicates that it is from the unaltered part or body of the lode, and consequently that the copper contents have not been leached out anywhere. This lode was found in the crosscut driven to obtain data for locating the New Arcadian lode, and has not yet been identified and correlated. It is possible that it may be the old Arcadian, which should occur in this vicinity. Drifting in both directions will be started at once.

Carp Lake, which in its recent reopening by Jerry Rourke, has disclosed such good values, both in the old openings and at other places on its extent of 2 miles on the strike of the Nonestuch formations, is offering to the public 10,000 shares of a new development company at \$3 a share to open up these beds, which have two rich strips of mineralization. The stock can be subscribed for at any of the Houghton county banks or brokers' offices. The control of the tract is in the hands of R. T. Looney, a Houghton lawyer.

Copper Range has made arrangements for 30 more houses by Rashleigh Bros. of Houghton, and intend to erect 20 themselves, making in all 70 to be built this season at the Champion.

Michigan is in the Baltic lode, about 8 ft. on the crosscut from the eastern drift, and the copper, though very fine near the hanging wall, is now showing the smaller masses so characteristic of this lode. In an oblong of 4 ft. on the length of the lode, the height of the drift, 7 ft., and the width, 8 ft., there was found 600 lbs. of mass varying in weight from 5 to 115 lbs. In the shift for the night of the 12th there was found over 400 lbs. equally heavy. The lode was found 24 ft. from the drift, which has been carried along the course of some good stringers, that both to the east and west are not quite so good as last week. Above the lode there is a broken zone carrying good copper 5 ft. wide.

The crosscut will be carried across the lode and some drifting done. This is the third mine which has commercial grades on the Butler lode, the Mass taking most of its rock from it and the South Lake now beginning to work it.

Cass, which has just been organized by Dr. L. L. Hubbard to take over the old Norwich or Copper Crown property, has one drill now working on the Malden property which lies about a mile east of the Norwich and which is under option. The possibilities of this stretch of $4\frac{1}{4}$ miles on the Norwich and optioned tracts is considered very good. This stretch embraces the Brooklyn, a mile wide; the Colling, $1\frac{3}{4}$; the Malden, three-quarters; a row of forties, one-quarter, and the Norwich, $1\frac{1}{2}$ miles, and is on the strike of the copper-bearing formations. This is practically virgin territory and consequently the exploration will be watched with great interest.

Calumet & Hecla is making a very good daily average, and in spite of a small accident at one of the shafts, is averaging 10,160 tons. The mine, notwithstanding the scarcity of men, is holding up to a splendid tonnage and is, barring accidents, running about 10,500 tons daily, which, of course, comes from the Calumet conglomerate and the Osceola amygdaloid on the Calumet & Hecla. The subsidiaries are hoisting proportionately high averages.

Keweenaw's rock in the east drift beyond the old Phoenix fissure is a splendid shot copper amygdaloid, and it is continuing in the winze that is being cut out about 30 ft. east of the fissure, to connect with the old adit recently cut through into the old workings, for the purpose of securing ventilation. This work is on the 7th level, which has covered the farthest distance east. The eastern drift on the bottom level, the 14th, has been driven 90 ft. from the shaft in good values.

Wyandot is forwarding its stockpile to the Winona rather slowly, as the rock has to be hauled a mile to the cars.

Cherokee's Lidgerwood hoist is now on the way and will be received in a few days, and just in time not to delay completion of the engine house. The foundations and building will be ready for it and in another month at the most it should be in commission.

Seneca still has the support of the mining men here in the belief that it will ultimately make a success, notwithstanding the failure of the syndicate, headed by T. F. Cole, to organize the new company. Undoubtedly at some future time someone will secure an option and successfully promote a company that will have money enough to thoroughly explore this very valuable and very large tract. With the little interest in coppers and the great success in the other lines it was impossible to get the speculating public to lock their money up for the 2 to 3 years that will be necessary to explore the property and develop its resources.

Mineral Range railroad, controlled by the Duluth, South Shore & Atlantic, which has had to borrow cars from the South Shore to keep up with the rapidly increasing tonnage of the district, has received from the St. Louis manufacturers 45 of the steel cars which were ordered last year. This road hauls for 13 different properties.

Hancock will show a very marked increase in August, as there will be quite a number of new stopes started. That this mine is only on the threshold of a prosperous career is the belief of those conversant with the mine's resources. It has now developed its different lodes sufficiently to know their average yield and has considerable ground ready for stoping.

Algolah's new boiler will arrive the middle of June and the work of sinking the new shaft will be resumed in a short time, since it will not take long to set the boiler up, the foundations being all ready.

Arcadian is only running two drills, as all the men are required on the surface in building the new boiler and engine houses and the foundations for the boiler and engine, which are just being started. These drills are on the 900 and 1250-levels, both exposing a very good class of rock. The rock for the mill test has been shipped to the Franklin mill, the first shipment having been made Sunday, and the quantity is

about 1500 tons. It is expected that it will equal if not exceed the results of the last test, which were 35 1/2 lbs. mineral, or a little over 25 lbs. of refined copper. The removal of the stockpile is very timely, as the space was needed for the extension of the rockhouse.

IRON.

Virginia.

A strike has been called here, though as yet its consequence has been small. The miners went out, but the mill men would not. The Oliver Iron Mining Co. says that it has had no difficulty in employing labor to fill the vacancies which occurred and the mines are now operating as before.

The Kerr or Sheridan mine is being operated by the Oliver Iron Co., just west of Hibbing. The overburden, which is shallow, is being dumped into Carson lake. It is expected to ship about 500,000 tons this season. The Long-year-Bennett interests have developed the Mace No. 2 mine at Nashwaak. This open pit was stripped by Butler Brothers, who are also stripping the Lamberton mine. The pit now being excavated will be 700 to 800 ft. long and 400 wide. The overburden depth varies from 30 to 60 ft. Two shovels are being used. This mine will also be ready to ship shortly after July 1.

Ironwood.

Inability to get material means that no work will be done on the Pabst shaft of the Oliver Iron Co. till about Sept. 1. D. E. Southerland, manager in this district, however, states that work at the Aurora shaft will proceed immediately. They will be 1800 ft. and 1500 ft. on the incline. Motive power will be electricity and both will be in operation in about another year. The Pabst shaft will go down to the ore horizon of its neighboring mine, the Newport.

Although it has been known that there was copper formation in the Gogebic range the fact has been given little publicity because the grade was not commercial. The Schlesinger interests, however, have become interested, and are now doing surface exploration, stripping and trenching at the copper-bearing series north of Bessemer. No workable grade has been found as yet, but this does not make it impossible.

Hoose & Person, under contract to the Cleveland-Cliffs Iron Co. have finished stripping Section Six mine, North Lake. Work on the first cut from which 50,000 tons of ore will be taken is under way. It is the intention to mill the lower portion of the deposit and ship the remainder. North Lake has been active in shipping, but there is a let-up just at present owing to congestion at the lake docks. Some of the ore will be taken out by Hoose & Person and some by Cleveland-Cliffs Co. Operations at the Portland mine, under lease to the Cleveland-Cliffs, depend on whether transportation for the ores can be obtained.

MISSOURI-KANSAS.

Joplin, Mo.

The meeting of the Mine Inspectors Association of North America was held in Joplin the past week and was attended by mine inspectors from the Atlantic to the Pacific coasts. The new officers for the coming year are Thomas Graham, Vancouver, B. C., president, and James Paul of Pittsburg, secretary. Mr. Paul has been the secretary since the association was organized 9 years ago. The inspectors were given 4 days of entertainment over the Joplin zinc district, and the Pittsburg, Kas., coal district. The meeting adjourned to meet in Indianapolis, Ind., for the 1917 convention.

Following in the wake of the strike of the hoisting engineers and the lowering of zinc ore prices there has been a revival in the interest of organizing the mine operators into a strong body of co-operative action upon question of coal import to all. The work has seen a parent organization launched in Joplin, and a number of other camps are being organized. Just with what purposes have not yet been decided, but a number of proposals have been made. One of these

is a proposed ore producers' bank to finance the ore producers when needing aid at times when it would be more profitable to hold ores for a higher market than sell on a declining one. Present banking facilities in the Joplin district leave the ore producers to shift for themselves, preferring other kinds of loans, yet handling all the ore producers' funds as deposits. The ore producers do not see the equity of supplying banks deposits aggregating about \$25,000,000 to \$35,000,000 annually, and yet receiving no credit upon their industry when they chance to need it. Other proposals are co-operative action with regard to markets and labor troubles. The operators' organization is distinct from the Sanitation Association, although it will co-operate with it along any lines that may chance to be in common.

There is still no settlement of the strike. The operators have either shut down their mines or they have put on green men and are teaching them how to operate the hoisting engines. A very large number of the operators have done the latter thing. While their new hoisting engineers are not yet as proficient as the old ones they report good progress, and expect to reach their old point of maximum capacity within another month or two weeks. The hoistermen have not gained any sympathy or any aid from the miners, as the miners want to work and believe that all the workmen should share alike in any cut or raise of wages. It appears therefore that the strike will result in failure for the hoistermen, and it is now believed that within another fortnight those mines now down will have put men to work in the strikers' places, rather than wait any longer for an adjustment of the controversy. The strike has, however, resulted in a curtailment of ore production which has been devoutly desired on the part of the ore producers in view of the increased surplus stocks extent in the field, and the lowered prices that have prevailed during the last month.

In the west Joplin sheet ground field, the A. W. C. Mining Co. has just completed its fourth mill. The plant is one of the best equipped that the company has. The plant will not be started till the conclusion of the hoistermen's strike.

Upon an adjoining tract of the field, J. M. Short is starting the construction of another big concentrating plant. The land has been thoroughly tested out by drilling. The indications point to the entire tract being underlaid with the sheet ground deposit.

Miami, Okla.

The United States Smelting Co. has just purchased the Marbury leases consisting of 60 acres lying between the Blue Goose and Beaver mines in the Cardin camp, and has started the development of the property by sinking two shafts to the ore deposit. The consideration given for the property is said to have been \$125,000. There were 20 drill holes put down and of these 18 were said to have struck good ore from 280 to 312 ft. The company is moving its Rayenswood mill to the newly acquired lease and will have the mill ready for operation as soon as the two shafts are down into the ore deposit.

The main concentration of the ore deposits from Fair creek southeast to Osage has caused a great deal of speculation as to what the Commerce Cardin run of ore would connect up with the earlier developed camp at Quappaw and Lincolnville. The long line of newly developed mines stretching from Cardin, including the Admiralty group, the Welch, the Emerson, the Marion and now the Osage mines, seems to have a continuous line. Final closing up of the distance between the developed areas with a solid string of connected prospects.

Webb City, Mo.

A new concentrating plant is being started on the lease of the Commercial Mining Co. at Prosperity, where a large body of ore has just been prospected and a considerable amount of development work done. The present company will have to undo the development work done by the Carnation Mining Co. which opened up a large amount of soft ground, and will sink the shaft into the sheet ground level. The period of low prices interrupted the work and the company finally through the death of its principal owner failed to realize its plans. The present company entered upon the lease, did a large amount of drill prospecting and then opened up the ground again. A mill has just been completed and will

start regular production within the fortnight. W. R. Davis of Joplin, is the general manager.

Amos Gibson and Herman Jones have begun the erection of the 500-ton concentrating plant recently announced for the Barratt sheet land at Porto Rico. The underground work is now under way and it is believed will be sufficiently along to supply the mill with ore by the time it is completed. The contract for the construction has been let to the United Iron Works of Joplin. The mine is located near some of the largest producers in the Porto Rico camp.

Opening up a lead deposit at 90 to 105 ft., the One Spot Mining Co. at Duenweg, is now starting to clean its ore. A battery of hand jigs is being installed. The ore is strictly a lead ore occurring in flint and clay and is very free and high grade.

Evans-Hall-Soy Mining Co. started its new 250-ton mill on the C. T. Orr land at Duenweg this week. The mill is designed to handle a deposit of sheet ground considered exceptionally rich. Those interested in the property: J. T. Evans and H. A. Hall of Joplin, and R. T. Soy of Peoria, Ill.

MONTANA.

Butte.

Col. D. C. Jackling, who has just returned from a trip through South America, spent a day this week looking over the progress made at the Butte & Superior since his last visit. He was agreeably surprised at the rapid work done on the two new shafts. It is now expected to have both of them down to the 1500 level by July 15, and the equipment and the shafts operating by the latter part of this year. The sinking of these shafts 1500 ft. vertically has been accomplished in 7 months' time. When they are in operation it will increase the capacity of the Butte & Superior 50%. "At the present time," said Col. Jackling, "we are producing at the rate of 180,000,000 lbs. of zinc per year. This is about 12% of the entire zinc output of the United States, which has increased from 750,000,000 lbs. 2 years ago to 1,500,000,000 lbs. per year at present. With the improvements now contemplated, we expect to be able to produce spelter at 4 cts. per pound, and should the price of zinc drop back again as low as 6 cts., the Butte & Superior would be in a position to make a profit of \$12 per share per year. We have been doing a large amount of development work on the 1700 and 1800 levels, and have opened up much virgin ground in the east end of the property. The size of the ore bodies and quality of the ore are larger and better than on the 1600 level, and we have ore bodies blocked out that insure the production for some years to come at the present rate. We have our spelter sold ahead until the end of this year at present price levels, and the outlook for Butte & Superior was never better." Jackling feels very confident that Alaska Gold will come out in good shape. The recent reports from there, he said, were better, and the development of that property is going steadily forward at a very satisfactory pace. "It takes time to develop such a large proposition as that of the Alaska Gold," says he, "and the only trouble was that the stock market got ahead of the actual developments and had to come back."

The Revenue group of claims in Madison county, which includes the Revenue, Monitor, Columbus and Lexington, have been taken over by New York capitalists. The mines are located on the Richmond Flats at Norris. There has been a great deal of work done on these mines in the past, and they have ranked among the big producers of Madison county. There are three systems of veins on the properties, and there is a splendid showing of ore in the mines. There is a vertical shaft on the group to a depth of 300 ft. A great amount of drifting has been done and it is understood there is a vast amount of ore in the stopes. The property is a gold proposition and carries good values. It is understood that it runs around \$10 per ton. It is the intention of the new managers to install a concentrating plant with a capacity

of 150 tons per day. The deal whereby the eastern capitalists got possession of this group of mines was put through by G. B. D. Turner. The mine is now fairly well equipped with machinery, but it is the intention of the new managers to put in more up-to-date machinery.

Radersburg.

The Keating Gold Co. has had a great deal of trouble in the past year in finding a profitable way in which to handle its ores. The management had expected to solve its greatest difficulty through the construction of the proposed railroad running to the Radersburg district from the nearest point on the Northern Pacific. The failure of the capitalists who had planned to put the road through to go ahead with its construction made it imperative for the Keating to find some other way out. The plan of constructing a mill at the property was taken up, but before proceeding the directors thought it best to get an expert to make an examination of the mine and the ores and decide on the best equipment. An expert was secured and sent to the property. He came back with a report that he was only a geologist, and what they needed was a metallurgist to furnish the information they wanted. So a metallurgist was secured and sent to the property. His report was not what the directors needed, and a third man was sent. He spent a couple of weeks at the property and had 3000 lbs. of ore taken from the 300 level and sent to San Francisco for testing. After a couple of weeks they sent back a report that there was no copper in the ore and that what they wanted was a cyanide mill. In speaking of this report one of the directors said: "We knew all that before. We knew also that going down 100 ft. below the 300 level they would encounter ore that carried from 1½ to 2% copper along with the gold and other values. The report wasn't what we needed at all. We are attempting to solve the problem of how best to handle these ores to get the values from them. We know they carry high values, but it is probable that we will have to do some more consulting with experts before we can determine just what kind of a mill we ought to have there. Mr. Barnes of Duluth, who holds the controlling interest, has extensive interests that keep him in New York, and he has not had the time to give the Keating property the attention it should receive. We hope, however, to interest Butte mining interests in the proposition and solve the problem within a short time."

Superior.

The Intermountain Mining Co., which several months ago acquired the old Amador mine, is operating full force and is netting \$70 a ton on its high-grade concentrates. From smelter returns received from 8 of the 11 cars shipped in May the concentrates averaged \$70 a ton, net, and jig concentrates \$50. The crude ore being shipped averages a little better than \$25. The latter comes from a different shoot than that supplying the mill, and is shipped without much sorting, only the larger pieces of waste being thrown out. The 2 last cars of concentrates for which the returns have come in each weighed 32 tons and netted \$2224 and \$2286, respectively. The 2 cars of jig tailings, both of which were lightly loaded, netted \$1506 and \$1892. Shipments amount to 3 carloads of ore and concentrates weekly, which will be increased materially with the installation of the Hardinge mill, which has been ordered. The property is equipped with a new 100-ton mill, which began operating in May, and a narrow gauge railway connects with the transcontinental system 7 miles from the camp. The line was repaired and inaugurated a regular schedule on April 6. The mine is developed to a depth of 700 ft. by a shaft, from the bottom of which extensive workings have been run, opening entirely new ore bodies. In addition there are reserves on the 200 and 400 levels that will supply the mill for several years, according to Oscar Nordquist, general manager, who states that these bodies will average 6½% copper, but by mining the higher grade ore separately and shipping it direct to the smelter the mill feed probably will be reduced to a product carrying about 3% copper. The company is capitalized for 2,000,000 shares, of which 450,000 still are in the treasury, and is entirely free from debt, besides having its property extensively developed and well equipped.

NEVADA.

Tonopah.

A new vein has been encountered in the Jim Butler mine, discovery being made on the 8th level of the Desert Queen shaft. Work has not advanced sufficiently to determine the extent or value of the ore, but indications are pronounced favorable. Preparations are being completed for more extensive work in the Stone Cabin section of the property, also for resumption of operations in the Wandering Boy workings, 750 tons are being sent weekly to the old Belmont mill.

The 1700 level of the Halifax is rapidly being placed in shape for extensive developments from this point. An abundance of cold air is now coursing through the workings and but little trouble is anticipated in future from bad air. Crosscutting from the 1300 level is progressing steadily, and an intermediate level is being driven into the hanging wall between the 1200 and 1217 workings. From the 1217 level a good tonnage of excellent ore is going to the West End mill.

Virginia City.

The Union Con. is producing ore to the value of \$12,000 to \$13,000 per week, most of the product coming from the 2400, 2500 and 2700 levels. On the 2400 level ore averaging \$44 is being extracted. Arrangements are being made for more extensive work in the Sierra Nevada mine, and properties on Gold Hill.

Rawhide.

The Nevada New Mines Co. has purchased the Black Eagle mine and mill, and will operate the New Mines and Black Eagle plants at full capacity. The Black Eagle mill has a capacity of 75 tons per day. The holdings of the Nevada New Mines Co. includes the old Rawhide Queen and Rawhide Coalition properties.

Wonder.

The Nevada Wonder Co. has acquired the lease of the Atlas Leasing Co. on the Hercules and Jack Pot mines. The lease includes control of a valuable water supply. The two properties extend north of the North Star mine of the Nevada Wonder, and it is planned to start early work on the Jack Pot group. Developments in the Nevada Wonder continue satisfactory, with high-grade ore showing on the 800 level of the Extension shaft and 1000 level of the main shaft.

It is reported arrangements are being made to reopen the Vulture and Spider and Wasp mines, both lying northwest of the Jack Pot group. The Vulture is controlled by Goldfield people and yielded some rich ore years ago. The Spider and Wasp is equipped with hoisting machinery and is stated to contain some good ore.

Taylor.

New York capitalists have taken a bond on the Monitor silver mine, owned by William Read of Capitola, Cal. The Monitor produced rich silver ore in early days, but has not been worked to any extent in late years.

Cuprite.

Mine equipment has been purchased for the Tom Rea copper property at Jackson mountain which is being developed in the interest of W. A. Clark. Equipment includes an air compressor, hoist, and power drills. The main shaft has been thoroughly timbered to the 200 level from which point it is being carried deeper. A crosscut on this level has exposed a vein of copper ore over 20 ft. wide and of shipping character. F. A. Evans is superintendent.

Goldfield.

According to present indications the 1000-ton capacity plant of the Goldfield Con. and 400-ton unit of the Flamingo Goldfield will be in operation before the end of June. Equipment is being installed at both plants, and most of the machinery on the ground or on the way. It is reported the Goldfield Con. will further increase the capacity of the plant within a few months, for the purpose of handling custom ore. Preliminary estimates place the earnings of Goldfield for May at \$52,500.

The Silver Pick Co. has resumed exploration on the Calyx drill, the new work being done at a point east of the west of the main shaft. Sinking of the main shaft to the

shale-latic contact is proceeding rapidly and has passed the 800 point.

The tonnage credit of the Jumbo Extension Extension mine carries for May at \$31,250, an approximate increase of \$2000 over April, and about \$10,000 over March. An increased output at the way of Velvet shaft, is about to start.

Reno.

Two prospects, Al Stevens and Geo. McClelland, a few days ago located an enormous body of tungsten ore 3 1/2 miles southeast of Mt. Montgomery, Nev. and only 1 mile from the Southern Pacific tracks. The ledge is exposed for nearly 2 miles in length and the width averages from 50 to 600 ft.; the richer ore runs as high as 30%, while the larger bodies average from 2 to 6%; it is in a granite and basic formation, the ore being scheelite and wolframite both. This part of the country has been located and relocated several times, being situated in one of the oldest mining districts in Nevada, but it seems no one knew there was tungsten in this vicinity. This same ground has been prospected time and again as there are good gold properties adjoining. It is believed that this will prove to be one of the largest tungsten strikes yet made.

NEW MEXICO.

Lordsburg.

Nellie Bly mine, 8 miles from Lordsburg, owned by the Susquehanna Mining Co., is being operated by B. W. Randall under a bond and lease. Production amounts to 6 cars per month of ore running 4 1/2% copper and 4 ozs. silver. The ore occurs as sulphides and carbonates in a gangue of lime, spar and aluminum. It carries 50 to 60% silica; 5 to 6% iron and 8 to 10% lime. The development is through shafts and tunnels. Randall expects to take over the property.

Stewart, Bonnett & Trainor have taken a 2-year lease on the Wilson-Hubertes mine, near the 85. The property is developed and lessees expect to commence mining.

The 85 Mining Co., for which A. I. Derrieden is general manager, and J. W. Jackson, superintendent, is shipping 7500 tons of ore to the Calumet & Arizona smelter, Douglas. The bulk of the ore is copper sulphide and carries 72% silica and is used largely as converter lining. A much larger tonnage than this was shipped, the recent decrease to 7500 tons per month being due to inability of the smelters to handle the larger amount. The mine is developed through a 450-ft. shaft, the collar of which is on a main haulage tunnel, 300 ft. from portal. A 100-ft. winze was sunk from the 450-ft. level, and it is intended to drift on this winze and make a 3-compartment raise to connect with the shaft, giving the latter a depth of 550 ft. Workings extend also from the haulage level up to the surface. The single drum hoist, on which a counterweight is used, is operated by electric power, produced by a generator driven by a Diesel oil engine. The air compressor is operated by direct connection with the Diesel. About two-thirds of the ore is taken from levels below the tunnel, and one-third from the levels above it. It is possible that another Diesel engine will be purchased, and the matter of constructing a mill for concentration by oil flotation has been considered. There are 190 men on the payroll.

Mogollon.

Work is under way for sinking main shaft of the Mogollon Mine, 100 ft. or more. A hoist was installed on the Maud S. mine has been moved to this plant to be used in underground work. The mill is treating about 100 tons of ore daily.

The main shaft of the Pacific Mine has been square setted and equipped to cut tunnel level and ore extraction will start at a point late. Terminal towers for an aerial tramway between the Pacific Mine and the Mogollon Mine are in place and ore bins at Mogollon will be erected as soon as lumber can be secured.

Work at the Eberle mine of the Oaks Co. is at present suspended, owing to a strike, both of which are holding out for a better price for their mill. At the Clinton mine, adven-

ing developments were recently started and after drifting but 5 ft. a 15-in. pay streak was encountered which has indications of opening into a large ore body. Shipments to the Socorro Co.'s mill were begun June 13.

Clean-up for last half of May of the Socorro Mining & Milling Co. yielded 25 bars of gold and silver bullion weighing over a ton. A 1% dividend was paid June 1, the third of like amount disbursed since Jan. 1.

Steeplerock.

The Carlisle Mining Co., operating the Carlisle mine at Steeplerock, about 13 miles from Duncan, Ariz., is planning the erection of a modern electrical power plant at Duncan, and an electric railway between Duncan and the mines at Steeplerock. It is also rumored that the capital stock of the company is about to be increased to \$3,000,000, and that \$1,000,000 of the stock will be taken in New York at par. H. K. Welch, manager of the company, was in Duncan this week, at which time he stated that the Carlisle is now entirely unwatered and sampled, and that a large tonnage of high-grade ore has been exposed. He further said that the experimental mill has been closed down temporarily, pending the completion of ore tests now being carried on at several testing plants throughout the country. When these are completed the mill will be enlarged probably before resuming operations, or a new mill of large capacity built. It is generally known that there is a large tonnage of ore blocked out ready for extraction, it being estimated that it contains 500,000 tons. The average value of the ores at the present market prices is over \$30 a ton. The Carlisle mine has been idle for 27 years. It was operated from 1880 until 1890, during which time about \$5,000,000 in gold ores were extracted, until the baser ores were encountered. The abandonment of the property in 1890 was due to the fact that there was no system at the time for handling the complex ores. During the time the property was operated it was owned first by Marshall Field, L. Z. Leiter and N. K. Fairbanks of Chicago, who sold it in 1887 to the London Exploration Co., who operated it for several years without success. The immense tonnage of ores now blocked out will average \$1 in gold, 2½ ozs. silver, 1.40% copper, 6% lead, and 5½% zinc. The development of the oil flotation process and other metallurgical devices have made possible a comparatively simple separation of the metals contained in the Carlisle ores.

OREGON.

Snake River.

There is an unusual amount of activity in this section in shipping, producing and development work. The Iron-*dyke* is shipping ore, as is the Arkansas and other copper properties. More men are employed throughout the district than ever before.

Cornucopia Mines Co. has let a contract to E. O. Hendrix for \$1500 in development work on the Gus Rogers claims, which give promise of rich gold-copper ore. Another project is under way, which will not only open up some good mines, but also some 500,000,000 ft. of timber. This is being promoted by A. P. Carnahan. He has ample backing to carry out the enterprise, which will be started with the construction of a road. The initial cost of this will be \$10,000. The property is located on Squaw creek, below Ballard landing.

Sumpter.

The Golden Chariot mine, in charge of Superintendent Conner, is being dewatered rapidly. The water has been lowered to a point where part of the mine workings can be reached from the shaft. It is only a matter of days when the diamond drill will be installed. It will be used in prospecting the veins at depth and drill holes from underground to a depth of about 300 ft. below the present workings. The drill has a capacity of 800 ft.

Placer ground in Sumpter valley is being prospected with drills. It is rumored that they intend to work the entire valley from McEwen to the gorge.

Contractor Costello has completed the road to the Buck

Gulch mine. The new road follows the old, and besides is at a lesser grade, and is about 3 miles shorter than the old one.

SOUTH DAKOTA.

The value of the gold, silver and lead produced in South Dakota in 1915 from 33 productive mines, 10 of which were placers, amounted to \$7,507,782, compared with \$7,431,343 in 1914, as reported by Charles W. Henderson of the Geological Survey.

The gold output in 1915 was 358,280 ozs., valued at \$7,406,305, compared with 354,758 ozs., valued at \$7,333,508 in 1914, an increase of \$72,797. The production of silver increased from 176,642 to 199,864 ozs. The placer gold output amounted to only 77 ozs., some of which went directly into jewelry.

South Dakota has produced during the 39 years of its active output, from 1876 to 1915, inclusive, \$192,663,945 in gold and 6,032,533 ozs. of silver, having a commercial value of \$4,315,005, a total of \$196,978,950.

A total of 1,889,975 tons of ore was mined and treated in 1915, compared with 2,019,262 in 1914. Of this total, 1,888,598 tons were treated in the mills of the state, yielding \$7,363,666 in gold and 196,360 ozs. of silver (in amalgamation bullion and cyanide precipitates), an average of \$3.90 in gold and one-tenth ounce in silver per ton. The output of smelting ore (1377 tons) averaged 1.44 ozs. gold and 2.54 ozs. silver.

The Homestake mine and mills were operated continuously throughout the year, and the mills treated 1,573,822 tons, which yielded gold-silver bullion and cyanide precipitates having a value of \$6,446,191, an average of \$4.10 a ton, compared with 1,587,774 tons, \$6,160,161 in bullion, an average of \$3.88 a ton in 1914. In addition, \$21,232 were realized from the sale of tungsten ore. The dividends paid during the year were \$2,210,208; the balance carried to profit account was \$1,032,933, and the disbursements and costs, excluding dividends paid, averaged \$2.66 per ton.

The Pocahontas mill was completely rebuilt, and one-half of the Amicus mill was rebuilt and rapid progress is being made toward its completion. Preparations have been completed for sinking the Ellison shaft to the 1000 level. Development was carried on without interruption and the measured ore reserves are large—sufficient to supply the reduction plants for many years.

The Golden Reward cyanidation mill was operated steadily on siliceous ore from its mines and on some custom ore. In addition a considerable quantity of partly oxidized ore was roasted at the Astoria shaft and sent to the mill. These sulphide ores had never before been treated successfully by cyanidation. Sulphide ore of good grade was sent directly to the smelter at Omaha.

The Mogul cyanidation mill was operated steadily on company and custom ore, with increased capacity. The Reliance and the Trojan mills were operated steadily. Some crude ore from the Trojan mine was shipped to the Omaha smelter.

The Wasp No. 2 Co. continued to operate its dry-crushing cyanidation mill, the mine being worked by the open-cut system, a steam shovel being used for stripping. The mill handled 111,300 tons, which yielded \$183,488 in cyanide products. This company also sold tungsten to the value of \$147,730. A dividend of \$82,500 was paid. The Bismarck mine and mill were idle. The new 50-ton cyanidation mill on the Rattlesnake Jack mine was operated for a period. Other producing mines were the Alameda, Balmoral, Cherry Gulch, Clinton, Crown Hill, Heidelberg, Juno, Marco Polo, Norwich, Ofer (Burlington and Apex claims), Two Johns and Victoria Extension. Sinking continued at the Oro Hondo property, a depth of 2000 ft. being reached at the end of the year.

A small yield of placer gold was made in Custer, Lawrence and Pennington counties. Development work was done on several lode properties in Custer and Pennington counties. The dredge at Mystic on Castle creek, was moved to the John Day district, Oregon.

UTAH.

Salt Lake.

The fact has been well brought out that production depends on smelter capacity and not the mine output. Orders have been given out by Utah smelters for operators to cut down their shipments for the present, but this in no way means that the smelters are slacking up. The order is directed more to silver-lead producers than copper. Several reasons are given for the action, which may last from 30 to 60 days. The winter accumulation of ore is now coming in and the plants are running at capacity. At present prices the smelters are unwilling to accumulate stockpiles. There is more than sufficient ore in sight now to continue at full blast through the summer. Small producers are all in the market with ore and this surplus will have to be absorbed. Most of the ores at present are being taken by contract and with the opportunity to pick what it wants the smelters are taking in the best. It takes 120 days for the smelters to realize on their product, as they are protecting themselves against any quick declines.

Alta.

The Tar Baby Mining Co. is intending to increase its capital from 400,000 to 500,000 shares. The money obtained is to purchase a compressor and drills, which it is expected will be installed during the latter part of July. The company is driving a tunnel for the lime-schist contact, which shows ore on surface. The tunnel is in a distance of 2200 ft. and at the breast has attained a depth of 1300 ft. on the vertical. The breast is showing mineralization and it is the opinion that the contact being driven for cannot be far ahead. The stringer of quartz which was heavily mineralized and cut recently in the tunnel was followed to the north in a cross-cut for 15 ft. The crosscut passed through the porphyry dike along which the tunnel has been driven 15° south of east. President Geene, after passing through the dike, ordered the miners to continue driving the main tunnel ahead, which work is now being done.

Stockton.

The Big Four Exploration Co., operating the Queen of the Hills mine, has made a good strike of ore carrying 48% lead and 29% ozs. silver. The company is expecting to find something of more importance, and that is the downward extension of the \$2,000,000 ore body that made the property famous years ago. That ore body was cut off by a fault, but a recent study of the geology of the property and district seems to warrant expectations of finding the part of the body beyond the fault. A distance of 150 ft. has to be driven before the objective point can be reached. It is confidently believed the results will be satisfactory. At the mill near Park City the reconstruction work is about finished and within a few days the plant will be handling 50 tons of tailings daily.

Eureka.

According to official reports from the Cedar-Talisman high-grade silver-lead ore has been found on the 300 level. It was in the east drift from the main shaft. The face shows 2 ft. that samples 30 ozs. silver and 42.5% lead. At this early date this appears like a downward extension from an old ore shoot mined on an upper level years ago. The high-grade discovery several weeks ago on the 700 level may be the still further downward extension of this shoot. A winze is being sunk on the new discovery and a drift is following it into the limestone. A carload of similar ore from the 700 level is now on the way to market. Some of the lower grade zinc ore has been shipped lately, but this will be discontinued and only the first class sent to market. The one carries 21 to 22%, while the better grades average near 30 and 32% zinc.

The Eureka King Mine Co. has recently been incorporated and hold 29 claims in the North Tintic district. Some of the people interested have been on the ground to map out a development campaign, and work, it is expected, will be started without delay. An order will at once be placed for new hoisting equipment. Electricity will be obtained

operation of the machinery. Three hundred feet of sinking will be done before crosscutting to the veins, which traverse the property. It is quite probable that the shaft work will not stop while the drifts are being sent out on the 300 level.

Milford.

At the North Star a large amount of galena ore has been developed and blocked out, and the first shipment will be sent about the first of next week. The property has been opened by a tunnel driven along the ore body for 50 ft. and a winze that has been sunk 65 ft., with ore showing in both. A second tunnel, located 100 ft. lower than the main tunnel, is being driven to attain greater depth, and lead values are showing in the breast. On another claim there has been developed a bed of ore for 350 ft. by a series of shallow shafts and trenches. A winze has been sunk on this deposit for 65 ft. A lower tunnel is being driven from the bottom of the canyon to tap this same body. Recently the company has completed a new boarding house and a larger force of miners is to be put to work. The development work is to be pushed. Albert McLease is in charge of the work.

Park City.

Lessees at the Daly Mining Co. are mostly on the 800 level and some on the 1200. About 150 tons per month are being shipped. The company is exploring the Ontario fissure while lessees are working the Daly fissure. The company is installing electric power for a compressor and as soon as that is completed it will put in an electric hoist. The Daly had been depending on the Daly West for power, and when that ceased it got back on the steam plant. The new plant will be capable of operating 12 drills. In prospecting the Ontario fissure in a virgin block of ground the company is working on the 500, 700, 800 and intermediate levels. This is the fissure in the quartzite which yielded up millions in the adjacent Ontario Silver. The vein now under development shows a streak of 6 to 18 ins. It samples 150 to 200 ozs. silver, 10 to 15% lead, \$3 to \$10 in gold and 1% copper. The block has never been entered from the Daly side except in short drifts. One of the objects now is to follow the fissure up through the quartzite to the overlying limestones. Some years ago a raise was started up on this fissure and reached the limestone. Some ore was found in pockets, but the fissure was lost. Recently it was picked up and is now being followed to the lime. Connection is being made between these various workings. A winze is going down from the 500 on the Ontario vein and a raise up from the 700. There is a good showing in this work. The vein is strong and the ore good.

WASHINGTON.

Spokane.

The East Portland Mining Co. with properties at Orient, has won its suit against the assessor of Stevens county, and the supreme court at Washington has ordered the valuation reduced from \$80,000 for 1909, \$60,000 in 1910 and \$40,000 each in 1911 and 1912 to \$50,000 in 1909 and to \$10,000 for each of the succeeding years. The property is owned principally by Patrick Burns and Blake Wilson of Calgary, Alexander Sharp of Vancouver, B. C., is manager. The mine has been idle since 1909, but prior to that is credited with ore shipments amounting to approximately \$750,000.

The richest showing of ore ever exposed in the Loon Lake region some 6 miles from Loon Lake, was opened recently on the east of the drift east across Grouse creek from the southeast of the Crane shaft, according to Andrew Laidlaw, a director in the Loon Lake Copper Co., who inspected the property recently. "The face is fully 6 ft. wide and shows a good showing of ore," said Laidlaw. "Half of it will average not less than 25% copper, while the entire exposure will average about 15%. The only general sample taken from the vein showed to the full face went considerably more than that, about \$100 a ton, net, at prevailing prices for copper. The showing is so strong and massive that we feel confident it is the west end of the big ore shoot opened

to some extent by the No. 1 shaft and old workings. The distance between the two shafts is 450 ft., so the drift will have to be extended 250 ft. to reach a point vertically under it. Though all other development work has been suspended temporarily to push the east drift to a connection with the old workings, I think we shall be able to ship a carload of high-grade weekly from now on. Manager Evan Morgan says we can count on another carload going to the smelter next week. The new strike was made by deflecting the course of the drift from the foot wall, which it has followed with more or less fidelity, in the belief that the ore shoots all occurred on that side of the ledge, diagonally to the hanging wall of the vein. The drift is now nearer the hanging wall than the foot, but the ledge has not yet been fully crosscut."

WISCONSIN-ILLINOIS.

Highland.

Shipments last week were confined to 1 car of carbonate zinc ore from the mines of the New Jersey Zinc Co. Several hundred tons of zinc ore being carried over.

Linden.

Much low-grade zinc concentrates are carried over, conservative estimates placing it at 3000 tons. Shippers for week of June 17 were the Linden Development Co., 3 cars to Cuba, 120 tons; Saxe-Pollard Co. to Mineral Point, 3 cars, 95 tons; Optimo No. 3, 98 tons; Ross Bros. to Mineral Point, 31 tons. Extensive drilling operations are being done by eastern interests on a 30-day option on the Gilman, Glanville, Weigle, Hinkle and Jewell.

Mifflin.

Reports for week of June 17 cover shipments from the Coker to Mineral Point, 245 tons; Biddick to Benton Roasters, 115 tons; Rundell to Cuba, 123 tons; Senator to Galena for separation, 84 tons; B. M. & B., 1 car high-grade to LaSalle, 41 tons; Peacock, under contract to American Metals Co., 38 tons. The Lucky Six, Grunow and Peni failed to report, but maintain a steady output. M. & A. Mining Co. is rushing work on a 200-ton mill.

Mineral Point.

Receipts of crude ore for treatment at the separating plants of the New Jersey Zinc Co. for week of 17th aggregated 28 cars, 1038 tons; refinery ore out to smelter at DePue, 15 cars, 560 tons; local operators turned in 17 tons. Mulhairn Mining Co. is developing new deposits west of here. Seven cars of Mexican calamine zinc ore and 5 Canadian carbonate zinc ore were received by the Mineral Point Zinc Co. last week.

Montfort.

The O. P. David mine, under agreement with the Milwaukee-Linden Development Co., shipped 4 cars of high-grade ore to M. & H. Zinc Co., LaSalle. The closing negotiations in a deal will be made on payment of \$25,000 in cash.

Platteville.

The report from the entire field for week of 17th are: To National Roasters, 34 cars, 1444 tons; Mineral Point Zinc, 2 cars, 1038 tons; Illinois Zinc Co., 5 cars, 203 tons; M. & H. Zinc Co., LaSalle, 11 cars high-grade, 437 tons; Grasselli Chemical Co., 11 cars, 460 tons; Benton Roasters, 3 cars low-grade, 115 tons; Wisconsin Zinc Roasters, Galena, 13 cars, 537 tons; American Metals Co., 38 tons; Lanyon Zinc Co., 6 cars, 225 tons high-grade ore; Edgar Zinc Co., 4 cars high-grade, 163 tons; Granby Smelters, 7 cars high-grade, 287 tons; Galena Refinery Co., 10 cars, 380 tons; total, 124 cars, 5327 tons. Two cars lead ore cleared from the Benton district, 110,000 lbs.; pyrites to General Chemical Co., 700,000 lbs. The gross recovery of crude ore for the week totaled 1290 tons, a considerable gain over the reports of the 2 weeks next preceding. Net to smelter, 2420 tons.

No business was done during the week in the price of blende, top grades going to \$77 to \$78, down to \$70 for medium and second grades. While more low-grade ore was handled during the week at separating plants, it was product

coming from mines associated with smelters and ore refiners engaged in the field, and the production among independent operators was curtailed appreciably during the week.

Local producers were: Klar-Piquette, with 2 cars out, 85 tons; M. & H. Mining Co., 32 tons to LaSalle; Star Mining Co. to LaSalle, 44 tons; Hodge mine to Cuba, 4 cars, 167 tons.

The old Enterprise mine equipment has been purchased for the Bell Mining Co. and has been dismantled and removed to the new mine site. The transfer marks the passing of one of the sturdy landmarks in the zinc mining field, the Enterprise stock at one time in 1906 going as high as \$800 per share and dividends were disbursed amounting to \$250,000.

West Hill Mining Co. has declared and paid another 10% dividend to shareholders. H. C. George has been appointed general manager of the Wisconsin Zinc Co. to succeed H. S. Snow. The West End Mining Co. is a new incorporation. Capital stock, \$25,000. Incorporators are D. J. Gardner, C. May, L. Hable, Chas. Roselip, Jr., and W. F. Weigle. Kistler-Stephens Co. have purchased the M. Weigle farm at Ipswich for \$25,000. Four drills at work here have proven an extensive deposit of zinc ore in places 20 to 30 ft. thick. A new plant will be supplied. Kistler & Co. have taken over 2000 acres of land at Council Hill and Elizabeth, Ill., for lead mining purposes. Four drilling machines are engaged in prospect work. Electric power is being installed at the Climax mine. A new shaft on the Block-House mine is down 140 ft., cutting sheet formations 10 ft. thick. Students of the Wisconsin Mining School tender a banquet to H. S. Snow, regent.

Cuba.

Receipts of crude ore at the National Works, with the exception of 3 cars, came from the Vinegar Hill Zinc Co., 34 cars, 1444 tons. Shipments of high-grade refinery ore were made to Illinois Zinc Co., 5 cars, 203 tons; Edgar Zinc Co., 4 cars, 163 tons; Granby Mining & Smelting Co., 7 cars, 287 tons. No local production was noted last week. Standard Metals Co., incorporated under the laws of South Dakota, capital stock \$200,000, has taken out a license in Wisconsin for a capital stock of \$25,000 for the purpose of acquiring zinc, lead and other mineral lands. An office has been opened in Chicago at 54 West Randolph street, M. M. Walton in charge.

Benton.

Low prices affected no producers in this district, returns for week of 17th showing delivery of 56 cars of ore, all grades, 4,618,000 lbs. The Frontier group shipped 11 cars, 460 tons; New Jersey Zinc Co., 4 cars, 165 tons; Fields Mining & Milling Co., from Thompson mine, 10 cars to ore refinery at Galena, 380 tons; Vinegar Hill Co., from Blackstone 4, Martin 4 and Kitcoe 14 cars, total 22 cars, 951 tons; Wisconsin Zinc Roasters to LaSalle, 40 tons; to Lanyon Zinc Co., 6 cars, 225 tons; Champion mine to Galena, 2 cars, 88 tons. In the New Diggings section of the district two new mills are building for the Wisconsin Zinc Co. One new plant is just put into service on the Hird mine for the Frontier Co., and another modern equipment is proposed for the Grotkin lease, near the Bull Moose mine. Extensive drilling operations are being followed in this section with two-score drilling outfits. Much low-grade ore was carried over, a number of small producers being shut out.

Hazel Green.

The Kennedy mine, usually the heaviest shipper, had an off week the 17th, and 2 cars were delivered to Mineral Point, 84 tons. The Cleveland mine showed better form, making it 5 cars to Mineral Point, 200 tons; Lawrence mine to Galena ore separators, 5 cars, 200 tons. Two new modern mills are in service on the McMillan Zinc Co. lease and for the Monmouth Zinc Mining Co. Drills are operating successfully for the Saxe-Pollard Co., Rio Mining Co. of Milwaukee, and the Vinegar Hill Zinc Co.

Galena.

The Black-Jack slumped in output last week, with only 2 cars to Mineral Point, 73 tons; Federal to Wisconsin Zinc Co., 80 tons; North Unity to Cuba, 2 cars, 83 tons; Wisconsin Zinc Roasters, 3 cars, 120 tons, to LaSalle. N. H. Snow secured 2 cars of lead ore. All of the separating plants in

the field, with the exception of the National at Cuba, carried over their pyritic by-product, which is now estimated at 1,000,000 lbs. The Skinner Separator handled ores from the Champion mine exclusively. The Joplin Separators received 13 cars of raw ore during the week, 537 tons. The reduced product assayed 61% zinc and sold at the top price, \$78. The Campbell Separating plant at Cuba is being taken over by local interests and will be diverted to custom work.

WYOMING.

Hudson.

The Wyoming Petroleum Co., who has been drilling in the Plunkett district, about 6 miles from here, has struck what it was after. At 150 ft. the oil sand was penetrated and a flow started which it is estimated will yield from 150 to 200 bbls. per 24 hours. The ground was known to be good for a number of years, but lack of capital prevented the owners from developing it. The oil has a gasoline content of about 68%, besides a good percentage of paraffin as a base. A 12-in. drill hole was made, and, according to Manager Segur, the company will continue to prospect the dome.

CANADA.

BRITISH COLUMBIA.

Silverton.

On July 10 the Standard Silver-Lead Mining Co. will disburse the regular monthly dividend of 2½¢ a share, or \$50,000, to stockholders of record July 1. This will make the payments for the current year \$350,000, and will increase the grand total to \$2,150,000, or \$1.07½ a share since dividends were inaugurated in 1912. The Standard is capitalized for 2,000,000 shares at \$1 each, and the July disbursement will make 7½ cts. a share above par value that stockholders have received in profit apportionments. The Standard Co. has been netting an average of \$100,000 monthly for some time, and it is estimated that the surplus now is in excess of \$400,000, which probably means that a considerable extra dividend will be declared in December, when the corporation usually distributes its excess reserve to its stockholders in the shape of Christmas presents.

Three Forks.

The net earnings of the Rambler-Cariboo Mining Co., which operates the Rambler-Cariboo mine and mill, were approximately \$11,000 in May, according to President A. F. McClaine, who predicts that the June earnings will be considerably greater, as the management contemplates increasing the crude ore consignments. Supt. Cameron states that he is mining considerable shipping ore from the 700 level and other parts of the mine. At present prices for metals, the crude ore nets about \$5000 to each 7-ton car, as against \$1000 for a similar quantity of lead concentrates, as the latter offers from the smelter show that a 34½-ton shipment of concentrates netted \$4183. The May shipments were 140 tons of lead concentrates and 70 tons of zinc concentrates, which will make the income for the period about \$100,000. Expenses for the month were larger than usual, because of the extra purchases of explosives, and mill aggregate about \$2000.

Hazelton.

The Delta mine, on the Rocher De Boule mountain here, has been purchased for \$20,000 by M. T. Williams and associates of Edmonton. The first payment of \$10,000 has been paid to Billie Thompson and Barney Hallibin, prospectors, who located the property a number of months ago and have been developing it since.

Pat Welch is making regular shipments to the Tacoma smelter from the Silver Star mine, which he owns in the Hazelton district. The ore goes to the ton.

Work has been started on the dome of the Rocher De Boule mountain to tap at depth the vein of the Rocher De Boule mine. In the upper workings of the mine being extracted at the rate of 100 to 150 tons a day, the larger shipments to the Tacoma smelter are being maintained.

There is a possibility of 10% copper, and it is said that level workings in the West claim and are 20 ft. In the long tunnel.

The Standard Silver-Lead Mining Co. has started a shaft on the Rocher De Boule mountain here, 20 ft. In the vein with 2 ft. of solid shipping ore that goes 9% zinc and 17 ozs silver. The tunnel is 100 ft. driven 1000 ft. On the surface the shoot has been proven to be 1000 ft. The smelter plant, put based in Spokane, making the ore to be 100 ft. a day will then be made in the tunnel. Next month shipments will commence to the Tacoma smelter.

The American Boy, owned by William Harris of Spokane, is being steadily developed.

New prospects are being and there are many men coming to prospect mining properties, but what they usually want is something better developed than most of the prospects of that section.

ONTARIO.

Cobalt.

At the McKinley-Darr property the new Callow flotation plant has been started. The new flotation cells were put in the mill which was operating and consist of two triple lead, roughing cells and two cleaner cells. A Perrin filter press is used so that the concentrates can be pumped direct to the press and are discharging the flotation concentrates. The flotation circuit is not a separate unit, but a separate system treating the concentrates as they come from the tables. This makes a much better recovery, saving silver that would otherwise be lost. The plant has a capacity of about 150 tons per day.

On Boston creek the R. A. P. Syndicate has made another find. At 167 ft. down it encountered a 12-in. streak of high grade, well sized milling ore in the foot and hanging wall veins. It is taken as an indication that the vein may be 200 ft. thick at depth. Work is being continued on the 200 level. In the west drift some good ore is being mined. The vein is about 20 ins. wide and 20 ins. of this is high grade ore. The shaft is being continued to the 300 level and a drift level will be run alternately in the east and west drifts on the 300 level.

In the old mine Frohewey mine 6 drills are being used and a production made through shafts Nos. 2 and 5. The mill is handling about 100 tons per 24 hours. The property was abandoned in 1914. There was considerable ore in the old workings at the time the property closed down after the bankruptcy of the mine. All that was necessary after the mine was reworked was to do some minor repairs on the mill, which required but a few days. The mine has been kept free from water during the interval in which operations were suspended.

In the 700 level mine extends to reach the vein they are after on the 200 level. The vein is about 60 ft. from the present level. The vein being sought at depth is a quartz vein, and is thought to be the one showing upon the surface workings on the lower levels, but recently measurements have revealed an entirely new vein. If the latter vein is found on the 200 level, a wire will be sunk on it to the 700 level for contact. The present shaft is in between the 200 and 300 ft. from the present level, it is thought to reach the top of the diabase sill.

Porcupine.

Work is being done to other promising properties it is reported that the mine will stop work at the Aqueduct mine on the 100 level. The vein has been operating the mine since the mill. Sinking was discontinued some time ago, but the 100 ft. had been reached. At the present time the mine is directed principally to stripping the ore on the 100 level. One on the level is in at 18 in. and another is in at 10 in. The lower workings are being developed.

Work is being done on the Belle Ellen. A drift on the 100 level is being reached. It is the intention to sink the shaft which will require between 200 and 300 ft. from the 100 to 200 ft. from the surface. The vein on the 100 level has widened out to about 18 ins. and contains a large amount of calcite.

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(6) Number of pages. Illustrated articles are indicated by an asterisk (*).

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I. GEOLOGY

GEOLOGY AND MINERALOGY

Geology

Probert, F. H.—*Superficial Indications of Copper*. [Discusses topographic features and shows in what way they indicate the presence of ore. Appearance of the outcrops are considered in a similar way].—M. & S. P. June 3 1916, p. 815; pp 634* ; 20c.

Wagner, P. A.—*Economic Geology and Mineral Industry of Southwest Africa*. [Abst. from a S. Afr. Geol. Surv. Memoir, on the diamond fields and their origin].—S. Afr. Mg. Jnl. April 22 1916; p 91; pp 1, 35c.

Ore Genesis

Wagner, P. A.—*Economic Geology and Mineral Industry of Southwest Africa*. [Abst. from a S. Afr. Geol. Surv. Memoir, on the diamond fields and their origin].—S. Afr. Mg. Jnl. April 22 1916; p 91; pp 1, 35c.

II. ORES AND METALS

(I) METALS AND ORES

Chromium

Edwards, C. A.—*Initial Temperature of Critical Cooling*. [Abstracts of a paper read before the American Society of Foundry Engineers, Mar. 19 1916, p. 165].

Copper

Seaman, W. Y.—*The Lure of Cripple Creek Gold*. [Gives separate accounts of the mines in the district, including a history of their growth, production, quality of ores produced and the several sides the particular mine has witnessed].—W. Y. Seaman, Denver; booklet; pp 48; 25c.

Smith, A. M.—*Alkalinity of Cyanide Solutions*. [In a brief way gives details

—M. & S. P. June 3 1916; p 815; pp 634* ; 20c.

Thum, E. E.—*Cost-Accounting in the Construction and Operation of a Copper Smelter*. [Information obtained from experience at the Anaconda Copper Co.'s smelter. Details for the distribution of accounts are given as also are methods of keeping costs].—Met. & Chem. Engg. June 1 1916; p 660; pp 234; 30c.

—*International Smelting Co., Miami, Ariz.* [Analyses of products used and produced and details of equipment and operation are given, with a complete flow-sheet of the plant].—M. & S. P. June 3 1916; p 822; pp 29; 20c.

—*Metal Output of the Central States*. [With some discussion the values and quantity of lead, zinc, silver and copper produced are given].—M. & S. P. June 3 1916; p 821; pp 1; 20c.

—*Roasting and Acid Making at Braden, Chile*. [Abst. from Teniente Topics, being a brief description of the Braden Copper Co.'s plant].—M. & S. P. June 3 1916; p 27; pp 14; 20c.

Gold Fields and Mining

Bulkley, J. N.—*Application of Electrical Power to Road Mining Work*. [Results with electric winding and comparison of the cost of steam and electricity are discussed].—S. Afr. Mg. Jnl. April 29 1916; p 112; pp 1; 35c.

Dudley, Boyd, Jr.—*The Distribution of Silver Between Metallic Lead and Litharge Containing Slags*. [Treats on the subject with respect to the crucible fire assay of gold-silver ores].—Met. & Chem. Engg. June 1 1916; p 636; pp 6; 30c.

Jacobs, E.—*Placer Gold Mining in British Columbia*. [A review of the production of gold from this source in general for the province and detail for the different sections].—Can. Min. Mg. Jnl. June 1 1916; p 71; pp 23; 30c.

Seaman, W. Y.—*The Lure of Cripple Creek Gold*. [Gives separate accounts of the mines in the district, including a history of their growth, production, quality of ores produced and the several sides the particular mine has witnessed].—W. Y. Seaman, Denver; booklet; pp 48; 25c.

Smith, A. M.—*Alkalinity of Cyanide Solutions*. [In a brief way gives details

regarding experience in this line and particularly at a plant treating a tough amorphous quartz with finely divided free gold].—M. & S. P. June 3 1916; p 828; pp 1; 20c.

—*Hollinger Costs in 1915*. [Detailed descriptive and tabulated information].—(Canadian Mg. Jnl. June 1 1916; p 272; pp 2; 35c.

—*Rand's Ore Reserves, South Africa*. [A compilation of official figures from annual company reports showing 90,000,000 tons in sight].—S. Afr. Mg. Jnl. April 29 1916; pp 1; 35c.

Gold Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, etc.

Iron Ores and Mining

Johnson, J. E., Jr.—*The Distribution of the Charge Column and the Ascending Gas Column*. [Details are given and the information is on the correct methods of charging and distributing both the fuel and ore. Considerable discussion is had about points which may tend to affect the distribution].—Met. & Chem. Engg. June 1 1916; p 642; pp 9; 30c.

—*Summary Report of the Geological Survey, Department of Mines, Canada, 1915*. [In one volume separate reports made during the year on different districts and topics are given].—Canadian Geol. Surv. Sessional Paper 26; pp 307.

Iron and Steel

Edwards, C. A.—*Initial Temperature of Critical Cooling*. [Abstracts of a paper read before the Iron & Steel Inst. (London)].—Engg. Mg. Jnl. 19 1916; p 165; pp 1; 35c.

Touceda, E.—*Malleable Iron, Its Characteristics, Uses and Abuses*. [A paper read before the Railway Club of Pittsburgh].—Foundry June 1916; p 231; pp 2; 25c.

Iron and Steel: Foundry and Furnace Practice

Edwards, C. A.—*Electric Furnace Construction and Operation*. [A paper read before the American Foundrymen's Assn. Treats on a practical way on the design and operation of the furnace with details on the

electrical problems involved].—Foundry June 1916; p 211, pp 142, 206

Johnson, J. E., Jr.—*The Distribution of the Charge Column and the Ascending Gas Column*. [Details are given and the information is on the correct methods of charging and distributing both the fuel and ore. Considerable discussion is had about points which may tend to affect the distribution].—Met. & Chem. Engrg. June 1 1916; p 642, pp 97, 208

Lead

Dudley, Boyd, Jr.—*The Distribution of Silver Between Metallic Lead and Lüharge Containing Slags*. [Treats on the subject with respect to the crucible fire assay of gold-silver ores].—Met. & Chem. Engrg. June 1 1916; p 636, pp 6, 206

Shellshear, W.—*Selling Lead and Zinc Concentrates*. [Notes on selling lead-zinc ores and concentrates. Some information in regard to flotation and thermic methods as related to selling are given. All is based on Australian practice].—Mg. & Engrg. Rev. May 5 1916; p 190; pp 3½*; 35c.

Verne, C. E.—*Zinc's Record Breaking Production*. [A review of the production and prices for several years in the Joplin district].—Zinc & Lead Jnl. June 1916; p 3; pp 2*; 20c.

Lead Smelting Data of the Herculaneum Plant, Missouri. [One table is given showing in detail the materials smelted and products resulting and the other shows the same for materials used and produced in the smaller units of the smelter].—E. & M. J. June 3 1916; p 985; pp 1; 25c.

Metal Output in the Central States. [With some discussion the values and quantity of lead, zinc, silver and copper produced are given].—M. & S. P. June 3 1916; p 821; pp 1, 20c.

Silver

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Metal Output in the Central States. [With some discussion the values and quantity of lead, zinc, silver and copper produced are given].—M. & S. P. June 3 1916; p 821; pp 1; 20c

Silver Milling, Metallurgy, Etc.

See Mill and Milling, Metallurgy, Chemistry, Assaying, etc.

Tin

Sohnlein, G. E.—*Combined Hydraulic and Mechanical Classifier*. [A paper read before the A. I. M. E. The classifier was designed especially to prepare the pulp of tin ores for jigging].—Mg. World June 3 1916; p 1049; pp 1*; 10c.

Tungsten

Miner, Fred L.—*Tungsten Camps of White Pine County, Nevada*. [Gives separate descriptions of the tungsten mining companies in this county].—Mg. Rev. May 30 1916; p 15, pp 3, 20c.

Taft, H. H.—*Notes on the Tungsten Ores of the Southwest*. [The occurrence and nature of these ores located principally in Arizona are given. Some information is also contained on those found in Colorado and New Mexico].—Mg. World June 3 1916; p 1047; pp 1½

Willis, C. F.—*Tungsten Mines in Arizona*. [Describes the nature of various

deposits in the state].—Mg. World June 3 1916; p 821; pp 1; 20c

Zinc

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Muth, E. G.—*Great Increase in Spelter Production*. [Reviews the general situation during 1915 and compares it with other nearby years].—Zinc & Lead Jnl. June 1916; p 5; pp 2½*; 20c.

Shellshear, W.—*Selling Lead and Zinc Concentrates*. [Notes on selling lead-zinc ores and concentrates. Some information in regard to flotation and thermic methods as related to selling are given. All is based on Australian practice].—Mg. & Engrg. Rev. May 5 1916; p 190; pp 3½*; 5c.

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(II) NON-METALS

COAL FIELDS

Coal Fields and Mining

Fay, A. H.—*Coal Mine Fatalities in the United States March, 1916*.—U. S. Bur. of Mines; pp 22.

McCrystle, J. — *Underground Mine Roads*. [Details of methods for streamlining for haulage ways in coal mines are given and a discussion on better haulage ways in coal mines].—Coal Age June 3 1916; p 959; pp 3½

Rearrangement of the Ventilation System of the Central and Northern Collieries, England. I. & C. E. Rev. May 19 1916; p 565; pp 2, 20c.

Coal Preparation, Marketing, Etc.

Higgins, C. L.—*How to Prepare a Coal Sample*. [A paper read before the American Society of Civil Engineers, New York, N. Y., Feb. 1916].—Mg. World June 3 1916; p 1047; pp 1; 10c.

Coal Dust, Fire Damp, Etc.

Chamberlain, J. S.—*Coal Dust and Fire Damp*. [A paper read before the American Society of Civil Engineers, New York, N. Y., Feb. 1916].—Mg. World June 3 1916; p 1047; pp 1; 10c.

Coal Dust, Fire Damp, Etc.

Chamberlain, J. S.—*Coal Dust and Fire Damp*. [A paper read before the American Society of Civil Engineers, New York, N. Y., Feb. 1916].—Mg. World June 3 1916; p 1047; pp 1; 10c.

Coke

Johnson, J. E., Jr.—*The Distribution of the Charge Column and the Ascending Gas Column*. [Details are given and the information is on the correct methods of charging and distributing both the fuel and ore. Considerable discussion is had about points which may tend to affect the distribution].—Met. & Chem. Engrg. June 1 1916; p 642, pp 97, 208

Coal and Coke By-products

See By-products, Coal, Coke, etc.

Johnson, J. E., Jr.—*The Distribution of the Charge Column and the Ascending Gas Column*. [Details are given and the information is on the correct methods of charging and distributing both the fuel and ore. Considerable discussion is had about points which may tend to affect the distribution].—Met. & Chem. Engrg. June 1 1916; p 642, pp 97, 208

Natural Gas

Burrell, G. A.; Biddison, P. M.; and others.—*Natural Gas by Absorption Methods*. [A paper read before the American Gas Assn. at American Meeting, Chicago, Ill., June 1 1916; p 651, pp 142, 206

CEMENT, STRUCTURALS AND CERAMICS

Cement

Rubin, G. A.—*Portland Cement*. [Treats on the manufacture, materials it is made from and its general physical and mechanical properties].—Jnl. of Franklin Inst. June 1916; p 774, pp 8, 20c.

Concrete

Hughes, J. H.—*Design and Construction of the Tubes for the Harlem River Four-Track Subway*. [A paper in the proceedings of the Institute of Science at Western Polytechnic, London, England, Oct. 1915].—Mg. & Engrg. Rev. May 5 1916; p 190; pp 2; June 11, p 52; pp 3, 20c.

Stone

Hicks, H. E.—*Construction of Building Stone*. [A paper read before the American Society of Civil Engineers, New York, N. Y., Feb. 1916].—Mg. World June 3 1916; p 821; pp 1; 20c.

Russell, S. R.—*Masonry Dams*. [The methods and standard practice are described in a general way].—Mg. & Engrg. Rev. May 5 1916; p 190; pp 2; June 11, p 52; pp 3, 20c.

OTHER NON-METALS

Acids

Keatinge and Van Matton, at Western Ohio. [A visit to an Portland Cement plant, being a brief description of the Braden Copper Co.'s plant].—M. & S. P. June 3 1916; p 827, pp 14, 20c.

Gems

Wagner, P. A.—*Mineralogy and the Mineral Industry of Southwest Africa*. [A paper read before the American Society of Civil Engineers, New York, N. Y., Feb. 1916].—Mg. World June 3 1916; p 821; pp 1; 20c.

III. TECHNOLOGY

MINES AND MINING

Prospecting

Grunow, W. R.—*Churn-Drill Prospecting at Morenci, Arizona*. [The technique is explained in detail. Detailed copper, lead, zinc, iron, silver and gold assays are given. The total cost per foot including the cost of the drill, 10 87¢, complete outfit, 10 87¢, and about 10 87¢].—M. & S. P. June 3 1916; p 827, pp 14, 20c.

Johnson, J. E., Jr.—*The Distribution of the Charge Column and the Ascending Gas Column*. [Details are given and the information is on the correct methods of charging and distributing both the fuel and ore. Considerable discussion is had about points which may tend to affect the distribution].—Met. & Chem. Engrg. June 1 1916; p 642, pp 97, 208

Surveying and Drafting

Johnson, J. E., Jr.—*The Distribution of the Charge Column and the Ascending Gas Column*. [Details are given and the information is on the correct methods of charging and distributing both the fuel and ore. Considerable discussion is had about points which may tend to affect the distribution].—Met. & Chem. Engrg. June 1 1916; p 642, pp 97, 208

Drilling and Boring

Elmendorf, W. J.—*Cost of a Crosscut Adit*. [Excerpt from a paper in Trans. Can. Mg. Inst. The figures were obtained from the Portland Canal Tunnels, Ltd., B. C.]—E. & M. J. June 3 1916; p 987; pp 34; 25c.

Grunow, W. R.—*Churn-Drill Prospecting at Morenci, Arizona*. [The drilling is being done by the Detroit Copper Co. Methods of operation and sampling are given. The total cost per foot, including the cost of the drill, is \$3.257, without \$2.048. A cost sheet is given].—E. & M. J. June 3 1916; p 534*; 25c.

Hicks, H. L.—*Quarrying at Rockland Lake, New York*. [The haulage, drilling and power equipment and operations are described in a general way].—Engg. & Cont. June 7 1916; p 512; pp 134*; 20c.

Richards, John.—*Adit Enlargement and Alignment at the Alaska Juneau*. [Jackhammers are used. Costs and details are given].—E. & M. J. June 3 1916; p 982; pp 1*; 25c.

Russell, S. R.—*Modern Quarrying*. [The bench methods and snake-hole methods are described in detail].—Dupont Mag. June 1916; p 4. pp 6; 20c.

Explosives and Blasting

Hicks, H. L.—*Quarrying at Rockland Lake, New York*. [The haulage, drilling and power equipment and operations are described in a general way].—Engg. & Cont. June 7 1916; p 512; pp 134*; 20c.

Russell, S. R.—*Modern Quarrying*. [The bench methods and snake-hole methods are described in detail].—Dupont Mag. June 1916; p 4; pp 6*; 20c.

Shafts and Shaft Sinking

Buffum, F. D.—*Handling Compressed Air in Shaft Sinking*. [A booster compressor is employed to keep water from the air transmission line. An air injector for ventilating and a water ejector are described, besides some notes on piping in shaft work].—Coal Age June 3 1916; p 956; pp 234*; 20c.

—*Emergency Escape-Way for Mines*. [A recently patented plan. Its construction is given and detail, as is the way in which it is expected to serve as an escape-shaft].—Mg. World June 3 1916; p 1045; pp 134*; 10c.

Tunnels and Tunneling

Elmendorf, W. J.—*Cost of a Crosscut Adit*. [Excerpt from a paper in Trans. Can. Mg. Inst. The figures were obtained from the Portland Canal Tunnels, Ltd., B. C.]—E. & M. J. June 3 1916; p 987; pp 34; 25c.

Hoff, O.—*Design and Fabrication of a Tunnel for the Hamden Four-Track City Tunnel, New York*. [Extract from a paper in the proceedings of the Engineers' Society of Western Pennsylvania].—Engg. & Cont. June 7 1916; p 533; pp 2; 10c. pp 4; 1916; p 3, 10c.

Richards, John.—*Adit Enlargement and Alignment at the Alaska Juneau*. [Jackhammers are used. Costs and details are given].—E. & M. J. June 3 1916; p 982; pp 1*; 25c.

Ventilation

Buffum, F. D.—*Handling Compressed Air in Shaft Sinking*. [A booster compressor is employed to keep water from the air transmission line. An air injector for ventilating and a water ejector are described, besides some notes on piping in shaft work].—Coal Age June 3 1916; p 956; pp 234*; 20c.

—*Re-Arrangement of the Ventilation System of the Wallsend and Hebburn Collieries, England*.—I. & C. Tra. Rev. May 19, 1916; p 576; pp 234* 35c.

Mine Sampling

Grunow, W. R.—*Churn-Drill Prospecting at Morenci, Arizona*. [The drilling is being done by the Detroit Copper Co. Methods of operation and sampling are given. The total cost per foot, including the cost of the drill, is \$3.257, without \$2.048. A cost sheet is given].—E. & M. J. June 3 1916; p 334*; 25c.

Transport

Higgins, C. H.—*Handling Retail Coal in a Concrete Cylinder Plant*. [Description, illustrations and drawings of a terminal plant for handling coal].—Coal Age June 3 1916; p 967; pp 2*; 20c.

—*Operation and Maintenance Cost of Aerial Tramways*. [Abst. from Aerial Tramways].—E. & M. J. June 3 1916; p 986; pp 34; 25c.

Haulage and Conveying

Hicks, H. L.—*Quarrying at Rockland Lake, New York*. [The haulage, drilling and power equipment and operations are described in a general way].—Engg. & Cont. June 7 1916; p 512; pp 134*; 20c.

McCrystle, J.—*Underground Mine Roads*. [Details of methods for surveying for haulage ways in coal mines are given and a discussion on better plans for haulage ways in coal mines].—Coal Age June 3 1916; p 959; pp 534*; 20c.

Labor and Management

Burrell, G. A.; Oberfell, G. G.—*Effects of Atmospheres Deficient in Oxygen on Small Animals and on Men*. [Results of a number of different tests made on both animals and men].—U. S. Bur. of Mines Tech. Paper 122; pp 12; 15c.

Hodgson, J. P.—*Co-Operative Effort on the Part of Each Employee*. [A paper read before the Arizona section of the A. I. M. E.].—Mg. World June 3 1916; p 1043; pp 134; 10c.

Production

Jacobs, E.—*Placer Gold Mining in British Columbia*. [A review of the production of gold from this source in general for the province and detail for the different sections].—Canadian Mg. Jnl. June 1 1916; p 274; pp 234; 35c.

Muth, E. G.—*Great Increase in Spelter Production*. [Reviews the general situation during 1915 and compares it with other nearby years].—Zinc & Lead Jnl. June 1916; p 5; pp 234*; 20c.

Seaman, W. Y.—*The Lure of Cripple Creek Gold*. [Gives separate accounts of the mines in the district, including a history of their growth, production, quality of ores produced and the several sales the particular mine has witnessed].—W. Y. Seaman, Denver; booklet; pp 48; 25c.

Verne, C. E.—*Zinc's Record Breaking Production*. [A review of the production and prices for several years in the Joplin district].—Zinc & Lead Jnl. June 1916; p 3; pp 234; 20c.

—*Metal Output of the Central States*. [With some discussion the values and quantity of lead, zinc, silver and copper produced are given].—M. & S. P. June 3 1916; p 821; pp 1; 20c.

Mining Costs

Elmendorf, W. J.—*Cost of a Crosscut Adit*. [Excerpt from a paper in Trans. Can. Mg. Inst. The figures were obtained

from the Portland Canal Tunnels, Ltd., B. C.]—E. & M. J. June 3 1916; p 987; pp 34; 25c.

Grunow, W. R.—*Churn-Drill Prospecting at Morenci, Arizona*. [The drilling is being done by the Detroit Copper Co. Methods of operation and sampling are given. The total cost per foot, including the cost of the drill, is \$3.257, without \$2.048. A cost sheet is given].—E. & M. J. June 3 1916; p 534*; 25c.

Richards, John.—*Adit Enlargement and Alignment at the Alaska Juneau*. [Jackhammers are used. Costs and details are given].—E. & M. J. June 3 1916; p 982; pp 1*; 25c.

—*Hollinger Costs in 1915*. [Detailed descriptive and tabulated information].—Canadian Mg. Jnl. June 1 1916; p 272; pp 2; 35c.

—*Operation and Maintenance Cost of Aerial Tramways*. [Abst. from Aerial Tramways].—E. & M. J. June 3 1916; p 986; pp 34; 25c.

MILL AND MILLING**Flotation**

Bancroft, W. D.—*Ore Flotation*. [A paper read before the A. I. M. E. Treats in general on the more simple theory regarding flotation and the phenomena on which it is dependent].—Met. & Chem. Engg. June 1 1916; p 631; pp 43; 30c.

Layng, H. R.—*Cyanidation of Flotation Concentrates*. [Contains discussion on a recent paper on the subject in the form of correspondence].—M. & S. P. June 3 1916; p 813; pp 34; 20c.

Shellshear, W.—*Selling Lead and Zinc Concentrates*. [Notes on selling lead-zinc ores and concentrates. Some information in regard to flotation and thermic methods as related to selling are given. All is based on Australian practice].—Mg. & Engg. Rev. May 5 1916; p 190; pp 334*; 35c.

Concentration: Sorting, Sizing, Washing

Ralston, O. C.—*The Control of Ore Slimes*. [The electricity originating in the slimes is taken up and details given regarding its effects and nature. The same is given regarding other substances either originally present in the slimes or being originated therein].—E. & M. J. June 3 1916; p 990; pp 434; 25c.

Shellshear, W.—*Selling Lead and Zinc Concentrates*. [Notes on selling lead-zinc ores and concentrates. Some information in regard to flotation and thermic methods as related to selling are given. All is based on Australian practice].—Mg. & Engg. Rev. May 5 1916; p 190; pp 334*; 35c.

Sohnlein, G. F.—*Combined Hydraulic and Mechanical Classifier*. [A paper read before the A. I. M. E. The classifier was designed especially to prepare the pulp of tin ores for jigging].—Mg. World June 3 1916; p 1049; pp 134; 10c.

—*Nelson's Ore Separator*. [A new machine for classification and concentration. Its construction and theory of operation are described].—Mg. World June 3 1916; p 1042; pp 34; 10c.

Cyaniding

Layng, H. R.—*Cyanidation of Flotation Concentrates*. [Contains discussion on a recent paper on the subject in the form of correspondence].—M. & S. P. June 3 1916; p 813; pp 34; 20c.

Smith, A. M.—*Alkalinity of Cyanide*

Solutions. [In a brief way gives details regarding experience in this line and particularly at a plant treating a tough amorphous quartz with finely divided free gold].—M. & S. P. June 3 1916, p. 248; pp 1; 20c.

Mill and Smelter Costs

Liebig, M.—The Roitsheim-Remy Continuous Zinc Distillation Process. [Translated from German in Metal & Erz. A complete and detailed description is given of this process, equipment required and methods and costs of operation].—Met. & Chem. Engg. June 1 1916; p 625; pp 4½*; 30c.

Thum, E. E.—Cost-Accounting in the Construction and Operation of a Copper Smelter. [Information obtained from experience at the Anaconda Copper Co.'s smelter. Details for the distribution of accounts are given, as also are methods of keeping costs].—Met. & Chem. Engg. June 1 1916; p 660; pp 2¾; 30c.

Hollinger Costs in 1915. [Detailed descriptive and tabulated information].—Canadian Mg. Jnl. June 1 1916; p 272; pp 2; 35c.

CHEMISTRY AND ASSAYING

Assaying

Dudley, Boyd, Jr.—The Distribution of Silver Between Metallic Lead and Litharge Containing Slags. [Treats on the subject with respect to the crucible fire assay of gold-silver ores].—Met. & Chem. Engg. June 1 1916; p 636; pp 6*; 30c.

Analysis

International Smelting Co., Miami, Arizona. [Analyses of products used and produced and details of equipment and operation are given, with a complete flowsheet of the plant].—M. & S. P. June 3 1916; p 822; pp 2*; 20c.

METALLURGY

Electrometallurgy

Gray, J. H.—Electric Furnace Construction and Operation. [A paper read before the American Foundrymen's Assn. Treats in a practical way on the design and operation of the furnace, with details on the electrical problems involved].—Foundry June 1916; p 241; pp 4½*; 25c.

Thermic Metallurgy

Liebig, M.—The Roitsheim-Remy Continuous Zinc Distillation Process. [Translated from German in Metal & Erz. A complete and detailed description is given of this process, equipment required and methods and costs of operation].—Met. & Chem. Engg. June 1 1916; p 625; pp 4½*; 30c.

Shellshear, W.—Selling Lead and Zinc Concentrates. [Notes on selling lead-zinc ores and concentrates. Some information in regard to flotation and thermic methods as related to selling are given. All is based on Australian practice].—Mg. & Engg. Rev. May 5 1916; p 190; pp 3½*; 35c.

Thum, E. E.—Cost-Accounting in the Construction and Operation of a Copper Smelter. [Information obtained from experience at the Anaconda Copper Co.'s smelter. Details for the distribution of accounts are given, as also are methods of keeping costs].—Met. & Chem. Engg. June 1 1916; p 660; pp 2¾; 30c.

International Smelting Co., Miami, Arizona. [Analyses of products used and produced and details of equipment

and pertaining to the same, with a complete flowsheet of the plant].—M. & S. P. June 3 1916, p 822; pp 2*; 20c.

Heroldianum Plant, Missouri. [One table is given showing the quantities of zinc smelted and products resulting and the other shows the same for lead smelted and produced in the smaller units of the smelter].—M. & S. P. June 3 1916, p 822; pp 1; 25c.

Ward, J. H.—The Control of Ore Slimes. [The electricity originating in the slimes is taken up and details given regarding its effects and nature. The same is given regarding other substances either originally present in the slimes or being originated therein].—E. & M. J. June 3 1916, p 990; pp 1½; 25c.

POWER AND MACHINERY

Electricity

Bulkley, J. N.—Application of Electrical Power to Rand Mining Work. [Results with electric winding and comparison of the cost of steam and electricity are discussed].—S. Afr. Mg. Jnl. April 29 1916; p 112; pp 1; 35c.

Phillips, H. M.—Induction Motor Characteristics. [Reprint from Power discusses the speed limitations, starting current, torque of squirrel cage motors and the advantages of squirrel cage motors in certain works].—Coal Age June 3 1916; p 990; pp 2½; 20c.

Ralston, O. C.—The Control of Ore Slimes. [The electricity originating in the slimes is taken up and details given regarding its effects and nature. The same is given regarding other substances either originally present in the slimes or being originated therein].—E. & M. J. June 3 1916, p 990; pp 1½; 25c.

Compressed Air

Buffum, F. D.—Handling Compressed Air in Shaft Sinking. [A booster compressor is employed to keep water from the air transmission line. An air injector for ventilating and a water ejector are described, besides some details of piping in shaft sinking].—Coal Age June 3 1916; p 990; pp 2½; 25c.

Elmendorf, W. J.—Cost of a Crosscut Adit. [Excerpt from a paper in Trans. Can. Mg. Inst. The cost of the adit obtained from the Portland Canal Tunnels, Ltd., B. C. is given].—E. & M. J. June 3 1916, p 987; pp ¾; 25c.

Richards, John.—Adit Enlargement and Finishing at the ... [Details of the enlargers are given, also are details of the work given].—E. & M. J. June 3 1916; pp 1¾; 25c.

Gas Producers, Producer Gas

Step, P. J.—A Four-Inch Pipe Made a Four-Inch Pipe Possible. [On the use of a four-inch pipe in the installation and operation are given].—Foundry June 1916; p 241; pp 4½*; 25c.

Combustion Engines

Bull, G. L.—The ... [Details of the combustion engines are given, also are details of the work given].—E. & M. J. June 3 1916, p 987; pp ¾; 25c.

Steam and Steam Engines

Bulkley, J. N.—Application of Electrical Power to Rand Mining Work. [Results with electric winding and comparison of the cost of steam and electricity are discussed].—S. Afr. Mg. Jnl. April 29 1916; p 112; pp 1; 35c.

Miscellaneous Power and Machinery

H. L. ... [The haulage, drilling, hoisting equipment and construction are described in a general way].—S. Afr. Mg. Jnl. June 7 1916; p 512; pp 1½; 25c.

IV. MISCELLANEOUS

Miscellaneous Costs

Bulkley, J. N.—Application of Electrical Power to Rand Mining Work. [Results with electric winding and comparison of the cost of steam and electricity are discussed].—S. Afr. Mg. Jnl. April 29 1916; p 112; pp 1; 35c.

Testing

Bancroft, W. D.—Ore Flotation. [A paper read before the A. I. M. E. Treats in general of the more common theory of ore flotation and the phenomena on which it is dependent].—Met. & Chem. Engg. June 1 1916; p 611; pp 4; 30c.

Phillips, J. K.; School, L. A.—The Inflammability of Illinois Coal Dusts. [Contains a description of the electrical apparatus used and results of the tests on samples from different places in the same district and from different districts. Results are tabulated and plotted as curves].—U. S. Bur. of Mines Bull. 102; pp 74*; 25c.

Metallography

Touceda, E.—Malleable Iron, Its Characteristics, Uses and Alloys. [A paper read before the Railway Club of Pittsburgh].—Foundry June 1916; p 231; pp 2; 25c.

Law, Legislation, Taxation

Cooper, Francis.—Financing an Enterprise. [For promoters, investors and businessmen. Brings out methods for placing the undertaking before people as well as methods of financing after the capital has been obtained].—Ronald Press, N. Y.; book; pp 341; 85c.

History

Stewart, W. Y.—The ... [Gives a history of the mines in the district, including a history of their growth, production, quality of ores produced and the several sales of a particular mine has witnessed].—W. & S. P. June 3 1916, p 822; pp 2*; 20c.

Societies

Mining Electrical Engineers' Association ... [Minutes of the ... meeting held on May 8 1916].—C. & T. Rev. May 19 1916; p 581; pp 1; 35c.

Financial

Shellshear, W.—Selling Lead and Zinc Concentrates. [Notes on selling lead-zinc ores and concentrates. Some information in regard to flotation and thermic methods as related to selling are given. All is based on Australian practice].—Mg. & Engg. Rev. May 5 1916; p 190; pp 3½*; 35c.

Cooper, Francis.—Financing an Enterprise. [For promoters, investors and businessmen. Brings out methods for placing the undertaking before people as well as methods of financing after the capital is obtained].—Ronald Press, N. Y.; book; pp 341; 85c.

Ore and Metal Markets; Prices-Current

New York, June 22, 1916.

Silver.—Quotations for silver per fine ounce at New York and per standard ounce at London for the week ending June 21 were as follows:

	New York Cents.	London Pence.
June 15.....	62 7/8	30 1/16
16.....	62 3/4	30 3/16
17.....	63 1/8	30 1/2
18.....	63 1/4	30 15/16
19.....	64 1/8	30 5/8
20.....	64 1/4	30 11/16
21.....	64 1/2	30 11/16

MONTHLY AVERAGE PRICES OF SILVER.

Month.	New York			London		
	High.	Low.	Avg.	1915.	1916.	1915.
January.....	57 3/8	55 3/8	56.775	48.890	26.875	22.544
February.....	57	56 1/2	56.755	48.477	27.000	22.759
March.....	60 1/4	58 3/8	57.935	49.226	27.080	23.650
April.....	63 1/2	60 3/4	61.415	50.034	31.375	23.250
May.....	71 3/4	68 1/4	69.915	49.215	34.182	23.950
June.....	.....	.....	.....	49.072	.....	21.577
July.....	.....	.....	.....	47.519	.....	22.950
August.....	.....	.....	.....	47.173	.....	22.750
September.....	.....	.....	.....	45.983	.....	23.000
October.....	.....	.....	.....	46.875	.....	23.923
November.....	.....	.....	.....	51.713	.....	24.640
December.....	.....	.....	.....	55.038	.....	26.232
Year.....	.....	.....	.....	49.690	.....	23.470

Difference in domestic and foreign prices explained by the fact that the New York quotations are per fine ounce; the London per standard ounce 925/100.

Copper.—After another week of complete inactivity in copper the Mexican situation has created a new aspect to the entire market. Whether the turmoil in the south can transform the copper market into maelstrom of activity eclipsing the previous buying movements or whether the advent of war will be taken by the country philosophically remains to be seen. At this writing there is an air of uncertainty. Copper, among all products, is certain to be affected. In the first place, it will not be long after hostilities are begun that production in the Mexican mines would cease. Mexican output is estimated at 20,000,000 lbs. a month, of which Greene-Canea contributes 6,000,000 lbs. and Montezuma 4,000,000 lbs. Then again Mexican laborers in the Arizona mines may become sullen and interfere with output there. In contrast with the smaller output will be the greater consumption of copper. Warfare in Mexico, according to the military authorities, will be mainly an infantry and cavalry affair, and not artillery. Thus small arm ammunition in profusion will be required, meaning the consumption of a considerable amount of copper.

Foreign buying of the red metal in the past week has been held in abeyance. The French and Russian governments have negotiated large loans with which to purchase war materials, and indications are that the negotiations for copper now pending will develop into actual business before the end of July. Furthermore, a renewal of foreign buying on a large scale will stimulate domestic demand overcoming the hesitancy now evident. The spread in prices asked by first and second hands continues, but as consumers are well covered for nearby positions and second hands have only nearby copper, the concessions do not affect producers. Spot and July electrolytic can be had at 27 1/2 cts., while August is offered at 27 1/8 and September at 26 1/2 cts. On the other hand, producers' prices for electrolytic range from 29 3/4 cts. for August down to 29 cts. for December. Spot casting copper in second hands was offered as low as 25 cts., while for August and September these sellers asked 2 1/2 cts. While producers' prices are seemingly artificial it is conceded, however, that the entire market will prevail as soon as buying on a large scale is resumed.

The London market has continued to decline, but the recessions are without importance to the general copper situation. Last week electrolytic copper fell £10-£11, while standard spot receded £10-£11, and futures £9 10s to £10. At the opening this week prices declined further. The fort-

nightly statistics showed few changes. Stocks of furnace material in the United Kingdom on June 15 totaled 2459 tons, a decrease of 513 tons, while stocks of fine copper in France increased 230 tons to 4000 tons. The float from Chile decreased from 3000 tons to 1500 tons, while the float from Australia increased 200 tons to 4300 tons. Thus the visible supply on June 15 is 1403 tons less at 12,250 tons.

Quotations for copper per pound at New York for the week ended June 21 were as follows:

June 15.....	Third Quarter Delivery		Casting.
	Lake.	Electrolytic.	
16.....	28 1/2 @ 28 1/2	28 1/2 @ 28 1/2	25 1/2 @ 25 1/2
17.....	28 1/2 @ 28	28 1/2 @ 28	25 1/2 @ 25 1/2
18.....	28 1/2 @ 28	28 1/2 @ 28	25 1/2 @ 25 1/2
20.....	28 1/2 @ 27 1/2	28 1/2 @ 27 1/2	25 1/2 @ 25 1/2
21.....	28 1/2 @ 27 1/2	28 1/2 @ 27 1/2	25 1/2 @ 25 1/2

Quotations for copper per pound at London for the week ended June 21 were as follows:

June 15.....	Standard		Electrolytic.
	Spot	Futures	
16.....	115 0/0	116 0/0	110 0/0
17.....	115 0/0	116 0/0	110 0/0
18.....	116 0/0	116 0/0	109 0/0
20.....	116 0/0	116 0/0	108 0/0
21.....	116 0/0	116 0/0	107 0/0

MONTHLY AVERAGE PRICES OF COPPER.

Month.	New York—Lake Superior.			1915.
	High.	Low.	Average.	
January.....	24.70	24.00	24.101	13.891
February.....	25.00	25.25	25.157	14.72
March.....	28.75	27.25	27.641	15.111
April.....	30.00	28.50	29.20	17.308
May.....	29.75	28.25	29.05	18.812
June.....	.....	.....	.....	19.32
July.....	.....	.....	.....	19.423
August.....	.....	.....	.....	17.472
September.....	.....	.....	.....	17.758
October.....	.....	.....	.....	17.925
November.....	.....	.....	.....	18.576
December.....	.....	.....	.....	20.375
Year.....	.....	.....	.....	17.647

Month.	New York—Electrolytic.			1915.
	High.	Low.	Average.	
January.....	25.00	23.00	24.101	13.707
February.....	28.25	25.25	27.462	14.572
March.....	30.00	27.25	27.641	14.96
April.....	30.00	28.25	29.65	17.057
May.....	29.75	28.00	28.967	18.601
June.....	.....	.....	.....	19.173
July.....	.....	.....	.....	19.68
August.....	.....	.....	.....	17.222
September.....	.....	.....	.....	17.705
October.....	.....	.....	.....	17.859
November.....	.....	.....	.....	18.826
December.....	.....	.....	.....	20.318
Year.....	.....	.....	.....	17.47

Quotations for electrolytic cathodes are 0.125 cent per lb. less than for cake, ingots and wire bars.

Month.	New York—Casting Copper			London	
	High.	Low.	Avg.	1916.	1915.
January.....	27	23.00	25.065	88.008	60.760
February.....	27.50	23.12 1/2	25.093	102.700	63.262
March.....	27.75	25.00	26.210	106.18	66.235
April.....	27.00	26.75	27.70	103.681	77.461
May.....	26.00	26.00	26.692	104.294	77.860
June.....	.....	.....	.....	.....	82.850
July.....	.....	.....	.....	.....	74.807
August.....	.....	.....	.....	.....	67.350
September.....	.....	.....	.....	.....	68.560
October.....	.....	.....	.....	.....	72.577
November.....	.....	.....	.....	.....	77.400
December.....	.....	.....	.....	.....	80.400
Year.....	.....	.....	.....	.....	.....

Tin. The market has almost been demoralized by the violent declines in tin at London and Singapore. Sellers here are at a loss to explain the reaction, but with each recession abroad prices here have been marked down, so that spot Straits tin can be secured at 40 1/2 cts., while spot Banka tin is quoted at 39 1/2 cts. Rumors attribute the reaction to heavy shipments from the Straits in June amounting to about 7000 tons, the increasing supplies on operators' hands in London,

who are unable to secure tin permits, and therefore hold greater stocks of Banka tin than Spelter holders, secured freely at concessions, but the only business done was for forward deliveries, large consumers deeming conditions unpropitious for buying. But throughout business has been limited. During the past week tin declined from 2 to 2½ cts., while at London Strait tin dropped £9 10s and at Singapore £8 10s. At the opening of the current week the foreign markets again declined, but not so violently. Straits tin for July delivery was quoted at 40 cts., for August delivery at 39½ cts., September at 39½ cts., October at 39½ cts. and November at 39 cts. The heavy shipments of Banka tin are now coming to light. The steamer *K. H. I.* is due here this month with 1250 tons Banka and additional large shipments are due in July. Chinese and English tin are being offered freely at concessions. Throughout the tin situation is weak and consumers, being well stocked, are waiting for further breaks before buying on any extended scale.

Quotations for tin per pound at New York and per ton at London and Singapore for the week ended June 21 were as follows:

	New York		London	Singapore
	Spot	June	Strait tin spot	
June 15	43.00	42.50	£182 16 0	£180 11 0
16	41.50	41.00	179 0 0	182 0 0
17	41.50	41.00	179 0 0	182 0 0
18	41.50	41.00	179 0 0	182 0 0
19	41.50	41.00	178 10 0	180 0 0
20	41.50	41.00	178 0 0	179 5 0
21	40.25	39.75	174 0 0	178 5 0

MONTHLY AVERAGE PRICES OF TIN, NEW YORK

Month	1915			
	High	Low	Average	Average
January	47.00	46.87½	47.883	47.25
February	47.00	46.25	46.931	47.71
March	46.00	46.25	46.78	48.03
April	46.00	46.50	46.371	44.88
May	46.00	45.75	45.8½	46.87
June	41.50	39.75	40.62	42.18
July	41.50	40.50	41.86	41.86
August	41.50	40.50	41.25	41.25
September	41.50	40.50	41.25	41.25
October	41.50	40.50	41.25	41.25
November	41.50	40.50	41.25	41.25
December	41.50	40.50	41.25	41.25
Year				46.004

Lead.—Extreme weakness prevails in lead, with prices in the outside market \$5 to \$10 a ton under the quotations of the principal producer. Since our last report there has been some buying for export which temporarily hardened the local market, but failed to influence conditions at St. Louis. As soon as this buying stopped the market receded. It was reported Russia was in the market for a large quantity, but interests formerly identified with Russian business assert that they have no authorization to make purchases. Business has been small, with domestic consumers waiting for a general readjustment of prices. It is expected that the A. S. & Co. will announce another reduction, as the spread in prices is too wide to ignore. Spot lead in the outside market was offered down 6½ cts. New York and 6.55 cts. St. Louis, while the leading interest in the New York and London markets at St. Louis. The Mexican market can have little effect on lead, as imports from Mexico have not been large and the loss of this source of supply will not aid the market. The London market declined during the week, but the reaction is not severe. Spot lead dropped £1 7s 6d, while futures receded £1 5s.

Quotations for lead per ton at New York and London for the week ended June 21 were as follows:

	New York		London
	Imports	Spot	
June 1	6.75	6.55	£41 10 0
16	6.50	6.55	41 0 0
17	6.50	6.55	41 0 0
18	6.50	6.55	41 0 0
19	6.50	6.55	41 0 0
21	6.75	6.55	41 0 0

MONTHLY AVERAGE PRICES OF LEAD

Month	1915			
	High	Low	Average	Average
January	6.25	6.00	6.125	6.125
February	6.25	6.00	6.125	6.125
March	6.00	5.75	5.875	6.000
April	6.00	5.75	5.875	6.000
May	7.50	7.25	7.375	7.250
June	6.75	6.50	6.625	6.500
July	6.75	6.50	6.625	6.500
August	6.75	6.50	6.625	6.500
September	6.75	6.50	6.625	6.500
October	6.75	6.50	6.625	6.500

Month	High	Low	Average	Average
January	1.10	1.05	1.075	1.075
February	1.10	1.05	1.075	1.075
March	1.10	1.05	1.075	1.075
April	1.10	1.05	1.075	1.075
May	1.10	1.05	1.075	1.075
June	1.10	1.05	1.075	1.075
Year				1.075

Lead Ore.—The market was a bit dull during the week ended June 21. In the Missouri-Kansas-Oklahoma district the price of lead ore declined to \$80 for the better grade ores was noted. The miners were again led to take the place of the strikers and most of the mines which were closed are again opening, but the demand is not strong. There were 1,150,000 lbs. of concentrates produced and the total for the year to date was 7,911,410 lbs. The respective values of these amounts were \$78,875 and \$2,342,880. The concentrates produced during the week were not a little in advance of the previous week's shipments.

MONTHLY AVERAGE PRICES OF JOPLIN LEAD ORE

Month	1916			
	High	Low	Average	Average
January	\$1.10	75.00	76.17	45.00
February	1.10	82.00	80.42	45.00
March	1.10	87.00	84.00	45.00
April	1.10	84.40	80.29	45.00
May	1.10	90.00	84.75	45.00
June	1.10	85.00	80.00	45.00
Year				53.34

Zinc Ore.—In the face of the fact that spelter prices were at the decline during the week ended June 15, prices of zinc in the Missouri-Kansas-Oklahoma district were unaffected and prices ranged from \$90 to \$95. The production of concentrates during the week, 15,279,200 lbs., was nearly 3,000,000 lbs. more than during the previous week. The total for the year to that date was 337,631,884 lbs. These quantities had values of \$524,431 and \$16,368,013.

Calamine saw another decline, which in part may have been due to the excessive production of the previous week. The price in the market rose \$5 to \$6½, as against \$50 to \$50 during the previous week. There were produced 129,540 lbs. of concentrates during the week, which brought the total for the year to 18,500,000 lbs. These amounts had the respective values of \$870 and \$687,738.

MONTHLY AVERAGE PRICES OF JOPLIN ZINC ORE

Month	1916			
	High	Low	Average	Average
January	85.00	85.00	100.25	75.00
February	85.00	85.00	110.75	65.00
March	110.00	80.00	90.00	65.00
April	110.00	98.00	99.25	61.25
May	110.00	90.00	88.17	60.00
June	110.00	90.00	90.00	60.00
Year				63.50

Spelter.—The price of spelter is suffering from the effect of the excessive production of zinc ore. For a time the market derived some strength from the labor trouble, but little protective buying developed and sellers resumed shading prices. The situation, however, is not entirely clear. Imports of spelter from the United States are not fully covered by the production of the principal producer in the United States. Joplin advices state that an agreement towards this end, but the state of affairs is not clear. It is believed that the Federal Reserve Board will be authorized to that an agreement to curtail production of spelter was offered down to 13% of the total production of the United States, with some sellers willing to take 15% at St. Louis, with some sellers willing to take 10% at New York. The London market is not so well supplied as it was a few days ago. The local market is not so well supplied as it was a few days ago. The London market is not so well supplied as it was a few days ago.

Quotations for spelter per ton at New York and London for the week ended June 21 were as follows:

	New York		London
	Spot	Spot	
June 1	68.00	68.00	£36 10 0
16	68.00	68.00	36 0 0
17	68.00	68.00	36 0 0
18	68.00	68.00	36 0 0
19	68.00	68.00	36 0 0
21	68.00	68.00	36 0 0

MONTHLY AVERAGE PRICES OF SPELTER

Month	1915			
	High	Low	Average	Average
January	6.25	6.00	6.125	6.125
February	6.25	6.00	6.125	6.125
March	6.00	5.75	5.875	6.000
April	6.00	5.75	5.875	6.000
May	7.50	7.25	7.375	7.250
June	6.75	6.50	6.625	6.500
July	6.75	6.50	6.625	6.500
August	6.75	6.50	6.625	6.500
September	6.75	6.50	6.625	6.500
October	6.75	6.50	6.625	6.500

MONTHLY AVERAGE PRICES OF SPELTER.

Month.	New York			London	
	High.	Low.	Avg.	1916.	1915.
January	19.42½	17.00	18.81	6.519	88.846
February	21.17½	18.67½	20.094	8.806	97.840
March	20.50	16.50	18.40	10.125	100.720
April	19.47½	17.75	18.76	11.48	98.103
May	17.50	14.75	17.48	15.825	89.507
June				22.925	100.320
July				20.803	98.150
August				16.110	68.250
September				14.493	64.400
October				14.196	64.196
November				16.875	88.240
December				16.675	89.153
Year				14.914*	69.929

*For the first nine months spot market nominal thereafter.

MISCELLANEOUS METALS.

Quicksilver.—Has the turning point in quicksilver been reached? This is the question now frequently asked. After declining to \$68 a flask, with sellers reporting business quietly done at \$65 per flask for spot virgin, the market has suddenly gained strength, with some active demand reported. Business this week was done at \$68 per flask. The English government was a buyer in this market, while about 350 flasks were taken by domestic consumers. At this writing there is an inquiry in the market for 500 flasks from a domestic consumer. Quicksilver in England sells around \$82 per flask, so that our price of \$68 enables a saving to the government. Drug houses have been active buyers in small lots. It is reported that a local banking interest still holds 1000 flasks which it took over from holders who had secured a loan. Whether quicksilver can return to near \$300 is doubtful. In the first place, England has shown its ability to break a corner, while increased supplies from Spain and other producing countries prevents a repetition of manipulation. South American mines are sending considerable quantities of recovered quicksilver to this market also.

Antimony.—Business still continues restricted, with sellers now devoting considerable time to the issuance of reports of a bullish nature, but without avail. While prices hold at levels noted in our last report the market is weak and buyers can find sellers willingly shading 2½ cts. for spot. It is reported that the diplomatic troubles in China arising from the death of President Yuan may stop output in the Yunnan district, while it is also stated that the Russian government was reconsidering its action with respect to the purchase of 2000 tons from Japanese interests, the order for which was canceled several weeks ago. Many dealers are receiving shipments of antimony for which they must pay around 35 cts., whereas they can only secure 20½ cts. in the present market. Canadian consumers who bought heavily at around 42 cts. have been forced to accept a heavy loss as a result of their heavy forward purchases.

Aluminum.—While other metals are declining aluminum is firm, active and higher. Spot No. 1 virgin ingots advanced to 63@65 cts. a pound in ton lots, with sellers reporting an active business. For pure 98.99% remelted sellers are 61@63 cts., while for No. 12 alloy remelted the asking price is 50@52 cts.

Nickel.—Business in this metal is of fair volume, with prices advanced to 15@17 cts. for ordinary forms and 5 cts. for high purity.

Pig Iron.—There has been a resumption of domestic business at the expense of prices, northern furnaces reporting a decline in production of the American Locomotive Co., the General Electric Co. and the American Brake Shoe & Foundry Co. A financial interest who held a little extra stock in the business at \$17.75 Buffalo, while Pennsylvania prices were held to the extent of 25 cts. a ton. The American Locomotive Co. bought 5000 tons for the second half, the General Electric, 10,000 tons, and the American Brake Shoe and Foundry Co., 6000 tons. A central Pennsylvania market has been formed with Labanon low phosphorus pig iron selling at \$1 a ton at \$2.50 Labanon furnace. Foreign business continues active, with over 50,000 tons Bessemer under negotiation for Italy and France.

Ferromanganese.—Domestic competition has put English makers out of the running. While spot English 80½ is held at \$300 seaboard, domestic furnaces are taking business at \$225@250 furnace for 80% or equivalent. One English maker has offered to take 1917 business at \$160 seaboard, but consumers are not disposed to close, as prospects are that domestic producers will offer a better price. The Temple furnace will soon be started on ferromanganese, taking Virginia ore. Speigelleisen for spot delivery is easier at \$60 furnace for 20½, while last half contracts are unchanged at \$50 furnace.

PRICES-CURRENT.

Acids—Muratic, 15 deg.	3.00	to	3.25
Muriatic, 40 deg.	3.25	to	3.50
Nitric, 56 deg.	1.75	to	.08
Nitric, 70 deg.	1.82	to	.08½
Alcohol—U. S. P., gal. grain.	2.70	to	2.75
Distilled, 100 proof, gal.	2.68	to	2.70
Wood, 47 c.	.70	to	.71
Alum—Powdered, lb.	.05½	to	.08
Ground, lbs.	.041	to	.07½
Lump, lb.	.04	to	.06½
Ammonia—			
White, white, grade, lb.	.08½	to	.08½
Muriate, lump	.17	to	.18
Arsenic White, lb.	.06½	to	.06½
Red, lb.	.45	to	.70
Barium Chloride, 100 lb.	110.00	to	115.00
Nitrate, Regs. 100 lb.	.18	to	.19
Bismuth—Metallic, lb.	3.11	to	3.20
Sulfate	3.10	to	3.15
Bleaching Powder	5.25	to	5.75
Borax—100 lbs. net lots	7.50	to	8.00
Coke—Connellsville furnace	2.50	to	2.75
Foundry	3.00	to	3.50
Copperas—Spot, lb.	1.50	to	2.00
Ferromanganese—Spot	250.00	to	350.00
Last half	200.00	to	295.00
Ferrosilicon, 50%			55.00
Ferrotitanium, per lb.	.68	to	1.24½
Fuller's Earth, 100 lbs.	.80	to	1.05
Glaucous Salts, bags	.60	to	.70
Calcined			2.50
Iron Ore—			
Bessemer, old range, ton	4.45		
Bessemer, Mesabi	4.20		
Non-Bessemer, old range	3.70		
Non-Bessemer, Mesabi	3.55		
Lead—Granulated, lb.	.15	to	.15½
Brown sugar	1.13	to	1.14
White crystals	1.75	to	1.75½
Broken, cakes	.14	to	.15
Powdered	.17	to	.17½
Litharge, American, lb.	.09	to	.09½
Mineral Lubricants			
Black, summer	1.21	to	.11
20 c.	.14	to	.15
Cylinder, light, filtered, gal.	.21	to	.26
Neutral, filtered, brown, 20 gal.	.57½	to	.58
Wood grade, 5 gal.	1.9½	to	.20
Paraffin—High viscos.	2.9½	to	.30
Naphtha (New York)			
Gasoline, pure	.32½	to	.32½
Benzine, 70 c.	.29	to	.29½
Nickel Salt, double	.07½	to	.08½
Single	.10½	to	.11
Petroleum			
Crude, medium	.15	to	.18
Refined, 100			.12
Platinum—Oz. 100	80.00	to	86.00
Potash Fertilizer Salts			
Kaib, min. 15% actual potash			32.00
Muriate, 80 to 85% basis 80%, ton	450.00	to	475.00
High grade sulphate, 10 to 55% basis			
50%	100.00	to	450.00
Hard salt, near 12% actual potash			Nominal
32.00			
Potassium			
Bichromate	.45	to	.50
Carbonate, old %	1.55	to	1.57
Cyanide, bulk, 100 lb.	.75	to	1.00
Chloride	.50	to	.58
Prussiate, red	1.35	to	1.40
Prussiate, red	4.50	to	4.75
Salt-peter, crude, lb.	.09½	to	.10
Refined	.30	to	.31
Soda Ash, 98% 100 lb.	1.25	to	1.50
Strontia Nitrate, lb.	.45	to	.48
Sulphur			
Crude, ton	28.50	to	29.00
Flowers, 100 lbs.	2.50	to	2.70
100, 100 lb.	1.95	to	2.25
Tin—Bichloride, 50	17.25	to	17.75
Crystals, 100 lb.	.35	to	.38½
Oxide, lb.	.51	to	.53
Zinc Chloride	.15	to	.22

Dividends of Mines and Works Continued

NAME OF COMPANY	Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY	Number Shares Issued	Par Val	Dividends on Issued Capitalization			
			Paid In 1916	Total to Date	Latest					Paid In 1916	Total to Date	Latest	
					Date	Am't.						Date	Am't.
Petro, G. S.	6,000,000	\$ 1	\$	\$65,000	Aug. 9, '06	00.04	Success...	1,000,000	\$ 1	\$255,000	\$1,160,000	May 23, '16	\$8.03

Corrected to June 1, 1916

*Includes dividends paid by Silver King Mf. Co. to 1907—\$10,675.00.

Dividends of Foreign Mines and Works

NAME OF COMPANY	Number Shares Issued	Par Val	Dividends on Issued Capitalization				NAME OF COMPANY	Number Shares Issued	Par Val	Dividends on Issued Capitalization			
			Paid In 1916	Total to Date	Latest					Paid In 1916	Total to Date	Latest	
					Date	Am't.						Date	Am't.
Auchtan...	60,000	\$ 8	\$	\$27,500	July 1, '13	00.25	Lae Cabrerilla...	1,040,810	\$ 10	\$	\$891,400	June 3, '12	10.00

Corrected to June 1, 1916.

National Defense and International Peace



Business and Patriotism

A Non-partisan Appeal to the Nation

THE WHITE HOUSE
Washington

April 21, 1916.

To the Business Men of America:

I bespeak your cordial cooperation in the patriotic service undertaken by the engineers and chemists of this country under the direction of the Industrial Preparedness Committee of the Naval Consulting Board of the United States.

The confidential industrial inventory you are asked to supply is intended for the exclusive benefit of the War and Navy Departments and will be used in organizing the industrial resources for the public service in national defense.

At my request, the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the American Society of Electrical Engineers and the American Chemical Society are gratuitously assisting the Naval Consulting Board in the work of collecting this data, and I confidently ask your earnest support in the interest of the people and government of the United States.

Faithfully Yours, Woodrow Wilson

COMMITTEE ON INDUSTRIAL PREPAREDNESS
OF
NAVAL CONSULTING BOARD OF THE UNITED STATES
IN COOPERATION WITH

THE AMERICAN SOCIETY OF CIVIL ENGINEERS THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
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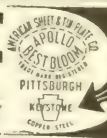
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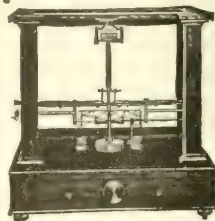
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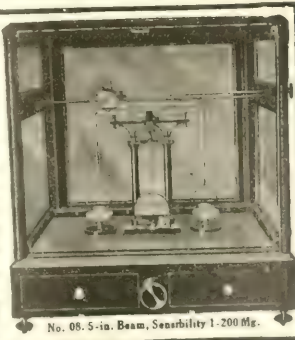
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Cables.

ORE BINS

See Hoppers, Bins and
Pockets.

ORE DRIERS

See Drying Apparatus.

ORE WASHERS

See Washeries.

OVENS (Drying)

See Drying Apparatus.

OVENS (Roasting)

See Furnaces (Roasting)

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APPARATUS**

Imperial Brass Mfg. Co.
K-G. Welding & Cutting Co.
Skinner & Co., M. B.

**PACKING AND PIPE
COVERING**

See Asbestos and Insulators.

PANS

Amalgamating

Allis-Chalmers Mfg. Co.
Moyle Engineering Works.
Traylor Engineering & Mfg. Co.

Roasting

Traylor Engineering & Mfg. Co.

PEBBLES (Grinding)

See Crushing and Grinding
Equipment.

**PERFORATED METAL
SIEVES, ETC.**

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Chicago Perforating Co.

Sieves

Allis-Chalmers Mfg. Co.
Bartlett & Snow Co.
Buffalo Wire Works Co.
Chalmers & Williams.
Chicago Perforating Co.
Multi-Metal Separating Screen
Co.

Wire Mesh and Gauze

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Allis-Chalmers Mfg. Co.
Bartlett & Snow Co.
Buffalo Wire Works Co.
Chalmers & Williams.
Multi-Metal Separating Screen
Co.

PIPE COVERING

See Asbestos and Insulators.

**PIPING AND
ACCESSORIES**

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American Cast Iron Pipe Co.
Clow & Sons, James B.
Donaldson Iron Co.
Glamorgan Pipe & Fdy. Co.
Lynchburg Foundry Co.
Massillon Iron & Steel Co.
U. S. Cast Iron Pipe & Fdy.
Co.

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National Tube Co.
Skinner & Co., M. B.

Pipe Fittings

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Lunkenheimer Co.
National Transit Co.
National Tube Co.
Queen City Foundry Co.
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Pelton Water Wheel Co.
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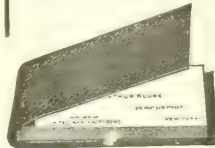
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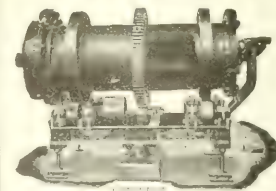
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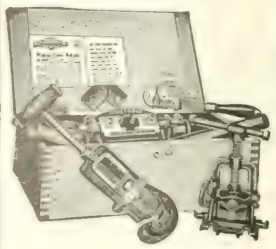
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Wellman-Seaver-Morgan Co.

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Pierce, L. S.

PLATES (Amalgamating)

See Amalgamating Equipment.

PLATES (Iron and Steel)

See Structural Steel.

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Chicago Pneumatic Tool Co.
Ingersoll-Rand Co.

POSTS

Carbo Steel Post Co.

POWDER (Blasting)

See Explosives.

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Morse Chain Co.

PRECIPITATORS

See Cyanide Equipment.

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Moyle Engineering Works.
See also Pans.

PULLEYS AND ROLLERS

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Flory Mfg. Co.
Lane Mill & Mach. Co.
Queen City Foundry Co.
Robbins Conveying Belt Co.
Wellman-Seaver-Morgan Co.

PULVERIZERS

See Crushing and Grinding.

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Cameron Steam Pump Works.
Crucible Steel Co.
De Laval Steam Turbine Co.
Goulds Mfg. Co.
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International Steam Pump Co.
Moore & Co. Engrs., Chas. C.
Pelton Water Wheel Co.
Prescott Steam Pump Co.
Southwark Fdy. & Mch. Co.
Worthington, Henry R.

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Epping-Carpenter Pump Co.
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International Steam Pump Co.
Monarch Eng. & Mfg. Co.
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Connersville Blower Co.
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National Transit Co.
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Moore & Co. Engrs., Chas. C.
Prescott Steam Pump Co.
Snow Steam Pump Co.
Worthington, Henry R.

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Connersville Blower Co.
Frenier & Son.
Goulds Mfg. Co.
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Monarch Eng. & Mfg. Co.
Prescott Steam Pump Co.
Worthington, Henry R.

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Goulds Mfg. Co.
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Worthington, Henry R.

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Goulds Mfg. Co.
International Steam Pump Co.
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Moyle Engineering Co.
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Goulds Mfg. Co.
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PUNCHERS (Coal)

See Cutting Machines.

PYROMETERS

Skinner & Co., M. B.

QUARRIES MACHINERY

See Cutting Machines, Drills, etc., Explosives, and Blasting Equipment, Pumps, Transport and Handling Equipment, etc.

QUARTZ MILLS

See Crushing and Grinding.

QUICKSILVER

See Mercury.

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RAILROADS

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Earl, E. P.
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Scott, Geo. S.

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Hegeler Zinc Co.
International Sm. & Ref. Co.
Metals Buying & Ref. Co.
Sandoval Zinc Co.
U. S. Sm., Ref. & Mg. Co.

REFINING EQUIPMENT

See *Smelting Equipment.*

RESCUE APPARATUS

Elmer, H. N.
Siebe, Gorman & Co.

RESPIRATORS

Multi-Metal Separating Screen Co.

RIFFLES (Table)

General Ore Concentrating Co.

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Lehigh Car, Wheel & Axle Wks.
Traylor Engrng. & Mfg. Co.
Wellman-Seaver-Morgan Co.

RIVETING MACHINES

Skinner & Co., M. B.

ROASTERS

See *Roasting Furnaces, under Furnaces and Accessories.*

ROCK CRUSHERS, ETC.

See *Crushing and Grinding Equipment.*

ROCK DRILLS

See *Drilling and Boring Equipment.*

ROLL CRUSHERS

See *Crushing and Grinding Equipment.*

ROLLER BEARINGS

Hyatt Roller Bearing Co.

ROOFING

Galvanized Sheets
American Sheet & Tin Plate Co.

SAFETY DEVICES

Hoisting
Balliet Engineering Co.

SAFETY HOOKS AND LINKS

See *Clips and Couplings.*

SAFETY LAMPS

See *Lighting Equipment.*

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Granby M. & S. Co.
International Sm. & Ref. Co.
Metals Buying & Ref. Co.
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Allis-Chalmers Co.
Link-Belt Co.

SAWS

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Wellman-Seaver-Morgan Co.

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Power & Mining Mach. Co.
Traylor Engrng. & Mfg. Co.
Wellman-Seaver-Morgan Co.
For other Screens see under *Perforated Metal, Trommels and Coking Equipment.*

SCREW CONVEYORS

See *Conveyors and Elevators.*

SECOND-HAND MACHINERY

See *Machinery (Second-hand).*

SEPARATORS

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Am. Zinc Ore Separating Co.
Buchanan Co., C. G.
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James Ore Concentrator Co.

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Bartlett & Snow Co.
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Chalmers & Williams.
Lehigh Car, Wheel & Axle Wks.
Standard Steel Works.
Traylor Engrng. & Mfg. Co.

SHOES, DIES, CAMS

See *Crushing and Grinding Equipment.*

SHOT FIRERS

See *Explosives and Accessories.*

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Dwight & Lloyd Sintering Co.

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Classifiers
Allis-Chalmers Mfg. Co.
Chalmers & Williams.
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James Ore Concentrator Co.
Morse Bros. Mch. & Sup. Co.
Traylor Engrng. & Mfg. Co.

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Chalmers & Williams.
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Traylor Engrng. & Mfg. Co.

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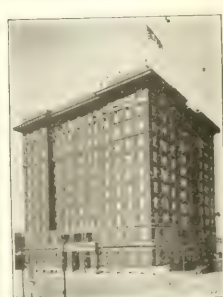


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Morse Bros. Mch'y. & Sup. Co.
Traylor Engrng. & Mfg. Co.
Traylor Filter Slime-Treating Equipment see under Cyanide Equipment.

SMELTERS (Custom)

See Refiners and Smelters.

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Morse Bros. Mch'y. & Sup. Co.
Traylor Engrng. & Mfg. Co.
Wedge Mechanical Furnace Co.
Wile Electric Furnace Co.

Ladle Liners

Monarch Eng. & Mfg. Co.
For other Smelting, Roasting and Refining Equipment see under Burners, Converters and Cupels.

SPRAYERS (Mine)

Ingersoll-Rand Co.

SPRINGS

(Coiled and Flat)
Gibson & Co., Wm. D.

STAMPS AND ACCESSORIES

See Crushing and Grinding Equipment.

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Deane Steam Pump Works.
International Steam Pump Co.
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Nordberg Mfg. Co.

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Jenkins Bros.
Lunkenheimer Co.
National Tube Co.
Wm. Powell Co.

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International Steam Pump Co.
Blake & Knowles Steam Pump Co.

Injectors

Jenkins Bros.
Lunkenheimer Co.
Wm. Powell Co.

Steam Fittings

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Morse Bros. Mch'y. & Sup. Co.
National Tube Co.
Wm. Powell Co.

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Lunkenheimer Co.
National Tube Co.
Skinner & Co., M. B.
Wm. Powell Co.

Steam Traps

Jenkins Bros.
Morse Bros. Mch'y. & Sup. Co.
National Tube Co.
Skinner & Co., M. B.
Wm. Powell Co.

For other Steam Accessories see under Governors, Hoses and Tubing, Piping and Accessories, Asbestos and Insulators and Turbines.

STEAM HOISTS

See Hoisting Equipment.

STEAM SHOVELS

See Shovels.

STEEL (Drill Steel)

See Drilling and Boring Equipment.

STEEL POSTS

See Posts.

STEEL (Structural)

See Structural Steel.

STEEL FLUMES

See Hydraulic Mining Equipment.

STOCKS AND DIES

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STONE CRUSHERS

See Crushing and Grinding Equipment.

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Robins Conveying Belt Co.

Bars

American Bridge Co.

Beams

American Bridge Co.
Robins Conveying Belt Co.

Corner Plates

American Bridge Co.
Robins Conveying Belt Co.

Girders

American Bridge Co.
Robins Conveying Belt Co.

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Cyanide

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Chalmers & Williams.
Hammond Iron Works.
Moyle Engineering Co.
Redwood Mfrs. Co.

Oil

Allis-Chalmers Mfg. Co.
Chalmers & Williams.
Hammond Iron Works.
Monarch Eng. & Mfg. Co.
Redwood Mfrs. Co.

Water

Chalmers & Williams.
Hammond Iron Works.
Redwood Mfrs. Co.

Wooden

Chalmers & Williams.

TAPES (Measuring)

See Surveying Equipment.

TAPPETS (Stamp-Mill)

See Crushing and Grinding Equipment.

TELEPHONES

Stromberg-Carlson Telephone Co.
Western Electric Co., Inc.

TESTING**LABORATORIES**See *Ore-Testing Laboratories.***THICKENERS (Slime)**See *Slime-Treating Equipment.***TIN AND TERNE
PLATES**American Sheet & Tin Plate
Co.**TOOL STEEL**See *Steel.***TRAMWAYS**See *Cableways, etc.***TRANSFORMERS**See *Electrical Equipment.***TRANSITS**See *Surveying and Drafting
Equipment.***TRAPS (Steam)**See *Steam Boilers, etc.***TROLLEYS (Overhead)**Ambursen Co. (Tramway
Dept.).
Wellman-Seaver-Morgan Co.
Westinghouse Electric & Mfg.
Co.**TROMMELS**Allis-Chalmers Mfg. Co.
Traylor Engrng. & Mfg. Co.**TRUCKS (Car)**See *Cars and Accessories.***TUBE MILLS
AND PARTS**See *Crushing and Grinding
Equipment.***TUBING**

National Tube Co.

TURBINES**Steam**Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
Morse Bros. Mch'y. & Sup. Co.
Pelton Water Wheel Co.
Southwark Fdy. & Mch. Co.**Water**Albany Lubricating Co.
Allis-Chalmers Mfg. Co.**TURBINE PUMPS**See *Pumps.***TUYERES**See *Furnaces and Accessories.***TWIST DRILLS**

Skinner & Co., M. B.

VACUUM PUMPSSee *Pumps.***UNIONS**Lunkenheimer Co.
National Tube Co.**VALVES****Back-Pressure and
Check Valves**Jenkins Bros.
Lunkenheimer Co.
National Tube Co.
Wm. Powell Co.**Gate Valves****(Iron and Brass)**American Spiral Pipe Works.
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Moore & Co. Engrs., Chas. C.
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Wm. Powell Co.
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Pelton Water Wheel Co.Wellman-Seaver-Morgan Co
Wm. Powell Co.**Pump Valves**

Jenkins Bros.

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Wm. Powell Co.

Valve Re-seating Tools

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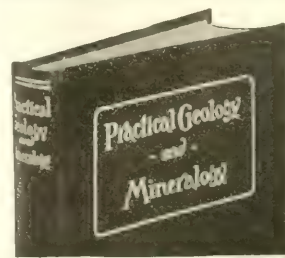
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Want Advertisements Continued on Next Page.

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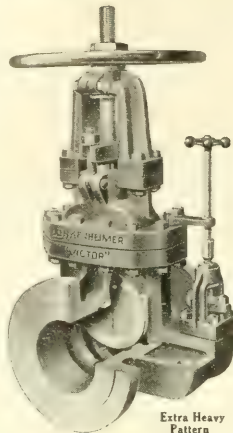
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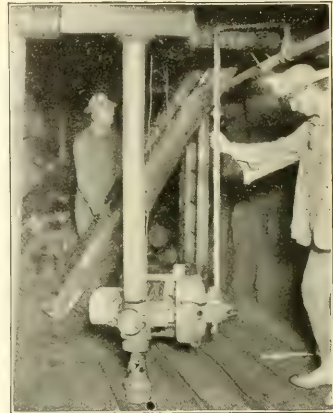
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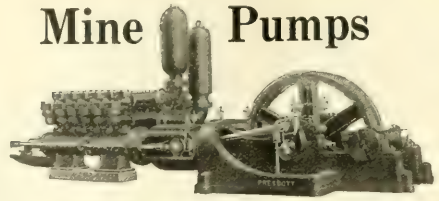
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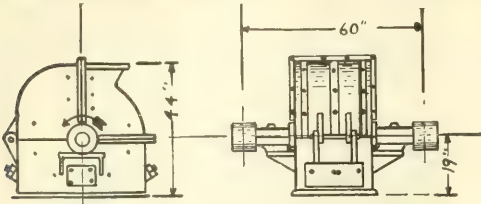


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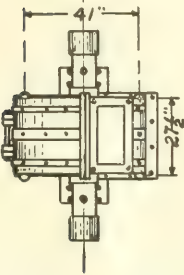
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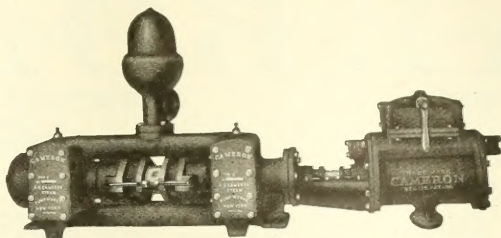
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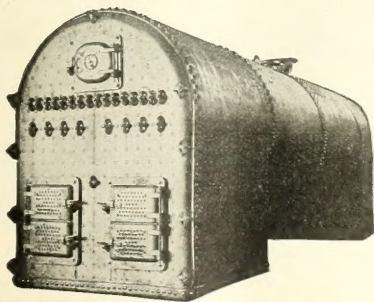
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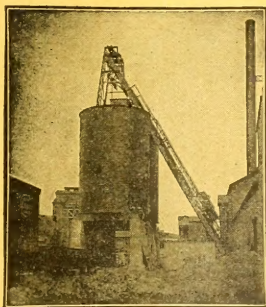
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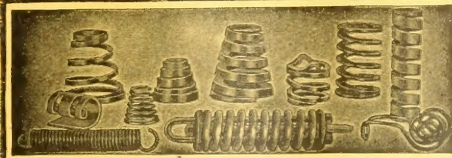
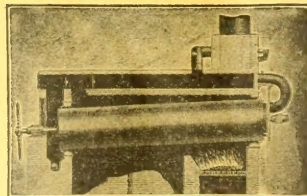
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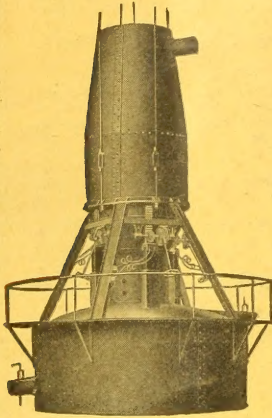


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