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Development of the Ocampo Power Plant

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SYNOPSIS—Sierra Consolidated Mines Co. found a number of small scattered power plants inefficient. For central plant, choice lay between hydro-electric and wood-burning steam-electric. Latter selected as most available for preliminary plant, erected in heart of a timber tract. Description of equipment and costs. One of the available water powers, Basaseachic Fall, was measured carefully with a large weir for two years. On basis of results, plans for development were made. Description of the flow and topography, with outline of proposed equipment and construction.

When the Sierra Consolidated Mines Co. acquired its properties in the Ocampo district of Chihuahua, Mexico,

delivered to the various points where it was used had gradually risen until it averaged about \$8, U. S. currency, per cord. It is needless to state that the cost per horsepower was enormous, as the result of such a price for cordwood and of the inefficiency incident to the operation of small, scattered units.

POSSIBILITIES OF CHEAPER POWER

It was obvious that in order to lower power costs materially, the operation of the numerous small units must be discontinued and the work centralized. The substitution of gasoline for steam engines would have effected a considerable reduction in fuel cost, but owing to high transportation charges, Ocampo being 90 miles from the



FIG. 1. DURAZNO POWER PLANT

Note open-front boiler house, adobe construction and corded wood.

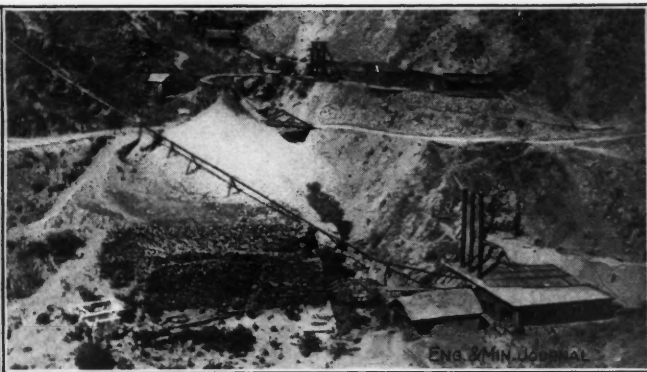


FIG. 2. BELEN SUBSTATION

Auxiliary steam plant in foreground, Belen shaft in background, air pipe line uphill on left.

and began active operations, it was confronted by the necessity of providing cheaper power. The hoisting and compressing equipment previously in use had been driven by steam, generated in wood-fired boilers. The mill was equipped with a steam engine and with a Pelton waterwheel operating under a head of 180 ft.; the supply of water, however, was sufficient for use only during the rainy season, and for continuous operation the steam drive had to be employed three-fourths of the year. As the mines had been in operation for about one hundred years, the country had been cleared of timber for some distance in every direction, and the price of cordwood

railroad, the saving would have been relatively less than at many other points where gasoline engines are operated economically. The difficulties connected with handling their exhaust, furthermore, makes them unsuitable for underground use, and in this case, much underground hoisting was to be done.

The possibilities of developing cheap power lay in the utilization of water powers owned by the company, or else in the utilization of a portion of the company's holdings of timber lands in the vicinity, which amounted to over 80,000 acres. Either alternative involved the installation of an electric-generating station with current distribution to the various points of use, and the use of electric or compressed-air drive for all equipment. The

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operation of the water-power plant promised, of course, to be the cheaper, but it was not considered advisable to undertake its installation before first obtaining accurate records of stream flow extending over a sufficiently long period to determine closely the amount of power that could be developed and also the capacity in reservoir storage that would be required to maintain a constant power output at the plant throughout the year. Further the quantity of power that would be required could not be determined in advance of development work. The work of recording the flow of the principal water power, that of the Basaseachic Fall, was therefore begun at once, while to provide for immediate requirements, a small steam-driven power plant was built.

THE PRELIMINARY WOOD-BURNING PLANT

The situation selected for this plant was Durazno, lying in the Balvanera land tract, about $4\frac{1}{2}$ miles north of



FIG. 3. TYPICAL STAND OF TIMBER NEAR THE DURAZNO PLANT

the town of Ocampo, on the wagon road leading to Temosachic on the Mexico North Western Ry. The timber is largely soft pine with a small intermingled growth of oak and native hardwoods, a typical stand being shown in Fig. 3. The average yield within a radius of several miles around the power plant is estimated at about 12 cords per acre. The elevation is about 8000 ft. above sea level. Water supply is obtained from a nearby stream that flows throughout the year.

The plant is almost on a direct line between Ocampo and the Basaseachic Fall, so that when this is later used for power, the transmission line will be merely an extension of the one already built. The Durazno steam-driven plant can then serve as an auxiliary. With this in view the transformer equipment was selected to give a line voltage of 22,000, which, while higher than necessary for economical transmission over the present line, will obviate the necessity of any alterations in existing equipment when the hydro-electric plant is built.

This Durazno plant was designed to be simple in plan and easy of operation rather than to give theoretically a high power output for the fuel used. The units of which it is made up are light and the plant could easily be moved from one location to another, should it be of advantage to do so. It is operated entirely with native Mexican labor, if the engineer in charge on each shift be excepted. The current is generated at 2300 volts and stepped up to 22,000 for transmission to Ocampo. At the substation there it is stepped down to 440 volts, except at the compressing station where 2200-volt motors are used. Fig. 1 shows the plant.

EQUIPMENT OF PLANT, LINE AND SUBSTATIONS

The generating station equipment consists of four 66-in. by 16-ft. Brownell tubular boilers rated at 100 hp. each; one 250-hp. Blake feed-water heater; two $5\frac{1}{4} \times 3\frac{1}{2} \times 5$ -in. duplex boiler-feed pumps; three 100-hp. Russell high-speed automatic engines running at 275 r.p.m., and belted to three 75-kw., eight-pole, 2300-volt, three-phase, 60-cycle, a.c. generators; three 5-kw., 1800-r.p.m., 125-volt, d.c. exciters; three-panel switchboard, Tyrrell regulator, etc. The step-up transformer station contains three type H, 75-kw. single-phase oil-cooled transformers with 2300-volt primary windings and 22,000-volt secondary, and is protected with a three-phase, 22,000-volt graded-resistance lightning arrester. Fire protection is afforded by a water tank placed on the hill above and connected to lines running through the plant.

The transmission line is of No. 6 hard-drawn copper



FIG. 4. THE FALL IN A FAIR STAGE OF WATER. THE SHEER DROP IS 900 FT.

wire carried on No. $3\frac{3}{4}$, 22,000-volt porcelain insulators and No. 98 metal pins made by the Locke Insulator Mfg. Co. The crossarms are 4x5 in. The total length of the line is 24,754 ft. It is supported on forty-nine 30-ft. poles with single crossarms, twenty-five 30-ft. poles with double crossarms, four 35-ft. poles with double crossarms, twenty-nine 30-ft. towers, and twelve 35-ft. towers.

The Ocampo substation, Fig. 2, was placed at the Belen mine. It contains three type H, 75-kw., single-phase, oil-cooled transformers, 21,000 volts to 2200 volts, a receiving panel, a three-circuit feeder panel, a 22,000-volt graded-resistance lightning arrester on the incoming line, and 2200-volt lightning arresters on the outgoing lines. In order further to simplify operations, the two air compres-

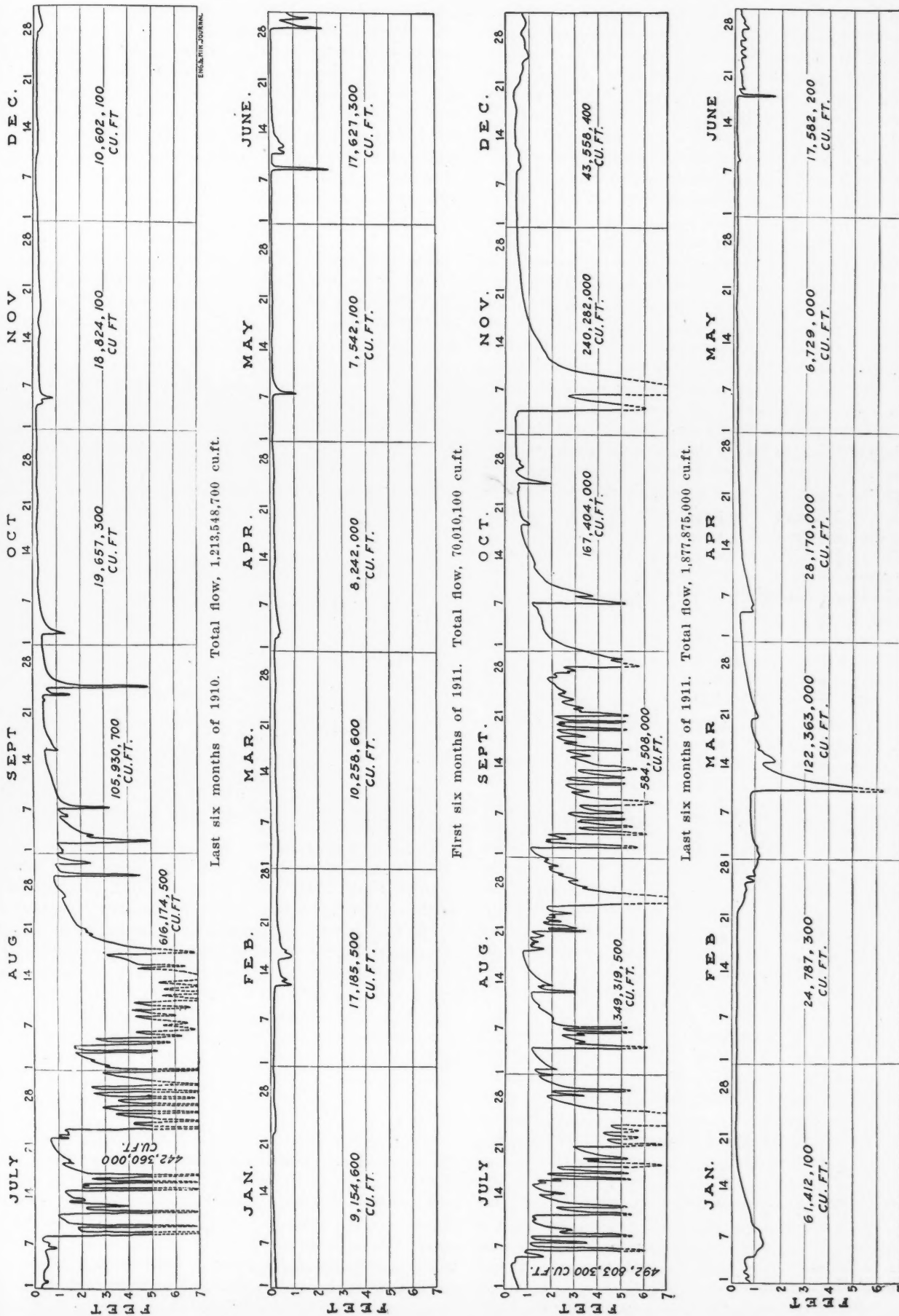


FIG. 7. RECORD OF DAILY FLOW OVER WEIR FOR TWO YEARS

sors in use were moved to a central point, about 100 ft. from the substation, and a new Ingersoll-Rand piston-inlet compressor was installed, making a total capacity of 1500 cu.ft. of free air per min. From this compressing station supply lines lead to the Belen, Matulera and Santa Eduvigis mines, where the bulk of the operations were being carried on. The greatest distance is to the latter mine, 6865 ft. between receivers at compressors and mine.

The cost of placing equipment in the heart of the Mexican Sierras is always high. Hauling the machinery and supplies from the railroad averaged \$52 per ton. Building materials, except lumber and adobes, were all expensive, since they had to be transported long distances, while the brick for the boiler settings, the lime, the sand, etc., even had to be packed in. Under these conditions the cost of the plant, \$135 per hp. of maximum capacity, was not excessive. The distribution of the cost is as follows: Machinery and electrical equipment, 33%; transportation and import duties, 20%; materials of construction, 16%; construction labor, 27%; miscellaneous expense, 4 per cent.

The construction of the transmission line was a difficult piece of work, owing to the character of the country traversed. For some distance from the generating station the line runs through timber, but for the greater part of its length it follows the rocky cliffs along the sides of the Arroyo del Cumbre. Many of the holes had to be blasted and the raising of the poles and towers on certain of the precipitous points was attended with some little danger. The poles were cut as near as possible to the points where they were to be erected, and were dragged by mules or packed by hand to these points. They cost from \$2.50 to \$12.50 delivered. The cost of construction was \$1902 per mile, the distribution being as follows: Poles, 17%; wire, 15%; other materials, 13%; clearing right-of-way and building trails, 9%; digging holes, 16%; framing and raising poles and towers, 17%; stringing wire, 4%; superintendence, 5%; miscellaneous, 4 per cent.

The plant was operated for only a few months before unsettled political conditions in Mexico forced a suspension of operations, in March, 1912. As operations were already on a restricted basis the plant was not run to capacity and consequently not with full economy. For the month preceding suspension, when the average output of the plant was 161 hp., the consumption of wood was 0.09 cord per hp. per day. The average cost of cordwood delivered at the plant was \$1.85 per cord.

WATER-POWER FEATURES

The water-power resources of the Mexican Sierras are numerous and afford a potential supply of cheap power for the country's enterprises, the value of which is inadequately appreciated at the present time. Some of these resources have already been utilized, the large installations of the Mexican Light & Power Co. in the southern part of the country standing out preëminently in this connection.

Three factors have combined to hinder the more general use of water power. The extremely rugged topography and inaccessibility of the whole Sierra Madre system renders an installation involving the generation and transmission of electric power on a large scale, usually extremely expensive, and the ordinary small operator chooses to, or is obliged to, meet his requirements by the

less efficient steam plant. The flow also is variable in the highest degree; a stream that is a raging, impassable river in the rainy season dwindles to a mere brooklet, or may cease its flow completely before the dry season is over. In the third place the country ordinarily furnishes few desirable reservoir sites, the characteristic topography consisting of steep, narrow cañons with a rapid drop, where impounding dams would back up comparatively little water and where the reservoirs would be rapidly filled by the débris carried down with the sweeping torrents of the rainy season.

BASASEACHIC FALL

The company, as stated, owned among its properties certain water rights of which the most important is the Basaseachic Fall, Fig. 4. A general reconnaissance was made of all these and of other streams open to denouncement and a number of preliminary surveys and flow estimates made of the same. As a result, the Basaseachic Fall was selected for more detailed measurements and surveys, both because it was one of the most available power sources as judged by the preliminary work, and because it was already owned by the company, together with the tract of land on which it is situated, this being available for locating the power plant, pipe line and dam for the head reservoir.

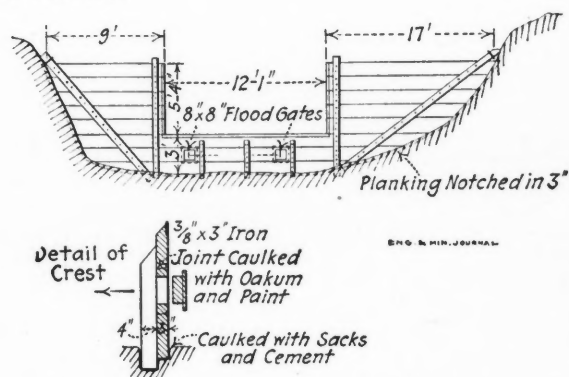


FIG. 5. THE CONSTRUCTION OF THE WEIR

The Basaseachic River is formed by the confluence of two streams, Basaseachic and Durazno Creeks, which come together about a half mile above the fall. Immediately below the confluence the river flows through a narrow gorge with almost perpendicular sides of rock, thence through a heavily wooded but still narrow and steep cañon to the edge of a cliff whence it falls into the chasm below in a single leap of over 900 ft. The fall with its rugged setting of perpendicular cliffs forms a bit of romantic scenery that stands out strikingly even in a region that is noted for its wild and picturesque character.

MEASUREMENTS OF FLOW

Rough estimates of the stream flow had been previously made in which two small weirs were used that recorded the flow with sufficient accuracy in the dry season, but afforded no reliable data during the rainy season. For the purpose of gaging the heavy flows a weir was built with a notch 145 in. wide by 64 in. deep, Figs. 5 and 6. This was placed about a quarter of a mile above the fall. It was constructed of 3-in. lumber, heavily braced, so as not to be carried out by the force of the stream or drift that might come down with it in the flood periods, the general

construction being as illustrated. The level of the water flowing over the crest was recorded on a Lallie recording float gage set at a suitable distance upstream, the float being protected by an inclosing box. The installation was in charge of a weir tender, who also observed and recorded the heights as shown on a stationary gage. At the end of each month the records as shown on the gage sheets were consolidated to form a continuous curve of the month's flow, and the corresponding quantity of water was computed. These were further consolidated into semiannual curves. The measurements were continued over a period of two years and the four semiannual curves covering the flow in this period are shown in Fig. 6.

The summary of the total recorded flow is as follows:

1910	Cu.Ft.	1911	Cu.Ft.
July.....	442,360,000	July.....	492,803,300
Aug.....	616,174,500	Aug.....	349,319,500
Sept.....	105,930,700	Sept.....	584,508,000
Oct.....	19,657,300	Oct.....	167,404,000
Nov.....	18,824,100	Nov.....	240,282,000
Dec.....	10,602,100	Dec.....	43,558,400
1911		1912	
Jan.....	9,154,600	January.....	61,412,100
Feb.....	17,185,500	Feb.....	24,787,300
Mar.....	10,258,600	Mar.....	122,363,000
Apr.....	8,242,000	Apr.....	28,170,000
May.....	7,542,100	May.....	6,729,000
June.....	17,627,300	June.....	17,582,200

Total first year..... 1,283,558,800 Total second year..... 2,138,928,800

As a matter of fact, the total actual flow was somewhat greater than the figures given, since in the rainy season the weir was often entirely submerged by the floods, at

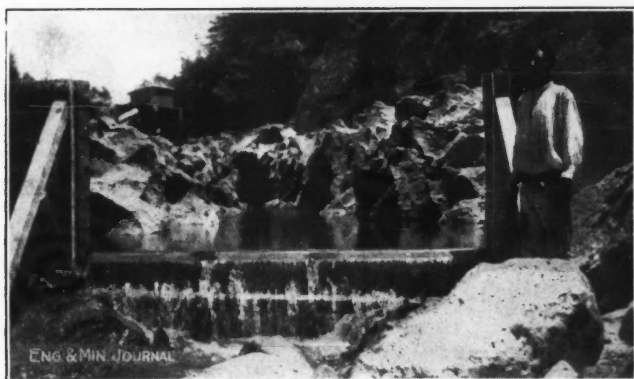


FIG. 6. MEASURING WEIR, RECORDING GAGE IN BACKGROUND AND JUAN, THE ENGINEER IN CHARGE

one time continuously for more than four days. As the channel at the top of the weir was 38 ft. wide, it can be readily seen that the additional flow when the weir was submerged would be enormous. The recorded flow averaged for the first year 40.7 and for the second year 67.8 sec.-ft. The highly fluctuating character is strikingly brought out, the maximum flow in the first year being 82 times the minimum for any month, and in the second year 87 times, figures which also would be increased if all the flood waters had been measured.

PROPOSED POWER PLANT

It is estimated that the waterwheels would develop 4200 hp. under the mean static head of 1163 ft., on the basis of the first year's measurements, and 6500 hp. on the basis of the second year's. Owing to the variable flow, continuous operation that would utilize the capacity of the stream or a large proportion of it, was only obtainable by providing reservoir capacity, the amount of which would be determined by a study of the average distribution of the runoff during the year. As the capacity of the stream was

greatly in excess of the probable requirements of the company, the problem of working out sufficient storage to utilize it all was not taken up. Surveys of several reservoir sites within a short distance of the falls showed that the construction of four dams would give a total storage of over half a million cubic feet. For a unit of 1000 net hp. delivered at Ocampo, or 1500 hydraulic hp., one dam above the falls, which would be required at any rate for the head reservoir, would afford sufficient impounding capacity. On the basis of this output, the mean effective head, using 30-in. wood-stave pipe for the upper part of the pipe line and 24-in. steel pipe for the lower part, would be, after deducting entrance and pipe losses, 1154 ft. This reduces with increased capacity until for that necessary to utilize all the water recorded the second year, the mean effective pressure would be about 1050 ft. The length of pipe line from the proposed damsite to the power station would be 4393 feet.

The type of dam that appeared most suitable was the steel-faced, loose rock, back-fill type, using a 2:1 angle from the horizontal for the steel face and 40° slope on the back fill, with a cap at least 20 ft. wide. The cost of this dam was estimated at \$865 per 1,000,000 cu.ft. storage capacity.

The pipe-line location runs down through a steep side-cañon reached by driving a short tunnel just above the fall. A 30-in. wood-stave pipe line was considered suitable for carrying the water to the head of this cañon, thence ¼-in. riveted steel pipe for 650 ft. and thence lap-welded pipe, increasing in weight from ¼-in. to ½-in. as the head increased. The generating station was designed to use tangential-type waterwheels direct-connected to 200-kw. generators, running at 2300 volts, with separate waterwheels to drive the exciters, pressure to be raised to 23,000 volts for transmission to Ocampo. It was estimated that the cost of power, delivered at Ocampo, operating the 1000-hp. unit, including interest and depreciation charges, would be about \$35 per hp.-year.



Snowslides in Southwestern Colorado

Winter has its terrors to the miners in the San Juan region of Colorado in the devastating snowslides that rarely fail each year to add to the already long list of lives lost, mills and mine buildings destroyed, and property damaged. Preëminent are the losses of the Liberty Bell in 1902 and the Camp Bird mills in 1906. In 1913 losses from slides were light. This year the outlook is not bright, for much damage has already been done, although the slides are usually most frequent later in the year.

Beginning Jan. 18 one of the most violent snow storms, of short duration, within the recollection of the older inhabitants, fell upon the San Juan country. In spite of drifting and blowing the snow remained 5 ft. deep on level places. Slides of great magnitude ran in places where they had never been known to run before. The Iowa mill suffered most, it being struck by three slides which sprung the timbers and threw the machinery out of alignment. The Angle station of the Silver Lake tramway was partly destroyed. Towers were torn out from the Iowa and Silver Lake tramways, resulting in the traffic to the mines being shut off; mine operations are temporarily paralyzed.

Four towers went out of the Sunnyside tramway, which in addition to handicapping progress in rebuilding may prevent starting up till spring. The Pride of the West mine buildings, which have stood in position since 1884, were struck by a slide and partly demolished. At the Shenandoah mine, which suffered so severely in the winter of 1906, the men took refuge in the mine workings. The big slide there carried a cabin from farther up the basin, where it had been built in 1878, directly over the Shenandoah buildings. Silverton is blockaded by snow-slides in Animas Cañon to the south and in places on the railroad track the snow is 40 ft. deep. The irony of fate is evident in the situation. Buildings which have endured storms for 40 years were taken out and others which are in extremely precarious positions were left intact.

Dr. Eliot on Labor Unions

Charles F. Pender, a member of the New Haven Trolley-men's Union, wrote to ex-President Eliot, of Harvard University, to find out why that distinguished scholar manifested such a dislike for the trade unions. He asked Mr. Eliot if he was aware of the fact that trade unionism had brought happiness to the worker because of shorter hours and increased pay. He also asked about profit sharing by the employees of a company. This was the reply received by Mr. Pender:

Cambridge, Mass., Feb. 5, 1914.

Dear Sir—I agree with you that trade unions have raised wages and shortened hours, and that collective bargaining in some industries has been decidedly advantageous to the working people. There can be no question that the factory system has been greatly improved in the course of the last hundred years through the war waged by the trade unions against employers and managers, and that it needed and still needs improvement.

My objections to the trade unions are altogether educational and moral. They seem to me to have had a bad effect on the character and happiness of their members because of certain methods which they have used and are still using. The first of these objectionable methods is the habitual use of violence against persons and property to gain their ends. The second is the limited output. The third is the uniform wage, alike for all journeymen without regard to age or skill. The fourth is the disregard of contracts—their own contracts and the contracts which employers or managers have entered into with owners or consumers but have not yet fulfilled.

The first and last of these practices are grave violations of the universal moral sense. The second and third rob the workingman of strong motives for self-improvement and make it probable that he will do no hearty, zealous, faithful work. Under those conditions it is impossible to be happy in the life work; for there is no happy, contented work except that done with good will, generous zeal and loyalty.

I cannot agree with you that the trades unions have brought happiness to any workingmen. Higher wages, shortened hours, better clothes and more meat do not necessarily contribute to genuine happiness, any more than the luxuries of the rich do. Happiness and content are states of mind.

Is it not perfectly plain that in our country the trade unionists are not really happy as a matter of fact? To my thinking they never will be, so long as they get no satisfaction in their daily work. It is the grudging spirit in which they work which prevents them from getting any content out of their work for a livelihood.

All well read, thinking people believe that the progress of civilization depends on universal, steady, productive labor; the unions seem to believe that the less one works the better.

Although profit sharing is not applicable in all industries, I see in sound methods of profit-sharing one mode of escape from the deplorable effects of trades-union teachings; for just profit-sharing will present to employer and employed alike precisely the same motive for faithful, generous, cooperative industry and for successful productiveness. No profit-sharing method will work which does not turn out to be in the long run profitable alike to employer and employed, to owner and wage earner, to capital and labor.

Very truly yours,
CHARLES W. ELIOT.

Dr. Eliot is a distinguished philosopher and has the gift of summarizing great ideas in a few words. In the above seven short paragraphs he has, it seems to us, stated the whole philosophy, sociology and economics of labor unionism.

Electric Shovels

There are at present from 12 to 18 electric shovels in operation in this country. These shovels may be divided into three classes: The friction electric, operated by a single constant-speed motor with friction clutches; the three- or four-motor direct-current equipment; and the three- or four-motor alternating-current equipment. The first class does not compare favorably with the steam shovel so far as speed is concerned, although it may be operated as cheaply.

There is probably no other class of machinery that presents a duty cycle so severe as that of the shovel, which is extremely short, varying from 7 to 12 sec. on the hoist, from 7 to 12 sec. on the thrust, and from 10 to 18 sec. on the swing, making a complete cycle in from 17 to 30 sec.; the motor to meet these requirements must have a sufficiently low armature inertia to permit of rapid acceleration and quick reversals under small power. It should also be a motor of rugged design, as it is subjected to severe overloads, shocks and frequent reversals. This is especially true of the hoist motors, to a less degree of the swing motor; while the thrust motor is practically stalled during the digging operation, although it may revolve or overhaul, according to conditions, and is operated at full speed only after the hoisting operation is completed.

Considerable advantage may be gained by using two hoist motors of small capacity instead of one large motor, as the power required for accelerating is much less. For example, assume a shovel that requires a 150-hp., 425 r.p.m. motor for the hoisting operation; this motor requires 117 hp. torque to bring it to speed in 1 sec., whereas if we substitute two 75-hp., 500 r.p.m. motors in place of it, each motor requires 32.3 hp. torque to bring it to speed in 1 sec., or 64.6 hp. torque, yet both equivalent to a saving of 45% in the power required to accelerate.

Most shovels will be required to operate on alternating-current circuits and the choice between the direct-current series motor with motor-generator set or the slip-ring induction motor with transformers must be made.

In laying out an electric shovel drive there are four things to be considered, the speed at maximum torque, the speed at light load, the power required by the motor, and the gear ratio. An increase in the gear ratio results in a decrease in power at both light and heavy loads, an increase in the speed at heavy loads, and a decrease in the speed at light loads. The direct-current series motor has the characteristics of the steam engine, in that it gives its heaviest torque on starting, speeds up under light loads, and slows down under heavy loads. It is much easier to control and requires considerably less apparatus, insofar as the control is concerned, than does the alternating-current equipment. A five-point control may be used, four points to cut out the armature resistance and the fifth to weaken the series field, which results in a high light-load speed. With the alternating-

Note—An abstract of a paper by H. W. Rogers (A. I. M. E. Bull., February, 1914).

current slip-ring motor it is impossible to obtain the maximum torque on starting; and the light-load speed, which is extremely important, is limited by the synchronous speed. The only means of improving this disadvantage is to reduce the gear ratio or use a higher-speed motor, either of which means an increase in the capacity of the motors and an increase in the inertia, resulting in an increase in the power required and a slower acceleration, both undesirable. This feature will be appreciated from the following data:

	Total WR ²	Diameter bring to Rotor Speed in 1	Per cent. Torque to
		Inches	Sec.
Two 80-hp., 500 r.p.m.—series....	444	16	43
Two 150-hp., 450 r.p.m.—induction	2480	30	98

Under this condition the natural result is a much larger kilovolt-ampere capacity of transformers for the induction motors than kilowatt capacity of motor-generator set for the direct-current.

The saving in operating expense of the electric over the steam shovel will depend somewhat upon the comparative cost of coal and electric power and will vary for different localities, but it should be remembered that the electrically operated shovel eliminates some labor, some expense in getting coal and water, and considerable waste. The greater wear and tear of parts having a transverse motion as compared with those having rotary motion and the elimination of boiler trouble should also be considered. Consider a 120-ton shovel which is ordinarily equipped with a 5 cu.yd. dipper and has an average capacity of approximately 2500 cu.yd. per 10-hr. day, based on an average working time of 55% and an average dipper capacity of 3¾ cu.yd., or 75%. With a good grade of coal the steam shovel will require approximately 3¼ tons per 8-hr. shift and will make an average of two complete cycles per minute. For comparison, however, take the maximum capacity, three cycles per minute. Thus either the steam or the electric shovel will have a total working time during one shift of 264 min., and will make 792 complete cycles handling 2970 cu.yd. of material.

The direct-current shovel would be equipped with two 80-hp., 500 r.p.m., 230-volt series motors on the hoist, one 40-hp., 550 r.p.m., 230-volt series motor on the swing, one 60-hp., 550 r.p.m., 230-volt series motor on the thrust, and one 150-kw., 900 r.p.m., 250-volt direct-current generator direct connected to a 225-hp., 900 r.p.m., 2200-volt induction motor, with four-point reversible automatic control on each motor. The estimated power consumption during each cycle will be: Hoisting, 1379 kw.-sec; swinging, 522 kw.-sec; crowding, 547 kw.-sec.; total, 0.68 kw.-hr. This equals 539 kw.-hr. input to the motors per 8-hr. shift, or, taking into account the efficiency of the motor-generator set, 657 kw.-hr. per 8-hr. shift. The motor-generator set will be running light 45% of the time, or 216 min. The power consumption in this time will be approximately 16.77 kw., or 60.4 kw.-hr. loss per 8-hr. shift. The total power consumption per 8-hr. shift will be 717.4 kw.-hr., or 0.241 kw.-hr. per cu.yd. excavated.

The alternating-current shovel would be equipped with two 150-hp., 450 r.p.m., 440-volt motors on the hoist, one 50-hp., 720 r.p.m., 440-volt motor on the swing, one 75-hp., 600 r.p.m., 440-volt motor on the thrust, and three 125 kil.-amp., 2200-480-volt transformers, with five-point reversible automatic control on each motor. The estimated power consumption during each cycle will

be: Hoisting, 2040 kw.-sec.; swinging, 759 kw.-sec.; crowding, 750 kw.-sec.; total, 0.987 kw.-hr. This equals 782 kw.-hr. input to the motors per 8-hr. shift, or, taking into account the efficiency of the transformers, 796 kw.-hr. per 8-hr. shift. The no-load losses on the transformers will be approximately 13 kw.-hr. per 8-hr. shift, and the total power consumption 809 kw.-hr., or 0.273 kw.-hr. per cu.yd. excavated.

The following table shows comparative expenses other than power for both steam and electric shovels:

	Steam	Electric
Labor per Shift		
Shovel runner	\$6.00	\$6.00
Craneman	4.00	4.00
Fireman	2.50	.....
Six pitmen at \$1.75	10.50	10.50
One watchman	1.75	.....
One coal passer	1.50	.....
Teaming (½ day)	2.50	.....
Oil and waste	1.50	0.75
Total	\$30.25	\$21.25
Saving, electric over steam	21.25	.....
	\$9.00 per shift.	

Comparative costs (except power), reduced to a day basis, are as follows, supposing 150 days of work per year and one shift per day:

	Steam	Electric Direct Current	Equivalent Alternating Current
Interest at 6%	\$5.20	\$7.75	\$10.85
Depreciation at 4%	4.03	6.00	8.43
Repairs at 10%	8.66	.....	.....
Repairs at 6% .....	.....	7.75	10.85
Labor per shift	30.25	21.25	21.25
Total cost per shift	\$48.14	\$42.75	\$51.38

It has been assumed that, owing to weather conditions, delays, etc., the shovel working year consists of 150 days and the above figures are based on this assumption; also that the shovel is only working one shift a day.

If the shovel works three shifts instead of one shift, interest and depreciation remain the same, provided the shovel is kept in repair. Repairs will increase when working three shifts, but not in direct proportion; therefore this item has been increased 50%. The costs per day would be as follows:

	Steam	Electric Direct Current	Electric Alternating Current
Interest at 6%	\$5.20	\$7.75	\$10.85
Depreciation at 4%	4.03	6.00	8.43
Repairs at 15%	13.00	.....	.....
Repairs at 9% .....	.....	11.63	16.28
Labor (three shifts)	90.75	63.75	63.75
Total cost (three shifts)	\$112.98	\$89.13	\$99.31

Disregarding the cost of coal and electric power, the saving of the direct-current shovel over the steam shovel would be \$810 per year for one-shift operation and \$3580 per year for three-shift operation. The alternating-current shovel working one shift would show a loss of \$486 per year. Working three shifts it would show a saving of \$2050.50 per year. The comparative cost of coal and electric power is variable and each case must be dealt with individually.

Disregarding the cost of fuel, it is evident that the electric shovel is better than the steam shovel; that the direct-current equipment is superior to the alternating; and that the saving in operating expense will warrant the increased investment.

The control on either the direct or the alternating current equipment is reversible and entirely automatic, all panels being equipped with automatic acceleration, the hoist and crowd panels being also equipped with a "jam" relay which inserts resistance in the circuit in case of extremely heavy overloads but does not open the circuit, the resistance being automatically cut out again by the same relay when the overload disappears.

The master controllers are located similar to the operating levers on a steam shovel, so that a steam operator will be entirely at home on an electric shovel.

[The address of Mr. Rogers, Schenectady, N. Y., suggests that this paper should be taken as an *ex parte* statement for the electric shovel, none the less interesting for that. In such steam-shovel work as that on the Mesabi, coal passing and teaming would not be charged against the steam shovel. And why should a steam shovel require more watching than an electric? The costs here worked out represent what the electric shovel should do. The operator is concerned more with what it has done and can do. The principal qualities a power shovel should possess are the ability to dig fast and to stand up to its work. Power cost is relatively unimportant. The electric shovel must show a longer history before fair depreciation and repair costs can be assigned.—EDITOR.]

The "Association of Mine Owners"

We have received numerous inquiries regarding the "Association of Mine Owners" which has recently circularized Western mines extensively. The Association's circulars invited mine owners to join and enumerated at least 20 different ways of bringing to them the advantages of coöperative activity. The membership fee of \$500 was to be reduced to \$100 to secure 1000 more members, and the annual dues were to be \$25. For this, the member was to have many advantages, such as legal advice, laboratory tests of his ore, mill plans, discounts in the purchase of machinery, a "true and impartial calculation of ore reserves and valuation," advice as to development, one examination of his property, and efficiency engineering in general, "from which follow lower operating costs," etc. These theoretical advantages were so attractively elaborated that one might have predicted a rush to embrace these opportunities. The habit of inertia developed by hard cash when no material benefits are in sight prevented the rush; then, too, miners are naturally individualistic, and about the only common point of view is the old tradition that all smelters are robbers.

The circulars of the "Association of Mine Owners" emanated from 220 West 42nd St., New York, but bore no signatures nor did it give the names of any of the backers, officers or members. When a representative of the JOURNAL called at the above address, he found no names on the door of the suite to which he was directed by the elevator starter. He found there two young mining engineers, graduates of a well known technical college, who explained that they had not been willing to put the name of the Association on the door until certain information had been forwarded to them from Colorado, where the Association was said to have been started by R. J. Tombo, of Denver, about 1½ years ago and to have "from 125 to 150 members." One of these young engineers returning from Montana had met Mr. Tombo in Denver; considering that the organization described by Mr. Tombo would form a good outlet for their engineering talents, these young men decided to undertake general charge of the Association, to establish headquarters in New York, and to secure new members for a commission of 5%. They proceeded to prepare circular matter, but were unable to get the names of the officers and members of the Association from Mr. Tombo

and to avoid delay, they said, their circulars were printed and sent out without any names.

In about two months' time, the engineers succeeded in learning the names of the officers and directors, for only one of whom a satisfactory postoffice address was given. The engineers wrote again on Jan. 7, 1914, for additional information and the list of members. This was not forthcoming, nor had Mr. Tombo established for the Association a \$5000 drawing account that had been agreed upon. After several fruitless telegrams, the engineers finally wrote to Mr. Tombo on Feb. 7, announcing the severing of their relations with the Association.

The names of the officers and directors of the "Association of Mine Owners" as sent by Mr. Tombo, were as follows: President, F. T. Dailey, independent operator in Gilpin County; vice-president and managing director, R. J. Tombo, 317 Breckenridge Block, Denver, Colo.; secretary and treasurer, E. L. Mark, president, High Range Mining Co.; O. N. Parker, president, Parker-Holman, leasers; P. D. Pike, general manager, North Star Group of Cripple Creek; M. B. Fancett, treasurer, Bull Mountain Mines Co." We do not find these names in any of our directories nor do we happen to know any of these men.

The Portland Cement Industry

For several years the cement trade has been one of the weakest spots in the industrial structure of this country, says the *Boston News Bureau*. Increase in consumption has been rapid, but plant construction has far outstripped the demand. The slump in building activity prevented the cessation in building of plants from correcting the difficulty. Millions of dollars are tied up in idle cement plants from which no income is being derived.

The condition is not limited to the United States, it having been said that Belgian interests are offering cement in Philadelphia at 20c. per bbl. less than it can be delivered for after being purchased in eastern Pennsylvania at 90c. per bbl. This fact, however, would not influence the market, as Belgian cement would not meet requirements in this country, but the fact tends to substantiate statements of general over-production.

The Rhine-Westphalia cement syndicate has not been renewed for 1914, a fact which has helped to demoralize the European trade. The members of the syndicate are still bound in certain ways until the end of the year, but the outside market has broken heavily and when the railroad administration of Hanover recently asked bids for about 17,000 tons of portland cement, it was offered at prices ranging from 13c. to 16c. per 100 lb., or less than half the recently prevailing prices.

The Universal Portland Cement Co. has been reported as cutting prices in the West, but as they get 20c. to 30c. more per bbl. at the mill than other manufacturers, this does not make much difference. Portland cement at present is 90c. per bbl. in bulk at the mill. No change in price is expected for some time. Production for 1913 will be over 90,000,000 bbl., the largest in history.

The Chilean Government has Acquired the Oficina Valparaiso, in Antofagasta Province, with a view to fitting up experimental plants and trying new processes for the cheaper production of sodium nitrates, says the "Board of Trade Journal." It is proposed to carry out a series of extensive experiments on a practical commercial scale, with a view to discovering some method for the treatment of low grade "caliche" (soil in which nitrate is found) that is not worth treating by existing methods.

Top Slicing at Bingham--I

By D. W. JESSUP*

SYNOPSIS—Soft ore occurring in lenses in limestone, with heavy hanging wall, is top sliced, the practice replacing to some extent the older square-set system of mining. General plan of operating top-slice stopes.

Top slicing is a method of mining by which ore is removed in horizontal slices from the top of an orebody downward to the bottom, mining one slice or floor at a time. The surface material and overburden follow the slices resting upon the supporting timbers as each floor is mined. The orebodies are reached by tunnels and raises, and these constitute the main passage-way through

limestone. The hanging wall is heavy and when opened up, the hanging becomes so abnormally heavy that it slacks, breaks in huge slabs, and produces an enormous pressure upon the timbers, causing them to break and to ride out of position. As a result the stope either caves or a large quantity of extra timber is required for reinforcing the sets. This may still fail to withstand the pressure and the cost of mining may become prohibitive. After several futile attempts to work these large orebodies by the square-set system, several of the mines adopted the top-slice method as practiced in Michigan, with several modifications. There are instances where

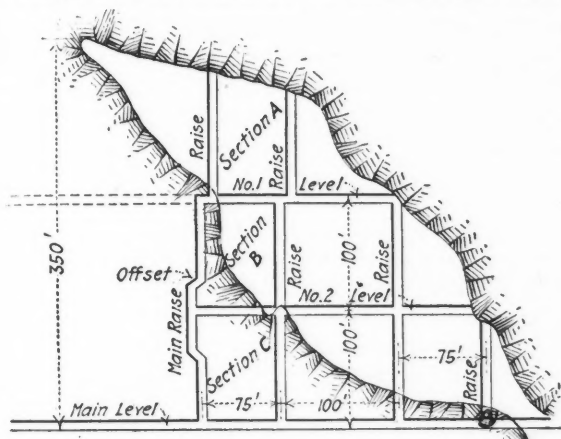


FIG. 1

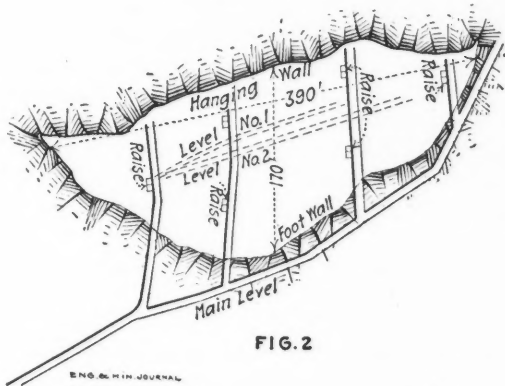


FIG. 2

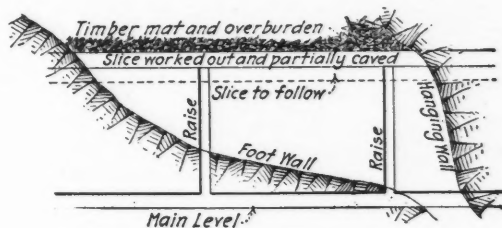


FIG. 3

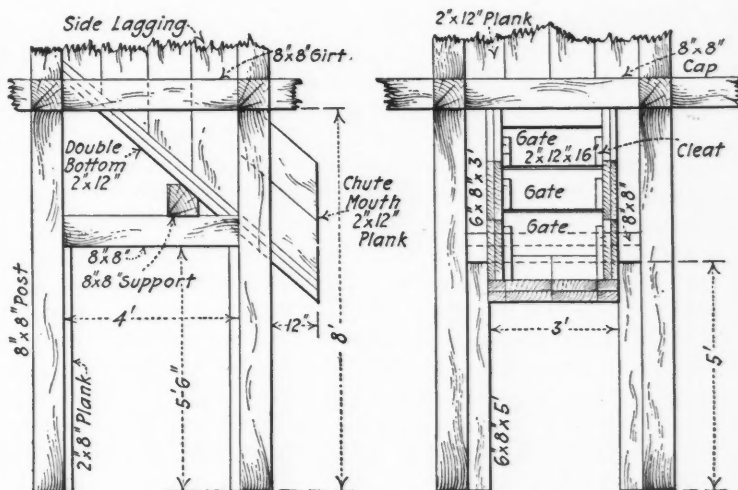


FIG. 4
CHUTE

MAIN OPENINGS IN AN OREBODY FOR TOP SLICING AND DETAILS OF A CHUTE GATE

This is the system as adapted to mining lenticular ore masses at Bingham, Utah.

which the ore is removed to the surface. Several of the large orebodies in Bingham Cañon, Utah, are being mined by this system with satisfactory results, especially as to low costs of mining and almost complete extraction of the ore. The system was first used in the camp about 12 years ago, replacing to some extent the square-set system, as the cost of extraction by that system was prohibitive.

LENSES IN LIMESTONE WITH HEAVY HANGING WALL

Most of the large orebodies at Bingham, other than the porphyry intrusions, occur as lenses and fissures in

the square-set system is used in preference to top slicing, but having been established, it would be awkward or almost impossible to alter this method of mining.

The orebodies in question have been formed in the limestone by replacement. They are somewhat lenticular in shape and range in size from a few feet to more than 100 ft. in width and several hundred feet in length. The strike is northwest. The dip is to the northeast and the pitch is about 65°. The hanging wall is limestone, the foot wall either limestone or quartzite. A number of the orebodies have been intruded by porphyry that carries little mineral and is not mined. All the ores are sulphides, pyrite, galena, sphalerite and chalcopyrite predominating.

*Mining engineer, Salt Lake City, Utah.

GENERAL PRACTICE OF TOP SLICING

The practice of top slicing is to raise to the upper limits of the orebody from tunnels and drifts. The whole top of the orebody is mined for the thickness of one set. Drifts are driven to the outer limits of the ore followed by crosscuts. The ore is then mined by working back toward the main raise, timbering and allowing the roof to settle as the ore is extracted. The timbers are framed as in the square-set system and are used omitting the sills. Lagging is placed over the bottom of the sets and if necessary over the top. After the slice has been finished, the timbers that have not been crushed by the overburden are blasted, and the whole top is allowed to fall upon the flooring. The slice below is then worked in a similar manner and the system is carried downward to the bottom limits of the orebody or to the main tunnel level. If the top of the orebody is of limited size, two or more floors are mined as in the square-set system, then top slicing is practiced. Flooring is laid and the sets are blasted in. This makes a good mat which partially prevents the fine overburden from running through into the following slices. If the hanging wall is hard and compact, it may not follow the mat of timbers until some time has elapsed and may do serious damage. As it is necessary to have weight above the slice against which the timbers must be blocked, the hanging wall is drilled and blasted, making sufficient material for an overburden to break the fall of the wall when it does drop.

SITUATION OF RAISES

As a rule, the raises are lifted at places where there will be an equal wheel or run for the mucker on each side of the raise. If possible the raise is kept away from the hanging wall as this is the heaviest material. The disadvantage of the foot-wall side is that the raise will be in waste and the wheel for the muckers will be longer as the slices proceed downward. Raises are also made in either wall so that they will intersect the ore at some definite point, but the raise offering the most advantages is made in the ore itself. In this case there is no dead work in making the raise and the only increased cost above stoping is in the building of the chute and the extra lagging. If the ground is wet or runs it is held in place by double lagging.

All the raises have two compartments, one for a manway and timberway, and the other for a chute. They may occupy the width of one set of timbers, making a narrow manway and chute, or better they may each occupy one full set. The latter affords better facilities for handling ore and timbers. At the top of the manway is placed the tackle used for timber hoisting. The timbers used in the raise are the same as those used in timbering the slice so that the joints may coincide. Up to a height of 50 ft. all the raises are vertical, but with greater height, offsets one set wide are made at a vertical distance of 50 ft. This breaks the fall, prevents packing of the ore to a large extent, and there is less wear of the chute. If the ore has a pronounced tendency to pack, the chute bottom is made bell mouthed, that is, the last two or three sets are made successively larger than the others.

The raises are made either to the right or left of the main tunnel and not over it. The entire bottom is

either removed, or a bench about 4 ft. high is left in place. The bench forms a solid bottom for the chute but makes handling timbers in the manway more awkward. The distance between the raises ranges from 50 to 100 ft., depending on the shape and size of the orebody. The closer together the shorter the wheel for the mucker. As the raises are mostly in ore the best practice is to lift them about 50 ft. apart. This distance will increase materially if the raises are to be in waste. A wheel of 100 ft. for the mucker is a good limit.

The chutes, Fig. 4, are made inside the timber set and are double lined with 2x12-in. plank. The bottom is laid at an angle of 50°. The mouth piece extends out a distance of 1 ft. or so that the end is just over the outside rail of the track and 6 in. above the car. The chute has two or three gates made of 2x12-in. plank each fitting in between cleats; they are worked with a pinch bar. The extra gates prevent large boulders from breaking through and falling on the track, they are also a protection to the carman when loading the cars. The posts in the bottom set of the raise are 9 ft. long, allowing sufficient room for the carmen to work.

SYSTEM OF STOPPING

As each raise reaches the top of the orebody, drifting to the ore limits is started. If possible, drifts are made on two sides of the raise, as this increases the capacity of the stope by making more runways and more available ground for mining. From the drifts, crosscuts are driven along the wall taking out the ore and replacing with timbers. Then the retreating system is employed. As the working faces recede toward the raise, the top caves in by the pressure of the overburden, and only a safe working place and runways are kept open. Successive cross-slices are taken out, holding up only such ground as is necessary for safe working. There is no advantage gained in keeping open an entire slice other than for air courses or a connection with another stope. If the top becomes too heavy the timbers are reinforced by additional timbers and lagging. Side lagging are used to prevent any waste from running in at the side and mixing with the ore.

The slicing system is worked to best advantage if the whole slice can be mined by the different stopes simultaneously, working from the several raises, and maintaining open connections between the stopes. This affords more working faces, makes a better circulation of air, and affords more than one raise to which the mucker can wheel the ore. But in practice there are always one or more stopes in advance of the others in order to keep up a production of ore and not have all of the stopes beginning and ending at the same time. Connections between the raises are made as soon as possible and stoping is begun halfway from each raise. Before the last sets of ore around the raise are taken out, drifting is begun on the floor below so that when the slice is drawn there will be at least two working places in the new slice and the production will not entirely cease. The ore in the immediate vicinity of the raise is not drawn until the slice is about finished. This is left in place to protect the raise; if taken out there is incessant trouble in keeping the raise open and a large quantity of timber is required to replace the ground. A hurry-up call for ore sometimes necessitates robbing the pillar near the raise; a solid crib of timber is then substituted, but it

often proves unsatisfactory. A key to this method of mining lies in open raises and haulage ways. The height of the slice depends on the width of the orebody and the pressure exerted by the overburden. If the pressure is great, a slice 8 ft. high is mined; otherwise the slice is 9 ft., using 6-ft. 8-in. and 7-ft. 8-in. posts respectively. A space of 1 ft. is left between the timbers and the floor above. This gives room for the blocking of the timber sets, also for a settling of the mat and overburden from the floor above.

Fig. 1 represents a vertical section of a large orebody. This was mined in three sections. The upper section *A* was partially worked by the square-set system before the top-slice system was resorted to. The ore was formerly trammed from the raises out through the No. 1 level and then transferred to the loading stations by means of aerial or incline tramways. Later the ore was taken out through the main raise and then through the main tunnel to the loading stations. Section *B* was mined from No. 1 level to No. 2 level, the ore being trammed out the main level. Then section *C* followed, the orebody being worked out to the main level. Fig. 2 shows a plan of the orebody with the main level, its laterals and raises. Fig. 3 gives an illustration of the mat of timbers and overburden following the slice. Though largely self-supporting it sometimes exerts an enormous pressure upon the timbers. The slice is mined and partially caved; it is to be followed by a lower slice. The ore is transferred through the raises and out the main level.

(To be continued)

Progress in Electrostatic Ore Dressing

The practical success of the electrostatic method (generally known as the "Huff process") began in 1908, with the installation, by the American Zinc Ore Separating Co., of a custom plant in the Wisconsin zinc field, separating marcasite from the blende of that region, marcasite being a good electrical conductor, blende a poor conductor of electricity. The success then obtained was due to three factors:

- (1) Use of electricity produced by commercial electromagnetic generators and transformers, of which the output and potential are steady and capable of easy regulation, instead of the very erratic frictional static machines.
- (2) Use of concentrated and powerful electrostatic field by means of two adjacent electrodes, giving steadiness and strength to the action.
- (3) Use of a grounded machine constructed almost entirely of metal, and therefore free from electrical disturbances.

The first Huff electrostatic plant in the West was put into operation at Midvale, Utah, for the United States Smelting, Refining & Mining Co. This plant has been in continuous operation seven days per week since 1909, saving 5,000,000 to 7,000,000 lb. of zinc per year, which heretofore had gone to waste. This plant now treats about 50 tons per day of zinc-iron middlings, partly furnished by the company's concentrator, partly from custom ore from the district. The work has been very uniform since the beginning. The feed to the mill assays approximately 0.04 oz. Au; 2.5 oz. Ag; 2.5% Pb; 1% Cu; 23% Fe;

Note—A paper by Frank S. Macgregor read at the Denver meeting of the American Electrochemical Society, September, 1913.

28% Zn. The separated zinc product assays 48-50% zinc with 3 to 5% iron, and the iron product about 10% zinc. Most of the gold, silver, copper and lead is found in the iron product, and this product is smelted in the company's lead furnaces. Four sizes are made in the mill, ranging from 20 mesh down. The feed to the fines machines often runs more than 50% through a 200-mesh screen. The treatment of such very fine ore is a distinct advance in the art.

Another zinc plant, put in operation in 1911, is that of the Calumet & Sonora Mining Co., at Cananea, Mexico. This plant treats 40 to 50 tons per day of zinc-copper middlings, to finer than 200 mesh. In this plant the ore is sized through 10 and on 20 mesh, on 50, and through 50 mesh; each size is then treated on its respective units. The feed assays 3 oz. Ag; 7% Cu; 3.5% Pb; 15% Fe; 30% Zn. The zinc product runs about 55% zinc with 5% iron, while the copper product carries practically all of the silver-copper—14 to 16% copper with only 8 to 10% zinc.

At the Sunnyside mines, in Eureka, Colo., an electrostatic plant has been continuously in operation since February, 1912. The tonnage treated here is about 20 tons per day, and 90% of the total feed passes a 150-mesh screen. Only a "scrap" or oversize screen is used, no sizing being necessary. The average assays of the products for a typical month are:

	Au (oz.)	Ag (oz.)	Pb (%)	Cu (%)	Zn (%)	Fe (%)
Heads.....	0.20	15.0	11.8	.....	30.0	10.2
Pyrite.....	0.33	19.0	15.6	3.6	12.6	26.1
Zinc.....	0.14	5.3	3.6	.....	41.3	3.7

Because of the high percentage of heavy gangue left in the table middlings, the zinc product is not so high grade as in some plants.

The Mary Murphy mine, at St. Elmo, Colo., is treating electrostatically approximately 15 tons of middlings daily, all passing a 30-mesh screen. Average assays show the following work, some of the gold occurring in the blende:

	Au (oz.)	Ag (oz.)	Pb (%)	Cu (%)	Zn (%)	Fe (%)
Heads.....	0.38	5.9	8.0	2.2	37.6	10.1
Pyrite.....	0.49	8.7	14.9	5.1	8.6	30.8
Zinc.....	0.19	3.6	4.2	0.4	49.3	5.0

A custom zinc plant has been built at Ouray, Colo. by David Forrester, for handling the middlings from the various concentrating mills of that district. It is equipped to handle 20 tons per day and has been operating since the fall of 1912. Some of the ores treated come from the Atlas, Barstow, Camp Bird and Mickey Breen mines. The following results indicate the work done there:

MILL FEED						
	Au (oz.)	Ag (oz.)	Pb (%)	Cu (%)	Zn (%)	Fe (%)
Class 1.....	0.11	59.3	6.9	0.80	25.4	16.9
Class 2.....	0.13	13.0	7.0	1.90	28.3	22.0
Class 3.....	0.20	11.0	1.95	2.50	14.7	30.5
SEPARATED PYRITE						
Class 1.....	0.19	103.1	10.56	1.08	7.44	28.9
Class 2.....	0.20	15.1	9.4	2.82	11.25	33.9
Class 3.....	0.25	13.5	2.46	3.29	4.91	38.6
SEPARATED BLENDE						
Class 1.....	0.03	13.4	2.86	0.25	44.0	4.2
Class 2.....	0.03	9.5	3.05	0.63	56.1	3.1
Class 3.....	0.10	4.7	0.92	0.54	42.7	6.8

Zinc smelters pay a much better price for a high-grade zinc concentrate than for a lower one, even if the impurity is only gangue, and it is not always feasible to remove all this gangue on the ordinary wet table without entailing too great a loss of zinc. At this plant an interesting

electrochemical action has been utilized to raise the percentage of zinc in the zinc product.

Ordinarily a crystal of zinc sulphide is a nonconductor, a characteristic which enables the separation just described to be made, but if the crystal be immersed for a short time in a very weak solution of copper sulphate, it becomes coated with a film of copper sulphide. This is an excellent conductor of electricity (speaking electrostatically) and if the particle is dried at a moderate heat, it behaves as a conductor, and is repelled by the electric charge in the same manner as pyrite, chalcopyrite, graphite or other conducting minerals. Separations of zinc sulphide from gangue have been made in this way on a laboratory scale for some time, but the method has been utilized commercially for the first time in the Onray plant.

The treatment is very simple: The zinc product is run into tanks, covered with a 0.5% solution of copper sulphate, allowed to stand for a short time, the solution drawn off for further use, and the ore then dried. On passing through the electrostatic separators a 40% zinc product is raised to 51% with only 5% zinc remaining in the gangue product, making a recovery of 97%. The consumption of copper sulphate is very small, a new solution treating several lots.

There is a very general impression that electrostatic separation is adapted only to zinc ores. As the Huff process was first worked out commercially on zinc, naturally its expansion has been most rapid in this direction. Other fields of application are now being entered. Excellent work in the concentration of crude silver ores has been done in a 30-ton mill in Austin, Nev. The minerals of the several ores embrace several silver compounds, together with pyrite. The gangue is quartz. The ore, crushed to 20 mesh, passes through a Ruggles-Coles cylindrical drier, is screened to 40 mesh, and then goes to the separators.

In Australia, a Huff plant concentrates molybdenite from its gangue. The crude ore is concentrated roughly by crushing and screening, the low-grade concentrates being then raised to very high grade by electrostatic concentration.

A plant is at present being installed in the Cobalt district of Canada, to improve the low-grade concentrates, thus lowering freight and treatment charges. Remarkable recoveries of the silver minerals have been indicated in the preliminary tests. The Canadian Bureau of Mines has installed a complete Huff electrostatic equipment in its new testing laboratory, at Ottawa, one of the finest in existence.

Two graphite mills now employ this method for removing mica from the graphite flake, the solution of a very vexing problem. It is not improbable that the entire concentration of some graphite ores will be done electrostatically.

Although the method has not yet been applied to the copper field, there are in this direction some excellent possibilities, especially in the concentration of those ores which occur in heavy gangues, such as garnet, epidote, barite, etc.

A recent development of great importance, both to the process and to the industry it affects, if the present indications are borne out, is for the cleaning of coal, both anthracite and bituminous. With anthracite occurs slate and other impurities which, in the finer sizes, are very

difficult of separation. Electrostatic separation has offered a solution for this problem, reducing the ash in the culm from 25 or 30% to 10 or 12 per cent.

In bituminous coal, the problem consists in the removal of ash and sulphur. Sometimes most of the sulphur present is "organic," so associated with the carbon that it cannot be mechanically removed, but when the sulphur is present as pyrite or in bone, it is readily repelled, and with its extraction comes a large reduction of the ash. Activities are just entering this field.

A typical mill flow-sheet for an electrostatic plant consists of a cylindrical drier, about 4x20 ft., made of sheet iron; bucket elevator to the top of the mill, carrying the dried ore to the screens. In some cases only a "scrap" screen is needed if the sizing required is 20 to 50 and through 50 mesh. If the various minerals will break mechanically free above 20 mesh, one or two coarse screens are necessary as 6 to 12, 12 to 20 mesh. Then the ore is taken to the separators, through which it falls by gravity, the conductors and nonconductors, as fast as separated, passing directly to storage bins. Returning a small amount of middlings from each separator back into the system is beneficial in making cleaner products. These middlings finally pass out of the system in the finished products.

The power required is small, a 3-hp. generating outfit being sufficient to electrify a plant of from one to 50 separators. The machinery of one plant is operated by 12 actual horsepower, which includes power for the drier, elevator, screens and six separators. One attendant will care for a shift, exclusive of handling ore.

In conclusion, while the installation of electrostatic separators has not been so rapid as the exploitation of some other metallurgical processes, it has developed a unique field of its own, to which no other process is so well adapted, and the tonnage treated electrostatically is steadily increasing.

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Nevada Consolidated

The report of the Nevada Consolidated for the fourth quarter of 1913 shows a gross production of 16,684,955 lb. of copper. Ore treated amounted to 833,898 tons, averaging 1.58% copper, compared with 813,153 tons of 1.53% average for the previous quarter. The cost of producing copper, including depreciation of Steptoe plant and all charges except ore extinguishment, was 8.63c. per lb. The earnings are computed on the basis of 15.-051c. per lb.

After payment of dividend No. 17, \$749,796, a credit of \$116,318 was made to undivided profits, after charging off \$114,272 for the original cost of the ore in the ground. The increase in net income over the previous quarter was due to increased production, lower operating costs and extra dividends from the Nevada Northern Railway.

Stripping operations resulted in the removal of 982,689 cu.yd. of overburden at a cost of \$398,518, of which \$171,271 was charged to operations. The Steptoe Valley Smelting & Mining Co. in December invested \$500,000 of its reserve for depreciation in its own capital stock and the investment account of the Nevada Consolidated was correspondingly decreased. An extra dividend of 50c. per share was paid out of surplus, making a total of \$1,749,524 in dividends for the quarter.

Details of Practical Mining

Homemade Steel Pulley Stand

One of the hoists of the Republic mine at Republic, Mich., is situated about 1500 ft. from the shaft. The hoisting ropes are conveyed over this interval, supported on pulley stands, which have been constructed largely of iron scrap available at the mine. The height of the stands is varied to meet the topography, so as to preserve a straight line between the vertical angles; the latter are taken care of by sheave stands of a different type. The stand illustrated is 9 ft. 3 in. high. The upright is bedded in concrete and guyed by two pieces of $\frac{3}{4}$ -in. cable. These are passed through two holes drilled in the pipe at right



PULLEY STAND OF PIPE GUYED WITH OLD CABLE

angles and thus serve as four guys; motion through the pipe is prevented by four small clamps on the guys next to the pipe. The ends of the guys are clamped to eye-bolts, which are passed through iron straps anchored to the ground and held by nuts with which the guys can be tightened.

The lower section of the upright is of $3\frac{1}{2}$ -in. pipe in this particular stand and the top section, 16 in. long, is of 4-in. pipe. This telescoping arrangement allows the pulleys to be adjusted exactly for height. The top section is held in position by four small setscrews. Transversely into this top section is set an arm to carry the pulleys.

This is a piece of double extra-heavy pipe with an outside diameter of 2 in. It is pinned into the upright, 3 in. below the top. The stand shown carries a third pulley, which is not used. The crossarm on this side is 24 in. long, its overall length being 36 in. The pulleys are 24 in. in diameter outside; they are free to move slightly along the crossarm, and are held on by split cotters through the arm with washers between the hubs and the cotters.

Storage-Battery Locomotive at the Copper Queen

Where the tonnage to be handled by an underground haulage system is not great a storage-battery locomotive is convenient. The running expenses are not much greater than with a trolley system, depending on the conditions under which the locomotive has to operate. (A. I. M. E. Bull., February, 1914.)

The Copper Queen Mining Co. operated a three-ton storage-battery locomotive at Bisbee for over two years, under the worst conditions of any locomotive in their mines as regards track and curvature, and the results were better than anticipated. To make use of one of the regular locomotives, the battery, consisting of 150 Edison cells, was mounted on a separate trailer. This battery had a total output capacity of 40 kw.-hr., the average voltage on discharge being about 180. The first trays furnished to hold the cells were of the regular type for automobiles and proved to have too small a clearance between cells. The hard bumping in switching combined with heavy sweating, due to the locomotive going from hot portions of the mine with moisture-saturated atmosphere to colder portions near the shaft, short-circuited the cells externally. After the trays were altered to provide larger clearances and the cells were painted with insulating paint there was no trouble from this source, although two or three cells were lost in a bad wreck.

The power required at power station per useful ton-mile was approximately double that required with trolley locomotives, or 1.6 kw.-hr., due to extra dead weight of battery car and lower efficiency of battery compared to trolley wire and track circuit, also to the losses in the motor generator used in charging the battery. With a locomotive designed to carry batteries the difference in power would be less. The power would also have been reduced if a motor controller had been used, grouping the cells in various combinations for starting, instead of a regular controller with starting resistances.

The traffic got too heavy to be handled with this locomotive and it did not run long enough to get figures on depreciation of storage battery. The maintenance of the battery-locomotive motor was less than on the trolley locomotive, but no exact figures are available. The capacity of the battery was approximately 50 useful ton-miles on one charge.

In comparing power used by a storage-battery locomotive and a trolley locomotive it would be fairer either to compare the actual input into battery with direct-current power used by trolley locomotives or use the alternating-current power input to rotary converter in both cases. In the case of this storage-battery locomotive the input was approximately 1.28 kw.-hr. per ton-mile, as against 0.875 kw.-hr. for the trolley locomotive. The figures for power on storage battery are based on two days' test and therefore are not so reliable as those on trolley locomotives, which cover a year's period.

Safety Priming Device

BY WILLIAM W. JONES*

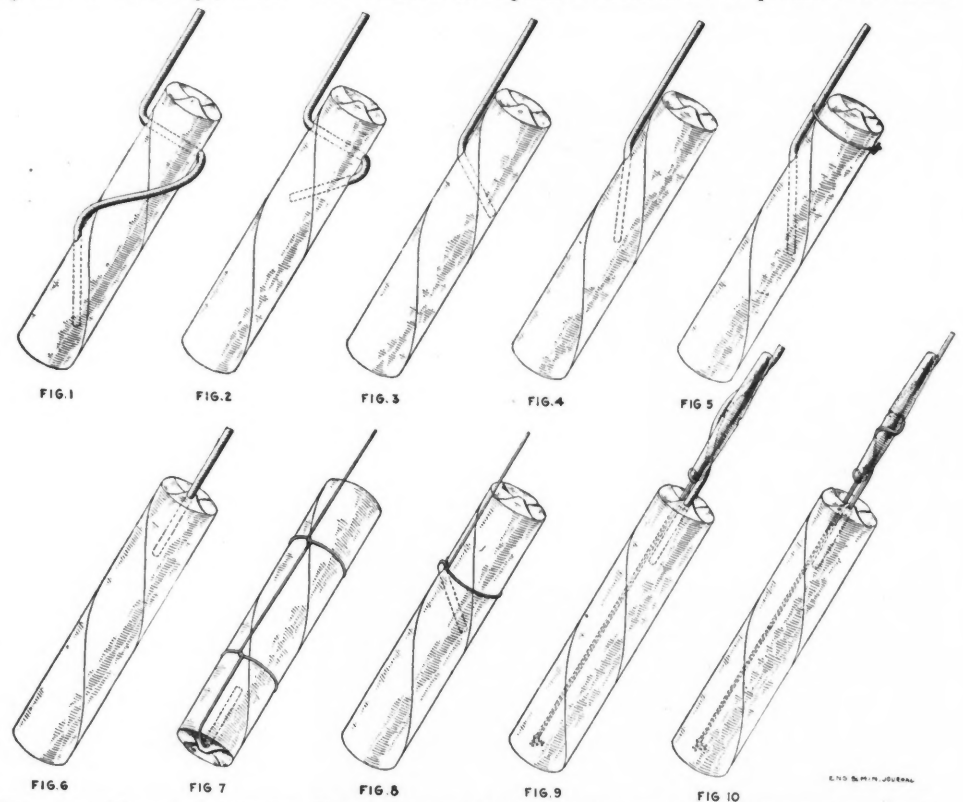
No entirely satisfactory method of constructing a dynamite primer has heretofore been available. Of the various methods of inserting the cap in the cartridge, some of the most unsatisfactory are here illustrated. Figs. 1 and 2 show the fuse laced through the cartridge. The lacing of Fig. 1 is perhaps the more objectionable of the two. The following disadvantages, however, attend either method: (1) The dynamite is likely to ignite as a result of the powder train in the fuse burning through its covering at some point in the cartridge and igniting the latter, which causes an imperfect explosion; (2) the powder train is likely to break where the fuse is bent at an acute angle causing a misfire; (3) the diameter of the primer is so increased that it cannot always be pressed down on the rest of the charge and the air gap may intercept the transmission of the explosion so that the inner part of the charge is not exploded; (4) the cap does not point along the charge and so loses part of its efficiency, and if thrust in too far, it is liable to penetrate the opposite side of the cartridge and be exploded by scraping on the rock.

In Figs. 3 and 4, the cap inserted at an angle does not give the most efficient detonation, and not being tied, it can easily pull out. In Fig. 3, either end may project, and thus cause a premature explosion. The same objection applies to Fig. 5, except that the tying tends to prevent the cap from pulling out. Tying is often neglected, however, as it takes time, and string is not always handy. In Fig. 6, the detonator points in the proper direction, but not being tied, is easily pulled out. In this case, the ends of the paper wrapping can be unfolded and tied around the fuse with a string, but as stated, tying is frequently neglected.

*State mine inspector, Albany, N. Y.

In Fig. 7 is shown perhaps the most commonly used way of priming with an electric detonator; it is open, however, to two objections: The business end of the detonator, if the primer be on top as usual, points outward instead of into the bulk of the charge, and the half-hitches are likely to damage the insulation. In Fig. 8, the detonator does not point to the best advantage and is liable to project on one side. Furthermore, in tightening the half-hitch around the cartridge, the sulphur plug may pull out of the detonator and cause an explosion.

It will be noted that the principal objections to the methods of priming here illustrated are that the cap is not placed to do its work most efficiently, or it is likely to be pulled out, causing a misfire, or it is liable to premature explosion. I have recently invented and patented a device illustrated in Figs. 9 and 10, which will largely do away with these objections and should be a great aid in reducing the number of explosive accidents. It permits the inser-



FORMER UNSATISFACTORY METHODS OF MAKING PRIMERS AND IMPROVED DEVICE

tion of the cap in the most efficient manner, while practically eliminating the danger of pulling it out or of breaking the fuse. It consists of an anchoring device to take the pull on the fuse or wires and relieve the cap itself of tension. As seen in Fig. 9, the fuse is laced through a small block, probably best made of wood or fiber, the holes being a close fit so as to grip the fuse lightly and placed at such an angle that no sharp bends will be made in the fuse covering. This block is attached by a cord or similar device to the cartridge; a large knot in the end of the cord would provide sufficient anchorage. This would, of course, be inserted when the cartridge was manufactured. In threading the fuse through the block, the latter is spaced so that the fuse between the block and the cartridge is a little loose and the cord takes all the pull.

In Fig. 10, the device is represented used with an elec-

tric detonator. The wires in this case are wound around the outside of the block in order to get a sufficient grip. It is evident that in using this device there is little or no danger of the caps pulling loose from the cartridge, and this simple fact makes it possible to place the cap in the safest and most efficient position.

Typical Coal Trestles

BY WILLIAM WALLACE*

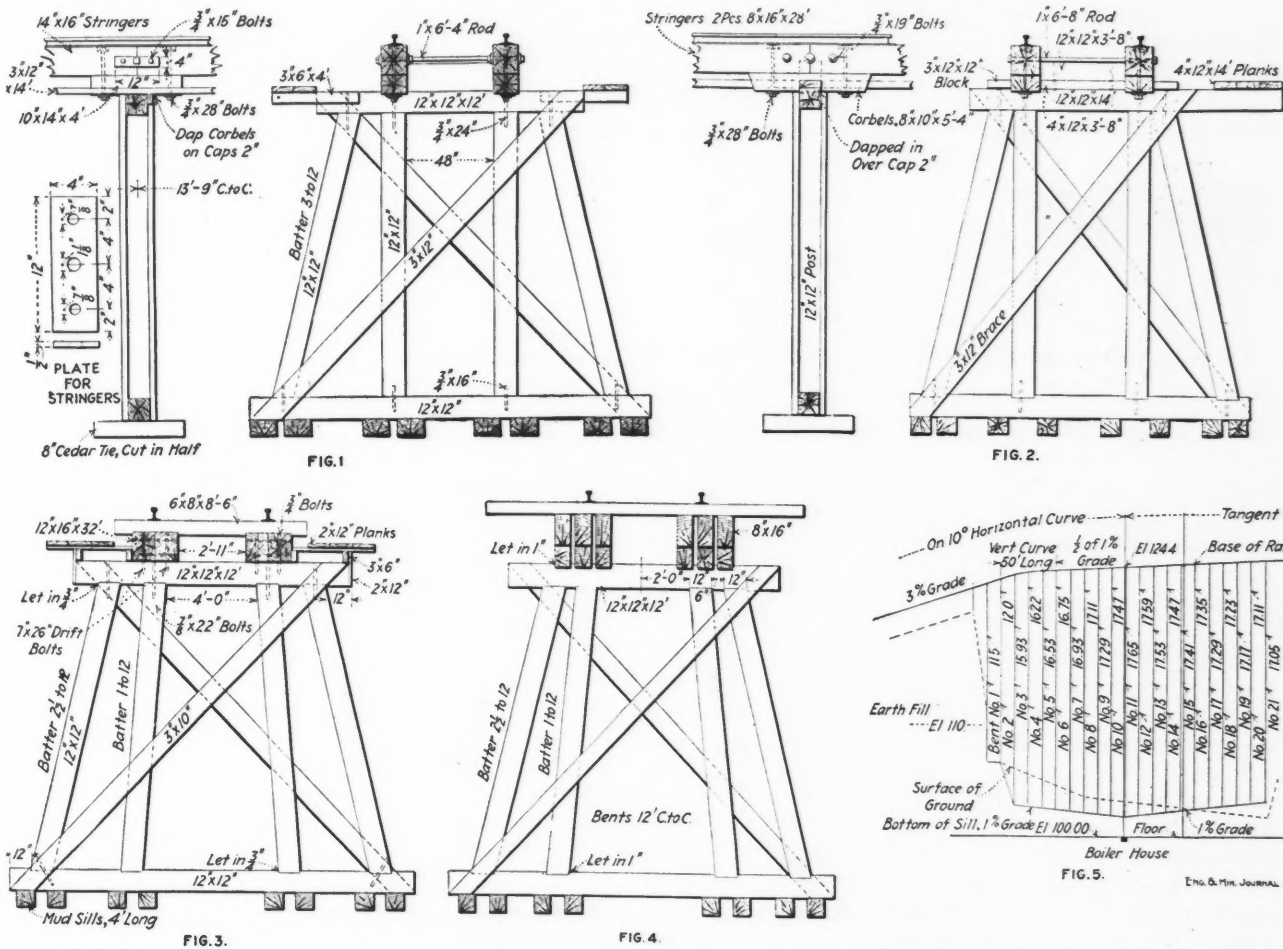
The surface equipment of many mines includes a trestle for bringing the coal to a point where it will dump into the boiler-house bins and also for providing storage against winter use. The accompanying figures show some typical methods of construction employed and also give the profile of one trestle. Squared timber for such trestles is almost universal.

on one side only, carried by an extension of the cap. In this trestle, the grade is 4%, except on one portion, which has a 12° curve, where it is 3%. These grades and curves represent the maximum permissible in good design.

TABLE OF TRESTLE DIMENSIONS FOR VARIOUS HEIGHTS

Number of Bent	Length of Inside Posts		Length of Outside Posts		Length of Sill		Number of Bent	Length of Inside Posts		Length of Outside Posts		Length of Sill	
	Ft.	In.	Ft.	In.	Ft.	In.		Ft.	In.	Ft.	In.		
1	11	9	12	1	16	0	12	17	10	18	4	18	6
2	12	3	12	7	16	0	13	17	10	18	3	18	6
3	16	2	16	7	18	0	14	17	9	18	2	18	6
4	16	6	16	11	18	0	15	17	8	18	1	18	6
5	16	10	17	3	18	0	16	17	7	18	1	18	6
6	17	17	17	5	18	0	17	17	7	18	1	18	6
7	17	2	17	8	18	3	18	17	6	17	11	18	6
8	17	5	17	10	18	4	19	17	5	17	10	18	6
9	17	7	18	18	18	4	20	17	4	17	10	18	6
10	17	9	18	2	18	6	21	17	4	17	9	18	6
11	17	11	18	4	18	6							

The bents are spaced 15 ft. 9 in. center to center and every third panel is diagonally braced with 3x12-in. planks. The tension rod and filling blocks between the stringers



SOME VARIATIONS IN DESIGN OF COAL TRESTLES FOR MINES

Fig. 1 is a trestle built on a 16° curve with a 2.5% grade. The trestle is 350 ft. long and every third panel is braced with 3x12-in. diagonals to form towers. The rails are laid directly on stringers, which are themselves carried on corbels over the bents and are spliced with steel plates on the sides. The bents are symmetrical and running boards are provided on both sides.

Fig. 2 represents a trestle similar to that of Fig. 1. It is unsymmetrical, however, and the running board is

are inserted at every bent on the tangents, while on the curve an additional set is used between the bents.

Fig. 3 represents a bent in which the rails are carried on cross-ties, four stringers being used in this case. The trestle is symmetrical with footboards on both sides; all the posts are inclined. The bents are spaced 16 ft., the long ties 8 ft.; between the long ties are 25-in. ties spaced 2 ft. In this case also every third panel is diagonally braced. In all these three types the safe maximum height is 22 ft.

*Mining engineer, New York.

The trestle in Fig. 4 is similar to that of Fig. 3 in its use of crossties. The bents are spaced 12 ft.; three stringers are used under each rail. In Fig. 5 a profile of the trestle is shown, indicating the grades and curves and in the table the dimensions for each bent are specified.

Choice and Care of Grate-Bars

A grate deteriorates faster at the front than at the back end of a furnace, because in ordinary firing more pounds of coal per square foot of grate surface are consumed there, while, relative to the rate of combustion, less air, which is the grate-cooling factor, passes through the air spaces (*Power*, Jan. 6, 1914). The volume of air through the body of the fire, immediately after a fresh charge of fuel, is insufficient for complete combustion, and the auxiliary supply through the grating of the furnace doors, is so limited in volume that only the fuel immediately back of the doors is benefited. Consequently, the front part of the fire reaches incandescence sooner than any other part of the furnace, with the possible exception of narrow strips next to the heated side walls. But, air admitted above the fuel is not a grate-cooling factor, and the air through the ashpit doors is hindered

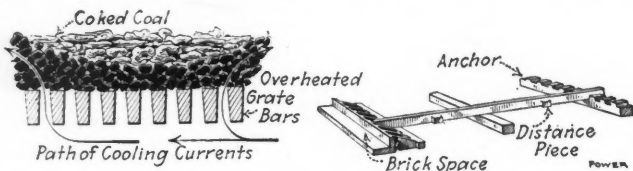


FIG. 1. AIR PATH THROUGH FUEL

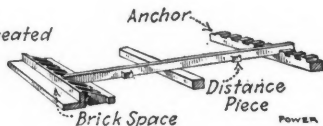


FIG. 2. CROSS-BAR GRATE SUPPORTS

from reaching the front quarter of the grates because of the sharp deflection required in the direction of its flow. Thus a strip of grate in the front of the furnace, from 1 to 2 ft. wide, may be subject to higher temperatures, and may therefore deteriorate more rapidly. Either slightly closer air spaces in the rear of the grates, or more cooling surface, greater depth of bar, in the front grates helps this situation.

Unequal and slovenly firing is also a source of grate deterioration. A hole burnt in the body of the fuel will offer less resistance and will pass most of the air so that the rest of the grate becomes too hot. Especially is this true with heavy fires, light steam demand and partly open damper. If the fireman, instead of leveling the fire, fills the hole with green coal, the draft will be almost checked there, and the spot will soon suffer from excessive heat by the coking of the coal on top, and its ignition near the grate. Fig. 1 makes this point clear.

When a grate-bar warps, it burns and breaks sooner than a bar that has not warped but is otherwise not in so good condition. This occurs most frequently to a bar that has arched upward rather than to one that has sagged. One of the principal factors of grate economy is the maintenance of an even surface, without irregularities in either bars or finger-pieces. In general, the bars wear evenly relative to one another, and, if they be so maintained, good service may be expected, though they may be sagged considerably at their mid length. But when they are disturbed and replaced without regard to their former evenness of surface, you may be sure that they will soon be destroyed. It is as important to number the bars of a grate when it is being removed as to

mark the parts when taking down any apparatus in the engine room. Otherwise, the grate surface will be uneven when replaced (Fig. 3) and both the fire and the fireman's slice-bar will tend to break the bars.

Many engineers infer that a thin bar is preferable since less grate surface is in contact with the fire, but reliable tests have proved that the grate receives heat as much from radiation through the interstices, as from direct contact with the burning fuel. Consequently, there being less material and only the same amounts of cooling surface, a thin bar must become many degrees hotter than a thick one, and, not having the rigidity of the latter, will soon bend sidewise, so that two or more come in contact, causing a wasteful enlargement of the air space on one side and serious diminution of the cooling surface on the other. Other considerations favorable to the use of thick grate bars are that they better sustain a layer of protective ash, and maintain the line of fire farther removed from their own surface.

Factors governing the depth of a bar are its length, the amount of fuel burned per square foot per hour, and the width of the air spaces. The latter consideration is rarely taken into account in grate design, but is a factor that materially influences the temperature of the grate. Grates with wide air spaces are subject to more radiation of heat than those with narrow spaces and should show more cooling surface or a greater depth of metal in the bar.

In this country, cast-iron grates have little or no competition; but in Europe steel and wrought-iron grates are used in plants that consider length of service and not initial cost, as the true measure of grate economy. The most common form is a series of straight bars extending unbroken from the front arches to the bridge-wall, and supported at the center by a girder. The bars are gen-



FIG. 3. UNEVEN GRATE BARS IMPROPERLY REPLACED



FIG. 4. SLICE BAR WITH LOWER LIP

erally forged 4 in. deep, and about $\frac{3}{4}$ in. thick. They are tightly packed by distance pieces, but are free to expand lengthwise, being anchored near the bridge-wall as shown in Fig. 2. Their chief advantage is, that when warped, they may be straightened and when impaired they may be welded and reformed. They have a smooth surface and the fires are more easily barred. The fire end of the slice bar is formed so that the lower lip slides between two bars (Fig. 4) and cuts all clinkers that may adhere to the sides.

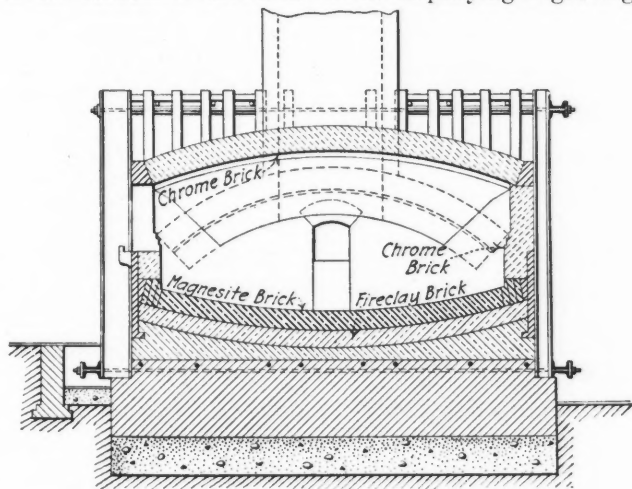
Appealing Method for Aneroid Correction

The fluctuations in an aneroid barometer which are the result of atmospheric variations, so frequently invalidate the readings for elevation as to make the instrument worthless in the opinion of many engineers. In *Economic Geology* for October, 1913, is described a method for partly overcoming this difficulty. It is based on the supposition that the atmospheric changes take place at a regular rate. By sitting down at intervals and obtaining the rate of change over, say, 15 min., the proper correction to apply to the altitude readings can be estimated. This method is described as one which appeals particularly to fat geologists.

Details of Metallurgical Practice

Addicks and Brower Basic-Lined Copper Furnace

Lawrence Addicks and Clarence L. Brower, of Chrome, N. J., have recently been granted a patent (U. S. Pat. 1,083,719, Jan. 6, 1914) for a basic-lined reverberatory furnace for copper refining and other metallurgical uses. The construction particularly suggested is a reverberatory furnace having a magnesite-brick inverted-arch bottom and chrome-brick sides and roof. A metal skewback is used to receive the thrust of the bottom and the basic bricks of the inverted arch terminate under the side walls in a level top, slightly above the copper line. The bricks are laid with a thin mortar made preferably of magnesite dust and silicate-of-sodium solution. The construction of the furnace is shown in the accompanying engraving.



BASIC-LINED COPPER REFINING FURNACE

The patentees state that the success and permanence of this lining have been amply demonstrated in actual practice and that it has advantages (1) in the treatment of foul material; (2) in reducing the quantity of slag formed in treating ordinary blister copper; (3) practical suppression of slag when pure material, such as cathodes, are being melted. We quote the following remarks from the patent specification:

“Copper refining has heretofore been commonly performed in a siliceous furnace having side walls of silica brick and a bottom of silica brick or sand, with usually a cooling vault beneath. The siliceous lining furnishes silica, which, with cuprous oxide in the copper, forms a silica slag, which has to be removed for treatment in a blast furnace. Should the charge contain impurities, which, when oxidized, have a very strong affinity for silica, the danger to the furnace is severe and frequently causes failure of the bottom; allowing the charge to run into the cooling vault. . . . When ordinary blister copper is treated in a siliceous furnace, about 4% of slag is formed, while the quantity necessary to carry off the impurities is far less than this figure. Some silica is desired to form

the necessary slag, but sufficient is present in the bullion itself and in the ash of charcoal, coke, poles, etc., used in the preceding charge. Pure material, such as cathodes, require with the basic furnace but a simple melting, whereas under siliceous practice the same cycle of operations, with production of about 3% of slag, is gone through with as in the case of blister copper. The basic furnace makes possible the practical suppression of slag. In actual practice it is indicated that the slag made in ordinary cyclic operation will not exceed 0.5%. . . . Any slag made can ordinarily be charged back with the next melt. The basic furnace also renders conceivable the continuous operation of the reverberatory by extension of the principle laid down in Pat. 980,584 of Jan. 3, 1911.” This patent, by Messrs. Addicks and Marks, provides for the feeding of cold cathodes into a copper-refining furnace while tapping the charge.

Referring to the new patent, it is our recollection that a basic-lined refining furnace was built and used in 1905 at the Baltimore Copper Smelting & Rolling Co. The Baltimore furnace had an inverted-arch bottom of magnesite brick, sides of magnesite and chrome brick and a silica-brick roof. The all-basic furnace of Addicks and Brower has the advantage of eliminating the dropping or spalling from the silica roof of the Baltimore furnace. With the practical elimination of slag in the basic furnace, it is understood that much of the copper oxide formed is dissolved in the metal and nearly low-set copper obtained at about the time the charge is melted, and the airtubes are inserted only for 15 or 20 min., thus saving several hours' time on a large charge. If subsilicate of copper be formed by the union of the copper oxide and silica from the charcoal or coke ash, this slag is so small in quantity that it is not necessary to skin each charge, as formerly.

Heating the Nipissing Low-Grade Mill

The heating plant at the Nipissing mill, Cobalt, is of the gravity type, according to James Johnston, in *Bull. A. I. M. E.*, January, 1914, and is placed 80 ft. away from the main mill building. The boilers are so placed that the water level in them is 5 ft. below the lowest floor of the mill. There are two horizontal tubular boilers 72 in. in diameter and 16 ft. long, working at from 0 to 10 lb. pressure, with a 10-in. steam line and 5-in. return water line between the boiler shed and the mill building. The radiation is distributed according to the accompanying table:

RADIATION AT THE NIPISSING MILL

	Radiators	Heating Surface, Sq. F.
Mill building	57	8,092
Washing plant	13	1,971
Vat shed	4	251
Total	74	10,314

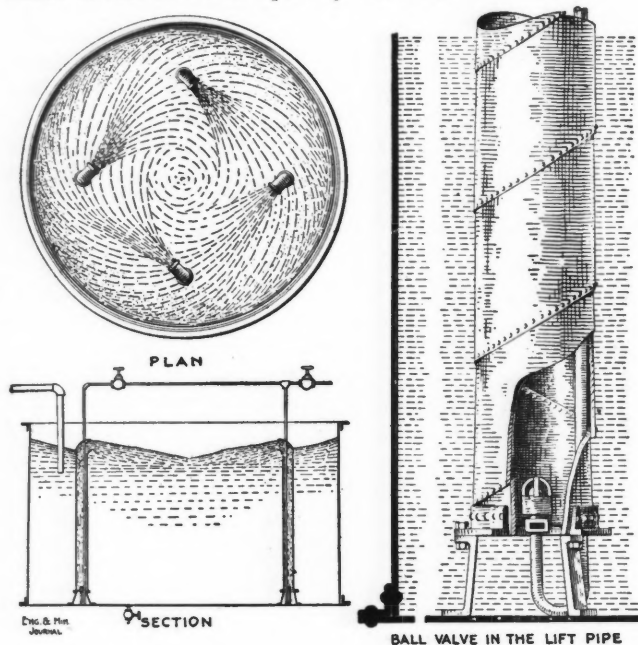
In addition to this there is about 40% more heating

surface in the distributing steam pipes about the mill. The plant has maintained an average temperature of 60° in the mill in coldest weather, which reaches a minimum of 40° below zero.

The Parral Agitator

A tank which was designed by Bernard MacDonald, now of South Pasadena, Calif., for agitating slime pulp in the cyanide process, was given the name of the camp in which its first large installation was made. The device has been in use for several years and has achieved a measure of success.

The idea which the tank puts into practice is, briefly, the replacement of the central lift of the Pachuca tank by several lifts of smaller diameter situated near the periphery of the tank. An erect cone may or may not be used in the bottom of the tank, the object, when used, being to deflect the settling material toward the periphery where it can be acted upon by the lifts.



THE PARRAL AGITATOR

In tall, narrow tanks, fashioned after the style of the Pachuca, only two lifts were used, that number being sufficient to satisfactorily agitate the material. The system, however, is not limited in its applicability to tanks of that shape, but may be used in tanks of larger area and much less height. In such tanks the number of air lifts is increased, reaching three or four in tanks of 20 to 30 ft. diameter.

A feature of the Parral tank, upon which much importance is placed, is the mode of redelivery of the pulp into the tanks at the top of the air-lift pipes. Instead of the usual open delivery into the tank, an elbow or turn is fixed on the end of the lift pipe, which deposits the entire contents of the pipe at right angles to the lift. As this elbow is placed at the level of the pulp in the tank, the energy of the material is utilized in imparting motion to the tank contents. The pulp exits at the top of the lifts are directed so that the travel of the material will be parallel with the sides, the result being that all of the pulp acquires a rotary motion, which is designed to avoid

settling of solids and to bring all of the pulp eventually within the range of influence of the air lifts, making for more perfect agitation. In most tanks, the cone bottom is now omitted, as the rotary motion is believed to be sufficiently strong to insure thorough pulp distribution. In cases, however, where a portion of coarse material accompanies the slimes, the cone is beneficial because it eliminates the central quiet zone of the tank and directs the coarse material toward the periphery where it will be acted upon by the air lifts.

An important detail of the tank is the ball valve through which air is admitted to the lift pipe. This is a simple steel ball fitting into a hard seat, the ball being confined by a basket. Pressure of the entering air raises the ball off the seat and allows its entrance into the pipe, this condition continuing as long as the air pressure is sufficient. Immediately upon dropping the air pressure, the ball drops back upon its seat, sealing the air pipe and preventing the entrance of slime or other solids which might choke it. The life of the ball valve is said to be about 18 months, at which time the basket and seat are worn out, but the ball is still good and can be used in another valve.

It is claimed that when agitation has been discontinued even for long periods of time, there is no difficulty in getting all the solids in circulation in a short time, the specific gravity reaching that obtaining previous to the shut-down in 1½ hr. as a maximum. The Parral tank is believed to be of particular advantage in copper hydrometallurgy as the entire outfit can be made of wood.

New Binder for Ore Briquettes

The filter dust which is obtained as a byproduct in the Halberger-Beth gas-cleaning system is said by Dr. Kippe, of Osnabrueck, Germany, to have exceptional binding qualities, who suggests the use of about 5% to briquette iron ore or concentrates.

This filter dust is a greyish powder similar to cement and is composed mainly of silica, alumina and lime, but only a small percentage of iron. It is not exactly known how the dust is formed, but it is believed to be largely a condensation product of volatilized slag. Its specific gravity is 2.37, though a cubic foot weighs only 18.7 lb. It has been mixed with portland cement, and, probably due to its extreme fineness, has been found to give increased cementing qualities. A furnace blowing 50,000 cu.ft. of air per minute is said to produce from 12 to 20 tons of filter dust per day, sufficient to briquette 240 to 400 tons of ore per day.

Extraction of Zinc from Slags, Desgraz Method

The briquetting of high-zinc slags, after cooling, with reducing materials, and then resmelting the mixture at a high temperature, has been practiced for some time. The objections are the loss of heat in allowing the slag to solidify, and the formation of stable zinc-iron compounds, which cut down the amount of zinc recoverable.

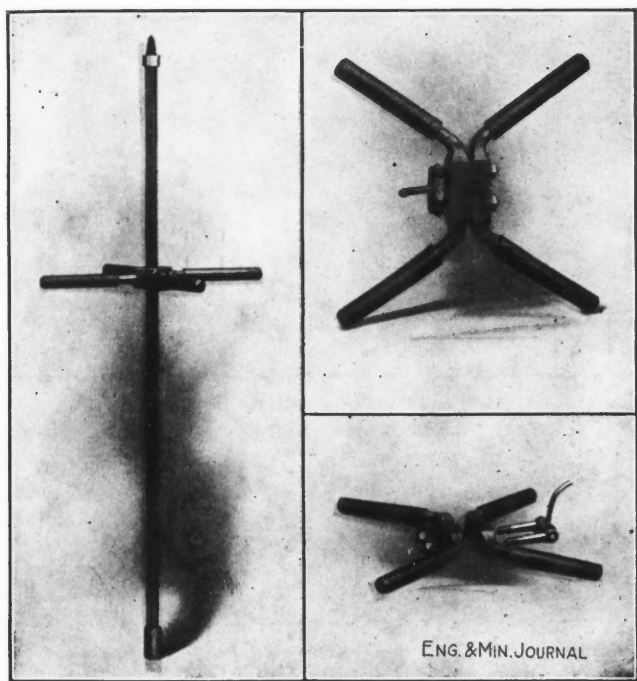
According to Desgraz, U. S. pat. 1,072,209, the process can be more economically worked by allowing the molten slag to flow into a reverberatory, and there treating it with lime, and a reducing agent. Enough lime should be used to equal about 25 to 35% of the charge.

Mining & Metallurgical Machinery

Improved Empire Drill Handle

An improved drill-rod handle is now being made by the New York Engineering Co., for holding the drill rod of its Empire prospecting drills. The new handles are made of a tool-steel forging and are practically unbreakable.

The new device has four handles instead of two, as heretofore, so that a double set of handles is not re-



NEW EMPIRE DRILL ROD AND HANDLE

quired. The handles are now covered with hard fiber sleeves which afford a good grip, and have an especial advantage when operating in excessively cold climates; the new handles do not break nor do the men's hands come in contact with the steel. This latter point is also an advantage in tropical countries as the old cast-steel handles often became so hot that it was impracticable to hold them with bare hands. Another objection to the old types of handles was that they would occasionally slip down on the rod, and endeavoring to tighten the handle with the setscrew, would often result in its breaking. The new handle has a positive grip on the drill rod, in one side of which there has been machined a set of teeth or corrugations; a corresponding set of teeth on the handle fit into the rod.

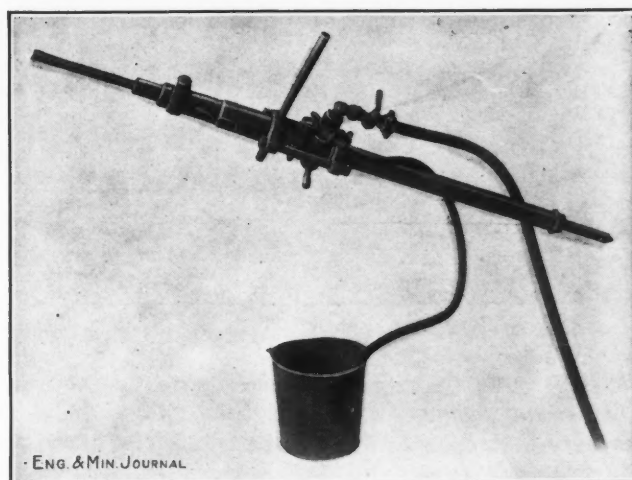
The new drill handle is made in two pieces clamped together by two through-bolts with eyes at one end. A connecting piece joins the two bolts and acts as a cam in clamping the two parts of the handle tightly to the rod. On releasing this cam, the handle separates a sufficient distance to permit sliding it up and down on the rod to any desired point; then it can be readily locked

in place by throwing the cam lever, after which it is impossible for the handle to slip down on the rod when operating. Another feature of the new arrangement is the marking of a scale on three sides of the top drill rod; these graduations are made in inches and the exact depth of the core in the casing may be accurately determined at a glance. This is a decided improvement over the old method of measuring by the manila rope, the length of which is subject to change with the varying conditions encountered. On account of its great importance in determining the metal content of placer ground, the depth of core must always be a matter of constant concern to the driller. It is necessary to keep track of the exact depth of core to prevent material from running in when drilling in loose or "running" ground; on the other hand, when drilling in hard or tight ground, it is necessary to carry a smaller core in order not to exclude material that properly belongs in the sample. The value of the scale on the new Empire rod is, therefore, apparent. The accompanying engravings show clearly the new handle before and after assembling on the drill rod.

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Water Spray for Stoper Drills

The device herewith illustrated for attachment to hammer drills using solid steel, is designed to spray the collar and so prevent the introduction of dust into the mine



STOPER-DRILL WATER SPRAY

atmosphere by drilling. It consists of a small casting which screws into the valve-inlet chest, and acts as an atomizer, having a nozzle which points toward the hole, an inlet for air and one for water. It is readily attached to and detached from the machine, the method of attachment being such that the spray cannot be got out of line with the hole.

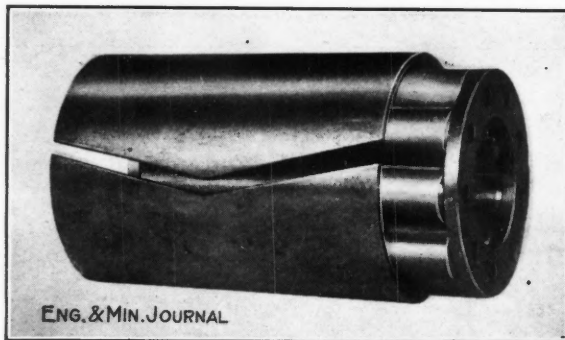
When air is admitted to the drill, a small portion of it passes through the valve chest and into the atomizer, drawing water on the injector principle from a pail or other convenient source of supply and throwing it as a

spray against the mouth of the drill hole, so as to moisten the dust and cuttings, as they run out. A regulating screw is provided for adjusting the amount of air and water used, making it possible to secure the highest working efficiency under varying conditions of air pressure and water supply. Water enters the device through an elbow, so that the water hose may be led away at the most convenient angle from the machine. The water hose is $\frac{7}{8}$ in. in diameter and has a hose nipple wired into the end for screwing into the atomizer.

The device is of interest since it is becoming more and more common for mining safety laws to require the use of a water spray for preventing dust in drilling; this is true in Arizona, for instance, and in Nevada. This spray is made by the Sullivan Machinery Co., and can be used with practically all Sullivan machines in the field. It weighs $2\frac{1}{2}$ pounds.

A New Roller Bearing for Mine Cars

A new roller bearing for mine cars, incorporating several interesting innovations, it is claimed, reduces friction from 25 to 50%. It consists of a number of large diameter rollers retained in a roller structure that is placed around the shaft, and inclosed within a high-carbon steel casing. A frequent objection to roller bearings—that the friction saved in using the rollers is lost in their contact with each other, producing an undesirable form of sliding friction—appears to have been overcome in the mounting of the rollers in such a roller structure that keeps them constantly separated and parallel to the axle.



THE SELLS ROLLER BEARING

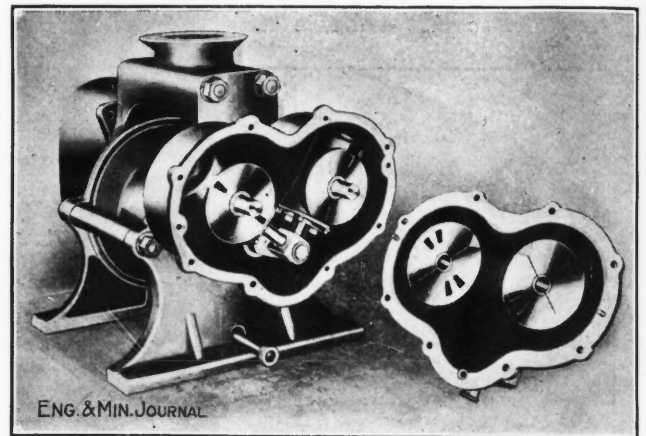
This form of construction is said to carry with it three important advantages: Smooth-running and long-lived rollers that maintain their cylindrical form until they have been worn out; an extra reduction of friction that has not been obtained in any other way, and practically permanent use of the original journal box. Rugged construction to withstand the hard service and abuse of the mining regions has been provided in generous dimensions of parts, and in proper choice of materials.

If the claims for them are substantiated, these bearings should have some effect on mining economics, since they would probably permit savings in time and expense that might release some capital for other activities, without increasing total outlay. For with 25% reduction in bearing friction, it is evident that the speed and capacity of haulage engines and locomotives can be increased; and it is pointed out that the cost of equipping with roller bear-

ings, to get this increased capacity, can hardly be compared with the greater cost of additional hauling facilities. These bearings, that are known to the trade as the "Sells" commercial-type bushing, are manufactured by the Royersford Foundry & Machine Co., of Philadelphia, Penn., which has long been known as the maker of the well known and widely used "Sells" roller bearings for line shafts.

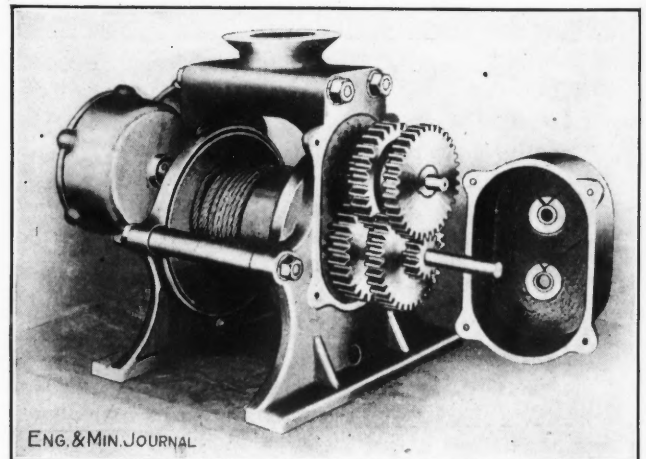
Compact Column Hoist

A light, portable hoist built by the Chicago Pneumatic Tool Co. for use in slopes, raises, etc., embodies several features of interest. As shown, it can be used either sus-



CYLINDER END OF THE HOIST

ended from an arm on a column or set on a timber foundation. Two views show the cylinder and gear arrangements. The cylinders are of the oscillating type set at 90° in a closed case. There is no movable valve mechanism. The air is controlled by a slide valve operated with a lever. This valve will permit the hoist to be operated

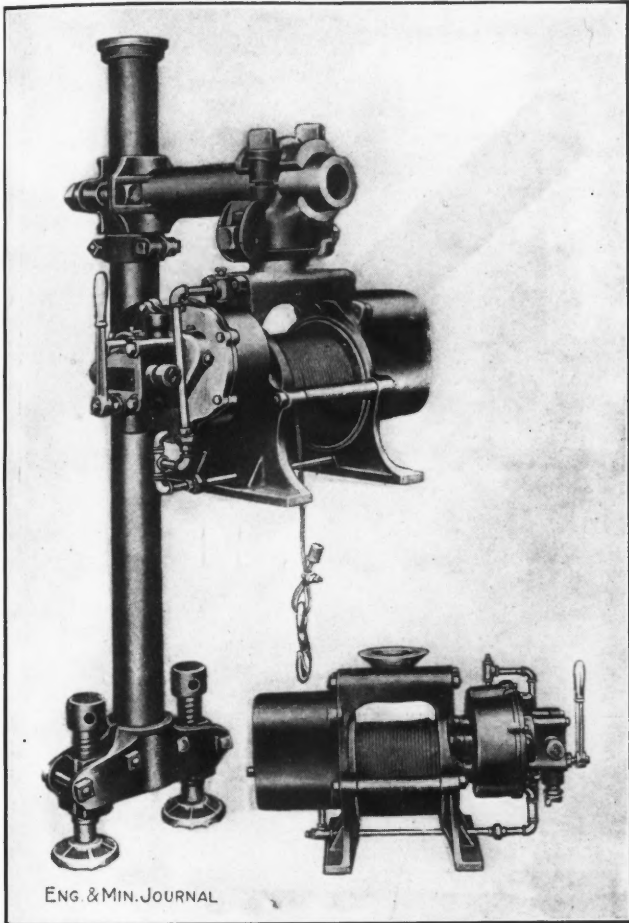


GREAT END OF THE HOIST

in either direction, but when released by the operator, it closes itself. The closed case holds lubricating oil, which is splashed into the cylinder seats and lubricates the cylinders as well as the crank bearings.

The gearing is arranged to lock positively whenever the motor stops. Thus no brake is necessary. The closed case here also allows of a thorough automatic lubrication.

The cylinders are $2\frac{1}{2}$ in. in diameter and have a $2\frac{1}{4}$ -in. stroke. The motor is rated at 2 hp., and is designed to use 1 cu.ft. of free air per foot of lift at sea level. With 80 lb. pressure, it will lift 650 lb. at a speed of 90 ft. per min. The drum, being 6 in. in diameter and 8 in.



THE HOIST MOUNTED ON COLUMN OR ON THE GROUND

long, will hold 200 ft. of the $\frac{5}{16}$ -in. rope recommended. The hoist weighs 300 lb. without rope, measures over all 17 in. in width, 19 in. in height, and 33 in. in length, and is listed at \$360. With a double-screw $4\frac{1}{2} \times 6$ -in. column and 200 ft. of $\frac{5}{16}$ -in. rope, it is listed at \$430.

✽

The Marion Revolving Shovel*

The light steam shovel revolving on its truck so as to work on any side, has a wide field of usefulness. Some of its applications are of interest to the mining industry. It is useful for handling material in the clay pit of a brickyard; it is of great value in road construction; under certain conditions it will be more economical than a larger shovel for loading broken rock in a quarry; it can be used in excavating for foundations; and for loading sand and gravel, as for concrete work, it is handy.

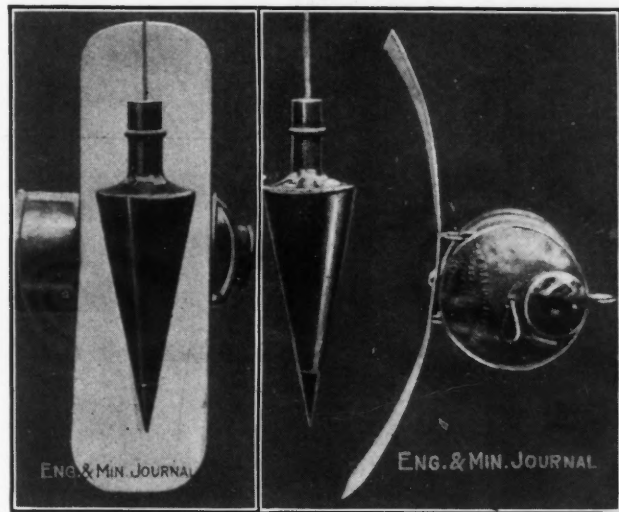
It is made in three models, ranging in weight from $17\frac{1}{2}$ tons to 45 tons with a dipper capacity varying from $\frac{5}{8}$ cu.yd. to $1\frac{1}{2}$ cu.yd. The height of dump varies from 11 ft. 2 in. to 16 ft. 6 in. and the dumping radius from 19 ft. to 26 ft. 9 in. Excellent features of design are the boom and the dipper handle. They are both built of Ohio white oak and reinforced with steel plates.

*Prepared from material furnished by the manufacturers.

Surveying Reflector for Acetylene Lamp

The time-honored method of giving a sight for the underground transit in western metal mines, has been to use a piece of tracing cloth held between the plumb-bob cord and the candle. With the growing use of the acetylene lamp for surveying, this method is not wholly satisfactory. The hot, jet flame of the lamp, unless closely watched, is extremely destructive of tracing cloth. One method of avoiding the difficulty is to use the hemispherical reflector with its surface somewhat dulled. A skillful helper can so hold a lamp thus equipped as to conceal the flame behind the bob while the top part of the reflector forms a white background for the head of the bob and the string. It is difficult, however, to keep the reflector clean of soot and rust on the one hand and not too dazzlingly brilliant on the other. Obviously, a device designed for the purpose of giving sights would be more satisfactory, and such a device, herewith illustrated, is now offered by the John Simmons Co.

It is constructed of sheet iron 2 in. wide and $7\frac{1}{2}$ in. long bent to an elliptical curve so that all parts are well illuminated, and painted with a white enamel. It has a hole in the center through which the lamp burner pro-



REFLECTOR FOR ACETYLENE LAMP

jects. A small piece riveted to the back consists of a nipple to slip over and grip the lamp burner and two eyes, to which is attached a strap embracing the lamp and holding the reflector on. As seen, the reflector has its long dimension horizontal when the lamp is upright. This permits it to be worn in the cap without danger of its striking the back. In use, the lamp is tipped on its side and the flame being concealed by the bob so as to eliminate all glare, the reflector then forms a white strip, showing the top and bottom of the bob and an inch or so of cord. The lamp in this horizontal position will burn long enough to give a sight. If desired, the reflector can be easily detached and carried in the pocket.

Not only is this device quicker and neater than the tracing cloth method, but it also gives a clearer sight and can be manipulated with one hand. The only precautions necessary are to hold the reflector plumb and to keep the lamp flame concealed.

Photographs from the Field



SANTA RITA, N. M., LOOKING SOUTH AND EAST; CENTER OF CHINO COPPER CO.'S PROPERTY

1, Manager's residence; 2, post office and lodge room; 3, merchandise warehouse; 4, Santa Rita Store Co. Bldg.; 5, mine office; 6, staff houses; 7, machine shop; 8, compressor plant; 9, drill shop; 10, transformer house; 11, oil warehouse; 12, steam shovel supply warehouse; 13, carpenter shop; 14, water-softening plant on Gold Hill; 15, Santa Rita Mountain; 16, main yards; 17, 6300 bench; 18, 6350 bench; 19, 6400 bench, of southeast orebody.



SOUTHEAST OREBODY

1, Standard shovel; 2, 6200 intermediate bench; 3, 6235 bench; 4, 6300 bench; 5, 6350 bench; 6, 6400 bench, of the southeast orebody.



SPECIAL MODEL, MARION STEAM SHOVEL

50-ft. boom, 3-yd. dipper; dumps 32½ ft. above its rail. 1, blast-hole churn drill; 2, 6235 bench; 3, 6300 bench; 4, 6350 bench; 5, 6400 bench, of southeast orebody.



TOWN OF HURLEY,

1, A. T. & S. F. R.R. freight yards; 2, Chino Copper Co.'s storage reservoir; 3, boarding house; 4, bunk



VIEW FROM ORE PILE NO. 1, LOOKING EAST THROUGH NORTHEAST OREBODY PIT FROM WEST SIDE OF WORKS
 1, Waste train of 12-yd. cars; 2, waste train; 3, ore train of 50-ton cars; 4, Santa Rita hoist house; 5, 6300 bench connecting northeast and west orebodies; 6, 6250 bench, west orebody.

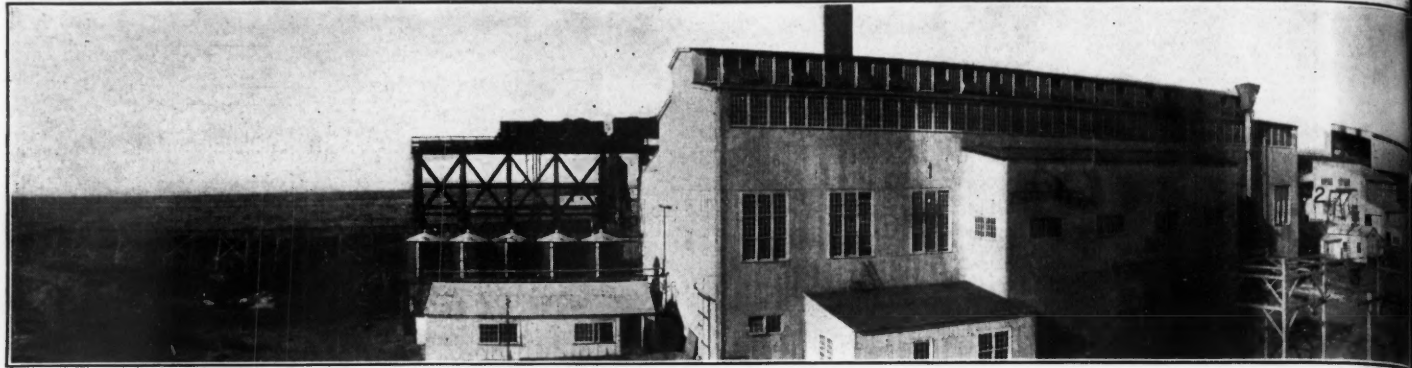


VIEW FROM EAST HILL, LOOKING WEST THROUGH NORTHEAST OREBODY PITS FROM EAST SIDE OF WORKS
 1, Santa Rita hoist house; 2, 6370 bench; 3, 6340 bench; northeast orebody; 4, 6300 bench connecting northeast and west orebodies; 5, 6280 bench; 6, 6250 bench, northeast orebody; 7, waste dump No. 3; 8, Booth Hill company houses; 9, Lee Hill.



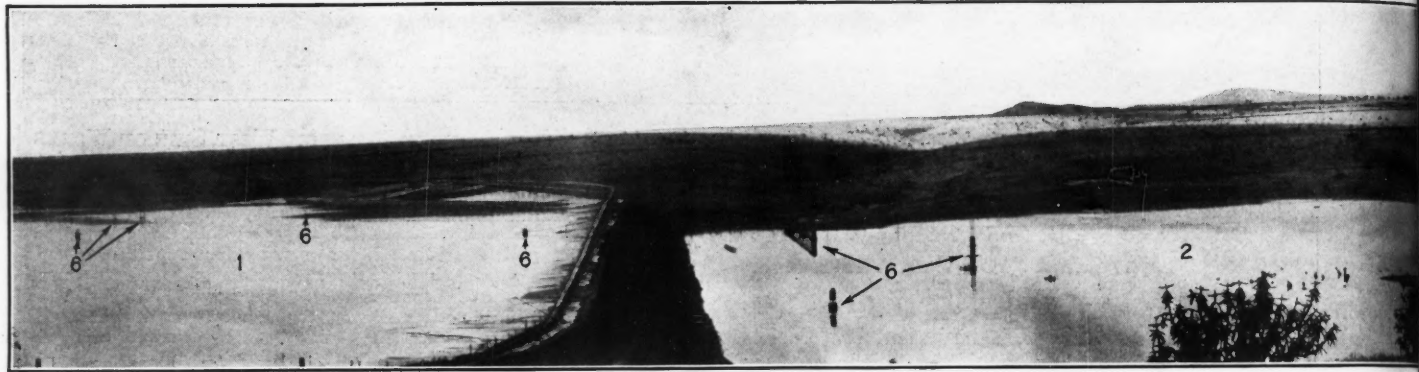
N. M., LOOKING EAST

house; 5, assay office; 6, general office; 7, staff house; 8, crude ore bins; 9, concentrator; 10, power plant.



GENERAL VIEW OF CHINO PLANT

1, Power plant; 2 coarse crushing plant; 3, sample house; 4, crude ore bins; 5, warehouse;



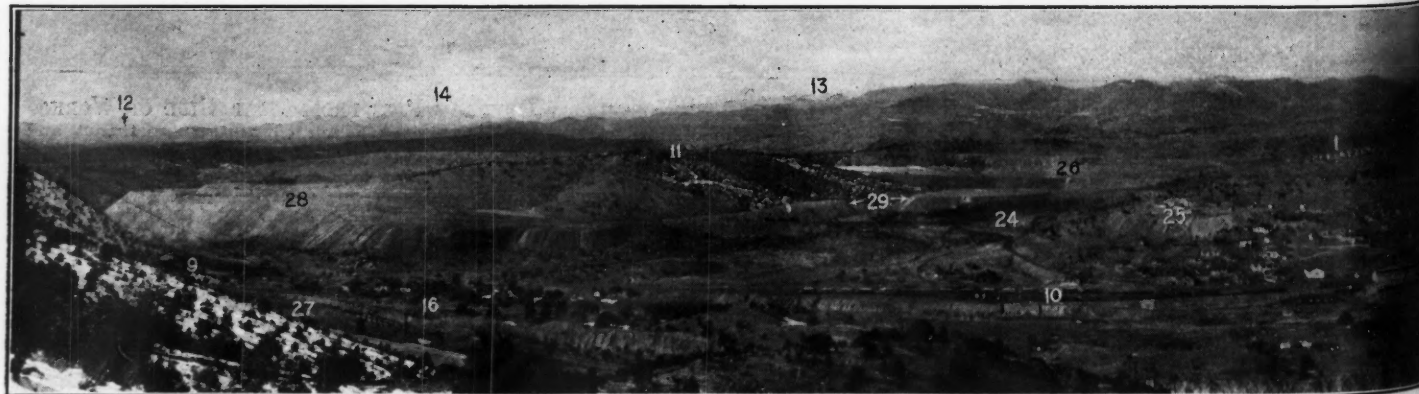
GENERAL VIEW OF CHINO COPPER CO.'S MILL

1, Dam proper and tailings settling-pond; 2, flood-water storage reservoir; 3, former temporary



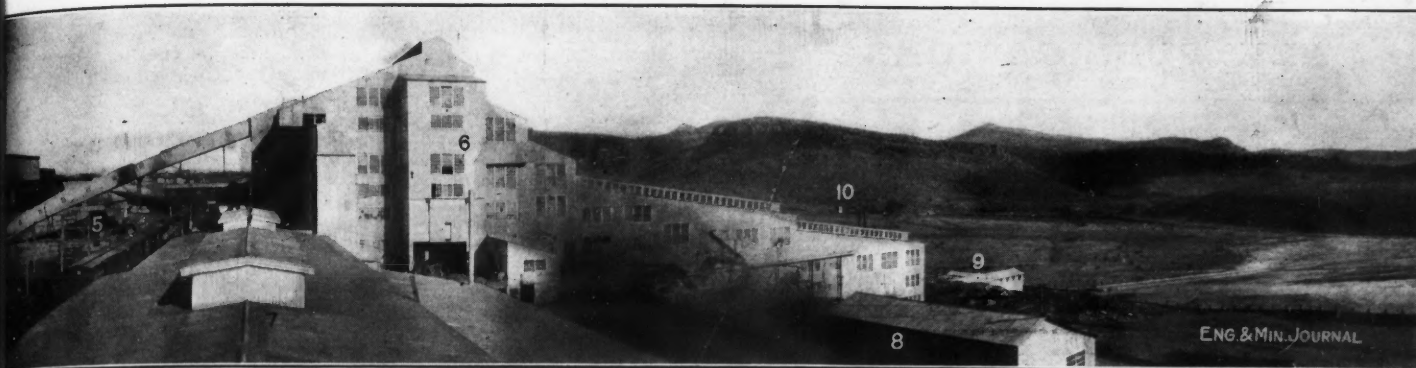
GENERAL VIEW OF MINE WORKINGS

1, Santa Rita hoist house; 2, rooming house and company houses surrounding; 3, restaurant; 4, site of old concentrator; bench; 11, 6280 bench; 12, 6300 bench; 13, 6340 bench; 14, 6370 bench, northeast orebody; 15, 6300 bench; 16, 6350 bench; dump No. 8; 23;



VIEW OF MINE WORKINGS

1, Booth Hill company houses; 2, Santa Rita Hill company houses; 3, staff houses; 4, warehouse; 5, machine shop; 6, 11, Lee Hill; 12, Bear Mountain; 13, Twin Sisters; 14, Pinos Altos; 15, divide between Santa Rita and Hanover gulches; 22, 6340 bench; 23, 6370 bench, northeast orebody; 24, 6300 bench, west orebody; 25, waste dump No. 1;



FROM ROOF OF MACHINE SHOP

5, concentrator; 7, machine shop; 8, pipe-fitters' shop; 9, water-recovery system; 10, "B" ranch pumping station.



AT HURLEY, N. M., FROM NORTHEAST END OF DAM

tailings storage and water-recovery plant; 4, power plant; 5, concentrator; 6, dewatering boxes.



FROM EAST HILL, LOOKING WEST

5, theater; 6, Booth tank, domestic water supply; 7, hospital; 8, main yards; 9, water-softening plant on Gold Hill; 10, 6250 17, 6400 bench, southeast orebody; 18, Lee Hill; 19, Wild Cat Hill; 20, waste dump No. 3; 21, waste dump No. 5; 22, waste Santa Rita Creek.



FROM GOLD HILL, LOOKING NORTH

steam-shovel supply warehouse; 7, merchandise warehouse; 8, Santa Rita Store Co. Bldg.; 9, Pinder well; 10, main yards; 16, Santa Rita Creek; 17, 6235 bench; 18, 6300 bench; 19, 6350 bench; 20, 6400 bench, southeast orebody; 21, 6280 bench; 26, waste dump No. 3; 27, waste dump No. 5; 28, waste dump No. 8; 29, ore pile No. 1.

NEW PUBLICATIONS

COAL-MINE ACCIDENTS IN THE UNITED STATES AND FOREIGN COUNTRIES. Compiled by Frederick W. Horton. Pp. 102, Bull. 59, U. S. Bureau of Mines, Washington.

A PRELIMINARY REPORT ON URANIUM, RADIUM AND VANADIUM. By Richard B. Moore and Karl L. Kithil. Pp. 101, illus. Bull. 70, U. S. Bureau of Mines, Washington, D. C.

THE STONE INDUSTRY IN 1912. By Ernest F. Burchard. Advance Chapter from Mineral Resources of the U. S., 1912. Pp. 119, illus. U. S. Geological Survey, Washington, D. C.

TOPOGRAPHIC MAP OF COLORADO, 1913. 35x49 in., unmounted. Colorado Geological Survey, Boulder, Colo.

This map has been prepared by R. D. George, the state geologist of Colorado, from maps and data of the U. S. Geological Survey, State Geological Survey of Colorado, U. S. Reclamation Service, and U. S. Forest Service, and other reliable sources. The scale is approximately eight miles to one inch. All post offices, towns, cities, counties, townships and ranges, forest and Indian reservations, railways, rivers, creeks, mountains, and all other natural features are shown; contour lines and graded coloring show the elevation above sea level of all parts of the state.

STRUCTURAL GEOLOGY. By C. K. Leith, 5 $\frac{1}{4}$ x8 $\frac{1}{2}$, pp. 169, illus.; \$1.50. Henry Holt & Co., New York.

Professor Leith has brought together in this manual the results of years of careful observation and study of the disturbed and metamorphosed rocks. Very clear and well illustrated exposition is given of the following topics: fracture and flow; fractures; faults; rock-flowage; folds; mountains; major units of structure such as geanticlines, geosynclines, ocean basins, continents, etc.; ultimate forces of secondary deformation; and unconformity. The book is not one for the beginner in geology, but for the student already grounded in the rudiments it is an illuminating manual. For the teacher it will prove suggestive, and much good advice is given regarding means of presentation, lines of reading, and sources of illustration.

DIE NUTZBAREN MINERALIEN MIT AUSNAHME DER ERZE, KALISALZE, KOHLEN UND DES PETROLEUMS. Vol. I. By Bruno Dammer and Oskar Tietze. 6 $\frac{1}{2}$ x10, pp. 501, illus., paper; 15 marks. Ferdinand Enke, Stuttgart, Germany.

The commercial demands of Germany and the desire for a manual which affords information not alone on occurrence and association, but on prices, utilization and markets, are both illustrated in this volume. The authors take up many useful minerals which are often overlooked in books on ore deposits and even in those on economic geology. The employment of some well known ores, such as galena and blende, for other purposes than as a source of the metals is an example. Methods of analysis of the several minerals are given in subordinate paragraphs. The following topics are treated, diamond, graphite, sulphur, realgar and auripigment, molybdenite; galena, blende, pyrrhotite, pyrite, marcasite, chalcocopyrite, quartz, opal, zircon, talc, manganese oxides, corundum, hematite, hydrargillite and diaspore, limonite, rock-salt, salmiak, cryolite, fluorite, spinel, chromite, borates, nitrates, calcite, aragonite, dolomite, magnesite, smithsonite, witherite, strontionite, the sodium carbonates, malachite, azurite, the uranium, thorium and vanadium ores.

Various colleagues having special knowledge of the several subjects have cooperated with Messrs. Dammer and Tietze.

INDUSTRIAL CHEMISTRY FOR ENGINEERING STUDENTS. By Henry K. Benson. 5x7 $\frac{1}{2}$, pp. 431, illus.; \$1.10. The Macmillan Co., New York.

This work is distinctly elementary and does not go deeply into any subject. It will be useful to students and to other persons who desire merely to obtain general ideas respecting the common processes of industrial chemistry.

MINERAL PRODUCTION OF CALIFORNIA FOR 1912. By E. S. Boalich, Statistician. 5 $\frac{1}{4}$ x8 $\frac{1}{2}$, pp. 64, paper. Bull. 65, California State Mining Bureau, San Francisco.

This bulletin is issued under date of September, 1913, by F. McN. Hamilton, State Mineralogist. It is similar in form and makeup to Bulletin 64 giving similar data for 1911, issued by W. H. Storms last November. The former bulletin contained 46 pages of statistical data and descriptive matter; the present bulletin contains 61 pages. There are tabulations embracing a summary of the year; the amount and value of production; comparative values in 1910, 1911, 1912; comparative production in various counties in 1910, 1911, 1912. One chapter is devoted to metals, including antimony, copper, gold, iron, lead, molybdenum, platinum, quicksilver, silver,

tungsten, tin, vanadium, zinc. Another chapter embraces all structural materials including asphalt, bituminous rock, brick, cement, chrome, crushed rock, granite, lime, magnesite, marble, onyx, paving blocks, sandstone, serpentine, slate, stone, travertine.

A separate chapter is given to industrial materials including asbestos, barytes, bauxite, clay, feldspar, fullers earth, gems, graphite, gypsum, infusorial earth, limestone, manganese, mica, mineral paint, mineral water, pumice, pyrite, sand for glass, soapstone, sulphur, talc, tufa. The salines are in a separate chapter which includes borax, nitrates, potash, salt, soda. Another chapter embraces the fuels, including coal, natural gas, petroleum.

These various chapters include also the total petroleum production from 1875 to 1912 inclusive, the total cement production from 1891 to 1912 inclusive, total gold production from 1848 to 1912 inclusive.

The data are compiled from direct returns from producers in answer to inquiries sent out by the bureau. Petroleum leads all the minerals in value of production; gold is second, cement ranks third. The bulletin states that the borax, magnesite and chrome production for the United States comes solely from California; and that 80% of the quicksilver for domestic supply is mined in California; also 80% of the platinum for domestic supply is mined in California; and the state is one of three or four states producing tungsten. California leads all the states in the value of petroleum produced, and is the leading gold producer; and is first of the states west of the Mississippi River in value of total mineral production. The California total in 1912 was \$91,472,385.

This bulletin is for free distribution. The supply is limited to what is believed to be necessary, though the demand for this class of bureau publications has largely increased since the present form has been adopted.

DIE LAGERSTÄTTEN DER NUTZBAREN MINERALIEN UND GESTEINE NACH FORM, INHALT UND ENTSTEHUNG. Vol. II, in two parts. By F. Beyschlag, P. Krusch and J. H. L. Vogt. 6 $\frac{1}{2}$ x10, pp. 727, illus., paper; 22.80 marks. Ferdinand Enke, Stuttgart, Germany.

The first volume of this exceptionally valuable work has been already reviewed in the "Engineering and Mining Journal." In its pages the general subjects introductory to a work on ore deposits are treated, and are followed by descriptions of orebodies of igneous origin and of those produced by the expiring effects of igneous outbreaks. In its earlier pages the present volume takes up veins and replacements and in its later pages stratified deposits. A discussion of joints and fractures in rocks leads to the treatment first of the precious metals and then of the others in sequence. The veins productive of the precious metals are divided into the young, or practically the veins dating from the Tertiary period, and the old or Pre-tertiary. The grouping helps in emphasizing some rather important contrasts and furnishes a plan of treatment which preserves a traditional point of view. Gold is the mineral of greatest prominence in the older veins; silver in the later ones. The old lead-silver-zinc mines with eight types based on characteristic association of ores and minerals follow and are distinguished from metasomatic lead-silver-zinc ores. Under the latter among others, are placed the lead and zinc deposits of the Mississippi Valley, but without very clear separation of gash veins, disseminated ores and ore-bearing breccias of chert. In only one of these three have metasomatic processes played a very prominent part.

As the orebodies of the other base metals are reviewed, veins and metasomatic deposits are generally kept separate. One cannot help feeling that the ores of the Cobalt district, Canada, despite their silver contents are more closely akin to nickel-cobalt-arsenic vein group than to the old lead-silver-zinc veins mentioned above, but in any plan of treatment, which turns on the associations of minerals, transitions are certain to be troublesome. In matters of interpretation differences are inevitable with some of the groupings. Thus the Cambro-Ordovician brown hematites of the Appalachians are so largely in surface clays and are so extensively due to processes of weathering that one is reluctant to consider them metasomatic without further qualification.

Under the stratified ore deposits a number of old geological battle-grounds are revisited. Are the Mansfeld copper ores sedimentary or infiltrated? How are fahl bands to be explained? Are pyritic lenses (Kieslager) sedimentary? Are the South African bankets old placers, etc? These pages are among the most interesting of the entire work because they treat of themes about which so many differences of opinion have prevailed.

The second volume maintains the high standard of thoroughness set by the first and is the product of careful scholarship and wide reading. It will be a welcome addition to many library shelves.

Correspondence and Discussion

Basic Converting

In the *JOURNAL* of Jan. 24, 1914, you make an editorial mention of the converting patent of Messrs. Wheeler and Krejci.

It seems to me that many laymen and metallurgists attach too much importance to the patents of Messrs. Peirce and Smith and more recently that of Messrs. Wheeler and Krejci.

Space will not permit of an intimate discussion of all the patents of Peirce and Smith, but if one will study them he will probably come to the conclusion that there is only one of any prime importance; namely, the temperature control. To me there seems to be just as wide a range of temperature in successful basic as in successful acid converting.

In the days of acid ore lining a good foreman or shift boss was judged just as much by the tons per shell or lining as the tons per shift. Today the same criterion holds. It was just as essential in acid converting to "dope" the charge to prevent foaming and developing too high a temperature "by adding cold matte, converter cleanings, scrap or ore," as it is the belief of the above mentioned patentees essential to basic converting.

If the charge in acid-lined shells was too hot the lining was rapidly corroded, the same principle applies to basic converting. Anyone who has worked with both acid and basic linings realizes that "undoped," a basic lining works hotter than an "undoped" acid one; but there are several things to be taken into consideration; namely, first, that cold matte, cold converter cleanings, cold scrap and often wet siliceous lining were put into an acid shell before the matte was tapped in order to increase the length of lining; secondly, that small charges were blown as compared to the enormous ones of the present. With a basic shell all materials are put in absolutely dry and the fluxes at a temperature of 1200° F., more or less, and secondly enormous charges are blown. These two things have, I believe, a great deal to do with the saying that a basic shell works hotter than an acid shell.

Anyone who has had to work with converter foremen and shift bosses who had previously worked with acid shells knows all about the "monolithic magnetite linings for basic copper converters." It is absolutely as old as basic converting. If one will take the trouble to read Baggaley's patents and also some of his experiments, you will see there the indications of the "monolithic magnetite linings for basic copper converters." The caps of Baggaley's converters were unlined, and if he had made a slag of the usual composition of a basic converter, the caps would necessarily have to be lined.

This "monolithic magnetite lining for basic copper converters" was a natural sequence of metallurgical progress when practical men changed from acid- to basic-lined shells. These men did not understand the difference between an acid and a base but when they discovered that their linings lasted longer with less flux or silica than the metallurgist had figured, they naturally continued to

run short of silica. When the metallurgists awoke to this fact some of them applied to the U. S. patent office for a patent, which was granted by men perhaps less qualified to judge whether it should be granted than the practical men who had made the thing possible and workable.

At Cerro de Pasco, in 1905, one of the regular shells was lined with basic bricks. The charges were large compared to the ore-lined shells. The converter worked hot and it was found necessary to run the converter short of silica and to put in the scrap made by the acid shells. The shell was relined with basic bricks, but not properly, by another person, and the lining collapsed. Because of a change in the men at that time, the experiments were discontinued. Similar experiments were tried later in Utah by some of the staff of the U. S. Smelting, Refining & Mining Co. Although these experiments were fairly successful, it seems that they were discouraged probably for the want of funds. Here again the charges were too hot and it was found necessary to run them short of silica and to use an excessive amount of "dope" to preserve the linings. Because of these considerations, I have sometimes wondered whether the Peirce-Smith patents would stand a test in court.

Personally, I do not see how Wheeler and Krejci could be granted a patent on a phase of the basic lining which has been used several years by different companies prior to the date of their patent. They would have to bring suit against each individual company and then prove that their patent antedated the particular company's use of their "process of forming furnace linings." It seems to me that this would be a tedious and time-consuming procedure.

JOHN W. JAMES.

New York, Jan. 31, 1914.

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Ventilation at Cripple Creek

I have read with interest an article in the *JOURNAL* of Jan. 17, by S. A. Worcester, on "Ventilation at Cripple Creek." It is a source of great pleasure to learn that the subterranean exhalations of carbon dioxide have been controlled by the simple application of air pressure, and for the successful solution of the problem great credit is due to Mr. Worcester. I wish, however, to call attention to the fact that in Professional Paper No. 54, U. S. Geological Survey ("Geology and Gold Deposits of the Cripple Creek District," by W. Lindgren and F. L. Ransome), the method which Mr. Worcester employs was clearly pointed out as the "only really effective way of combating the evil." In this publication the relation between appearance of gas and atmospheric pressure was also demonstrated.

Probably Mr. Worcester refers to this paper in mentioning gas analyses contained in "a lengthy chapter by the U. S. Geological Survey."

WALDEMAR LINDGREN.

Boston, Mass.

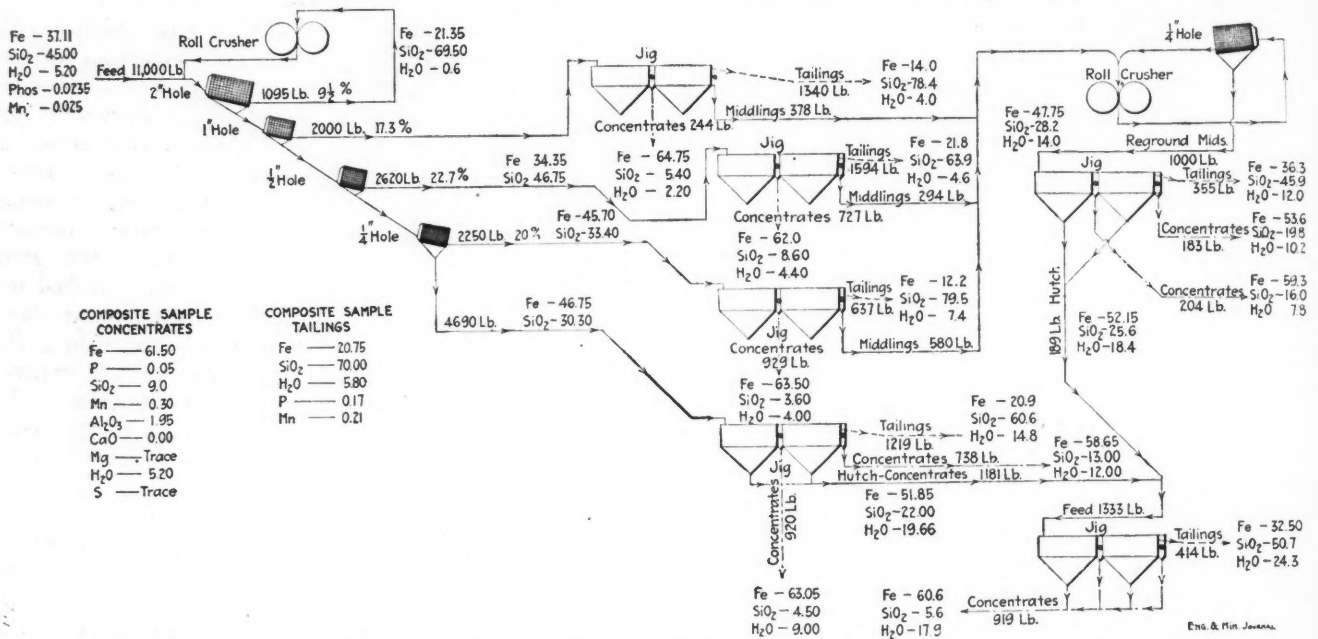
Joplin Jigs for Iron Ore

Sulphur in 1913

I have noted in the JOURNAL, Dec. 27, 1913, an article on the Cuyuna Range, in which the author appears to be skeptical about a system of concentration originating in this district being of any service for Lake Superior ores. It seems to be the fashion with a good many engineers to discredit anything done in this section and I am sorry to see the JOURNAL falling into this error.

As indicated in the article, the Pittsburg Steel Ore Co. brought a carload of its ore to Joplin and we spent some three weeks going the whole matter carefully with the result that an extremely satisfactory system of concentration was worked out, and this statement, we are sure,

Referring to the article on sulphur in the JOURNAL of January 17, p. 165, the paragraph about the Freeport Sulphur Co. is incorrect, as the company is pumping sulphur at the rate of 200 tons per day. A second unit has been contracted for and is in the course of construction. This installation will have a double capacity, making the mine operations equivalent to treble their present output. It is estimated that the new equipment will be ready for operation in six months. Railroad traffic has been temporarily interrupted by the recent disastrous floods in Texas, but this damage is now being repaired and transportation will be resumed shortly. The trade



QUANTITATIVE FLOW SHEET OF JOPLIN JIGGING TESTS ON 5 1/2 TONS OF MINNESOTA HEMATITE

will be confirmed by the officials of the Pittsburgh Steel Ore Co.

We have just completed a test on some low-grade ores from the Mesabi, which may be of interest, and which we believe will convince the reader that some of us at least, down here in southwest Missouri, have a little intelligence when it comes to working out problems of this sort.

We are inclosing herewith a graphic representation of results of this test and these results, we believe, require no comment from us.

F. F. BUTCHER,
Vice-President and General Manager,
American Concentrator Co.

Joplin, Mo., Jan. 5, 1914.

[There was no fling whatever at Joplin practice implied in the article in question. The success of the operators of that district is too well known. The skepticism expressed was in regard to the applicability of a lead- and zinc-jigging method to the Minnesota iron ores. We hope to be refuted by developments. The desirability of a cheap and efficient method for handling the low-grade Minnesota ores not of the "sandy" type is unquestioned. Whether the method eventually successful shall use the Joplin jig, or some other machine, we shall join with the Minnesota iron miners in giving it a welcome. We wait to be shown.—EDITOR.]

generally is much interested in the new development and the future outlook is highly encouraging to the owners of this property.

PARSONS & PETIT,

New York, Jan. 21, 1914.

Guggenheim Exploration Co.

Noting the report of the Guggenheim Exploration Co. in the JOURNAL of Feb. 7, 1914, I made up the following tabulation of the first six balance-sheet items:

	Shares Held	Balance Sheet Value	Stock Exchange Value, Feb. 4	Yearly Income
Am. Sm. Sec. Co.	34,000	\$3,060,000	\$3,264,000	\$204,000
Utah Copper	405,504	9,161,767	22,449,972	1,213,512
Yukon Gold	2,842,625	10,114,564	7,106,562	852,787
Chino Copper	97,750	2,534,803	4,203,205	293,250
Am. Sm. & Ref. Co.	69,500	4,767,265	4,830,250	347,500
Ray Con.	154,300	3,245,851	3,028,138	305,700
		\$32,884,250	\$44,882,127	\$3,219,649

Regular dividend requirements on a 12% basis are \$2,495,160. In addition the company enjoys the income on \$11,537,165 cash and demand loans, and \$1,183,226 of other investments. Individual opinion as to the true value of Guggenheim Exploration Co.'s stock will vary as to whether one is pessimist or optimist concerning the "porphyry coppers."

A. A. NASON.

New York, Feb. 10, 1914.

Editorials

The Prospects for Copper

Some of the agencies in the selling of copper that possess good judgment and imagination are looking for a rise in copper this spring. Their reasons are the continued excellent statistical position of the metal, the obvious maintenance of European demand and the probable revival in domestic consumption.

As to the statistical position: The production, computed on the basis of the smelters' returns, decreased in 1913 both for the world and for the United States. The refinery production in the United States increased. We pointed out a good many times during 1911 and 1912 that the smelters' returns plus imports of crude copper were showing a surplus as compared with the refiners' returns, and that the latter must be carrying an increasing stock of crude material. In 1913 it was the other way and by the end of that year the accumulation of crude copper must have been eaten into very largely, and the smelters' current production being materially diminished, we found reason to say in our issue of Jan. 10, 1914, that "there will be no cause for surprise if we see some comparatively small refiners' productions in the forthcoming monthly reports."

The January production of refined fell in with that forecast. The fact is that the crude supply of American refiners averaged only about 137,000,000 lb. per month in 1913, a figure including the increased importation of foreign blister copper, which, of course, diminishes the supply of foreign refiners by just so much. In the last quarter of 1913, when the Lake production was small and the output of several Mexican smelters was materially diminished, the monthly supply of American refiners fell below the average rate of the year.

Now, there is no strong prospect of important augmentation of supply during the next six months, or even during this year. Utah appears to have attained the maximum of what is expected of it, for the present at least. The new Granby works at Anyox, B. C., is just beginning production, but will hardly figure largely for a while. Braden is swelling its output, but very slowly. Chino, Miami and Ray will probably make some increase, but not much before the second half of the year. Inspiration's output apparently is not going to amount to much for a long while yet, and the new giant, Chuquicamata, looms in the more distant future. The Lake mines are gradually regaining their gait, but it will be many months yet before they repeat their ante-strike rate of production. The producers of Sonora and Lower California are unchecked in their operations, but elsewhere in Mexico copper production is seriously hampered.

Looking abroad, Katanga at last is making an output worth counting, but it increases slowly. Rio Tinto, no doubt, continues to suffer from its repeated labor difficulties of 1913, which may not yet be fully adjusted if we may judge from the new, though short-lived, strike, in January last. Russia and Japan appear to be the only

foreign countries that are forging ahead steadily in copper production.

If, therefore, we may expect a halting, or even receding, supply of crude copper; and if the American refiners have reduced their accumulation to about what they must normally carry, the logical deduction is a stationary, or even diminishing supply of refined copper for a while at least.

In this connection let us point out that absolute conclusions must never be drawn from the American refinery statistics alone. The copper industry is so international, more so now than ever before, that any statistical review must combine the data for both Europe and America, at least. American refiners have year by year increased their capacity, are able to refine crude copper in competition with all the rest of the world, and must constantly grasp foreign supplies in order to keep their works going at the most economical rate. In 1913 they fetched materially larger supplies from abroad, even taking standard copper out of the English market, diminishing Europe's supplies by just so much. May not the remarkably large exports from the American refineries in December and January be explained in part as the return of Europe's own copper, brought hither as crude and sent back as refined?

So much for production. With regard to consumption, European business appears to have maintained itself at a high rate in spite of the stringency in finance, which lately has been greatly relieved. In the United States the manufacture of copper fell to a low point, but we cannot rationally conceive it to have fallen so low as did the domestic deliveries by the refiners. Rather do we imagine that the manufacturers' previous purchases enabled them to fill the diminished orders of their customers, and that those customers were allowing their own stocks of goods to run down. The actual use of copper may not have declined, and probably did not, so much as the reports of either manufacturers or refiners indicated.

There are now distinct signs of revival in business and in confidence in this country. Money has become remarkably easier and railway and industrial companies are able to do the financing that they need to. The Steel Corporation is once more showing increases in unfilled orders. The number of iron furnaces in blast is increasing. The number of idle railway cars is decreasing. Even the copper manufacturers are talking with more optimism.

With regard to the prospects for copper, we have repeatedly seen the market to move just opposite to what the statistics have indicated it ought to do. About the end of 1911 the price rose when the statistics were bad. In 1913 it fell when the statistics were good. The explanation of these paradoxes is that when statistics and sentiment are opposed, the wisest traders disregard the statistics and act according to the trend of sentiment. In 1913 statistics were good, but sentiment was bad. In 1914 statistics are still good, and sentiment appears to be becoming good. Hence, the expectation of a rise in the metal that is entertained in well informed quarters.

A Radical Change in the Columbia School of Mines

The trustees of Columbia University have just announced a radical change in their engineering and mining schools. Following their own words, they have, with the unanimous recommendation of the faculty of Applied Science, determined to raise the requirements of admission to the School of Mines, of Engineering and of Chemistry, and generally to elevate and strengthen the course of engineering and technical study, from and after July 1, 1914. These schools will then become advanced or graduate schools. After July 1, 1915, candidates for admission will be required to present evidence of such preliminary general education as can ordinarily be had only by three years' study in a college of high rank. These schools will then be strictly professional and specialized for students who are candidates for any one of the several degrees that are offered.

The trustees and faculty have felt that because of the increasing seriousness of the demands upon the engineer, young men should come to their professional studies better trained than has often been the case, and should be able to use at least one modern language in addition to their own. It is also felt that the fundamental courses in mathematics, chemistry, physics and mechanics should be taught in college, and that only after their acquisition should the student take up in the professional school their application to the several branches of engineering.

The idea of requiring collegiate preparation for admission to professional schools is not a new one, and indeed has always been required by theological schools, and has in recent years been a prerequisite for many of the best law schools and the best medical schools of the country. The Thayer Engineering School, at Dartmouth College, has for many years been the only one of that kind requiring a first degree for admission. Harvard made the change a year or so ago. Now Columbia follows in the lead of those institutions. Neither Dartmouth nor Harvard has ever had a large number of students in its graduate school, and the financial risk, at least in so far as Harvard is concerned, has lately been largely eliminated by its union with the Massachusetts Institute of Technology. Columbia is the first institution to face a large financial deficit as the result of carrying out this plan. Its trustees and faculty believe, however, that the time has come when the move must be made, and they feel sure that if they succeed many other institutions will follow their example. Engineering education in France and Germany has for a long time been on this higher basis, and there can be no question that the sacrifice that Columbia is now going to make, if necessary, is fully warranted by the great educational gain that will result.

A prominent member of Columbia's faculty writes us:

The six-year course, three in college and three in professional school, has been in operation at Columbia since 1897 as an elective option, and has been taken during this period by an increasing number of students. The success that we have attained in this tentative experiment has been sufficiently encouraging to lead us to believe that we shall very quickly build up a large and flourishing school on the new basis, and the pecuniary sacrifice we hope will neither be serious nor long continued.

Columbia's action in this matter is a bold recognition of what the engineering press has long been arguing; viz., that young engineers are turned out too poorly prepared

in general science, in the knowledge of language and literature, and in the humanities. The faculties of the engineering schools have replied that they concur in that opinion, but that their freshmen come to them inadequately prepared by the high schools and during the four years in the engineering schools there is no time for anything but the subjects directly connected with applied science and the arts. Columbia's action is a step toward abandoning the attempt to lift the high schools and is a reversion to the old plan of collegiate instruction, which of late years has been more or less disregarded, but now is to be revived and introduced between the high school and the engineering school.

The Phantom Placers of Santo Domingo

Last week we threw some light on the phantom placers of Santo Domingo, which have seduced many investors during the last 10 years. These placers have been lately examined, to our own knowledge, by the following reputable and qualified engineers: J. W. Ledoux, H. F. Lefevre, T. H. France and Homer L. Carr. Mr. Ledoux is a civil engineer of high class and is chief engineer of the American Pipe & Construction Co., of Philadelphia. Messrs. Lefevre and France are mining engineers so well known professionally that they need no introduction to our readers. Mr. Carr is a young, but competent and reliable engineer, who was formerly a member of the editorial staff of the JOURNAL. Indeed, he went with Mr. Lefevre in Santo Domingo soon after he left us. These placers have also been examined by F. Lynwood Garrison, a very well known mining engineer, and by C. J. London, of Philadelphia. These six men unite in reporting that the Santo Domingo placers do not contain payable deposits of gold so far as anybody knows at the present time; anyway not those placers which they have examined, and their examinations have covered the more prominent of them.

These pseudo-placers have been the subjects of numerous promotions in the United States. The victims have been to a rather remarkable extent men of considerable means, but we fancy that many in more humble circumstances have been snared. Anyway, we have met and talked with some.

In 1906 the firm of A. O. Brown & Co., members of the New York Stock Exchange, became interested in Santo Domingo and organized the Santo Domingo Gold & Copper Co., which resulted in an humiliating fiasco. In commenting upon this in the JOURNAL of Jan. 26, 1907, we said:

The affair is a fine example of opera bouffe in mining. The promoters were gulled into the belief that several square miles of territory contained payable dirt, uniformly all over. No engineer was sent out to verify that idea. This was deemed unnecessary in view of the fact that Tom, Dick or Harry could dig at random and pan out gold. The preliminary investigations were apparently of that character. After the company had been organized its sponsors smelled a rat and caused a competent investigation to be made, in consequence of which the directors decided to suspend development, and A. O. Brown & Co. sent out a circular letter to their subscribers of the purport of the above. Probably it was a job of "salting" that caused the mischief.

It turned out to be a job of salting as we then surmised. We referred to this episode last spring when we heard of some pending Santo Domingo promotions and of some expeditions going to Santo Domingo, and issued a warning, saying in our issue of Apr. 19, 1913:

The shares of several gold placer-mining companies to operate in Santo Domingo are now being offered to the public. The broker's circular respecting one of these companies, which has come to our attention, is extraordinarily glowing and we understand that another promoter offers a guarantee that his poorest ground will average at least \$2.50 per cu. yd. Such talk is in itself suspicious.

Suspicious respecting Santo Domingo gold placers are further aroused by recollections of the malodorous Santo Domingo Gold & Copper Co. of about seven years ago, of the salting of the samples of its gravel, of the deception of A. O. Brown & Co. and the fate of that firm.

We are informed that several groups of investors have been taken to Santo Domingo and have come back so enthusiastic "that they are now inducing their innocent friends to invest in the new El Dorado." One of these investors, in describing the large quantity of gold that was obtained from pannings under his observation, stated that "gold was so plentiful that really it was a constituent part of the soil." This has a familiar ring.

We have not seen any reports respecting the alleged Santo Domingo placers over the names of engineers that we recognize.

Two of the expeditions that went subsequently to Santo Domingo, led by experienced engineers, were unmistakably salted. There was a repetition of the swindling of A. O. Brown & Co.

People are naturally curious to know how it happened that an experienced engineer going to a region of evil repute, warned personally to be on his guard against salting, going thus with his eyes open, *could* be so tricked. In fact, he obtained some extraordinary "samples" and said to himself "They're trying it." He put down some more holes, using methods that excluded the danger of salting, as he thought. He did not then comprehend the extensive ramifications of the salting system, and the number of *prestidigitateurs* among the native population. It seemed later as if every negro man and woman habitually carried salting pills somewhere about their persons and used them whenever occasion required. From the sterilized holes, as he thought them to be, the engineer obtained what impressed him to be normal returns of fair dredging ground. The ground itself looked, geographically and physically, as if it ought to be such. A little gold was known to occur in the region. His conclusion was that the conspirators were trying to make a property that was just fair look fabulously rich; in other words, that they were trying to make a mince pie look as if it had ice cream on top of it. He knew that there was no ice cream, but he thought he had the pie. There were other things in an ingenious stage setting that contributed to the deception, which it is needless to relate in this article. As it turned out there was not even any pie. Mr. Ledoux in his article last week described the probable method of salting.

Two engineers, examining two different properties ostensibly owned by two different persons, companies or interests, at about the same time in 1913 were salted. They know they were salted. They do not know who did it or who inspired it, although they have strong suspicions. They know that in examining certain properties evil things happen. It is something like what yellow fever used to be at Havana. People knew that if they went there they were likely to contract it, though how or why they could not precisely say.

Mr. France examined the Buena Ventura property and was able to take his samples without any assistance. However, there was a colored gentleman along with him who habitually obtained gorgeous "pans." He would call, "Come and see what I've got." Mr. France would then take a sample right alongside of his, pan it and get noth-

ing. One day he remarked to his colored guide, philosopher and friend, "Oh, you're salting those samples of yours!" Quick as a flash the colored man replied, "You can't prove it, boss." Nor could he, though the inference was strong enough.

In fact, salting seems to have been going on in Santo Domingo for so long that the professors of the art have acquired great dexterity. Also, the knowledge and practice of the art appears to have spread so extensively that the performance may be experienced in many quarters. The vendors of a property never know anything about it, of course. When charged with swindling they virtuously deny it and maybe sue their victims for non-fulfillment of their contract to purchase, or for something else. Is there any effrontery more monumental than to try to collect payments still due from the purchaser of a mining concession who has found himself salted? Yet those very things have happened. Oh, shade of Chicken Bill!

BY THE WAY

A writer in the *New York Evening Post* thus lists the classes who are interested in affairs of the Stock Exchange: "There are bankers, investors, speculators, professionals, manipulators (although Stock Exchange officials now deny this), lambs, insiders, outsiders, bulls, bears, plungers, cliques, fools and syndicates." He might have added wolves, sharks, hogs and some others. And if his purview had taken in the Curb market, his characterization might have been even more extensive.

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Should a geologist know how to hobble a horse? Because Senators could not agree whether a scientist of the U. S. Geological Survey ought to be expected to know how to hobble a horse, the Senate on Feb. 13 debated whether it should pay Jacob Wirth, of Poplar, Mont., for two horses lost when hired by representatives of the Survey. "We won't get many scientists if we make them hobble horses or stand the loss," said Senator Lane. "A great many horses are likely to be lost if we pay for these," replied Senator Thomas. The Senate was unable to decide this weighty case during the day, it not having come to the attention of the President. However, it is better for the Senate to talk about such things than to be passing pork bills.

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Few business men have appeared in Washington to discuss for the committees of Congress the new anti-trust bills, which has caused surprise in administration circles. The Washington correspondent of the *New York Evening Post* offers the following: "I think I can explain why the business men are not coming here," said a witty woman. "The present situation reminds me of the scenes in the play 'Nellie, the Beautiful Cloak Model.' In the first act the villain of the piece meets Nellie, the heroine, and tries to throw her off the Brooklyn bridge. In the second act he meets her again, and ties her to the tracks in the subway. She is barely rescued. Then he meets her the third time he tries to push her off an elevated railway platform in front of an express train. In the fourth act they meet again, and Nellie shrinks affrighted. The villain asks her earnestly: 'Nellie, why do you fear me?'"

Mr. Flannery on Radium

The production of radium and the treatment of radium ore is not an important industry, notwithstanding the recent hullabaloo about it. However, as the producer who is going to be hurt by Government competition, or thinks he is, and as the first industrialist to come under the shadow of such competition, the views of Joseph M. Flannery are interesting. He told the Senate's Committee on Mines and Mining, the other day, that he would turn his plant over to the Government free of cost to use it until there had been extracted enough radium to give free treatment to patients if, when the Government had obtained the necessary supply, it would go out of the business. This proposition aroused some surprise and interest. Mr. Flannery told the members of the committee at the outset that if the Government were to require the producers of radium to sell their products exclusively to the Government, the latter should purchase all produced in this country.

The bill as it came from the House requires the producers of radium ores to offer their product to the Government before accepting any offers from outside, but does not require the Government to purchase. Mr. Flannery denied that his company enjoyed a monopoly of the production of radium in the United States. He admitted that he was contemplating the establishment of mills in Colorado and Utah, but said that the enactment of the pending bill would spell ruin to the industry in the United States.

"If the purpose is to furnish the public radium for humane and charitable uses, I will be glad to give the Government the benefit of our process," said Mr. Flannery, "but if the Government simply wants to use our process to compete with producers of radium, I would not feel justified in doing so. I understand that the Government has no practical or economical process for extracting radium from the ore."

In opposing Secretary Lane's proposal, Mr. Flannery said that there was one other company in the United States engaged in extracting radium from ores and that four other groups of men were seriously contemplating entering the industry.

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Oroville Dredging, Ltd.

The consolidated balance sheet of Oroville Dredging, Ltd., and constituent companies at July 31, 1913, has been issued from the San Francisco office, together with excerpts from the report of W. P. Hammon, general manager, covering the California and South America operations from Feb. 1 to July 31, 1913.

Mr. Hammon's report shows a total of five dredges operating at Feb. 1, 1913, on the Oroville property in California. On Feb. 25, however, Exploration No. 1 dredge sank and went permanently out of commission, being the oldest dredge then in the Oroville field. On May 10, Boston & California dredge was taken out of commission because the ground, owing to extraordinary conditions, could no longer be worked at a profit. The three dredges continuing in operation, were Boston No. 4 and Exploration No. 2 and No. 3. Three factors contributed to increased cost of dredging operations: Destruction by fire, May 12, of the main electric power station, and labor troubles of May and June; extraor-

inary conditions in Boston & California Dredging Co. tract rendering dredging unprofitable; new bucket line, costing \$12,186, for Exploration No. 3 dredge. The net profit from dredging and shop operations in California for the six months was \$60,911, and \$59,763 was credited to dismantlement reserve. The surplus on July 31 was \$402,645, practically the same as at the beginning of the year.

The dredges operated by Oroville Dredging, Ltd. exhausted a total of 30.38 acres, yielding an average of \$5709 at a cost per acre of \$3604; net profit per acre, \$2105. Total dredging time, 12,863 hr., 30 min.; average daily dredging time, 19 hr. 17 min.; total yardage, 1,612,519 cu.yd.; daily average, 2416 cu.yd.; actual average depth 32.9 ft. Average costs per cu.yd.: Labor and material, 1.41c.; electric power, 0.85c.; water, 0.12c.; repairs, 3.14c.; smelting and express charges, 0.04c.; general expense, 0.86c.; taxes and insurance, 0.36c.; total expense, 6.78c. Average returns per cu.yd., 10.75c.; average net revenue per cu.yd., 3.97 cents.

The profits realized since the last dividend of Oroville Dredging, Ltd., in 1909, together with surplus at that date and dismantling and depreciation reserve, amounting to \$906,344, and other advances making a total, \$1,197,137, have been invested in Pato Mines, Ltd. Owing to various adjustments incident to testing the dam, hydro-electric plant and dredge during December and January, the date of Feb. 1, 1913, has been accepted as the commencement of the producing stage for the Pato Mines, Ltd. At that date the dredge was about 1200 ft. distant from the limits of the proved dredging field.

Up to July 31, the approximate date of reaching the tested area, the Pato dredge exhausted 11.42 acres, which yielded an average of \$5824 per acre, at a cost per acre of \$4916. Total dredging time, 2740 hr. 20 min.; daily average dredging time, 15 hr. 8 min. Total yardage, 449,596 cu.yd.; daily average, 2483 cu.yd. Actual average digging depth, 24.4 ft. Average costs per cu.yd.: Labor and material, 3.18c.; clearing ground, 1.64c.; electric power, 2.06c.; repairs, 1.78c.; bullion expense, 0.38c.; general expense, 3.45c.; total expense, 12.49c. Average returns per cu.yd., 14.79c. Average net revenue per cu.yd., 2.30 cents.

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Chino Quarterly Report

The Chino Copper Co. reports that in the last three months of 1913 it produced concentrates containing 13,970,438 lb. of copper, from 512,450 tons of ore. The average percentage of copper in the ore was 2.08 and the average extraction was 65.54%. The costs per pound after allowing for smelter deductions and without making credits for miscellaneous revenues, was 9.42c. The net profit from milling was \$778,143, increased by miscellaneous receipts to \$812,087. Dividends of \$645,405 were paid.

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Shannon Quarterly Report

The Shannon Copper Co. reports that for the last three months of 1913, it treated 58,336 tons of Shannon ore and 14,281 tons from the company's outside properties and produced 3,403,853 lb. of copper, 588 oz. of gold and 25,836 oz. of silver at an average cost of 12.37c. per lb. of copper.

Annual Meeting, A. I. M. E.

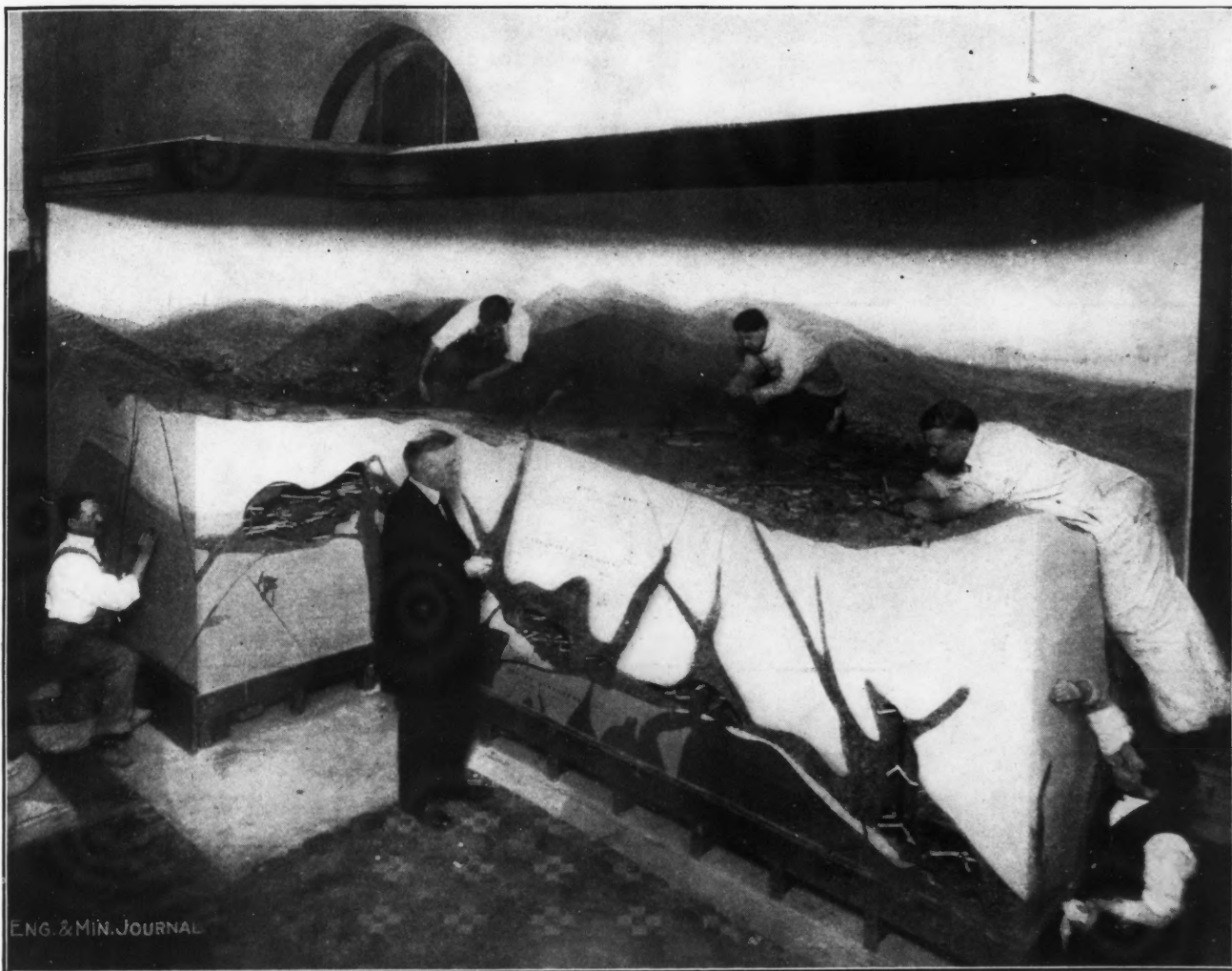
SYNOPSIS—Report of the meeting in New York, emphasizing the personal element of the proceedings.

The annual meeting of the American Institute of Mining Engineers convened on Feb. 16 at the Engineering Societies' Building, in New York.

Following the registration of members on Monday evening, the visitors had an opportunity to get acquainted at a smoker given in one of the lecture rooms. After

lowing last summer's meeting at Butte." This report, also reproduced on a following page, evidenced that the Institute had been studied from a new point of view.

One of our friends, returned lately from Colorado, told us of meeting there an engineer not long away from London, who, in the course of conversation, inquired: "What kind of a chap is this Professor Kemp of yours? I've been reading some of his writings and they've struck me as being *quite unusual*—really extr'ordin'ry, don't



MODEL OF THE COPPER QUEEN MINE

This shows the model, nearly completed, in the American Museum of Natural History. As described in a previous article in the "Journal," it is difficult to discern where the model leaves off and the mural painting begins. The model represents a block of the country rock under Bisbee, about one mile long and $\frac{3}{4}$ mile wide. The photograph is of particular interest in showing the model-makers at work. Dr. E. O. Hovey, who designed and supervised the model, is standing in the foreground.

the address of welcome by Pres. Charles F. Rand, the local entertainment committee announced that it decided to eschew the usual vaudeville talent for smokers, and presented a diverting program containing more "mining color." The first number was a lantern slide, announced as "The Present and the Future (*Edisohn Record*)," reproduced on the next page, containing a vision of the ascending son of Butte. The second feature was a report on the state of the Institute by an "expert, who was engaged by the president and directors immediately fol-

you know!" "That's very true," replied our friend, "but we don't *always* take Kemp seriously; not when he's talking at smokers and dinners and such affairs."

Is this a sufficiently clear diagram?

Now, we don't know and can't make any affidavit about it, nor by the same mark can he prove any alibi (so far as we know), but nevertheless we suspicion strongly that Kemp *might* be able to tell what kind of a quill (or typewriter) Pat. Corrigan uses.

The guests were further entertained with a number

of interesting slides of remarkable photographs from different parts of the world. The wives of many of the members being present, the evening was concluded with a reception in the Institute quarters on the ninth floor.

The annual business meeting took place on Tuesday morning. Unlike that of last year, it was brief and harmonious. Announcement was made of the election of the official ticket, as the result of the letter ballot previously conducted. The successful nominees were: Benjamin B. Thayer, director and president; H. C. Hoover, director and vice-president; W. L. Saunders, director and vice-president; R. W. Brock, of Canada, director for District 11; C. W. Merrill, of San Francisco, director for District 6; Albert R. Ledoux, of New York, director for District 0; Henry L. Smyth, of Cambridge, director for District 1; D. C. Jackling, of Salt Lake City, director for District 7.

the lively discussion which followed, most of the speakers supported Mr. Ledoux, but Mr. Stone asked for another year's trial of the system. Mr. Thayer precipitated a secondary discussion by demanding to know just what arrears had to be paid by a member who was dropped before he could be reinstated, saying that much confusion existed on this point. Mr. Richards said that no confusion should exist as the constitution was explicit, and he proceeded to elucidate its provisions. Mr. Stone promptly elucidated its provisions in quite the opposite sense, and Mr. Thayer jubilantly asserted that this divergence of opinion among authorities proved his point.

Finally, after an authorizing motion had been carried, President Rand appointed Mr. Richards and Mr. Parker a committee to draft a new regulation. This committee later in the day submitted a draft, extending the time of delinquency to two years and specifying that the delin-



"THE PRESENT AND THE FUTURE"

(Rand, after a memorably successful year, has qualified for higher glory, while over the horizon appears the rising son of Butte. All hope, however, that it will be many years before Rand fulfills all of the artist's conception.)

Reports of the various committees were made, the most interesting being that of the committee on increase of membership, to the effect that the number of new members obtained in 1913 was about equal to that obtained in the three years preceding.

A little interest was injected into the proceedings by Mr. Ledoux, who wanted the sense of the meeting as to whether the amendment adopted last year, making one year's delinquency in payment of dues cause for being dropped from membership, was not too harsh; he stated his belief that it was working harm to the Institute. In

quent for reinstatement should have to pay the amount with which he was charged on the Institute books when dropped, and should receive the "Transactions" for the time covered by these payments. The meeting approved the change, but this must wait for the next annual meeting before it can be voted upon as an amendment. Meanwhile, however, the directors have the power to extend the time of delinquency by a year and probably will do so.

Three papers were scheduled for the morning session. That by H. A. Guess, on mining and milling methods

prevailing in Southeastern Missouri, and that by James Johnston, on the Nipissing mill, were read by B. A. Robinson, assistant secretary of the Institute. That by George Otis Smith, on the Disposition of Natural Resources, was read by title only. Mr. Guess' paper was the subject of some written discussion by Mr. Whaley, of the Myers-Whaley Co., who objected to the statement that the Myers-Whaley shoveling machine was no cheaper than hand shoveling, and also to the restriction on its applicability indicated by the paper.

T. T. Read, discussing the Nipissing paper, called attention to the great amount of scientific research carried on in American metallurgical laboratories and works and the splendid results obtained. Mr. Spilsbury, who was in the chair, commented upon the high extraction obtained at the Nipissing, over 95%, as against the 80 to

Patrik Corrigan
Benny Tibby
Consulting Miners.



Butte, Mont.
Feb. 14 1914
St. Valentines Day.

Misthor Rand;

Pres'dent, American Institoot of Miners,
Rook-sharps, Metal-melters and Assayers;

Sorry,

The mmbere of this firm were glad to see you and the other directors of yer Institoot laast summer and we arre ehure that we kin do yure Institoot a heap o' good. The gra't throuble wid the Institoot this very edmitio is the ondoe influence of the High-brow liment. Ye hev got too mooch of these collidge perfiessors, who aint no good aboot a mine and who do be allers making throuble. We know that ye, yerself, come into offie after the Institoot had had a bad dose of wan o' thim, and wot has set it on its two feet, solid-like is the fact that ye are a practical man. We know that ye are an old railroader, soocostomed to ohtand off the Car-wheel Turners Union and the loikes o' thim; and that ye've managed mines and know how to handle the lab'ring men. The Institoot has had wonderful succier under yure mandigment, but ye ought to allers beware o' thim high-brow fellers. The gra't future hope o' the Institoot lies in the fact that

ye are to be succeeded by me old frind Ben Thayer, wan of the finest practical miners in Ameriky and an old Butte man himself. Shure I mind the time that Ben oom out to Butte, wid his collidge diplomy of Civil Engineer, and how he felt he had to be oivil to ivribody down in the old Andecondy shaft, where he got his first job with me and Ben Tibby. Shure he'd say 'Beg yure pardon will ye give me the wrinch', and 'Excuse me ye've got me shtriking hammer'. But we had to take all that nonsense out of him and timsely he larned to talk like anny Paddy in the shaft. Oho! he was a *WXXX* o' foine feller was Ben, and we're *WXXX* proud of him here in Butte. He'll keep yore Institoot booming along jost loike the Andecondy mine, but wot I want to ligitize me ye have got to knock the collidge bizzness out o' these fellers before they're much good, and it's the Andecondy ehait that giv' ye yure next Pres'dent and doant ye go to thinking anny thing different. I've seen a lot o' these collidge fellers in my tims. Some o' thim makos good miners and some o' thim don't, but gooc to raisin' apples down in Wash'ton State. The boys that takes to mindin' do be sometimes getting quite a big wad. Sometimes these fellers with the wade gooc back to see their old perfiessors and ye

ought to hear thim tell about it when theycome to Butte. ' Shure', says wan, 'there's Perfiessor Flunkem', he says, 'he busted me all to shplinters in Mining 206', he says, 'or maybe Jolligee 77?', he says, 'or Ingineering 57A', he says, 'I see ye coming the old humberg says, Hammond, me brave bye, says he, 'we want ye for a perfiessor', says he, 'or if it aint me old student Par'k Channing, says he, 'or 'By gracious it's me old Boy Ghistler, so 'tis, or perhaps, ' Well, Honnen, ye look a bit ehoutered and volder in the face than the slim lad o' '75', says he; but all this blarney dont work or bamboozle the boys a bit, it dont. Ye foind all this out by talking wid thim, and it all goes to show ye've got to look out for these high-brow fellers in the Institoot.

Ye've been rather running thim too hard in the Committee, Misthor Rand, but I'll oom round to yure Committeee pristinly, so I will. I hev got a bigger thing than that on me mind now, so I hev. Ye do be making a bad mistake in general policy, the way things some throuble as is plaguing the New Haven Railroad; the Sntel Thrust; the Rookyfeller crowd; the United Segarr crowd and all the rest. Ye oot with thim Machinery ehaps, and thim Illinois crowd fellers, ye've been getting up a Thrust in Ingineering Sassiety and have put all yure m'terial prop'ity in the hands of a holdin' comp'ny called the United Ingineering Sassiety. The whole bizzness involves the stifling of competition,

interlocking d'rectorates, monop'ly, and all thim terrible things. As shure as ye're born, ye will have the Attorney Gen'ral of the United States on yure neck before ye know it. I dont know how yure going to divide up the big building among the Founder Sassiety and the Affiliated Sassiety; or how yure going to stand off the sleepless officers of the gov'ment; but my advice is to get yure new Prsident to appoint a Committee with John D. Ryan, another Butte boy, as Chairman, and have him keep ye out of throuble, same's he has the Amalgamated.

Yure Institoot is now nearly out o' debt, thanks to me old frind James Douglas, for whom I'r a tims I pounded steeel in the old Copper Quane moine prop'ity. Shure the Copper Quane moine has been a fine thing for the Institoot, but ye might as well make other plans for the future. Ye cant expect to have got in the Douglas ehope much if any more. I observe that the Kaiser Wilhelm is now said to be the richest man in Germany, and I think ye might make him Honor'ry Loctens't Gen'ral, or Honor'ry Grand Field Marshall of the Institoot, wid a big sword, and maybe he'd do something handsome fur ye.

I note that under yure mandigment the policy of Committee has been divilped widout end. That's another Butte idee in spehulization. Ye got it the laast tims ye was out here from Hennessy's big Department Store, right down under the Annoony offices. Hennessy has a pine and needles department or committee, wid a spehul floor-walker or chairman; a pants and overalls department wid its own floor-walker;

a pick and shovel committee wid its chairman who is a gr'muliet in iron and steel; and so on, and so on. Hennessy adds wan new department or Commitoo a week, same's you do; and he's growing like *WXXX* punkin vines, running all over ivry where, same's you be.

But I'll tell ye thies. Hennessy dont be putting no collidge perfiessors on the floor walkers jobs. Bet yer life he dont. Now take fer instance yure Committee on Mining Jolligy. Who'd ever want to moine Jolligy. Jeecligy means rooks and no mining man mines rooks if he can help it. He mines ore. But if ye must have this Committee it's a dam good wan fur the collidge perfiessors. Round 'em all up and put 'em on it. I hear ye tried to git wan of thim who hadn't been a collidge perfiessor very long fur the floor-walker of this committee, but he wouldn't stay on the job. Geel if he'd been a collidge perfiessor ten years ye couldn't a pried him off wid a crow-bar.

And then, there's the 'I run and Sntel' Committee; ye've got another wan o' thim high-brows there. I dont know what it'll be coming to. After a good practical man like yerself, and after the great, practical journalist of the Institoot set it a-going, it's too bad to lave the papers on good, furnise cinder and pig iron behind, and disooc the 'Ag diagram o' Carbon' which doant say nothing about iron or steeel eether. Now take the Petroleum and Gas Depart-

ment, under the greatest Floor-walker of thim all, me old frind Cap'n Tony Lucas. Look what he do be doin'. So much Gas it do take three full days of the annual meeting to blow it off, and all the other Departments o'n go to *WXXX* some other building to meet in.

And now I must say a word for yure Secret'ry, the reformed high-brow. Ye ought him young enough to make quite a man of him yet, and I do be hearing the boys say he's the rale stuff.

I oom to me bill, and I head of me parther, Ben Tibby from ventilating yure Institoot anny more. Angthor, I've had me char to pay me respicks to yer old high-brow and I'd rather do the job fur muthin' than not hev the ohanot.

Respect'ly
Patrik Corrigan
Consulting Miner.

P. S. I didn't know there was to be ladies pristin or I wouldn't a let in a single dam.

85% obtained in Mexico, which country he considered to be the home of silver cyaniding. Mr. Packard objected to crediting Mexico with having originated the cyanidation of silver ores, noting some early work along that line in Utah and Montana. Mr. Chauvenet told of going to the Black Hills in the early days of cyaniding, where the Homestake was sending \$3000 per day down the creek in the tailings, of his successful treatment of these tailings, and of his recommendation of Charles Merrill as the man to build that company a cyanide plant. He attributed the great advance in the art of cyaniding to the perfection of the filter. Reginald E. Hore gave a brief summary of the progress of low-grade ore treatment at Cobalt; the early attempt at cyanidation made by the Buffalo company did not find many imitators and the Nipissing was the first really successful plant, this success being largely due to the method of desulphurization.

The afternoon session was devoted almost wholly to papers and discussions on electricity applied to mining. William Kelly acting as chairman. Two papers, by C. M. Means and H. H. Clark, on safeguarding electricity underground, provoked some discussion. Mr. Rice stated that the portable electric plant was of especial value in coal mining, but might some day become standard in metal mines. Mr. Clark, replying to a question, said that before long a thoroughly satisfactory electric lamp of the storage-battery, hat type would probably be on the market, weighing as little as 3½ lb. Mr. Tillson asked for information on the primary-battery lamp, stating that the storage-battery type had been found too heavy by the New Jersey Zinc Co., although offering the great advantage of increased safety around the powder magazine.

In the discussion of H. W. Rogers' paper on the electrical mechanical shovel, Mr. Spilsbury asked whether the high peaks could not be ironed out by using the Ward Leonard flywheel set. Mr. Rogers said he had figured on that for a 120-ton shovel, but that four units were necessary, taking up 20 ft. and there was no room for them on the shovel, while if they could be got on, they were far too expensive. A paper not on the program, written by Sanford B. Belden, of the Jeffrey Mfg. Co., and describing recent developments in electric locomotives, coal cutters and mechanical loaders, was read by Mr. Dunlap.

Mr. Rand announced that at a meeting of the directors at noon, the following executive officers were elected for the coming year: Sidney J. Jennings, first vice-president; George C. Stone, treasurer; Bradley Stoughton, secretary; and B. A. Robinson, assistant secretary.

Part of Mr. Legrand's paper on electrical haulage at the Copper Queen was read by Mr. Kelly. Mr. LeFevre read a paper not on the program, describing the extensive use of electricity at the Witherbee-Sherman mines and mills. Mr. Kelly ran over briefly the paper by himself and Mr. Armstrong, describing the electrical installations at the Penn mines. In reply to questions by Mr. Pauly, Mr. Armstrong stated that the saving in maintenance on the electrical centrifugal pumps, as against the older steam-driven plunger pumps, was chiefly on the water end, and that in the unique type of water rheostat used, the resistance could be anything desired and the slip varied from 20 to 6%, the usual slip in running being from 7 to 8%. Mr. Tillson asked whether, with the grounded system of electric signaling any trouble was had with "spook" signals as at Franklin Furnace?, Mr. Armstrong said they had no such trouble.

J. E. Johnson, Jr., started something by asking how the hoisting efficiency at the Penn compared with that obtained at the Anaconda by the Nordberg air hoists, where he understood an efficiency of 50% was obtained, the work having been undertaken by Mr. Nordberg after the electric hoist manufacturers had refused to bid under the hard specifications imposed. Mr. Pauly then demanded to know where the gentleman got his figure of 50%, saying that he had the real figures which showed 29% and at that the air had to be reheated. Furthermore, his experience was that one of the most troublesome pieces of machinery in existence was the air-end of an air compressor. Mr. Johnson retorted that the overall efficiency in Butte had been published at 50% and that when it came to trouble an electric motor had it all over the air-end of a compressor for keeping a man awake longer at night for more nights in the year. Unfortunately the exigencies of time required that this highly entertaining and valuable discussion be cut off in its youth.

Mr. Saunders, in introducing himself and his paper on electric-air drilling performance at the Kensico dam, remarked that the last time he was called into consultation on a balky, power-driven air compressor, he had found the motor at fault and not the air cylinders. He called attention to the fact that the excavation and quarry work at Kensico furnished the first instance where electricity had done all the drilling on a large job, and that this was the first successful operation of the electric-air drill mounted on a carriage for large, deep holes. With some discussion of Mr. Donaldson's paper on grouting in shaft sinking, the meeting came to an end within five minutes of the time set, a remarkable achievement.

If the zest of battle which made last year's meeting so interesting were missing this year, in technical value the 1914 meeting was far superior. Two papers, particularly in the fields covered by the JOURNAL, merit special mention, namely, that entitled, "The Mill and Metallurgical Practice of the Nipissing Mining Co., Ltd., Cobalt, Ont.," by James Johnston, and "The Use of Electricity at the Penn and Republic Iron Mines, Michigan," by William Kelly and F. H. Armstrong. These two papers in their fields may be fairly said to reach the high-water mark of technical value.

On Tuesday evening, a session was held at the Museum of Natural History, where the Copper Queen mine model was on exhibition. The first part of the evening was devoted to an illustrated lecture, "Placer Mining in British Columbia," in which H. W. Du Bois described some of the hydraulicking operations with which he had been intimately associated. He discussed especially the high-carbon sluice plates by reason of which costs had been much reduced, and showed pictures of the latest sluices, using 40-lb. manganese-steel rails at the head for about 300 ft., and then the high-carbon (1.25% C) plates. In concluding the lecture, Mr. Du Bois showed some interesting views of the Canadian Rockies, the game and flora of the region, and motion pictures illustrating the conditions encountered in prospecting the country, which is promised an increased development by the Canadian railroad extensions now building.

Preceding the exhibition of the Copper Queen mine model, Dr. E. O. Hovey sketched briefly the history and geology of the Warren district, and described the methods used in the preparation of the model, which was the gift of Dr. James Douglas to the American Museum of Natural History. The accompanying picture gives an idea of the model which has been prepared with extreme care as to accuracy and on which Doctor Hovey and from three to six assistants have been engaged for over three years. Some idea of the care used in the preparation of the model will be obtained when it is explained that the corrugations on metal exteriors of the buildings are to scale. The model was made to a scale of 24 ft. to the inch, and is intended to give the lay public a clear conception of a typical American mining district and mine. The part of the district shown by the model is from a point southeast of the Czar shaft, extending south-southeast 5315 ft. to a point 450 ft. beyond the Lowell shaft; in the other direction the model takes in a portion of Queen Hill, practically all of the Spray mine, and extends northeasterly about three-quarters of a mile. The area covered by the model is L-shaped and a vertical section of 1200 ft. is shown. Separate models of some of the shafts were made, and another interesting exhibit was a beautiful limestone grotto encountered in stoping in the Copper Queen mine; this was preserved and presented to the Museum of Natural History some time ago.

Prof. L. D. Huntoon, who acted as chairman of the meeting, then announced a short discourse on mineralogical specimens of the Copper Queen mine, by Prof. James F. Kemp, who said that he would talk about only one specimen of the Copper Queen mine, James Douglas. He sketched briefly Doctor Douglas' active life, his boyhood and studies in Edinburgh, and at Kingston University, his early mining experience in Quebec, the Hunt and Douglas leaching process, and his successful guiding of the Copper Queen mine since 1880. Professor Kemp referred only briefly to Doctor Douglas' contributions to technical literature, which were well known, but spoke specifically of Doctor Douglas' other literary works with which Institute members were not so familiar, such as "Canadian Independence and Imperial Federation," "Quebec in the 17th Century," "Untechnical Addresses on Technical Subjects," "Journals and Reminiscences of James Douglas, M. D." (his father), "New England and New France;" the last just published by Putnam's, con-

trasts the development of the New England colonies with that of New France, Doctor Douglas's birthplace.

After viewing the Copper Queen model, the members and guests were served a collation and the hall containing the North American bird groups of the Museum was kept open for their inspection.

Pig-Iron Production of the United States

The Bureau of Statistics of the American Iron & Steel Association has collected and published statistics of the production of pig iron in the United States for the full year 1913. The total for the second half of the year was 2,010,903 tons below that of the first half. The total for the year is greater than those of Germany and Great Britain combined.

PRODUCTION BY FUELS USED

The production for the years 1912 and 1913, grouped by fuels used, was as follows:

	1912	1913	Changes
Coke and bituminous.....	29,132,733	30,348,973	I. 1,216,240
Anthracite and coke.....	236,467	254,901	I. 18,434
Anthracite alone.....	10,712	22,446	I. 11,734
Charcoal.....	347,025	339,981	D 7,044
Total.....	29,726,937	30,966,301	I. 1,239,364

Only a very few stacks use raw bituminous coal. Practically almost 98 per cent. of our pig iron is made with coke as fuel. The total increase in 1913 was 4.2% over the previous year.

The production in 1913 was the largest reported in any calendar year in our history. If, however, we combine the output of the second half of 1912 with that of the first half of 1913, a total is reached for the twelve consecutive months of 32,143,265 tons, or 1,176,964 tons more than in the calendar year just closed.

PRODUCTION BY USES OF IRON

The production of pig iron for two years past, classified by the uses for which it was intended, was as follows, in long tons:

	1912		1913	
	Tons	Per Cent.	Tons	Per Cent.
Bessemer.....	11,381,656	38.3	11,276,567	36.4
Low-phosphorous.....	232,359	1.0	316,818	1.0
Basic.....	11,417,886	38.4	12,537,746	40.5
Ferromanganese.....	125,378	0.4	119,496	0.4
Spiegeleisen.....	96,316	0.3	110,338	0.4
Charcoal iron.....	317,025	1.2	339,981	1.1
Foundry, forge, etc.....	6,076,287	20.4	6,265,355	20.2
Total.....	29,726,937	100.0	30,966,301	100.0

Included in charcoal iron is a small quantity made with charcoal and electricity; also 3332 tons of ferro-phosphorus. In 1913 for the first time a division was made of merchant iron. Of the total given above 21,232,063 tons, or 68.6%, were made for the consumption of the makers in conversion into steel or other forms; 9,734,238 tons, or 31.4% for sale as pig iron.

Akin to this is the division below, which shows the forms in which the pig iron was used, whether delivered directly to mixers, openhearth furnaces, or cast ready for a second fusion:

	1912		1913	
	Tons	Per Cent.	Tons	Per Cent.
Used in molten condition.....	16,466,722	55.4	16,738,952	54.1
Sand cast pig.....	6,309,495	21.2	6,689,680	21.6
Machine cast pig.....	6,214,127	20.9	6,522,075	21.1
Chill cast pig.....	726,077	2.5	1,000,172	3.2
Direct castings.....	10,582	.....	15,422	.....
Total.....	29,726,937	100.0	30,966,301	.....

These details were not reported prior to 1912. They show that the practice of using molten metal, either direct from the furnace or through a mixer, continues to grow from year to year in the steel works.

CONDITION OF FURNACES

There were 355 stacks actually in blast during a part or the whole of 1913. The number active during the year was 313 on Jan. 1; 304 on June 30, and 205 on Dec. 31. The total number of furnaces standing on Dec. 31 last was 462, so that 257 were idle. This includes, however, a number of old furnaces, which are not likely to be in blast again. In 1913 there were five new blast furnaces built, having a total capacity of 596,000 tons yearly; and one charcoal furnace of 13,500 tons capacity was revived and rebuilt. At the close of 1913 there were three new furnaces in course of erection and eight being rebuilt. These will have a yearly capacity of 505,000 tons of iron. During the year 10 furnaces, with a nominal capacity of 316,000 tons, were finally abandoned or dismantled. Nearly all of them had been idle for many years.

The following table gives the production of pig iron by states in 1912 and 1913. Gross tons are used:

	1912	1913
Pennsylvania.....	12,552,131	12,954,940
Ohio.....	6,802,493	7,129,525
Illinois.....	2,887,359	2,927,977
New York and New Jersey.....	1,976,107	2,187,620
Alabama.....	1,862,681	2,057,911
Indiana and Michigan.....	1,770,628	1,775,883
Wisconsin and Minn.....	303,370	367,326
Virginia.....	256,167	341,815
Mo., Colorado, and Calif.....	397,731	324,263
West Va., Ky., & Miss.....	343,120	315,731
Maryland.....	219,546	289,959
Tennessee.....	338,238	280,541
Connecticut and Mass.....	17,366	12,810
Total.....	29,726,937	30,966,301

Georgia, Texas, Oregon and Washington were the only states having one or more blast furnaces that did not make pig iron in 1913. California, which does not have a blast furnace, produced a small tonnage of pig iron in an electric furnace. Georgia last made pig iron in 1911, Washington in 1910, Texas in 1909, and Oregon in 1894. For the first time in over 40 years, and probably for the first time in its history, Mississippi appears in 1913 among the states which made pig iron.

Standard Oil Gets Concession in China

Announcement is made of the granting of a concession by the Chinese government for the development of unassigned petroleum resources in the Provinces of Shen-Si, Shan-Si, and part of the Province of Chi-Li. These provinces are in the northern part of old China south of the great wall. The concession is in the nature of a partnership agreement with the Chinese government and the Standard Oil Co., and does not involve the loan of \$15,000,000 as provided in the preliminary negotiations. It is now proposed that an American-Chinese company be formed, in which the government shall have a minority interest, and in return aid in every way the exploratory and development work of the American engineers. It is understood that should development prove unsatisfactory in the above-mentioned field the territory covered by the agreement may be extended. W. E. Bemis, a vice-president of the Standard Oil Co., of New York, is quoted as saying:

The Chinese authorities agreed to make arrangements with land owners for the laying of our pipe lines, the building of railroads and storehouses, and, of course, for the free operation of plants in such fields as we may discover. We have had geologists and experts in the oil business looking over the ground for some time, and when their reports come in, the company will be ready to start developments. The Standard Oil Co. has invested \$20,000,000 in China since 1903, and the company has 20 steamers plying across the Pacific, carrying annually between two million and three million barrels of oil.

Our agreement with China will lead to a tremendous expansion of business in that country. We ourselves are prepared to spend between \$6,000,000 and \$10,000,000 in development work if the results of exploration warrant. The drilling machinery is now being assembled for shipment from San Francisco and will go forward early in March.

A dispatch from Peking under date of Feb. 15., states that the Chinese government will receive 37½% of the stock of the American-Chinese company, with the privilege of purchasing an additional 7½% within two years after the formation of the company. The Standard Oil company will retain a minimum of 55% of the stock. It is interesting to recall that Japanese endeavored unsuccessfully to negotiate a concession covering practically the same territory as above mentioned even at the time when the negotiations provided a \$15,000,000 loan to the Chinese government. However, Japanese interests have lately undertaken several small petroleum operations in this part of the Chinese empire.

Treasury Rulings on Depreciation

WASHINGTON CORRESPONDENCE

On Feb. 12, the Treasury Department issued "Regulations No. 33" in which are included new and extensive provisions with reference to the payment of the income tax by various classes of corporations. Among these are important regulations with regard to the establishment of depreciation by mining companies, a subject that has been under litigation during the past year. It is provided that:

Art. 141. The depreciation of coal, iron, oil, gas and all other natural deposits must be based upon the actual cost of the properties containing such deposits. In no case shall the annual deduction on this account exceed 5% of the gross value at the mine (well, etc.) of the output for the year for which the computation is made.

Art. 142. The term "gross value at the mine," as used in paragraphs B and G of Sec. 2 of the act of Oct. 3, 1913, prescribing a limit to the amount which may be deducted in the return of individuals and corporations as depreciation in the case of mines, is held to mean the market value of ore, coal, crude oil, and gas at the mine or well, where such value is established by actual sales at the mine or well; and in case the market value of the product of the mine or well is established at some place other than at the mine or well, or on the basis of the bullion or metallic value of the ore, then the gross value at the mine is held to be the value of the ore, coal, oil, or gas sold, or of the metal produced, less transportation, reduction and smelting charges.

If the rate of 5% per annum shall return to the corporation its capital investment prior to the exhaustion of the deposits, the rate on which the annual deduction for depletion of deposits is based must be lowered in accordance with the estimated number of years it will take to exhaust the estimated reserves. In case the reserves shall be in excess of the estimates, no further deduction on account of depletion shall be made where the capital investment has been returned to the corporation.

Art. 143. In addition to the deduction to measure the loss due to depletion, the corporation will be allowed the usual depreciation of its machinery, equipment, etc., such depreciation to be determined on the basis of the cost and estimated life of the property with respect to which the depreciation is claimed.

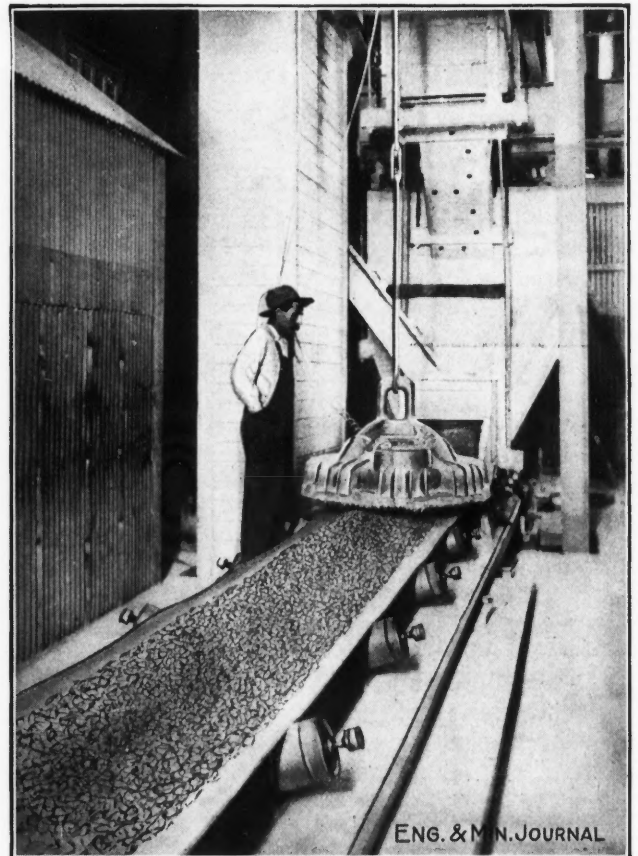
Art. 144. Corporations leasing oil or gas territory shall base their depletion deduction upon the cost of the lease, and not upon the estimated value, in place, of the oil or gas.

Art. 145. Corporations operating mines (including oil or gas wells) upon a royalty basis only cannot claim depreciation because of the exhaustion of the deposits.

Art. 146. Unearned increment will not be considered in fixing the value on which depreciation shall be based.

Magnet to Remove Iron from Ore

The accompanying photograph shows one of the magnets used in the Miami mill at Miami, Ariz., to remove iron from the crushed ore. There are two of these magnets used. Besides the one shown in the accompanying engraving, another magnet is placed over the inclined



MAGNET TO REMOVE IRON FROM ORE IN THE MIAMI MILL, ARIZONA

conveyor that takes the products of the crushing plant to the concentrating mill proper. This conveyor feeds into a bin from which a second conveyor distributes the ore to the circular-mill bins, the magnet shown in the accompanying photograph being over the latter conveyor. The ore handled by this conveyor has all been crushed to pass through ¾ in., about 6% being retained on a ½-in. screen.

The magnets, which were made by the Electric Controller & Manufacturing Co., of Cleveland, Ohio, were placed over the chutes leading to the gyratory crusher originally, but it was found that they did not remove all of the iron at these points, and more satisfactory results have been obtained by using the magnets in their present positions.

PERSONALS

B. B. Thayer has returned from Butte.

George H. Garrey, who was in Chicago last week, is now in Missouri.

Homer L. Carr left New York on Feb. 20 to make a mine examination in Honduras.

W. M. Henderson Scott has left for Honduras on business connected with Breitung & Co.

Kirby Thomas has returned to New York from a professional trip to North Carolina.

David McClure has left San Francisco for a trip through the mining regions of South America.

J. M. Kurie, formerly at Philadelphia, is now at 625 I. W. Hellman Building, Los Angeles, California.

F. Lynwood Garrison, who has been in Colorado on professional business, returned home this week.

T. M. Owen, formerly in the flotation department of the Broken Hill Proprietary Co. is visiting in the United States.

H. F. Lefevre, who was about to depart for Arizona, will be detained in New York about 10 days by a minor operation on his throat.

C. M. Eye has just completed a 200-ton mill for the Imperial Reduction Co., near Ogilby, Calif., where he has charge of the mining property.

Carl J. Trauerman, of the metallurgical firm of Rothwell & Trauerman, Butte, Mont., will take charge of the milling operations of the Bully Boy Co., Marysvale, Utah, after Mar. 1.

Newton B. Knox has returned from Colombia, and has been lecturing on alluvial mining before students of Columbia, Harvard, Yale and the Massachusetts Institute of Technology. He leaves New York, Feb. 21, for London.

Joseph W. Boyle, general manager of the Canadian Klondyke Mining Co., who has been in New York for some weeks, was called to Woodstock, Ont., recently by the death of his mother. Mr. Boyle will be in New York again before returning to the Klondyke.

Jesse Scobey has just retired from the Henry E. Wood Ore Testing Co., Denver, of which he was vice-president, and will give his entire attention to the operations of the Compania Minera La Luz y Los Angeles, the largest gold producer of Nicaragua. His headquarters will be in Pittsburgh. Mr. Scobey is the inventor of the Scobey tilling sampler, and for 15 years has been active in the metallurgical and mining progress of Colorado, Arizona, Mexico and Nicaragua.

S. F. Shaw is engaged in some work at Frisco, Utah. Nearly every mining property of the American Smelting & Refining Co. in Mexico being closed, he was given a leave of absence to go to Frisco to make some experiments on the dump of tailings of the Horn Silver mine, and also to straighten out the concentration mill, so that the lead-zinc sulphides yet in the mine may be handled at a profit. B. B. Lawrence, of New York, is consulting engineer for the Horn Silver company.

OBITUARY

E. H. Lamont died suddenly at Gunnison, Colo., Feb. 3. He had an office in that town, but most of his time was spent at Ohio City. Mr. Lamont some years ago acquired a series of properties at Ohio City and organized the Raymond Consolidated Mines Co. He organized a number of other companies and was well known among mining men in that section of Colorado.

Captain William Wivell, who was in charge of the underground work at the Crosby mine, Nashwauk, Minn., for the Cleveland-Cliffs Iron Co., died on Feb. 9. He was 64 years of age and had spent over 40 years in the Lake Superior district. Upon coming to this country from Cornwall, he located at Ishpeming, Mich., where he was employed as mining captain at the Moro mine under Frank P. Mills. Later he worked at the Lake mine at the same place, being transferred from there to Minnesota. He was an expert mining man and well thought of in the Lake Superior district.

F. H. Kindl, constructing engineer, Pittsburgh, died in that city Feb. 4, aged 51 years. He was born in Bohemia, Austria, and came to this country when quite young. He

graduated from the Case School of Applied Science in Cleveland in 1884, and after a few years of practical work in Chicago went to Pittsburgh in 1888 and was made chief engineer of the Carnegie Steel Co. In this capacity he had supervision of construction of a number of large buildings, including that occupied by the company in Pittsburgh. From 1900 he carried on the business of consulting engineer, particularly on large buildings. He leaves a widow and three children. He was a member of the German and Union clubs, Pittsburgh; the Engineers' Club, New York; the Technical Society, Pittsburgh, and the Carnegie Veteran Association.

J. H. Fairbank, of Petrolea, Ont., died Feb. 10, aged 82 years. He was known as the largest individual oil producer in Canada and was interested in many industrial enterprises. Mr. Fairbank was born at Rouse's Point, N. Y., and went to Canada in 1853 as a surveyor, becoming prominent in connection with the oil boom at Oil Springs and Petrolea. He effected several improvements in the system of oil production, the most important being the operation of several wells from one central engine, which effected considerable economies in the industry. In later years he was in partnership in the refining business with the late Samuel Rogers, the firm name being Fairbank & Rogers. His interests were afterward taken over by the Imperial Oil Co. Mr. Fairbank took an active part in civic and political affairs and represented East Lambton in the Canadian House of Commons for some years. He leaves a son and daughter.

SOCIETIES

American Concrete Institute—The annual meeting was held in Chicago, Feb. 16-20, when a number of reports and papers on concrete construction were presented.

Canadian Mining Institute—A special circular from the secretary states that the headquarters of the Institute at the annual meeting in Montreal, Mar. 4-6, will not be at the Windsor Hotel as previously announced, but at the Ritz-Carlton Hotel, Sherbrooke St., West.

Mining and Metallurgical Society—The dinner to Mr. and Mrs. Hoover, at which the medal of the society will be presented to them, will be at the Biltmore Hotel, Madison Ave. and 43d St., New York, on Monday, Mar. 9, 1914, at 7 p.m. The Biltmore is the newest of New York's big hotels and is directly opposite the Grand Central railway station and only one block from the subway station.

University of Oregon—The departments of civil engineering in both the Oregon Agricultural College and the University of Oregon have been ordered eliminated by the board of higher curricula. The State Grange had commenced an agitation about the cost of running the colleges so it was decided to cut down expense. This is considered a mistaken ruling as the state will lose by it.

American Electrochemical Society—The next meeting of the New York section will be a joint one with the New York sections of the American Society of Mechanical Engineers and the American Institute of Mining Engineers, and will be held in the Engineering Societies Building, 29 West 39th Street, New York, at 8.15 p.m., Mar. 10. Edward Van Winkle will preside. The subject for the evening will be "Color Photography, Its Processes and Results by Originators of the Processes." The speakers are F. E. Ives, Westley Allison, John Powrie, Henry Hess and C. W. Robinson.

Idaho Society of Engineers—At a meeting on Feb. 6, following the conference of the Reclamation Service, this society elected the following officers for the year: President, E. G. Eagleston, Boise; vice-president, R. G. White, Wallace; secretary, Ira F. Shaffner, Boise; treasurer, Fred H. McConnell, Caldwell; executive committee, J. P. Congdon, Boise; Fred A. Wilkie, Ashton, and E. A. Wilcox, Twin Falls. J. W. Shepherd, in charge of construction work on the Rogers Pass tunnel of the Central Pacific, gave an address on "Problems and Methods of Fixing Tunnels." Barry Dibble, of Minidoka, spoke on "Electrical Manufacture of Nitrate Fertilizer." Mine Inspector Bell spoke on "Idaho's Mineral Resources."

Transvaal Mining Exhibition—The third annual mining exhibition under the auspices of the Chemical, Metallurgical & Mining Society of South Africa, will be held at Johannesburg, Transvaal. The exhibition will open on May 19, and will close on May 29. The scope of the exhibition will be on much the same lines as in previous years: Chemical, metallurgical and mining apparatus and devices for laboratories, works and mines; models, working or otherwise, of apparatus for similar purposes; plans; diagrams, etc., of mines,

works, plants, machinery and apparatus; safety and rescue and other ambulance apparatus and appliances; and specimens of crude and manufactured mineral or other natural products of South Africa. The Exhibition is primarily for the benefit and information of those engaged and interested in mining work, and to give those in search of mineral products an opportunity of ascertaining where these products may be obtained. Fred Rowland, P. O. box 1183, Johannesburg, Transvaal, is secretary in charge.

INDUSTRIAL NEWS

The Hardinge Conical Mill Co., of 50 Church St., New York, has had an active demand in South America, not only for the Hardinge pebble mill but also for Hardinge ball mills, especially when sectionalized for muleback transportation. Among the South American orders which they have had are: Braden Copper Co., 36 Hardinge pebble mills; these vary from 22 to 36 in. in the cylindrical portion and have a diameter of eight feet. They are used for grinding, preparatory to concentration by the Minerals Separation process. The Bar Principal Mining Co., Guamocho, Colombia, has purchased one 4½-ft. by 13-in. ball mill and one 6-ft. by 48-in. pebble mill. In Bolivia, the Olla de Oro Gold Mining Co., of La Paz, has purchased one 4½-ft. by 13-in. sectionalized Hardinge ball mill and one 6-ft. by 22-in. sectionalized Hardinge pebble mill; these are for operating on a free-milling gold-bearing quartz, amalgamation being practiced following the Hardinge mill. The Incaoro Mines Co., of La Paz, purchased a similar equipment and, in Peru, the Buldibuyo Gold Mining Co. has a 3-ft. by 8-in. sectionalized Hardinge ball mill driven by water power; amalgamation is practiced following the ball mill. Emilio F. Wagner, a machinery agent at Lima, has purchased a 4½-ft. by 13-in. Hardinge ball mill for use in Peru, and R. G. Barthold & Co., of 4 Stone St., New York, have exported two 4½-ft. by 13-in. Hardinge ball mills, both of which are being used in Peru.

TRADE CATALOGS

The Marion Steam Shovel Co., Marion, Ohio, Catalog Marion Revolving Shovels. 48 pp. Illus. 8¼x4½ inches.

The Platt Iron Works Co., Dayton, Ohio. Bull. 741; Triplex Power Pumps. 52 pp. Illus. 11x8½ inches.

Nelson Valve Co., Chestnut Hill, Philadelphia, Penn. Folder. "Triple Tested"—Iron body gate valves. Illustrated.

Electric Weighing Co., 180 13th Ave., New York, N. Y. Catalog. Electric Conveyor Scales. Messiter Patents. 8 pp. Illus., 9x6 inches.

Industrial Works, Bay City, Mich. Book No. 108. Locomotive cranes. 56 pp. Illus., 6x9 inches.

The Wm. Powell Co., Cincinnati, Ohio. Booklet. White Star valves. 16 pp. Illus., 3½x6 inches.

The Brown Hoisting Machinery Co., Cleveland, Ohio. Pamphlet C. Brownhoist safety crabs and winches. 8 pp. Illus., 6x9 inches.

Alberger Pump & Condenser Co., 140 Cedar St., New York. Bulletin No. 18. Spiroflow surface condensers. 32 pp. Illus., 6x9 inches.

National Tube Co., Frick Bldg., Pittsburgh, Penn., "National" Bulletin No. 18A. "National" Reamed and Drifted Pipe. 12 pp. Illus. 11x8 inches.

Quigley Furnace & Foundry Co., 105 West 40th St., New York, N. Y. Bulletin No. 4. Powdered Coal as Fuel. 8 pp. 11x8½ inches.

This bulletin describes the method of powdered-fuel firing.

Pacific Tank & Pipe Co., San Francisco, Calif. Hydraulic Data. 96 pp. Illus. 5x7 inches.

The advantages of wood-stave pipe are presented in this volume. Besides its line of cyanide tanks, this company makes a specialty of the manufacture of Douglas fir pipe at its Portland factory, and redwood pipe at the San Francisco and Los Angeles factories. Engineering data required in the installation of wood-stave pipe, collected by H. T. Coale, chief engineer of the Pacific Tank & Pipe Co., have been incorporated in this volume, on which a nominal price of \$2 has been placed.

NEW PATENTS

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

CONCENTRATOR—Ore Concentrator. Henry Earle, Montreal, Quebec. (U. S. No. 1,085,596; Feb. 3, 1914.)

COPPER-CLAD STEEL—Process of Making Clad Metals. William Marshall Page, Philadelphia, Penn. (U. S. No. 1,084,474; Jan. 13, 1914.)

CRUCIBLE—Metallurgical-Furnace Part. Willis W. Case, Jr., Denver, Colo. (U. S. No. 1,085,540; Jan. 27, 1914.)

CRUSHING—Ball Mill. Charles Lewis Carman, Riverside, Calif. (U. S. No. 1,085,109; Jan. 27, 1914.)

CRUSHING—Lifting Mechanism for Stamp Mills and the Like. Theodor Frey, Hochdorf, Switzerland. (U. S. No. 1,086,151; Feb. 3, 1914.)

CRUSHING—Manganese-Steel Stamp Shoe. Frank A. Haughton, Iliou, N. Y. (U. S. No. 1,085,861; Feb. 3, 1914.)

CRUSHING MILL. Thomas Leggett Sturtevant, Quincy, and Thomas Joseph Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Co. (U. S. No. 1,083,951; Jan. 13, 1914.)

DRILL—Electrically Driven Drill. Walter F. Trotter, Charleston, W. Va., assignor to the Jeffrey Manufacturing Co. (U. S. No. 1,086,797; Feb. 10, 1914.)

DRILL SUPPORT. Josef Kubát, Kladno, Austria-Hungary. (U. S. No. 1,085,344; Jan. 24, 1914.)

DRILLS—Drill-Holding Head for Miners' Drills. Cornelius E. Holt, Washingtonville, and Provost R. Rauch, Leetonia, Ohio, assignors to the Leetonia Tool Co., Leetonia, Ohio. (U. S. No. 1,085,811; Feb. 3, 1914.)

DRILLS—Post Collar for Rock Drills. Richard Netteli, Houghton, Mich. (U. S. No. 1,085,467; Jan. 27, 1914.)

DRILLS—Pressure-Reducing Valve for Air-Feed Drills. Albert H. Taylor and Lewis C. Bayles, Easton, Penn., assignors to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,086,413; Feb. 10, 1914.)

DRILLS—Rotating Means for Rock Drills. Daniel F. Waugh, Denver, Colo., assignor to the Denver Rock Drill Manufacturing Co., Denver, Colo. (U. S. No. 1,084,183; Jan. 13, 1914.)

ELECTRIC ZINC FURNACE with Integral Compound Resistors and Compound Condensers. John Thomson, New York, N. Y. (U. S. No. 1,086,416; Feb. 10, 1914.)

ELECTRIC ZINC FURNACE with Integral Condenser. John Thomson, New York, N. Y. (U. S. Nos. 1,086,414; 1,086,415; 1,086,417; 1,086,418; Feb. 10, 1914.)

EXCAVATING BUCKET. Joseph W. Porter, Marysville, Calif. (U. S. No. 1,084,662; Jan. 20, 1914.)

FLOTATION PROCESS—Apparatus for Agitating and Aërating Liquids or Pulps. Allen Crawford Howard, London, England, assignor to Minerals Separation, Ltd., London, England. (U. S. No. 1,084,210; Jan. 13, 1914.)

LAMPS—Igniter for Miners' Lamps. Lorenzo D. Vaughn and Theodore Miller, Grafton, W. Va. (U. S. No. 1,084,872; Jan. 20, 1914.)

LEACHING PROCESS of Treating Ores. Charles J. Best, Oakland, Calif. (U. S. No. 1,084,600; Jan. 20, 1914.)

PHOSPHORIC ACID, Method of Manufacturing. Maximilian Mattheus Haff, Ottawa, Ont., assignor to Thomas Leopold Willson, Ottawa, Ont. (U. S. No. 1,084,856; Jan. 20, 1914.)

RADIUM—Method of Obtaining the Radioactive Matter in Thorium-Containing Solutions. Fritz Glaser, Wiesbaden, Germany, assignor to Charles Glaser, Baltimore, Md. (U. S. No. 1,084,734; Jan. 20, 1914.)

REDUCTION FURNACES, Muffle for. Alexander Roitzheim, Duisburg-Ruhrort, Germany. (U. S. No. 1,086,939; Feb. 10, 1914.)

REGENERATIVE FURNACE—Reversing Regenerative Furnace. Luther L. Knox, Avalon, Penn., assignor to Keystone Furnace Construction Co., Pittsburgh, Penn. (U. S. No. 1,085,138 and 1,085,139; Jan. 27, 1914.)

REGENERATIVE FURNACES, Gas Port for. Alan Wood, 3d, Conshohocken, Penn. (U. S. No. 1,084,688; Jan. 20, 1914.)

ROASTING—Metallurgical Furnace. Utley Wedge, Ardmore, Penn. (U. S. No. 1,086,494; Feb. 10, 1914.)

ROASTING FURNACE. John B. F. Herreshoff, New York, N. Y., assignor, by mesne assignments, to Nichols Copper Co., New York, N. Y. (U. S. No. 1,085,419; Jan. 27, 1914.)

SCREENING APPARATUS. Leslie M. Sheridan, Anaconda, Mont. (U. S. No. 1,085,997; Feb. 3, 1914.)

SEPARATION—Method and Apparatus for Separating Ores or the Like. Oscar Alfred Zander, Guldsmeshyttan, Sweden. (U. S. No. 1,083,979; Jan. 13, 1914.)

SEPARATOR—Apparatus for Washing and Separating Sand, Ore, and the Like. Henry O. Johnson, Buda, Ill. (U. S. No. 1,086,183; Feb. 3, 1914.)

SMELTING FUMES—Fume-Condensing Apparatus. William R. Heslewood, Oakland, Calif., assignor, by mesne assignments, to South Fork Smelting Co., Oakland, Calif. (U. S. No. 1,3684, reissue; Feb. 10, 1914.)

SMELTING—Spout for Ore-Smelting Furnaces. Callie Cook Benton, Gary, Ind. (U. S. No. 1,086,884; Feb. 10, 1914.)

TIN—Process of Detinning. Franz von Kügelgon, Holcombs Rock, Va., and George O. Seward, East Orange, N. J., assignors, by mesne assignments, to Columbia-Knickerbocker Trust Co., trustee. (U. S. No. 1,086,921; Feb. 10, 1914.)

Editorial Correspondence

SAN FRANCISCO—Feb. 11

Examination of the Zella Mine at Jackson, Amador County, has just been completed by Robert E. Cranston, of San Francisco, consulting engineer for Breitung & Co. The examination was confined chiefly to the new orebody recently disclosed and developed from the 1570-ft. level in a winze 450 ft. deep. There is a drift at the 1570-ft., another 157 ft. deeper and another at the bottom of the winze. These drifts run each way on the orebody. The situation of the orebody is about 3000 ft. north of the collar of the shaft; the average dip is about 63° east. It is on the contact of schists and Calaveras slates, and is not a part of the central belt or Mother Lode proper, but lies east of the hanging-wall side of the central belt. The property is south and east of the Kennedy mine and extends 5000 ft. along the north and south strike of the formation. The mine has been kept open during the last month only for this examination, which occupied three weeks. The economic development and profitable operation of the property will necessitate the sinking of a new shaft to a depth of 2000 ft. and building a new mill. Should the mine not be sold there is no reasonable probability that the present owners would undertake improvements.

A Grant to Standard Oil Co. of permission to sell \$4,518,200 stock issue at par to present stockholders, has been made by State Railroad Commission. This stock at present market quotations is worth over \$12,000,000. The decision of the commission points out that the Standard is and will be at all times amply able to finance that portion of its business which the commission may declare public-utility business, and therefore the granting of the permission asked can in no way injure the public. The commission distinctly states that the granting of this permission must not be construed to establish a precedent. Further reason for granting the application is that it has been customary for the Standard to adopt this method, the selling of stock to its present stockholders at par, when financing an undertaking, and that to insist upon departure from this method would be a serious embarrassment. If it shall be found later that the Standard pipe line is not a public utility the commission declares that this decision will have done no harm. It was suggested that the same amount of money could have been secured by selling a much smaller amount of stock in the open market at, say, \$280 per share instead of making its present stockholders a gift of the difference between that price and \$100, the par value. The main question, however, and the only one upon which there was any argument, was as to the propriety of selling the stock at par; and the decision declares that in the first case hereafter presented to the commission in which jurisdiction is undoubted this main question will be determined. The commission suggested to the Standard, and other corporations, of course, that they had better not rely on the commission in further or other applications of this character. If this rule be laid down for the Standard in California today, why should not the same rule apply to the Standard and to other corporations tomorrow? The next move in order would be for the commission to declare the Standard pipe line not a public utility, and warn all other corporations that such ruling must not be taken as establishing a precedent.

DENVER—Feb. 13

The Congressional Strike Investigation Committee has been holding sessions for three days in the senate chamber of the Colorado capitol. The investigations thus far indicate that the committee intends to probe impartially into the political and social conditions in the coal fields. James Dalrymple, state coal-mine inspector, blamed the operators for the death of 111 miners during the last year through failure to comply with law. James Adams testified that he lived in Joplin, Mo.; that he had engaged to come to Colorado to work on an irrigation dam and to purchase irrigable land with his earnings; that, with 53 other men, he was transported to Colorado with no fore-knowledge of the deception played upon them; that his party first learned of a coal strike when their train was boarded at La Junta, Colo., by militiamen; that they were escorted to Delagua and ordered to work in the coal mines there; that he and some others attempted to escape but were forced to return by the militiamen; that he finally escaped by walking 22 miles through deep snow.

His testimony was faulty in many respects, especially when he failed to identify his own signature to a contract. This and other such testimony was an effort on the part of the union leaders to prove peonage, but inasmuch as there is no mine at Suffield where one witness said he was forcibly made to work the testimony fell rather flat. Thus far, the most important witness examined has been John R. Lawson, Colorado member of the executive board of the United Mine Workers of America. He was allowed to give his testimony in his own fashion, and he went into long detail regarding the causes that led up to this strike. He said that the operators had never conceded anything except when positively forced to do so by threats of strike; that union organizers had been murdered by mine guards, but that prosecution of the murderers was always conducted by packed juries. He, too, accused the public officials of crooked practices. He spoke of the "Battle of Hastings" and "The Battle of Forbes" as though they were historic events, and he swore that the strikers in the tent colonies were denied militia protection. The committee will resume its investigations in rooms of the Trinidad Chamber of Commerce. It will investigate the powers of the militia, and the infractions of laws regarding habeas corpus and rights of liberty, and it will probably give personal inspection of the tent colonies and sociological conditions in the coal camps. So far, the investigation has shown tense feelings on both sides. Numerous witnesses other than those above mentioned gave testimony, but so far they have all been called by the union side of the argument, the operators reserving their testimony until the last, if possible.

CALUMET—Feb. 14

The Strike Investigation began Monday afternoon, Feb. 9, and the Federation side of the controversy was heard first. Several witnesses were placed on the stand by the Federation, testifying as to conditions, wages received, etc. Numerous pay-checks were introduced, several of them being many years old. Men testified to conditions under which they worked and gave their particular individual grievances, but these, so far, have not revealed any concerted grievances affecting the entire working body, with the possible exception that they were required to work. Attorney Hilton, for the Federation, reiterated his charge that the Citizens Alliance was responsible for the Christmas Eve disaster in Italian Hall, where 72 lives were lost, mostly children, through the false alarm of fire. The committee will adjourn to Calumet to take testimony in this incident. Hilton made these charges before the coroner's inquest was made, but the inquest which took several days to conclude and hear from all possible witnesses, exonerated the Alliance from any possible connection with the accident. Conditions and incidents that happened in the district for 25 years and more back are being put in the records. The committee allowing great latitude. La Salle Copper Co. is operating eight machines in No. 1 shaft and has started two machines in No. 2 shaft. Rock shipments are going to the mill. The Franklin has started a small party of men driving a crosscut on the 32nd level. The Copper Range Consolidated is gradually getting back to normal production and shipped on the average 3000 tons of rock to the mill daily the last week.

HIBBING—Feb. 13

Drilling On the Mesabi Range in the Hibbing and Chisholm regions has rarely been as extensive as now. The operations are being conducted by and for the Steel Corporation. The drill work is not exploration in the usual sense of the term, but is, rather, a checking-up process. The lands on which the operations are under way have been tested previously. Their mineral value is known approximately. It is to map out deposits and gain accurate data of the extent, quality and other characteristics of the orebodies that the present work is being done. Since the remainder of the Great Northern lands held by the Steel Corporation are to be surrendered the first of next year, it is advisable that the company open more of its own deposits. The drilling in the Hibbing and Chisholm country is with this object in view. It is expected that the work of opening several mines will be undertaken in the spring. Some of these will rank with the biggest shippers on the range. Not only has the Steel Corporation practically all of its own drills in service, but probably three-score others are being operated under contract. Of these, the Carlson

Exploration Co. alone has 20 in commission. Included among the other contractors are the Longyear company, Cole & McDonald and George A. St. Clair. Two properties that the Steel Corporation is preparing to open in the Virginia district of the Mesabi are the Prindle, a prospective open pit, and the Richelieu, which will be an underground producer. The Prindle is north of the city of Virginia and near the Alpena mine. Its deposit is of large proportions. The Richelieu adjoins the Yates location and is adjacent to the town of Kinney. The overburden is of such depth and character that all the ore will be taken out through shafts.

BRAINERD—Feb. 8

Exploratory Operations Were Hindered last week, on the Cuyuna Range, by temperatures of from 30 to 40° below zero.

Organization of the Minneapolis, Mille Laacs & Northern Ry. Co., which plans constructing a line from Anoka, Minn., near Minneapolis, into the Cuyuna district, its northern terminus probably being Crosby, a total distance of about 150 miles, was announced last week. It is understood that the Soo Line is behind the proposed move. Such a line would give that road a chance to bid for the tonnage on the South Range of the Cuyuna district, now absolutely in control of the Northern Pacific.

The Question of Taxation on Mineral Rights, a matter of first importance to mineral property owners in the Cuyuna district, was brought to a head last week, when the county commissioners of Crow Wing County, in which all active or important portions of the present-known Cuyuna range are located, met with the attorneys of the Pine Tree Lumber Co., a Weyerhaeuser subsidiary. The large land-holding interests in the district have in the past sold their surface but retained the mineral rights. These mineral rights have not heretofore been taxed, although efforts along these lines have been made at various times by the county officials. The results of the recent conference are that the lumber company agrees to pay \$3000 taxes for the years 1906 to 1909 on the mineral rights to 517 parcels of land owned by it in the county. The tax assessed amounted to \$6249.46, the difference being voided by the commissioners.

BUTTE—Feb. 11

Complaint of Bear Creek Coal Operators and those of the Roundup district was recently heard by the railroad commission at Billings. The complaint states that greater shipping advantages are enjoyed by the mine owners of Sheridan, Wyo., due to lower transfer charges between the Burlington and Great Northern than those in effect from the Northern Pacific and Milwaukee to the Great Northern. The complainants assert that coal from Wyoming is brought into Montana under such low charges that the product of the Bear Creek and Roundup mines is excluded. The case was taken under advisement.

JOPLIN—Feb. 14

A New Sludge Mill, that of Mattes Bros., was completed last week. It is west of Joplin and marks perhaps the largest enterprise of that kind in the field and sets a standard of sludge-mill practice that is superior to all other plants in the field with the possible exception of the Oronogo Circle, Priscilla and the American Davey plants. The new plant contains 16 Wildfey tables, besides a number of slimers, settling tanks and spitzkasten of sufficient capacity to care for the settling and sizing of the sands. The new plant will be started up and adjusted within the next 30 days, and some idea of its efficiency and practice can then be obtained. Now, it can only be said that it is the most ambitious plant of its kind in the field. It will be driven by a gas engine and will handle the accumulated slimes from the Duquesne and Jackson mills, which are located upon the Mattes Bros. land. From both of these plants there is a large accumulation and from now on the slimes will be taken directly from the two mills and flumed to the settling tanks at the new plant.

The Treatment of Fines is receiving more attention than heretofore. The Oronogo Circle mill a few years ago did more along that line than any other mill for a number of years. The remarkable results obtained so aroused other operators that there was a general introduction of slime tables in most of the mills. However, no great effort was made to secure proper separation of slime from sand, and losses were heavy. With time and experience has come a much better practice and there seems now to be a determined activity among the larger operators to make a better saving. This has been especially brought home since the low-price period of the last year. The district now has in it such excellent examples of slime practice as the Oronogo Circle, Priscilla, American Davey, Coahuilla, Mattes Bros. and the

Falls City. All of these plants are built with the idea of dewatering and screening all tailings and settling all water used in the milling of the ores. Later a proper classification into sands and slimes and the handling of the various sizes over different tables or slimers. More recently some experimental work has been attempted upon this class of concentration through the use of McQuisten tubes, such as have been installed so successfully in the Morning mine in the Cœur d'Alenes. A company is now working upon this system of concentration at the Priscilla mine, just west of Joplin. The work is being watched with particular interest by most of the larger operators. Still another item of similar interest is the report that one of the largest tailing piles in the Quapaw camp is being investigated and experiments made with a view of trying out some oil-flotation process. With so many different things under trial it appears that there will be a number of interesting developments in the treatment of sand and slimes in the Joplin district during the coming year.

Entrance of the Western Federation of Labor to the Joplin district with a view of directing labor strikes, is a recent development of interest. It is reported that two mines in the Miami camp have a strike on hand, due to the demands of this organization. So far as known, this is the first strike ever called in the district by the Western Federation. It was known that the Federation workers have been making desperate efforts to unionize the labor of the field, but it was unsuspected that their strength had grown to such proportions as to be able to call a strike which would really have any effect upon the district. Although the Federation has been working for several years the number of men enrolled in the local union was said to be small and the organization very unstable. It would appear that in the Miami camp the organization is really obtaining a foothold, even though all previous efforts have failed to command the attention or fidelity of the Joplin miners. There have been strikes at other Joplin mines many times, but it was due entirely to local causes and was never due to nor undertaken by a union organization.

SILVER CITY, N. M.—Feb. 11

All Minors Were Discharged, Feb. 1, from the Chino Copper Co.'s mines and mill. The aggregate number of discharges at Santa Rita and Hurley was several hundred. The new ruling is intended to increase the safety and efficiency of the operations at both camps. The "safety first" movement is becoming of paramount importance in mining operations in the Southwest. Warning notices and safety instructions are becoming conspicuous in all the larger camps, and "Get the Safety Habit" is the slogan.

COBALT—Feb. 13

Delay at Fountain Falls Water Power Plant has been experienced by the Northern Ontario Light & Power Co. in the work of installing machinery, on account of the nondelivery of the electrical apparatus. At present, the waterwheels are being placed in position but the generators have not been shipped. It is expected that in March an additional 3500 hp. will be available for the Cobalt mines from this new power plant and that there will be no danger in the future of the periodical shortages of power which have occurred every year.

A High-Grade Vein on Peterson Lake Property is the most important discovery and event, so far, of the year in the Cobalt camp. At present, there is practically 7 in. of high-grade ore in the face of the drift and the wall rock carries good milling gold. The Peterson Lake company is the owner of the ground leased by the Seneca-Superior and Gould companies and in addition, has considerable territory which has reverted to it by several other companies throwing up the leases that they once held. A short time ago, the company undertook a comprehensive scheme of developing this ground, with the result that this important discovery was made. It is interesting to note that the Seneca-Superior which made such a startling success last year, formerly held the ground on which this new discovery was made. The management of the Seneca-Superior, however, believed that the geological conditions were unfavorable for the occurrence of orebodies and allowed the lease on this particular property to revert to the Peterson Lake company only a few months ago. At one time, half a dozen companies were operating on Peterson Lake, but with the exception of a small amount of ore taken from the Nova Scotia lease, the result of all the development work was nonproductive. It is altogether probable that other veins will be found in this ground as the experience has usually been in Cobalt that productive ground contains a number of veins.

The Mining News

ALABAMA

Jefferson County

WOODWARD IRON CO. (Birmingham)—Third furnace has been blown in making output 1100 tons of pig iron daily.

AUXFORD BROWN ORE CO. (Russellville)—Washer nearly completed. Will probably start latter part of month.

LITTLE RIVER LAND CO. (Birmingham)—Company recently incorporated with capital of \$25,000 to develop coal and mineral lands near Gadsden. E. B. Le Fevre, president; S. E. Jordan, vice-president; W. G. Bellenger, secretary.

SLOSS-SHEFFIELD STEEL & IRON CO. (Russellville)—No. 6 washer started a few weeks ago and is now shipping 150 tons of brown-ore per day. Three shovels are working on approach to washer and when completed better ore will be available. Work has been begun on No. 7 washer, which will be a duplicate of No. 6. Centrifugal pump recently installed in new pumping station is about ready to go into operation.

ARIZONA

Gila County

INTERNATIONAL SMELTING & REFINING CO. (Miami)—Kansas City Structural Steel Co. is making rapid progress with steel work at smelter, machine-shop building being well under way.

INSPIRATION CONSOLIDATED (Miami)—H. K. Porter Co. has shipped from Pittsburgh another locomotive and Pullman company has on road from Chicago thirty-two 60-ton gondola ore cars. General Electric Co. is shipping large 50,000-lb. transformers. Test mill continues to operate three shifts per day, treating ore about as rapidly as mining department is able to hoist it. Week before last four carloads of concentrates were shipped to smelter at Cananea, making a total of nine carloads since mill has been in operation. Oliver filter press is giving satisfaction, since it has been re-wired. Trent filter is being installed and will be given a thorough test.

SUPERIOR & BOSTON (Globe)—Vein has been reached by crosscut on 1000-ft. level. Conditions there are similar to those found previously where sulphides were encountered. Probability is that this strike will be further developed on 1200-ft. level soon. Plans on 1000-ft. level are to explore country east beyond Quo Vadis fault to determine vein conditions. Shipments last month amounted to 31 cars of high grade and 13 cars of low grade. Stope conditions above 800-ft. level were encouraging. High-grade ore has been exposed in every opening recently made directly above this level. Diamond drilling has been continued on 600 level north to determine whether vein showing on surface is of value at this depth. Lessees are at work at Limestone shaft. Black Oxide and old workings under Great Eastern shaft. Shipments from these places last month were seven cars; 4 from Limestone, 2 from Black Oxide and 1 from Great Eastern.

Maricopa County

QUICKSILVER DEPOSITS IN MAZATZAL MOUNTAINS have been recently examined for a foreign syndicate by W. E. Defty, a mining engineer.

LAPIS LAZULI IN PARADISE VALLEY has been found near Cave Creek road. Several of the gem stones have been cut locally; some have been sent to New York for cutting.

MARICOPA QUICKSILVER MINING CO. (Phoenix)—Fourteen claims have been purchased from H. H. Bowman and William Reynolds. They are in Mazatzal mountains in Sunflower district.

Yavapai County

A LIST OF MERITORIOUS MINING PROPERTIES in Yavapai County has been prepared for free distribution by the Prescott Chamber of Commerce. List includes about 160 groups of claims and furnishes information, such as might enable owners or prospectors to create interest with Eastern mining investors. Chamber of Commerce has no financial interest in this list, desiring, solely, to bring miners and promoters together. Some properties are developed sufficiently for presentation to capital. Others are in early stages of development, and a great number are mere prospects which indicate the making of mines. Chamber has not investigated statements made by those furnishing items to this list, which can be secured upon application to Secretary, Prescott Chamber of Commerce, Prescott, Ariz.

CALIFORNIA

Amador County

KEYSTONE (Sutter Creek)—Peter Zaro, chuck tender, has brought suit for \$5000 for injuries to his arm resulting from being struck by a drill which another chuck tender was attempting to remove from a machine.

GRITTON (Volcano)—Mine is closed down, it is reported, because of refusal of State Industrial Accident Commission to undertake insurance of employees. Other insurance companies have also refused. Same refusal is to be expected by other owners of prospective mines.

SOUTH EUREKA (Jackson)—A miner was killed Jan. 26 by falling from a skip, which he had "jumped" at 2300-ft. station. Skip was carrying men off shift at 3:30 p.m. and as it ascended from lower level man, instead of waiting for stop jumped on. He landed on skip but failed to get within, and out of danger of timbering against which his head was caught. He was dropped to bottom, a distance of about 400 ft. This miner and all others had been, as they always are, warned against jumping skips.

Butte County

PENNSYLVANIA DREDGING CO. (Oroville)—State Anti-Débris Association has brought suit to enjoin dumping of dredge tailings in Feather River. Company claims that tailings were accumulated and deposited while dredge was digging its way across river bed, and that it had been previously deposited there by other dredges.

Calaveras County

MELONES (Angles Camp)—It is reported that some rich ore was recently disclosed in an extensive orebody. This is not uncommon in Melones, though it is not often reported.

REINER (Altaville)—Old board of directors has filed another petition in bankruptcy, new board withdrawing its petition for revocation so as to allow matter to be adjudicated by U. S. district court at San Francisco.

Eldorado County

EMMA (Georgetown)—J. J. Meyers and J. J. Dunn have sold a one-third interest in this group of mines on Georgetown divide to W. T. Russell, of Fresno.

Fresno County

CONTACT MINING & MILLING CO. (Trimmer)—Articles of incorporation filed. Capital stock, \$250,000. Directors are: J. K. Apperson, C. C. Overstreet, R. T. McNeil, of Trimmer, M. J. Overstreet, of Lemoore, J. N. Hayes, of Phoenix, Ariz.

Humboldt County

HORSE MOUNTAIN COPPER MINING CO. (Eureka)—At annual meeting of stockholders proposition to build a 50-ton concentrator was considered.

Inyo County

SNOWFALL IN THE SIERRA IN JANUARY was unusually heavy. At South Lake, 7 ft.; Sabrina, 5 ft.; Mt. Montgomery, 7 ft.; Wilshire Bishop Creek mine, 97 in. Observation at Bishop recorded 9.52 in. of rain in 26 days.

SALINE VALLEY SALT CO. (Swansea)—A hot-air dryer is being installed in grinding mill. Cottages will be built at tramway camp. Nine to 15 cars per week are being shipped.

KEANE WONDER (Independence)—In suit of Earl Clemens against Wellington Gregg, Jr., superior court rendered judgment foreclosing trust deed from Keane Wonder to Frances-Mohawk Milling & Leasing Co. and B. J. Tatum. Decree was for \$70,583 in favor of Tatum and \$153,586 in favor of State Bank & Trust Co. Frances-Mohawk interests were settled by stipulation. Clemens sought to enjoin enforcement of trust deed. Supplementary decree of sale is to be made if judgment is not paid.

Imperial County

GOLD CROSS (Brawley)—Thomas S. and W. G. Krutz and T. S. Muller, of Chicago, owners, recently visited this mine, and are reported to have stated that mining will be resumed within a month. Property is said to have been a large producer.

Kern County

PLACER GOLD CO. (Randsburg)—It is reported that a dry-land dredge is being installed.

YELLOW ASTER (Randsburg)—Assay building was destroyed by explosion and fire, Jan. 20, caused by a leak in feed pipe to muffle furnace. Gasoline supply tank was prevented from exploding by shooting holes through sides with a high-power rifle and allowing contents to escape. Carroll Tuttle, was badly burned about face, neck and hands.

COLORADO

Boulder County

YELLOW PINE (Crisman)—A shoot of ore showing masses of wire silver was opened by lessees week before last. Property was formerly worked as a gold mine.

BOULDER TUNGSTEN PRODUCTION CO. (Boulder)—Manager J. G. Clark proposes to erect a concentrator at a site that will permit gravity tramming from various mine mouths and where a deep adit will be later started.

Chaffee County

LILY (Salida)—Shipments, about one carload per week to Ohio & Colorado smelter.

ST. LOUIS (Bonanza)—Lessees Asley & Smith are developing this old property at greater depth and have made small, rich shipments to smelter. One lot ran 7.25 oz. gold besides silver and lead.

MADONNA (Monarch)—New pumps have been installed to unwater below sixth level and to permit mining a shoot discovered last summer. Vein is several feet thick but carries a narrow streak assaying thousands of dollars per ton.

Clear Creek County

ROCKFORD TUNNEL (Idaho Springs)—Production has resumed from Donaldson vein. Ore is sold to smelteries.

DORIT (Idaho Springs)—F. L. Patrick intends to install cyanide equipment in mill now doing simple concentration.

COMBINATION MILL (Idaho Springs)—A Motter furnace is to be installed. Stamps will be replaced by crusher and rolls. Mill will treat custom ores by roasting and concentration.

Eagle County

SOUTH DAKOTA (Eagle)—This property adjoins Lady Belle that was discovered last winter and has produced silver from sandstone country. Recently investigation shows that strains in formation are due to uranium. Specimens have been determined as carnotite by U. S. Bureau of Mines, Denver.

Gilpin County

BARNES (Central City)—Shipments of rich gold-copper ore are being made.

BAKER (Central City)—Warne and Semmens have opened vein from San Juan tunnel and are shipping good ore.

HOMER (Central City)—Stephen Laner shipped 12 tons that ran 10½% copper, 9 oz. silver, and 1.16 oz. gold. Mine is on Central Mountain.

GERMAN & BELCHER (Central City)—Fourteen sacks of high-grade pitchblende ore are stored in Rocky Mountain National Bank, awaiting shipment to Denver plant.

LAST CHANCE (Central City)—Mine is close to German and Belcher mines. Lessees McNicholas and Floyd have opened a good shoot of pitchblende ore on the 100-ft. level.

TWO-FORTY (Central City)—During recent snow blockade on railroad, mine was obliged to stock hundreds of tons of first- and second-class ore. Shipments have been resumed and mine has continued operating.

Lake County

MIDNIGHT (Leadville)—Horrigan Bros. are shipping from their lease regularly.

MOYER (Leadville)—Iron-Silver Mining Co. expects to resume hoisting in shaft that has been retimbered.

LAPLANDER (Leadville)—Ore is being saved by lessees (until shipment is possible in spring) from two raises. Adit will be pushed.

PORTER (Leadville)—Lessees on this property are shipping 50 tons per day, running 6 to 18 oz. silver per ton. Ore is oxidized iron.

LEADVILLE DISTRICT MILL (Leadville)—Is treating tailings from old Adams mill and is recovering 60 tons per day of concentrates running from 40% to 45% zinc.

ARKANSAS VALLEY SMELTERY (Leadville)—This plant is operating to capacity. Roasting department is being re-modeled and enlarged to take care of increasing amounts of sulphide ores.

Summit County

BLUE FLAG (Breckenridge)—Ore from this mine is treated in company's mill at head of Illinois Gulch.

WELLINGTON (Breckenridge)—James Moynahan was found dead in his cabin. Death probably due to accidental discharge of revolver.

NEW YORK (Breckenridge)—W. C. Tracy has built a small blast furnace and plans to smelt his ore.

Teller County

PORTLAND (Victor)—A station is being cut on 1750-ft. level of No. 2 shaft.

DANTE (Cripple Creek)—Gaylord mill has been shut down, pending repairs to rolls.

MARY MCKINNEY (Anaconda)—Annual stockholders' meeting was held Feb. 9.

UNITED GOLD MINES CO. (Cripple Creek)—E. M. de la Vergne has been appointed superintendent, to succeed Edward Bebee.

ELKTON (Elkton)—At monthly meeting of board, held Feb. 9, regular dividend of 2c. per share, or \$50,000, was declared. E. M. de la Vergne was succeeded on board by John Tait Milliken, of Golden Cycle. It was decided to open mine to lessees, above tenth level; applications are now being considered.

IDAHO**Cœur d'Alene District**

IDORA HILL (Wallace)—Secretary Winder states that mill on Sunset Peak started running recently on ore from Tuscumbia, which is being worked by Idora Hill under a lease. Bins are full of ore and mine is prepared to supply an abundance of ore to keep mill going on a steady run. Snow came at an opportune time to make a good snow road from Idora mill to Prichard, shipping point to which ore is hauled.

STAR (Mullan)—It is reported that an extensive deposit of low-grade ore was opened recently in this mine, adjoining Federal company's Morning property, recently taken under bond by Federal from Finch-Campbell estate interests, and that discovery leaves no doubt but bond will be exercised when it matures. Considerable development has been done on Star by former owners and a large body of low-grade ore exposed. Federal company continued work through No. 5 level of Morning mine, encountering vein at between 400 and 500 ft. below upper workings. Bond on Star calls for a \$750,000 payment, extending over several years, the second instalment of which will fall due in a few weeks.

MARSH (Burke)—For last two months output has been maintained at rate of 150 tons daily except for five days in December, when property was shut down for lack of water, and five days in January, when operations were suspended because of motor that drives hoist being out of commission. About 750 tons of concentrates are being shipped monthly. Tram has been repaired and capacity increased, ore bins enlarged and a new sorting plant built. Improvements have cost about \$8000, but addition of sorting plant alone, it is believed, will increase net earnings from \$1500 to \$2000 monthly, according to officials of company, who base their estimate on saving in transportation and milling costs. Sorting plant already is in operation and its capacity can be increased easily to meet further needs of mine. Proposed raise to connect new three-compartment shaft with main tunnel level will be commenced some time this month unless there is unforeseen delay, and output of mine materially increased.

GEORGIA

KAOLIN MINING AND PREPARATION for Northern market is being carried on quite extensively. Following companies are operating: Albion Kaolin Co., Hepzibah; American Clay Co.; Atlanta Mining & Clay Co.; Georgia Kaolin Co.; and John Sant & Sons Co., all at Dry Branch; Kaolin Mining Co., Claymont; Edgar Bros. Co. and McIntyre Kaolin Co., both of McIntyre. Kaolin is mined in open cuts, washed to remove grit, and shipped to paper mills, where it is used as a filler, or to pottery and porcelain works. Most companies use either steam-shovels or cable excavators to remove overburden of sand from pits.

MASSACHUSETTS**Franklin County**

FOLIATED TALC CO. (Rowe)—Company is mining and grinding foliated talc in Berkshire Hills not far from site of old Davis pyrites mine (now closed) and near eastern end of Hoosac tunnel. Talc mine is 250 ft. deep and has two levels. Talc is hauled by team one mile to mill, ground, packed in burlap-bags, and hauled four miles to railroad. Mill is operated by water power, a mountain brook furnishing 360 hp. from a head of 135 ft., being conveyed ¼ mile in 2½ in. iron pipe. Another company, Massachusetts Talc Co., formerly operated a mine near-by, and hauled talc five miles to Zoar on railroad where its grinding mill was situated, but mill burned down and has not been rebuilt.

MICHIGAN**Iron**

HILLTOP (Crystal Falls)—Work will be resumed here within a few days, question of title and royalty has been settled. It will be operated in connection with Victoria, which adjoins. These mines are now under lease to the Cuyahoga Mining Co.

ZIMMERMAN (Iron River)—This property has been reopened with a small force and it is intention of management to put on 200 more men Mar. 1. Considerable ore has been sold for 1914 delivery. Mine was closed for two years through failure to make sales of ore.

BALKAN (Alpha)—Contract for stripping part of this property will be awarded within a short time, bids having been asked for by management. Company now knows more about area to be stripped than it did when first call for bids was issued, as a great deal of probing has been done in ore area from shaft which was sunk last fall. Not near as much dirt will have to be moved as was at first anticipated.

McDERMOTT SHOVEL—Captain Harry McDermott, of Iron River, who is at head of McDermott machine shops, is in Cleveland looking after demonstration of McDermott steam shovel at shops of Wellman-Seaver-Morgan Co. Shovel is intended to be used in loading ore underground into tram cars and will be a big labor saver if it works out as planned. It was tried out at Sheridan mine in Iron River district some time ago and worked satisfactorily.

ARCTIC IRON CO. (Negaunee)—A judgment for \$899,403 in favor of company in its suit against Cleveland-Cliffs Iron Co. and William G. Mather, has been rendered by Judge Sessions in U. S. District Court. Finding was based on allegation that William G. Mather took advantage of his position as secretary of the Arctic company when it was turned over to Regent Mining Co., by making a secret agreement, whereby defendant profited to extent of judgment.

DEXTER (Ishpeming)—This property, idle since 1896, is to be pumped out by Cleveland-Cliffs Iron Co., which secured a lease from Barnes Land Co. owners, four years ago. Main shaft is 560 ft. deep, with eight levels. Ore mined on upper levels carried from 7 to 15% manganese and found ready market, although iron content was not high. Year property was shut down a large deposit of soft hematite was uncovered; it contained 56% iron, but little manganese. It could not be sold. Several drill holes were put down several years ago and new lessees will probably drill to check former drill records, which showed ore of a merchantable grade.

NEGAUNEE (Negaunee)—One new electric pump is now working and it will not be long before other two are in commission. One is a seven-stage, high-pressure, Alberger centrifugal, with a capacity of 1000 gal. per min. under 1000-ft. head. It is driven by a 400-hp. induction motor. Other two are Prescotts, 5x24 in., direct-connected, duplex reciprocating. They are also of 1000 gal. capacity, working under 1000-ft. head. Each is driven by a 350-hp. synchronous motor, 120 r.p.m., 3-phase, 60 cycles, 2200 volts, separately excited by motor-generator set. Each suction is fed by one 1200-gal. Alberger line centrifugal pump under 30-ft. head. Pumps are on tenth level of new steel-concrete shaft.

MINNESOTA**Cuyuna Range**

BRAINERD-CUYUNA MINING CO. (Brainerd)—Shaft now down 80 ft. An additional pump is being installed to take care of increased flow of water. Indications are that much water will be encountered in shaft as it gets deeper, as it is initial operation in a comparatively large district, Barrows mine, several mines away, being its nearest neighbor.

MEACHAM MINE (Crosby)—It is stated that Inter-State Iron Co., a subsidiary of Jones & Laughlin Steel Co., has taken over Meacham mine, northwest of Crosby. This mine has a concrete shaft and some drifting has been done. It was pioneer in its vicinity, and was shut down on account of great volume of water encountered. Since that time water level has been lowered considerably by other mines near-by. No ore has ever been shipped.

Mesabi Range

OLIVER IRON MINING CO.—Active preparations have been started toward operation of Richelieu mine, in Sections 15 and 12, near town of Kinney. It is an underground operation, and will be of considerable size when operating at full capacity.

PITT IRON MINING CO. (Aurora)—Day and night shifts now working on new shaft on Canton 40-acre tract. This shaft is to be used to raise a considerable tonnage of ore which cannot be economically hoisted through present operating shaft.

MISSOURI-KANSAS-OKLAHOMA**Joplin District**

ANOTHER RICH BLENDE STRIKE AT CAVE SPRINGS, Mo., has been made by Galena, Kan., operators. It is near the old Rowena, once a big producer of the Galena district.

ZINC ORE AT A DEPTH OF 167 FT. was encountered by Emil Carlson, while drilling on a tract near Cassville, Mo. The drill was still in ore at 190 ft. The strike is first made in that section.

SCHOOL HOUSE MINING CO. (Cartersville, Mo.)—Company incorporated for developing lease.

I. H. WILLIAMS & CO. (Klondike, Kan.)—Good strike has been made on 40-acre lease of Leckie land.

HARTFORD (Galena, Kan.)—Concentrator started up after two weeks' shutdown. Deeper ore veins being worked.

GRIFFITH & CO. (Joplin, Mo.)—Lead and Silicate are being hoisted. Lease is on Robinson land. Ore is found at 80-ft. level.

YELLOW PUP (Klondike, Kan.)—A new run of ore is providing a weekly turn-in of from two to four cars of zinc weekly.

MISSOURI HILLS ZINC CO. (Thoms Station, Mo.)—Shaft in lead ore at 57 ft. Drill showed ore from 47 to 90 feet scale.

BLIND TIGER MINING CO. (Joplin, Mo.)—Ten Per Cent Co. has made good strike on Murphy land, 15-ft. face worked at depth of 40 ft.

HEMPHILL LAND (Aurora, Mo.)—Drill entered ore at 60-ft. level. John Martin and Ira Hemphill form company prospecting tract.

COLEMAN LEASE (Aurora, Mo.)—American Zinc, Lead & Smelting Co. now drilling on tract. Extensive campaign probably will be conducted.

KENTUCKY LEAD & ZINC CO. (Joplin, Mo.)—New strike of zinc ore shows 24-ft. face. Mill soon to be erected will handle ore from three shafts.

CHRISTMAS GIFT (Joplin, Mo.)—Mine is becoming richer weekly. First 51 tons of ore from drift cleaned 14,500 lb. of zinc ore, assaying 64% zinc.

WANETA (Joplin, Mo.)—Concentrator destroyed by fire in August to be replaced by modern plant. Ore exists at various levels, from 96 ft. to 176 feet.

COOPER HOLLOW TRACT (Galena, Kan.)—This old producer is coming back with lead-ore prospects, many good strikes having been made recently.

LONE ELM MINING & DEVELOPMENT CO. (Joplin, Mo.)—Big tract to be opened when ground has been drained; monster pumps installed to beat water.

LOAFMAN LEASE (Miami, Okla.)—Drill holes show two runs of ore. Shafts to be put down soon. Ore first found at 35-ft. level, better vein at 100 feet.

UNDERWOOD & CO. (Granby, Mo.)—Pumping has begun to drain mine at 225-ft. level, where good orebody exists. Has been one of best producers in this camp.

MONTANA**Cascade County**

AT GREAT FALLS REDUCTION WORKS one-sixth of force employed in concentrator was laid off, Feb. 1, as a result of policy of management to discontinue concentration of Butte low-grade ores. These will hereafter go to Washoe works at Anaconda. It is expected that all units of Great Falls concentrator will be closed down by May 1, resulting in a reduction of present force by at least 200 men. Enlargement of smelting department which is now going on will probably absorb part or all force heretofore employed in the concentrator.

ANACONDA (Butte)—At the Badger State mine the work of sinking main shaft, three compartments wide, is going along steadily, and has reached a point 175 ft. below 2000-ft. level. At 2200-ft. level a station will be cut and development work commenced. Preparations are being made to change chippy, or auxiliary hoisting engine, in main shaft, for a more powerful one, as with present engine only a single-deck cage can be used, and if sinking is carried much deeper it will be unable to do even that much beyond a certain depth. It is planned to exchange Green Mountain mine hoist, which is larger and more powerful, for engine now in use, and work of excavating for hoist house will be commenced soon. At Emily shaft, which is used for an air shaft and for conveying timber and supplies into mine, work of extending shaft by raising from 1200-ft. level to connect at 1000-ft. level, is under way. Also preparations are being made to raise shaft from 1800-ft. level. Final connection of overhead tramway from collar of Belmont shaft to new steel and concrete ore bins, nearly 800 ft. distant, has been completed, and within a short time new ore bins will begin to receive ore. Work on tramway has dragged somewhat lately for reason that workmen have been needed at several other of company's properties where there was a more immediate need of additional ore-bin capacity.

Lewis & Clark County

PIEGAN-GLOSTER (Marysville)—Barnes-King Development Co., which acquired this property some time ago, is doing but little work at present on account of weather. Air raise from Norman tunnel to surface, a distance of 155 ft., has been completed, and company is planning to resume development work in a short time.

Madison County

JOHNSTONE-MOFFAT—Machinery has been purchased and preparations are being made to commence operations at an early date at properties in Bear Gulch and Cole Cañon. Copper ore, carrying gold and silver in fair amounts, was opened there some time ago, and oreshoot will be extensively developed.

Silver Bow County

BUTE-DULUTH (Butte)—Rumors that Eastern men were seeking to secure control of properties seem to have gained strength in minds of those who claim to know. W. H. Weed inspected mines and leaching plant for several days. He said that company turned out 100,000 lb. of copper during January from 3200 tons of ore mined and treated, at a total cost of \$3.02 per ton. With copper selling at 15c., this would mean a profit of \$2.50 per ton.

MONTANA POWER CO. (Butte)—Plans are under way to materially increase present capacity of company's power plants in order to meet demand caused by proposed electrification of railroads and by rapid development of industries in Montana among which mining in all its branches takes precedence. Company has developed electrical energy of 102,000 hp. with 1400 miles of transmission lines, and an estimated reserve of 280,000 hp., which when developed will swell company's capacity to nearly 400,000 hp. For electrification of 430 miles of Milwaukee railroad and for other industrial purposes power is being developed at present at Great Falls of Missouri River where 80,000 hp. are available and at Thompson Falls of Clark Fork of Columbia River where 40,000 hp. can be generated. An additional 40,000 hp. are to be developed at other minor power sites of company, making a total of 260,000 hp. for which there is a present demand. To raise money for contemplated expansion company has recently sold to a banking syndicate, headed by Lee Higginson & Co., of Boston, an issue of \$10,000,000, 5% sinking fund and refunding mortgage bonds which will soon be offered for public subscription. A foreign syndicate has taken \$2,500,000.

NEVADA**Churchill County**

NEVADA HILLS (Fairview)—Report for year 1913 states that 41,919 tons were milled; average grade, \$13.77; net profits, \$176,965.

Elko County

ALPHA (Jarbidge)—Good-grade ore is being developed on lower levels, and five-stamp mill is operating steadily.

ALTITUDE (Jarbidge)—High-grade ore is being mined. It is stated that a small stamp mill will be installed next spring.

LEGITIMATE (Jarbidge)—Shoot of good-grade ore was discovered recently. Small mill may be built in near future.

LITTLE DEVILS (Jarbidge)—Shipments of high-grade ore are being made. This mine is under option to Cleveland people.

Humboldt County

BUCKSKIN MARY (National)—Lease has been granted and work will commence as soon as snow melts enough to permit transportation of supplies.

SEVEN TROUGHS COALITION (Seven Troughs)—Winze from 1000-ft. level has been sunk to depth of 100 ft. Vein at this point has straightened from 50° pitch to nearly vertical, and is 10 ft. wide, with 10-in., high-grade oreshoot on foot wall.

Lander County

PLACER GOLD in **BATTLE MOUNTAIN DISTRICT** has been discovered, according to report from Philadelphia Cañon.

AUSTIN CENTRAL MINING CO. (Austin)—Lessees are sinking winze in north drift from main tunnel. Narrow shoot of high-grade ore has been discovered.

Lyon County

MILLS OF SILVER CITY WERE SHUT DOWN recently for several days on account of severe storms.

MASON VALLEY MINES CO. (Thompson)—Ore receipts for month of January, 1914, were as follows: From Mason Valley mine, 8505; from Nevada-Douglas, 4075 tons; from other mines, 4007 tons. During the same month five cars of matte and 11 cars of blister copper were shipped.

Mineral County

PAMLICO (Pamlico)—Lessees on this mine have cut shoot of good-grade ore.

PINE GROVE MINES CO. (Pine Grove)—Repairs to electrical installation, which was damaged by recent storms, have been completed, and mill is again in operation.

YERINGTON MOUNTAIN (Yerington)—Development is being done on 225- and 500-ft. levels by a small force. No shipments have been made for some time on account of impassable roads. Every available chute, raise and winze in mine is full of broken ore.

Nye County

PACTOLUS (Pactolus)—Mine is being worked by lessees. Shipments of good-grade ore have been made.

EARLE LEASE (Manhattan)—A two-stamp mill will be installed at once. Amalgamation only will be used in treatment and tailing will be impounded for future cyanidation. A large tonnage of ore is on stock pile.

WEST END CONSOLIDATED (Tonopah)—Drifting has commenced on 500-ft. level on full face of ore assaying \$35 to \$50. Crosscut on 600-ft. level has cut hanging-wall vein 6 ft. wide. Foundations for 10-stamp addition to mill are completed and carload of machinery has arrived. Dividend of 10c. per share, payable in March, has been declared; total dividend, \$178,000.

Storey County

SIERRA NEVADA (Virginia City)—It is reported that this company will sink below 2500-ft. level in east vein system.

MURTAUGH (Silver Star District)—This group, which is being worked by lessees at present, has been bonded and new company will commence work as soon as leases expire.

CALEDONIA (Virginia City)—Negotiations for purchase of Dietrich mill at Gold Hill have been made. Company is permitted to crush 1000 tons free if mill is put in repair and crushing begins within 30 days; 30 days from commencement of crushing, mill may be purchased for \$7500. Development work in mine has been progressing satisfactorily.

NEW JERSEY**Warren County**

EMPIRE STEEL & IRON CO. (Oxford)—At Washington mine, an explosion occurred on seventh level, Feb. 6, which considerably reduced output of iron ore for 10 days. Night shift was at work at time, but no one was injured. Cause of explosion is not definitely known. Mine has one of largest deposits of iron ore in New Jersey. It has been producing 10,000 tons per month of ore running over 60% iron, for nearby Oxford furnace, which produces basic pig iron. Stock of ore at furnace is sufficient to carry through interruption to mining operations.

NEW MEXICO**Grant County**

CHINO COPPER CO. (Santa Rita)—Excavation is being made for foundation of crushing plant through which all ore will pass from ore cars to Santa Fé railroad cars en route to mill at Hurley. Plant under construction will crush any size ore handled by steam shovels so that it will pass through grizzlies at concentrator.

Luna County

FLORIDA MINING & DEVELOPMENT CO. (Deming)—Company is shipping high-grade zinc ore from claims south of Cook's Peak. Development work in district is showing pay ore.

Otero County

LYNCH & MURPHY (High Roofs)—Shipments are being made to El Paso smelter of low-grade porphyry copper ore. Property is showing large deposit of low-grade porphyry claimed to be similar to that of Santa Rita district.

Socorro County

LINCOLN MINING & DEVELOPMENT CO. (Mogollon)—Recently purchased equipment, including 25-hp. gasoline engine, compressor and machine drills, has been received and installed and shaft is being unwatered, after which sinking will be resumed.

ALBERTA DEVELOPMENT CO. (Mogollon)—It is reported that this company is preparing to do development on Alberta Group, several hundred feet of work done to date having demonstrated lode to be of value. Good mill ore being exposed.

OAKS CO. (Mogollon)—Work was started week before last, driving tunnel "A" of East End tunnel group, deepest heading on this property. Last month's mining in upper levels of this group have disclosed a fine body of mill ore, assaying from \$15 to \$25 per ton.

PACIFIC MINES CO. (Mogollon)—On lowest level, fine oreshoot has been opened. Stope is from 10 to 15 ft. in width and ore from it mills better than \$30 per ton. Sinking of shaft below 250-ft. level is in progress.

NEW YORK**Jefferson County**

ST. LAWRENCE TALC CO. (Natural Bridge)—This new company, financed by New York men, has opened a talc mine and built a grinding mill on southwest end of talc range. E. D. Mix, formerly assistant superintendent of International Pulp Co., is in charge.

St Lawrence County

THE MAGNETITE MINES AT JAYVILLE are to be reopened. These old mines were first opened in 1854 and iron ore drawn 15 miles in wagons to blast furnace at Fullerville now long closed. In 1876 specimens of ore took first prize at Centennial exhibition at Philadelphia; much of ore is high in iron and low in phosphorus. Mines were again active in late '80's, after completion of Carthage & Adirondack Ry. from Carthage to Jayville. Beginning in 1893 and lasting 15 years, extensive litigation prevented further development. Benson iron mines of Pilling & Crane of Philadelphia, recently reopened, are 15 miles east of Jayville; Benson ore, after concentration, is shipped to furnaces in Pennsylvania. High freight rates have been worst obstacle to commercial working of iron mines in county.

NORTHERN ORE CO. (Edwards)—This zinc company is completing its mill equipment.

SOUTH DAKOTA**Fall River County**

ARDMORE OIL CO. (Ardmore)—Well No. 1 is approaching 1300-ft. mark. Hole has just been cased to 1200-ft. depth with 10-in. casing. Dakota sandstone, the oil-bearing rock of this section, is expected at 1600 to 1700 feet.

Lawrence County

HEIDELBERG (Two Bit)—Shipment of 20 tons has been sent to Golden Reward cyanide plant, at Deadwood, returns showing \$16 per ton. Several hundred tons of lower-grade material are piled on dump, this shipment having been sorted from ore removed in course of widening main adit along ore vertical. Fifty business men of Deadwood are interested in property, and are contributing monthly assessments for development. Promotion, along highly conservative lines, was made by Deadwood Business Club, after mines and mining committee of club had, last summer, investigated large number of prospects.

HOMESTAKE (Lead)—Plastering is practically finished at Recreation Hall, and other interior decoration work is well in hand. Rooms on main floor and halls and foyer of theater have been plastered and calcimined and fancy border and ceiling work completed. Plasterers are busy on ceiling of theater, balcony and boxes, and large part of rafters and supports have been removed. Ceilings are high and permit of good and airy spaces above balcony, and acoustics promise well. In basement all plastering has been finished, cement floors all laid, and heavy enamel rim of swimming pool completed. Pool is 75 ft. long, 25 ft. wide, with a maximum depth of about 10 ft. and minimum of about 4 ft. Sides and bottom will be tiled, and numbers, formed of colored tile, indicate depth at various points. Lighting and ventilation of basement will be a striking feature. Shower baths will be in corners of swimming room, and dressing rooms and lockers in adjoining rooms.

TEXAS**El Paso County**

HAZEL (Van Horn)—Three carloads of concentrates are being shipped to smelter monthly.

PHELPS-DODGE (Van Horn)—Large shipment of machinery is on ground of Black Shaft mine and extensive development work is expected to be started soon.

UTAH**Juab County**

TINTIC SHIPMENTS for the week ended Feb. 6 amounted to 153 cars. There were 18 shippers. During January 684 cars were shipped, as compared with 617 cars in December.

UNCLE SAM (Eureka)—Lessees have recently found good ore in upper workings.

GOLD CHAIN (Mammoth)—Work, which is being done through Lower Mammoth has cut quartz with bunches of low-grade ore. In this way property is being opened to a much greater depth than would be possible through Gold Chain workings.

BLACK JACK (Mammoth)—A car of shipping ore carrying copper, gold, silver and lead is being loaded. This was obtained in older workings by force put on to develop low-grade ore for treatment at Knight-Christensen mill. This work resulted in opening some shipping ore.

DRAGON CONSOLIDATED (Silver City)—Tunnel which is being driven north has connected with old Black Dragon shaft at 300-ft. point. This shaft was sunk many years ago. Tunnel is following vein, and opening a large deposit of low-grade ore. About 1700 ft. has been driven, and connections with shaft have improved ventilation.

MAMMOTH (Mammoth)—Since first of year this property has been one of the heaviest shippers in Tintic. Present output is about 150 tons daily, most of which is coming from large dumps. These dumps are low-grade, but under present arrangements can be cleaned up with some profit. High line to mine has been blocked with snow, but has again been opened. Development work is being done.

YANKEE (Eureka)—A report has been sent to stockholders explaining necessity of an assessment of 2c. per share. Development is being done in search of Colorado-Beck tunnel ore channel, which was followed for 6000 ft. to south of Yankee. Most of work has been on 200 level, and raises and crosscuts are now being driven near Beck Tunnel line. Further prospecting in this section may be necessary, before ore channel can be located. Heretofore no work has been done, where this channel could be expected. Promising development is being done on 1700 level, where quartz mineralized with iron, silver, and lead is being followed.

CHIEF CONSOLIDATED (Eureka)—A report for year ended Dec. 31, 1913, shows 6383 ft. of development to have been done. Total ore shipments amounted to 51,173 tons, which brought \$376,827, after payment of smelting, transportation, and sampling charges. Average gross value per ton was \$16.29. Smelting, freight, and sampling charges were \$8.92, leaving \$7.37, average net value. Net profit, after payment of all charges, was \$12,587. Receipts, including \$303,023 cash on hand Jan. 1, 1913, amounted to \$698,720. Disbursements—including purchase of mining ground, machinery, and equipment, amounted to \$483,658, leaving \$215,061, cash on hand Dec. 1, 1913. Two dividends of \$87,645 each were paid.

Salt Lake County

UTAH CONSOLIDATED (Bingham)—A dividend of \$1 per share amounting to \$300,000 has been declared. Since 1903, \$30.70 per share has been paid. The last dividend of 50c. was paid three months ago. Total dividends by company amount to \$9,210,000. It is reported that company has a surplus, and contemplates investing in mining properties in Alaska. Physical condition of Bingham property is good, with considerable new territory to be opened.

CANADA**British Columbia**

ALLUVIAL TIN NEAR DEASE LAKE, in northern British Columbia, has been discovered, but no information is at hand as to quantities.

SS. "VADSO" SUNK, Feb. 3, in 170 fathoms of water. The "Vadso," loaded with coal for Granby mines on Observatory Inlet, struck a rock in Nagosa Gulf. No passengers were on board and crew of 26 was saved.

GOLDEN CHARIOT (Oroville, Wash.)—J. L. Harjer, of Republic, Wash., has bonded this property on Kruger Mountain in Osoyoos district. Extensive development work is planned.

CANADIAN MINING & EXPLORATION CO.—W. J. Rolfe, M. E. has returned to Vancouver from a visit to Salmon River section of Portland Canal mining division where he bonded Hercules group for this company. Hercules is situated on southern slope of Mt. Dilworth, about 4000 ft. above sea-level and 20 miles from salt water. Zone of mineralization can be traced for 3000 ft., with a width ranging up to 30 ft. or more. Shoots of ore are exposed in open cuts, four to five feet wide, practically solid, composed of pyrite, chalcopyrite, galena and zinc blende. In addition to the silver, lead and copper, ore carries some gold.

Ontario

BEAVER (Cobalt)—Ore has been found in granite which is first discovery of its kind in district.

DOMELAKE—At annual meeting, a bylaw was passed authorizing increase in capital by an additional 250,000 shares of treasury stock which will be issued at 30c. Report presented at meeting showed that during year 6400 tons of ore and 7920 tons of waste were hoisted. Average value of ore ran was \$8.07 per ton and a total of 3717 tons was treated, from which bullion and concentrates to value of \$25,369 were recovered. It is estimated that an additional six months' development work will enable mine to send 50 tons per day to mill.

The Market Report

METAL MARKETS

NEW YORK—Jan. 18

METAL MARKET

The metal markets were not as active as in the preceding week, and prices showed small fluctuations only.

Copper, Tin, Lead and Zinc

Copper—The market has been dull and flat. The larger producers have maintained a price asked of 14½c., delivered, 30 days, for domestic shipment, but have shaded that in their offerings for export through their foreign representatives. Indeed there has lately been right along a keen copper competition for the foreign business, that being the quarter where just now the demand chiefly lies. Outside of the bigger agencies, copper has been offered at material concessions. On Feb. 14 there were sellers at 14.70@14.75c., delivered, usual terms, for domestic shipment and since Feb. 16 there have been sellers at 14.70c., delivered, usual terms, with intimations that bids of 14.60@14.62½c. would be respectfully entertained. Sales for export have been made at prices netting less than these figures. In the absence, however, of either any pressure to sell or any particular demand to buy the market has been rather nominal throughout the week.

The average of our prices of electrolytic copper for the week was 14.55 cents.

The production of Lake copper increased a little in January and some of the product of mines other than the Calumet & Hecla and Quincy is now beginning to appear in the market, but only in trifling quantities. The fancy brands of Lake copper fetch 15½c.; Buffalo electrolytic is reported at 15c., and ordinary good brands at 14½c. The sales reported, however, are scarcely above the order of carload lots.

The London standard market has fluctuated within comparatively narrow limits. On Thursday, Feb. 12, spot was £65 8s. 9d. and three months £65 17s. 6d. On Feb. 13 spot advanced to £65 17s. 6d. and three months to £66 7s. 6d., but reacted on Monday, Feb. 16, to £65 11s. 3d. for spot and £66 3s. 9d. for three months. It closes at £65 for spot and £65 10s. for three months.

Base price of copper sheets is now 20c. per lb. for hot rolled and 21c. for cold rolled. The usual extras are charged and higher prices for small quantities. Copper wire is 15¼@16c., carload lots at mill.

Exports of copper from New York for the week were 11,296 long tons. Our special correspondent reports the exports from Baltimore at 2561 tons for the week.

Visible Stocks of Copper in Europe on Feb. 15 are reported as follows: Great Britain, 10,090; France, 1870; Rotterdam, 3400; Hamburg, 4090; Bremen, 1140; other European ports, 750; total, 21,340 long tons, or 47,801,600 lb. This is a decrease of 1030 tons from Jan. 31. In addition to the stocks above, 2120 tons are reported afloat from Chile and 3100 from Australia, making a total of 26,560 tons.

Tin—The demand on the part of American consumers having almost entirely ceased, there was a lack of orders from this side in the London market. This fact created a weaker tone, which was intensified by the anticipated deterioration in the statistics, as shipments from the East are very large. In view of this easier tendency, sellers of spot material in this market became more ready sellers, so that the premium which was lately exacted for prompt supplies has now disappeared. The market closes weak at £178 15s. for spot and £180 2s. 6d. for three months, and about 39¼c. for March tin here.

Lead—After the surprise in the market on Mar. 11, which we reported last week, some considerable transactions followed at the materially lower level, the A. S. & R. Co.'s price of desilverized at St. Louis being 3.92½c., while independents sold Missouri lead at 3.87½c. This range of the market prevailed up to Feb. 18 when a little improvement was manifested.

The London market is unchanged, Spanish lead being quoted £19 10s. and English lead 15s. higher.

Spelter—A moderate business was done during the first three days of the week at slight concessions in price. Producers were evidently trying to find a market. During the last two days the metal was offered freely at 5.25c., St. Louis, by numerous sellers. A large consumer became interested and a considerable tonnage was negotiated at a little under that price on Feb. 18. Producers ask premiums for contracts in futures—April delivery, and later.

The London market is unchanged, good ordinaries being quoted £21 7s. 6d. and specials 7s. 6d. higher.

The International Zinc Syndicate at its meeting on Feb. 4 made no change in prices, its London quotation for February becoming thus, £21 15s., with 2s. 6d. premium for each month up to end of April, beyond which no quotation is made.

Base price of zinc sheets is unchanged at \$7.25 per 100 lb., f.o.b. Peru, Ill., less 8% discount.

DAILY PRICES OF METALS

NEW YORK

Feb.	Sterling Exchange	Silver	Copper		Tin Cts. per lb.	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.		New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
12	.....	...	14	14.55	...	...	3.87½	5.40	5.25
13	4.8530	57½	@15	@14.65	40½	4.00	@3.92½	@5.42½	@5.27½
14	4.8535	57½	@15	@14.60	40½	4.00	@3.87½	@5.37½	@5.22½
16	4.8565	57½	@15	@14.55	40½	4.00	@3.92½	@5.42½	@5.27½
17	4.8585	57½	@15	@14.50	39½	4.00	@3.87½	@5.37½	@5.22½
18	4.8570	57½	@15	@14.55	39½	4.00	@3.92½	@5.40	@5.25

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic; of casting copper 0.15 to 0.25c. below. The quotations for lead represent wholesale transactions in the open market for good ordinary brands; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

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

LONDON

Feb.	Silver	Copper				Tin		Lead		Zinc	
		Spot		3 Mos.	Best Sel'd	Spot	3 Mos.	£ per Ton	Cts. per lb.	£ per Ton	Cts. per lb.
		£ per Ton	Cts. per lb.								
12	26½	65 1/8	14 22	65 1/8	70 1/2	183 1/2	184 1/2	19 1/2	4 24	21 1/2	4 64
13	26 1/2	65 1/8	14 31	66 1/2	70 1/2	184	185 1/2	19 1/2	4 21	21 1/2	4 94
14	26 1/2	65 1/8	14 24	66 1/8	70 1/2	183	184 1/2	19 1/2	4 21	21 1/2	4 64
16	26 1/2	65 1/8	14 24	66 1/8	70 1/2	183	184 1/2	19 1/2	4 21	21 1/2	4 64
17	26 1/2	65 1/8	14 15	65 1/8	70	181	182 1/2	19 1/2	4 21	21 1/2	4 64
18	26 1/2	65	14 12	65 1/2	70	178 1/2	180 1/2	19 1/2	4 24	21 1/2	4 64

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21½c.

Other Metals

Aluminum—Business remains quiet and sales moderate. Prices are about the same, or perhaps a little easier, 18½@19c. per lb. being quoted for No. 1 ingots, New York.

Antimony—A fair jobbing trade is reported, but not much doing in futures. Cookson's is quoted at 7.20@7.25c. per lb.; Halletts at 7@7.10c.; while 6@6.15c. is asked for Chinese, Hungarian and other outside brands.

Quicksilver—Business has been fair and prices are unchanged. New York quotations are \$39 per flask of 75 lb. for large lots. Jobbing price is 54c. per lb. San Francisco, \$38.50 per flask for domestic orders. London price is £7 10s. per flask, with £7 quoted from second hands.

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

Cadmium—German quotation is 750 marks per 100 kg.—equal to about 81c. per lb.—f.o.b. works in Silesia.

Magnesium—The current quotation for pure metal is \$1.50 per lb. for lots of 100 lb. or over, at New York.

Selenium—For large lots, 100 lb. or over, \$3@3.25 per lb. is quoted; while \$5 per lb. is paid for retail orders.

Exports from Baltimore for the week included 1653 lb. selenium to Hamburg.

Gold, Silver and Platinum

Gold—The price of gold on the open market in London was unchanged at the Bank level—77s. 9d. per oz. for bars and 76s. 4d. per oz. for American coin. Most of the gold received was taken for the Dutch banks. In New York there was a curious duplication of transactions, \$2,000,000 being taken for export to Paris, while \$500,000 was taken in London for shipment to New York. Today the London order was canceled.

Iridium—Demand continues small and there has been no change in prices. Dealers ask \$75@78 per oz., New York, for pure metal.

Platinum—Talk of higher prices continues, but no actual advance has been made. Business continues rather quiet. Dealers ask \$43@44 per oz. for refined platinum and \$46@49 per oz. for hard metal.

Our Russian correspondent writes under date of Feb. 2 that the market is unchanged. Demand is steady. The offerings of new metal by the starateli are small, owing to the season. Quotations at Ekaterinburg for crude metal, 83% platinum, are 9.65 rubles per zolotnik; at St. Petersburg for the same grade, 37,100@37,200 rubles per pood. These prices are equal to \$36.28 and \$36.41 per oz., respectively.

Silver—The market has ruled firm and steady the past week at 26½d. in London, with buyers limited. Market closes firm.

Exports of silver from London to the East, Jan. 1 to Feb. 5, as reported by Messrs. Pixley & Abell:

	1913	1914	Changes
India.....	£ 1,037,000	£ 567,000	D. £ 470,000
China.....	35,000	10,000	D. 25,000
Total.....	£ 1,072,000	£ 577,000	D. £ 495,000

Supplies of silver arriving in London have been light so far this year.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Feb. 14

The base price paid this week for 60% zinc ore was \$42.50 per ton. A premium price of \$43.50 was paid. The base price paid for 80% lead ore was \$53 per ton.

SHIPMENTS WEEK ENDED FEB. 14

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	3,040,310	226,220	813,280
Year	18,944,580	724,360	6,598,410

Shipped during week to separating plants, 3,078,390 lb. zinc ore.

JOPLIN, MO.—Feb. 14

Zinc blende sold as high as \$46, the assay base ranging from \$42 to \$43, the metal base from \$41 to \$42 per ton of 60% zinc. The calamine base price is \$21@24 per ton of 40% zinc. The average of all grades is \$40.38 per ton. Lead sold as high as \$54, the base price resting at \$50 per ton of 80% metal contents. The average of all grades is \$50.88 per ton. The third blizzard began this week on Thursday evening, with 6 in. of snow. The temperature has remained 15 deg. above

zero as the lowest point, but has risen only enough to cause a temporary thaw, placing the roads in such condition that very little loading has been done since Wednesday, as it rained all of Thursday before the snow began. Outputting is badly crippled and loading is next to impossible.

SHIPMENTS WEEK ENDED FEB. 14

	Blende	Calamine	Lead	Value
Total this week....	8,164,690	446,900	1,391,460	\$209,290
Total seven weeks	69,213,760	3,938,450	12,770,990	1,761,635
Blende value, the week, \$168,805; seven weeks, \$1,398,040.				
Calamine value, the week, \$5095; seven weeks, \$43,570.				
Lead value, the week, \$35,390; seven weeks, \$320,025.				

IRON TRADE REVIEW

NEW YORK—Feb. 18

Improvement continues to be manifest in the general tone of the iron and steel markets. This is shown in a concrete form by the increase in orders for various forms of finished steel and in the greater activity at mills. A temporary setback was found in the intense cold and heavy snow storms of the past week, which interfered with all work, and delayed transportation.

So far as actual new buying of steel products is concerned there is a recession in activity as compared with the movement in January, but this is with the interpretation that contracting means buying. As a matter of fact contracts are worth little in the steel trade and the actual flow of business is determined by specifications. In some important lines specifications have greatly increased over the January rate. In tubular goods the specifications thus far this month are about 75% greater than those received in the corresponding period in January. In sheets the specifications are also large. In bars, plates and shapes there is probably some decrease in specifications.

Business in pig iron has increased and there has been quite a heavy buying movement in basic and foundry irons, but without much change in prices.

Foreign Trade of the United States in iron and steel and machinery, year ended Dec. 31 is valued as below by the Bureau of Statistics of the Department of Commerce:

	1912	1913	Changes
Exports.....	\$289,128,420	\$294,435,060	I. \$5,306,640
Imports.....	29,328,709	33,601,322	I. 4,272,613
Excess, exports.....	\$259,799,711	\$260,833,738	I. \$1,034,027

The increase in exports this year was 1.8%; the gain in imports was 14.6%. For the last three months imports have shown a decrease as compared with last year.

PITTSBURGH—Feb. 17

Steel mill operations are increasing, though very slowly. While some mills are operating almost at capacity, or at better than 80%, there are others running at less than 60%, and these mills have no expectation of reaching full operation for some time. There is therefore no effort to force the market. The mills are standing firmly on advanced prices and awaiting the development of heavier consumption. Much of the increase in production thus far experienced is for the replenishment of stocks. The average of steel mill operations is now close to 70% of full capacity, showing a slight increase even in the past fortnight.

The Carnegie Steel Co. has announced new tonnage wage scales for its Ohio works at Youngstown, involving reductions in rates per ton. It is represented that the change is due to the introduction of improved machinery, whereby tonnage output is increased. There is no disposition in the Central West to make any general wage reductions at this time.

Pig Iron—The Republic Iron & Steel Co. has purchased 10,000 tons of bessemer pig iron for quick shipment from the Brier Hill Steel Co., paying \$14.25 at furnace, which is 25c. above the market as lately quoted and based on sales made in January. The Westinghouse Electric & Manufacturing Co. has purchased about 4000 tons of foundry iron for its Allegheny works and about 6000 tons for its Cleveland works, paying about \$14.15, delivered, for the Pittsburgh district iron and about \$13.25, delivered, for the Cleveland iron. Delivery is altogether for second quarter. The company had inquired for second half also, but only a few furnaces were willing to quote for the later delivery, and those that did quote named substantial advances. The market is as follows: Bessemer, \$14.25; basic, malleable and No. 2 foundry, \$13.25@13.50, at Valley furnaces, 90c. higher delivered Pittsburgh, except that some furnaces would give away their freight ad-

Assessments

Table with columns: Company, Delinq., Sale, Amt. Lists various companies and their assessment details.

Monthly Average Prices of Metals

SILVER

Table showing monthly average prices for Silver in New York and London from 1912 to 1914.

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

COPPER

Table showing monthly average prices for Copper in New York and London from 1913 to 1914.

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

TIN

Table showing monthly average prices for Tin in New York and London from 1913 to 1914.

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

LEAD

Table showing monthly average prices for Lead in New York, St. Louis, and London from 1913 to 1914.

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

SPELTER

Table showing monthly average prices for Spelter in New York, St. Louis, and London from 1913 to 1914.

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

PIG IRON IN PITTSBURGH

Table showing monthly average prices for Pig Iron in Pittsburgh from 1913 to 1914.

STOCK QUOTATIONS

Table of stock quotations for COLO. SPRINGS, SALT LAKE, and TORONTO.

Table of stock quotations for TORONTO.

SAN FRANCISCO Feb. 17

Table of stock quotations for San Francisco, Feb. 17.

N. Y. EXCH. Feb. 17

Table of stock quotations for New York Exchange, Feb. 17.

N. Y. CURB Feb. 17

Table of stock quotations for New York Curb, Feb. 17.

BOSTON CURB Feb. 17

Table of stock quotations for Boston Curb, Feb. 17.

LONDON Feb. 4

Table of stock quotations for London, Feb. 4.