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St. Joseph Lead Co.'s Smelting Plant, Herculaneum, Mo.

SYNOPSIS—This smelting plant in southeastern Missouri treats lead concentrates in blast furnaces, the furnace charge being sintered on Dwight-Lloyd machines. The plant has been reconstructed during the last three years and now represents the highest development in sintering-and-blast-furnace treatment. The lead on the furnace charge amounts to about 40%, which is extremely high as compared with Western silver-lead practice.

The St. Joseph Lead Co. about three years ago began the reconstruction of its smelting plant at Herculaneum, Mo., and after suffering an interruption from fire in June, 1913, which destroyed the sintering plant, has now brought its works up to a high standard of efficiency.

consists essentially of a Dwight-Lloyd equipment for sintering the furnace stock and blast furnaces for smelting. There are no ore hearths, reverberatory roasting furnaces, and similar equipment of the early days. The Savelsberg roasting process, which was in use for a number of years at these works, has now been supplanted by Dwight-Lloyd straight-line sintering machines.

The low-grade lead matte produced is pre-roasted in a Holthoff and a Wedge furnace, their product being then sent to the sintering machines for incorporation in the furnace charge. The lead matte is roasted and resmelted until sufficiently high in copper to warrant concentration in one furnace in a special run, the product then being sold as copper matte. The lead is refined first by



GENERAL VIEW OF SMELTING WORKS OF ST. JOSEPH LEAD CO.—LOOKING NORTH

It represents the highest development in this country in the sintering-and-blast-furnace treatment of lead concentrates.

LEAD CONCENTRATES SMELTED IN BLAST FURNACES AFTER SINTERING

The materials treated are the lead concentrates from the company's mills at Bonne Terre, Leadwood, and Doe Run. Smelting these concentrates in blast furnaces is made commercially possible only by the use of Dwight-Lloyd sintering machines, practically the entire furnace charge passing over these machines, with the exception of the limestone and coke. Thus, the smelting plant

liquating to remove most of the impurities and then in steam kettles.

The principal fluxes used are limestone, sand and pyrites cinder; the last is obtained from various acid plants of the Mississippi Valley, while the limestone is quarried close by, and a quarry of nearly pure silica sand has been opened about three miles from the smelting plant.

WORKS ON THE BANKS OF THE MISSISSIPPI

The Herculaneum Works is situated on the banks of the Mississippi River and is served by the Mississippi River & Bonne Terre Ry., which connects it to the St.

Louis, Iron Mountain & Southern at Riverside, two miles from Herculaneum and 30 miles from St. Louis. The lead concentrates from the company's mills are received at the plant in steel dump cars, which are sampled with a 4-ft. posthole auger, by drilling twenty-four 6-in. holes to the bottom of each car. The auger is withdrawn every few inches and some of the drillings are placed in a sample can. This method has been found to check with mechanical sampling and is much more easily accomplished.

The concentrates are dumped into bins in the mixer building, an effort being made to distribute them so as to accomplish a rough bedding. A conveyor leading to the mixing plant runs under these bins and the various ingredients of the charge are fed to it by screw feeders actuated by a double-cone drive, so that their speed may be readily adjusted. At regular intervals the man in charge of the conveyor receives the feed for a full minute in a box, and if the weight per minute varies from the amount specified the cone drive is adjusted until exactly the right amount is being fed. The conveyor passes in turn under the pyrites-cinder hopper, the roasted-matte hopper, the concentrate and the sand hoppers and receives the amount of each ingredient required. The material is sprayed with water before entering the mixing apparatus. The mixing plant consists of a revolving drum and Fernholtz clay pulverizers, the latter being specially designed for this work.

EIGHT DWIGHT-LLOYD SINTERING MACHINES

The sintering plant comprises eight Dwight-Lloyd straight-line machines, 42x264 in. Draft is induced for each two machines by a No. 110 Sirocco fan, which provides a suction of 5 or 6 in. of water. The sintering bed is about four inches thick and the speed is so regulated that it is about 12 min. in passing over the windbox. Fuel oil is used for ignition, with modified Hauck burners, the atomizing being done by steam or compressed air. The fans are operated by 75-hp. Electro Dynamic Interpole motors, direct connected, and about 1000 cu.ft. of free air per minute is drawn through the sintering bed of each machine. On account of the nature of the charge there is a great tendency for the grates to become clogged, and a man is employed continuously at each machine to clean the grates. The sinter is discharged into standard-gage cars for transfer to the blast-furnace bins.

The concentrates fed to the sintering machines contain from 65 to 74% Pb, 14% S, 3% SiO₂, 5% FeO, from 1 to 5% Zn, 0.5% Cu and from 3 to 5% lime and magnesia. Besides the concentrates, the sintering charge contains pyrites cinder, flue dust, sand and roasted matte. The sintered product usually contains from 45 to 50% Pb, 12 to 15% SiO₂, 17 to 21% FeO, 4 to 5% S, and from 4 to 5% lime and magnesia. The lead tenor of the sinter may not much exceed 50% without causing difficulties in roasting by reason of being too fusible. The gases from the sintering machines contain about 4% of sulphur dioxide.

The crushing of limestone and matte is done in a building 50x100 ft. The limestone is crushed in a No. 5 Gates gyratory crusher and raised by a bucket elevator to one of two bins that discharge into standard-gage cars outside the building. The matte is crushed by two Blake crushers and by two sets of Allis-Chalmers 14x36-in. rolls until it passes ¼ in. The crushed matte is delivered to

the top of the roaster buildings by a belt conveyor. The crushing of the matte will be abandoned when arrangements are completed for granulation.

MATTE ROASTED IN HOLTHOFF AND WEDGE FURNACES

The matte is pre-roasted in one Holthoff single-hearth furnace and in one seven-hearth Wedge furnace. The Holthoff furnace is 36 ft. in diameter, and the annular hearth makes a revolution every 11 min. A gas producer in the center of the furnace furnishes heat through eight ports. Oil firing has been recently substituted for gas. This furnace handles about 40 tons of crushed matte per day, which is fed at the outside and discharged at the inside of the hearth. The sulphur content of the matte is reduced from 24% to about 12 per cent.

The Wedge furnace is 21 ft. 6 in. in diameter and is operated by a 25-hp. motor. The capacity is about 60 tons per day and the repairs are less than those on the other furnace, and the fuel economy is much greater. The two lower hearths of this furnace have been converted into firing hearths to increase the capacity. The pre-roasted matte is taken in standard-gage cars to bins serving the mixing plant.

LARGE BLAST FURNACES

The St. Joseph Lead Co. does all its smelting in four blast furnaces, 42 in. wide and 192 in. long. The Herculaneum lead furnaces are the longest in the United States, except one furnace at Perth Amboy, N. J.; they are exceeded in hearth area, however, by the furnaces at Murray and by those at Tooele, Utah. Originally the Herculaneum furnaces were 160 in. long inside; eliminating the end bosh made the furnaces 16 ft. long. They are in all respects similar to Western furnaces. The tuyeres vary in diameter from 4 to 4½ in., are at 16-in. centers and are 15 in. above the slag line. The steel jackets are 6 ft. high, four being used on each side and one on each end.

A charge column of about 17 ft. is maintained, and the blast pressure varies between 24 and 34 oz. Air is taken from the bustle pipe for each side jacket by a 12-in. pipe, which serves three tuyeres. Blast is furnished by one No. 7 Roots blower and three Connersville blowers, two of 84 cu.ft. capacity and one of 68 cu.ft. capacity per revolution. The furnace tops are similar to those in the newer Western smelting works, the gases being drawn off below the feed floor.

The furnace charge is made up in a charge car of the Pueblo type and is raised on an incline to the feed floor by an electric or steam hoist. The charge consists of 6000 lb. of sinter, 1000 lb. of slag shells, and the necessary limestone and coke, which latter amounts to about 12½% of the charge. In 1913, two charge pits were provided, one being used for sinter exclusively and the other for fuel and flux. This change has enabled the same crew of 18 men to make up 95 charges per 8-hr. shift against a previous maximum of fifty.

In tapping the furnaces at this plant, the tapper uses an unusually long rod, from 20 to 30 ft., and stands outside the zone of fume and sparks. The matte is still handled in hand pots, but this will shortly be supplanted by a mechanical-handling equipment using large bowls transferred by an electric overhead crane to a barrel-type storage furnace at the granulating plant. The matte usually runs about 3% copper, but this gradually increases to



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VIEW OF BLAST-FURNACE BUILDING AND FEED FLOOR



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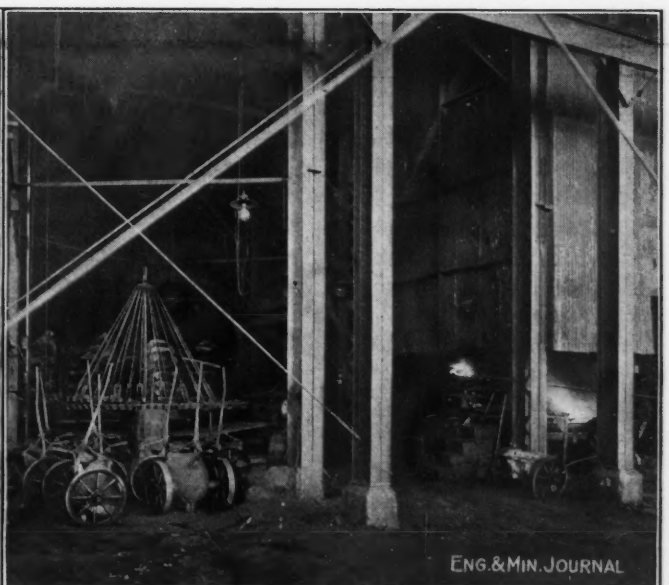


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DWIGHT-LLOYD SINTERING DEPARTMENT



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TWO VIEWS OF THE TAPPING FLOOR AT HERCULANEUM, MO.

about 7.5% when the matte is set aside for concentration.

The slag from the forehearth flows into 27-cu.ft. one-piece slag pots, and is taken to the dump by electric locomotives; on returning, the pots are "shelled" directly into all-steel standard-gage railroad cars, which stand on a depressed track. The slag shells, which contain 4% lead, are sent to the blast-furnace bins.

The lead on the furnace charge is about 40%, which is extremely high as compared with the Western silver-lead practice. The coke formerly used was of inferior quality, but first-quality coke is now found to be cheapest in the end. A special coke track was installed last year, so that coke can now be unloaded from railroad cars directly into charging barrows.

As the composition of the sinter is known, it is fairly easy to control the composition of the slag. A typical

to make it of the class that formerly used to be known in the trade as "chemical" or "chemical hard" lead. During recent years, however, that designation has disappeared, and nowadays "St. Joe" lead is sold as an ordinary Missouri brand. Following the practice inaugurated by the St. Louis Smelting & Refining Co. at Collinsville, Ill., the St. Joseph Lead Co. is planning to put in a desilverizing plant to remove the small percentage of impurities contained in its ordinary product, and to produce a very high grade of desilverized lead the premium commonly paid for such lead and the small amount of silver that can be extracted from the ordinary lead making this an advisable thing to do. The company will thus, after Jan. 1, 1915 produce from 1000 to 2000 tons of desilverized soft lead per month, which will be marketed as the "Doe Run" brand. It is expected that this lead will contain from 99.98 to 99.99% Pb and practically no silver,



BAGHOUSE OF ST. JOSEPH LEAD CO.—LOOKING SOUTH

analysis is: SiO_2 , 33%; FeO , 36; CaO , 14.5; MgO , 4; Al_2O_3 , 3; S, 2; Zn, 4; Pb (wet) 1.2%. It has not been found practical to make a high-lime slag, on account of the presence of magnesia. The slag is sampled every hour.

The four blast furnaces each develop an average capacity of 225 tons of charge per day and produce about 90 tons of lead, with a maximum of 300 tons of charge and a load production of 120 tons. The lead wells, provided with a pouring spout, are tapped directly to molds on a casting wheel. The rough lead pigs are trucked to the refinery siding, which contain four liquation furnaces. These have cast-iron shells and a water-cooled bridge wall and are fired with coal. From these furnaces the lead passes to 30-ton kettles, where after agitating with steam and skimming off the dross, it is siphoned to a casting wheel on the floor below. There are two casting wheels, each serving two kettles. Cast-steel kettles are now used in place of the cast-iron kettles originally installed.

The "St. Joe" lead contains a little antimony, enough

copper, arsenic, or bismuth, and with only an insignificant amount of antimony.

DUST- AND FUME-COLLECTING SYSTEM

A new baghouse and flue system was erected in 1913 at an expense of \$150,000 for filtering the gases from the blast and refinery furnaces. The dimensions of the baghouse building are $216 \times 56\frac{1}{2} \times 50$ ft. The thimble floor is 16 ft. above the ground and the filtering area above this is divided into four sections. There are 2496 bags, each 30 ft. long by 18 in. in diameter. Cotton bags having 48 threads to the inch are used, and no difficulty has arisen from the burning of the bags. The gases are sent through the baghouse by means of a fan 16 ft. in diameter; the impeller is 8 ft. 1 in. wide, and operating at 203 r.p.m. delivers 140,000 cu.ft. of gas under a head of 2 in. of water. The baghouse is equipped with mechanical-shaking devices, and it is now planned to handle the baghouse product with vacuum collectors. The fume assays about 74% lead.

About 900 ft. of flue precedes the baghouse; there is a 600-ft. section of steel balloon flue followed by a masonry flue having 13-in. walls and 5-ft. jack arches. A cyclone dust collector has been installed to handle the blast-furnace flue dust from the balloon flue. The dust is delivered into a conical bin and taken through a pug mill, where it is wet and delivered to the main mixer belt.

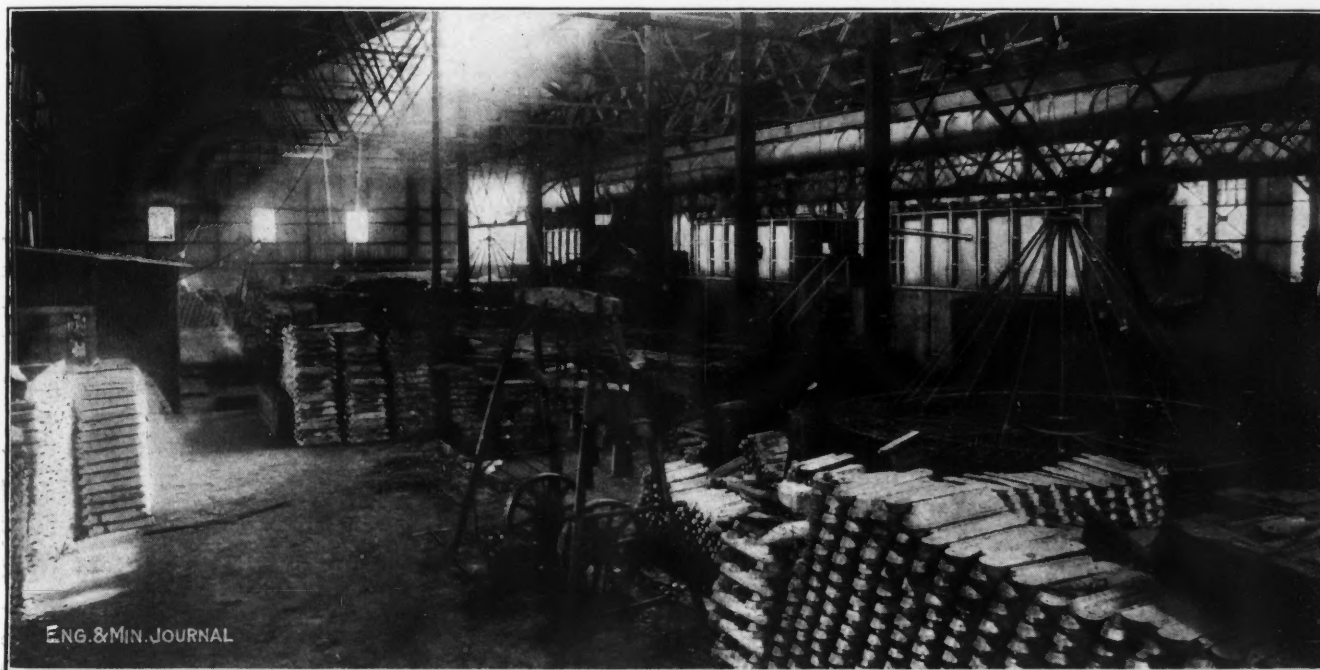
The Herculaneum works has the tallest lead stack in the United States; it is 350 ft. high by 20 ft. inside diameter, and rests on a concrete block 68 ft. square, which in turn is supported by concrete piles, the distance to bed-rock necessitating this construction. The stack is protected from lightning by eight platinum-tipped rods which extend well up above the top of the stack and connect with the ground through two copper rods.

An unusual feature of this smelting works is a thaw house capable of holding eight 50-ton cars of concentrates. It is heated by coal, and is used only during a few weeks of winter, when the wet concentrates freeze

The Proposed Bureau of Safety in the Department of Labor

By R. W. RAYMOND

Congress has at last adjourned, after the longest session in its history, without taking final action upon two mischievous bills, proposed in the interest of "organized labor," and pressed by the permanent "labor" lobby which Mr. Gompers and his associates maintain at Washington. Since Congress will not reassemble until early in December, there is reason to hope that its members will be, by that time, less susceptible to the threat of those who claim to represent that extremely vague power, the "labor-vote." A few weeks ago, we saw the spectacle of both parties making haste in competitive surrender to this secret organization, in the almost unanimous passage of a provision exempting the labor unions from the duties and penalties prescribed for other citizens or associations. Perhaps there will be less Congressional cowardice after



INTERIOR OF LEAD REFINERY OF ST. JOSEPH LEAD CO., HERCULANEUM, MO.

in the cars and delay unloading. The heating apparatus is a coal furnace with 350 ft. of 48-in. pipe.

During the last two years the St. Joseph Lead Co. has expended about \$250,000 in the reconstruction of its smelting plant at Herculaneum and when this campaign of reconstruction is finished, the plant will be representative of the best practice in this country, both in its smelting work and in the handling of materials.

The staff at Herculaneum is as follows: William Allen Smith, manager; H. P. Saunders, superintendent of construction; D. L. Cleaves, superintendent of roasting; J. N. Goddard, superintendent of smelting; R. T. Rolufs, superintendent of smelting; C. F. Setz, research chemist; A. B. Horton, chief clerk.

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Total Production of Coke in the United States in 1913, according to the U. S. Geological Survey, was 46,299,530 short tons; an increase of 2,315,931 tons over 1912. The quantity of coal used in the manufacture of coke in 1913 was 69,239,190 tons, showing 1.496 tons of coal used to one ton of coke made; conversely the coke production was 66.9% of the coal used at coke ovens.

election. But it is not the less important that good citizens should understand what is proposed and will continue to be urged by that lobby which never adjourns, and which has won already, through the weakness or indifference of politicians, numerous victories of special privilege and class legislation.

The two bills above mentioned, which are not by any means dead, but still dangerous, are No. 10,735 and No. 18,500 of the House of Representatives. The first is "An Act to Create a Bureau of Labor Safety in the Department of Labor." It passed the House Mar. 11, 1914, was read twice in the Senate the next day, and referred to the Committee on Education and Labor, from which committee it was favorably reported without amendment, July 27, and placed upon the calendar as No. 621. It will be seen that nothing remains but to pass it. But there is said to be "an arrangement" that the provisions of this bill shall be so amended as to avoid conflict with the work of the Bureau of Mines. If this report be

true, it is strong evidence that the Senate had made up its mind to pass the bill—the stipulated amendment representing a compromise, as the alternative of a complete surrender.

The other bill (No. 18,500) is apparently the lash which was intended to drive Congress into the acceptance of the first. It is "An Act to Transfer the Bureau of Mines to the Department of Labor." It was introduced in the House Aug. 24, 1914, and referred to the Committee on Mines and Mining, which has not taken, as yet, any action upon it. And according to the talk at Washington, it is not expected that the committee will favorably report this bill. But the date of its introduction is significant, since it followed a brief consideration in the Senate of No. 10,735, which developed some opposition to that bill. The second bill, perhaps, scared the friends of the Bureau of Mines, and it is quite possible that they saw fit to consent to the "arrangement" by which the second bill should not be reported favorably, and the first bill should be allowed to pass, so amended as not to interfere with the Bureau of Mines. If this arrangement should be carried out, the Department of Labor will take charge of all investigations, etc., except those relating to safety in mines and metallurgical works, which shall continue to be conducted by the Bureau of Mines, in the Department of the Interior.

Yet this compromise is not advisable unless nothing better can be got. In the first place, it would not permanently protect the Bureau of Mines. In the second place, the Department of Labor is not a proper authority to direct inquiries of the kind here contemplated. By history and organization, it is a political department. Its head is, and will doubtless always be, a member of a labor union. That is what the Department was created for—to give "organized labor" a share in the government.

The Department of the Interior, on the other hand, contains several technical and scientific bureaus, which have been kept, thus far, measurably free from political interference. At all events, this has been the case with the Bureau of Mines, the admirable work of which has won the praise of the world. An important branch of that work has been the investigation of the conditions of health and safety in mining and metallurgical operations; and that investigation has shown clearly that one of the chief causes of the recent increase in mine accidents has been the lack of discipline among miners. This has developed itself especially since the beginning of this century, and is largely due to the spirit of lawlessness fostered by the miners' unions. In July, 1902, I wrote editorially:

In mining—above all, in coal mining—there are special reasons, both of economy and of safety, for the enforcement of a rigid discipline. And the indispensable element of such discipline is the instant discharge of an employee who violates a salutary rule, whether the offense causes disaster or not. But for the past two or three years, at least, under the rule of Mr. Mitchell and his organization, it has been impracticable to discharge a man without incurring an instant strike and demand for his reinstatement. I do not say that on proof of clear violation of a rule recognized by the union as necessary, the discharge might not be ultimately approved. * * * But what seems to be inevitable is, that even if the justice of a discharge be ultimately acknowledged, the employer is first fined for it by a considerable loss of money through a strike, and when he is forgiven nobody makes good his loss. He is treated like the Western traveler who was mistaken for another man and shot on sight, and who received while dying the sincere apology of his murderer for the unintentional error. Moreover certain rules are not recognized by workmen as necessary.

As an instance, I cited the notorious recklessness of coal miners as to smoking pipes underground, and their consequent disobedience to rules forbidding the opening of safety-lamps or the carrying of matches there. A similar case is presented by their resistance to all rules intended to prevent the creation of an unnecessary amount of dust by the excessive use of explosives. Moreover, all mine managers are aware that the principal obstacle to experimenting with new systems or apparatus for the promotion of either safety or efficiency is the resistance of the miners' unions.

In the anthracite regions, the situation in this respect is not so bad as it was in 1902, but in other coal-mining regions more completely dominated by "organized labor," it is worse.

Now the investigations of the Bureau of Mines have brought out something of the truth in this respect; and consequently "organized labor" would like to extend its power not only over legislation, but over the governmental inquiries intended to furnish a basis for legislation.

But the Bureau of Mines is too strongly entrenched in public favor to be a suitable point for a first and direct attack. And, after all, that is only a part of a much larger field in which technical associations are exposing the same evil. Hence the proposal of a Bureau of Safety in the Department of Labor. Let us hope that it will not be necessary, in order to save the Bureau of Mines, to put all other industries at the mercy of that thoroughly and hopelessly political executive department. Such inquiries, if they are to be prosecuted by the Government at all, should not be controlled by parties seeking other ends than the simple truth—still less by parties whom the truth may hurt. "Organized labor" should, of course, be fully heard for or against any legislation affecting its interests. In fact, it is both heard and felt, as nobody can deny. But it ought not to run a scientific bureau besides.

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Manganese Ore in Brazil

U. S. Consul Frazer at Bahia, Brazil, writes that from the end of 1912 to date no manganese has been shipped from Bahia, as prices in foreign markets have not been high enough to make the working of the Bahia mines profitable. The only three in the state are the Pedras Prestas, Sape, and Onha; all are owned by the same company and situated about 20 miles from the town of Nazareth, on an estuary of the Bay of Bahia. The latter two mines named are connected with the Nazareth Railway by a narrow-gage line $5\frac{1}{4}$ miles long, over which the ore is hauled to the Nazareth Railway siding and dumped into railway cars, which carry it 14 miles to the town itself beside the bay. There it is put into sailing lighters and taken to the ship. From the other mine, Pedras Prestas, the ore is also taken to the Nazareth Railway by a narrow-gage line, down which the cars run by gravity, the empty trucks being hauled back to the mine by mules. It is stated that the ore contains 43 to 49% metallic manganese and would average about 45%, and that an average analysis would be: Metallic manganese, 45%; phosphorus, 0.016; silica, 3 to 4; iron, 3 to 6; moisture, 2 to 3%. The cost of mining, railway transportation, lighterage, export duties, etc., is given as \$2.80 per ton.

The Law of Crushing--I

By H. STADLER*

SYNOPSIS—Much controversy among students of crushing operations has arisen over the selection of proper laws, the two principles being stated in those known as the laws of Rittinger and Kick. Rittinger's law states that the work of crushing varies as the surface exposed during crushing; Kick's law, that it varies as the ordinal numbers of any regular reduction scale at a constant ratio. Theoretical discussions of known laws of physics and mechanics tend to support the validity of Kick's law.

All the methods suggested by various experts for the computation of crushing efficiency are based on crushing laws deduced, for the obvious reason of mathematical simplicity, from the dissection of a unit cube into smaller cubes. The functions of the cubes vary with their sizes according to simple algebraic relations and on each reduction in grade they are in exactly defined mathematical relations to one another, so that any intermediate value can readily be interpolated by calculation or graphically. It is then assumed that the average values of the functions of the irregularly shaped particles follow, during the operation of their reduction, the same laws as the

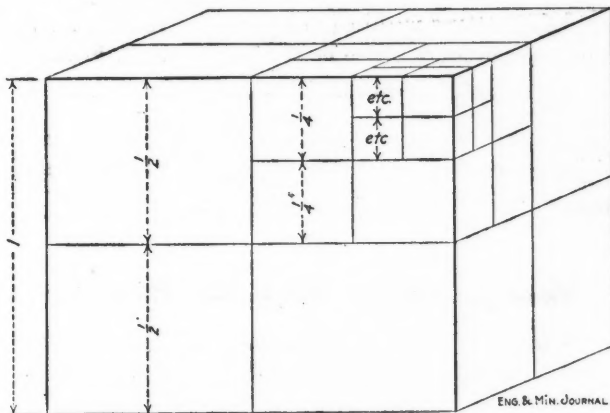


FIG. 1. SUBDIVISION OF CUBE

theoretical cubes. By actual measurements it has been proved that this assumption is not only admissible and correct but also that it is followed with remarkable precision.

COMPARISON OF CRUSHING LAWS

The crushing laws hitherto advanced by various investigators are stated, in abbreviated form, in the accompanying table in the two ways in which they can be read, according as the work done in crushing is meant to refer to the rupture of individual sizes or to the total work done in obtaining the final product from a unit mass. The given examples of the varying functions of the cubes, in accordance to which these laws are supposed to vary, refer to a regular reduction of the unit-cube at the assumed ratio 8, because at this ratio a clear conception is possible to the mind.

THE VARIOUS CRUSHING LAWS

CRUSHING LAW	The Energy required for causing the rupture of bodies of given sizes varies as:	Example for Reduction Ratio 1 : 8 No. of Fractional Cubes 1 : 8 : 64 : etc.
So called Rittinger's Law, applied by Dr. Caldecott and H. S. Pearce.	The squares of the diameters, or as the cross-section.	1 : 4 : 16 : etc.
Kick's Law, applied by H. Stadler.	The cubes of the diameters, or as the Volume or Weight.	1 : 8 : 64 : etc.
	The Total Work spent upon producing the final size from the unit body varies as:	
So called Rittinger's Law applied by Dr. Caldecott and H. S. Pearce ¹ .	The surfaces exposed during crushing, or, as the reciprocal of the diameters.	1 : 2 : 4 : etc.
Klug and Taylor ² .	The square of the diameter of the original size divided by the square of the diameter of the final size.	
R. W. Chapman ³ .	The number of meshes of the I. M. M. standard screens.	1 : 1+1 : 1+1+1 : etc. 1 : 2 : 3 : etc.
Kick's Law ⁴ , applied by H. Stadler ⁵ .	The ordinal numbers of any regular reduction scale at a constant ratio.	

(¹) Journ. Chem. Met. and Min. Soc., S.A., Sept., 1906. (²) Journ. W. Aust. Chamber of Mines, Jan., 1906. (³) Proc. Aust. Inst. of Min. Eng., 1909. (⁴) F. Kick-Gesetz der Proportionalen Widerstande, Leipzig, Arthur Felix, 1885. (⁵) Grading Analyses and Their Application, Trans. I. M. M., Vol. XIX, 1910-11.

It will be noticed from the table that the proportion of the work done to the factors which determine the laws of Messrs. Klug and Taylor and of Prof. R. W. Chapman is the same as that of the so called Rittinger's law. They are evolved on different bases, but actually they are all three identical. The only two laws left for further consideration are the so called Rittinger's law, which uses the reciprocal of the diameters (represented by the mesh apertures) as an index of the work done on each grade, and Kick's law using the ordinal number of the grades of a regular reduction scale by volume as the comparative representative of the work done.

FALLACY OF RITTINGER'S LAW

The load required to overcome the cohesive power of the molecules is, of course, measured by the area over which the separation has to be effected, or expressed in a more general form: External forces causing an analogous deformation of geometrically and technologically similar bodies vary as the square of their homologous dimensions. The complications arising from the deformation of the sectional area, its shape, time of action, etc., during the operation of separation are only of theoretical interest and for all practical purposes they do not affect the validity of this universally recognized law on which all our statical calculations are based. With the admission of this indisputable truth, the fallacy of the so called Rittinger's law is at once apparent, because "force" and "work done" cannot at the same time be proportional to the area of rupture. The advocates of the law cheerfully disregard the distance through which the force operates in doing work, and all the figures obtained by this law and the conclusions drawn from it are therefore incorrect.

If this conclusion, arrived at by theoretical considerations within the comprehension of any student of elementary physics, would require corroborative evidence of actual practical experience it can be produced without troubling much about figures. Many years ago exhaus-

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tive series of tests were made by Van Reytt to determine how nearly Rittinger's law holds good in practice, and the conclusions arrived at were "that the ratio of work done to increase the surface is fairly constant with coarse sizes, but with fine sizes the increase of surface is much more rapid than the work required to produce it." (Richards, "Ore Dressing.") In consequence of the enormously rapid progression in the exposure of surfaces with the increase of the fineness of the particles practically all the energy spent is represented in these finest grades only, and no credit is given for the hard work done in exposing fractures from coarse rock. Contrary to practical experience, the efficiency of stamps would increase with the fineness of the mesh on account of the larger percentage of fines produced, and conversely, rock breakers would give an exceedingly poor return for the amount of power consumed.

THEORETICAL CONFIRMATION OF KICK'S LAW

The dominion of the imaginary law, which owed its passing existence to traditional thoughtlessness, having

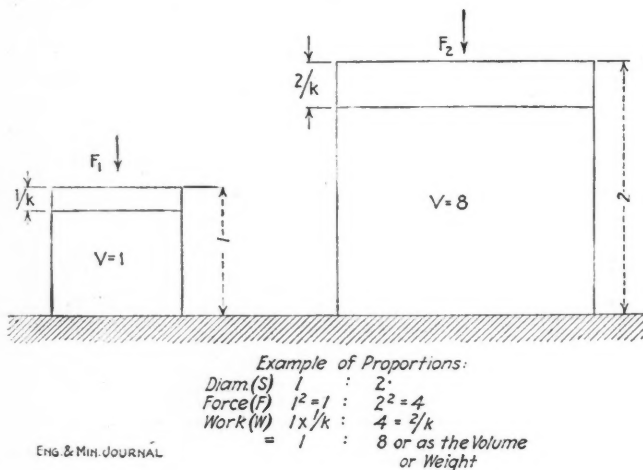


FIG. 2. PROPORTION COMPARISON

come to an end, it remains to give proof of the correctness. The only remaining crushing law, that of Prof. Kick, reads: "The energy required for producing analogous changes of configuration of geometrically similar bodies of equal technological state varies as the volumes or weights of these bodies."

Reverting again to the crushing of cubes we saw that the load required to cause analogous deformation (here the ultimate value of breaking strength) is proportional to the cross-section and varies therefore for a cube of the edge (S) as S². The displacement of the force against the opposing stresses is obviously represented by the distance by which the body can be compressed or lengthened before reaching the breaking point. This deformation varies as the edges of the cubes, and the mechanical work done, measured by the product of force into deformation, varies therefore as S² × S = S³, or as the volume.

A more scientific theoretical proof, adduced by Prof. Kick, depends upon a presumption which though admissible and most probable, our present knowledge of matter unfortunately fails to prove. Several lines of thought entitle us to assume that the analogous deformation of geometrically and technologically similar bodies

exerts, during the change on two particles in an analogous position, equal pressures and corresponding equal specific stresses. The probability in favor of this assumption is indeed very great, considering that the analogous particle-differentials in two geometrically similarly deformed bodies must move in each time-differential in the same—therefore parallel—direction. This fact conditions the acting of similar systems of forces in both cases. As the work required to produce the differentials of deformation of these particles, of equal volume-proportion as the original bodies, varies under the application of equal forces as the cubes of their homologous dimensions, or as their volumes (energy of shape), it follows that also the sums of the integrals of these energies, i.e., the total work done must vary as the volumes.

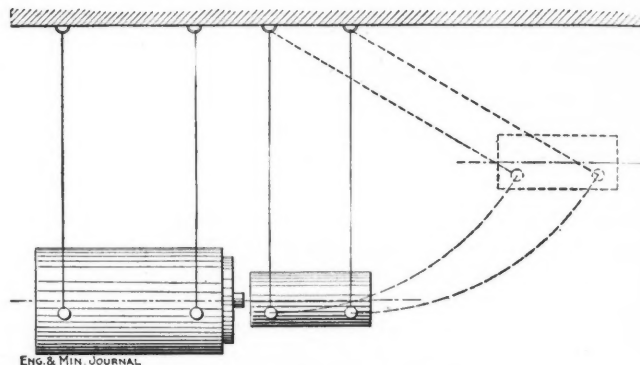


FIG. 3. BALLISTIC HAMMER

For deformations within the limits of elasticity an unobjectionable proof has also been given by Prof. F. Steiner.¹

PRACTICAL EVIDENCE FOR KICK'S LAW

Experimentally it has been proved by Prof. Kick that the height of fall required to cause the rupture of spherical bodies of homogeneous constitution by impact on a

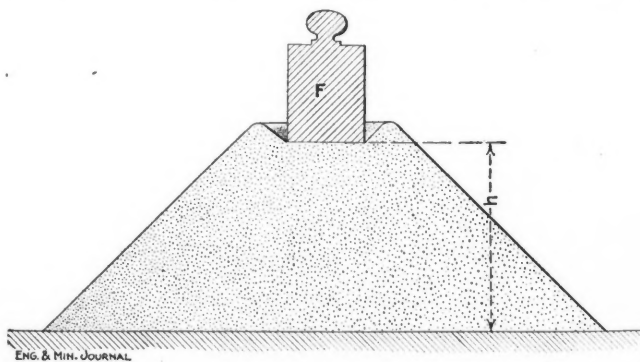


FIG. 4. SAND AS A BODY OF LOOSE TEXTURE

rigid bottom plate is constant for each given material and quite independent of the size of the spheres. The work done is here expressed by the product of the weights into the height of fall, but as this "breaking height" has empirically been proved to be constant the work done is bound to vary as the weights or volumes. This demonstration is much more conclusive than the experiments executed with falling weights, because all the numerous sources of error of the latter are here eliminated with the exception of the vibration of the bottom, acting as anvil.

Of the potential energy measured by the product of

¹"Dingler's Polytech. Journal," 1884, Vol. 251.

weight into height of fall of the hammer only a portion is actually consumed by the test specimen and the rest is lost for the purpose of crushing. The varying fall velocities affect the amount of these losses to such an extent that impact tests are practically worthless if not carried out with a ballistic hammer or with a specially made impact machine, for instance that of I. Amsler-Laffon & Son, Schaffhausen, Switzerland, by which the energy consumed, together with the deformation produced during the whole operation, is automatically registered.

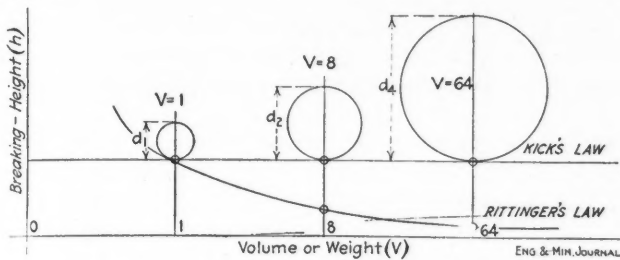


FIG. 5. COMPARISON OF LAWS

Similarly it is experimentally proved that in accordance with Kick's law the fracture of n spheres of a total weight of 1 kg. requires the same energy as one sphere of 1 kg. weight.

A rough but very intuitive demonstration can be made with cones of carefully heaped-up sands with equal angles of repose. It will be found that the products of the weights, placed on the top, by the distance to which they settle, are proportional to the volumes or weights of the heaps which have been deformed, or crushed if we consider them as bodies of extremely loose texture.

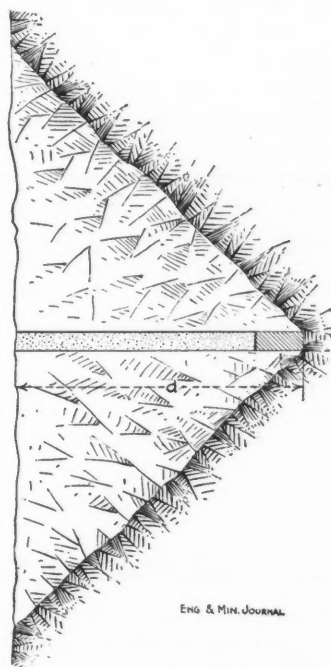


FIG. 6. VARIATION OF EXPLOSIVE CHARGE

The empirically ascertained constancy of the breaking height is corroborated by a mathematical proof with an *argumentum ad absurdum*. For this purpose we determine the height of fall h for the two laws, and in both cases we must have: Work W equal to the product of volume V by the height of fall h , or, $W = Vh$. According to the law adopted we have:

<p>For Kick's Law</p> $W \propto V$ <p>Hence $h \propto \frac{V}{V} \propto 1$</p>	<p>For Rittinger's Law</p> $W \propto d^2$ $Vh \propto d^2 \propto \frac{V^2}{V^2}$ $h \propto \frac{V^2}{V}$
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In the case of Rittinger's law the plotting of the values results in a hyperbolic curve with the ordinates as asymptotes, and the conclusion would be that the breaking height decreases with the weight of the spheres. An in-

finately large sphere would therefore burst at the breaking height zero, an obviously absurd conclusion. The eventual curve of the breaking height can never intercept the abscissa except in the case of $V = 0$, and the only possibility of the curve is therefore to be a straight line parallel to the abscissa.

All the formulas suggested for estimating the required charge of explosives in blasting are based on the over one-hundred-years-old rule of Lebrun that the explosive force of the charge must be proportional to the cube of the depth of the borehole, but as the volumes of the breaking cones, which for any given ore have equal vertex angles, vary as the cubes of their heights it follows that the work done in blasting varies as the volume of the broken rock. Actual experience accords with this practical rule which by the nature of the circumstances can only be an approximation. Kick's law holds good therefore even in the extreme case of the coarsest possible crushing, and at the other end governs also the elastic deformation of gases and liquids, though this application is of little practical value since the laws of Mariott and Poisson cover a much wider ground for gases. All branches of technology abound with examples of proofs

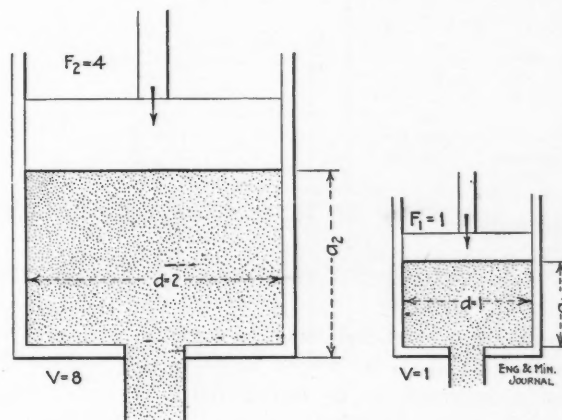


FIG. 7. ENERGY FOR DISCHARGING PLASTIC MATERIALS

of the correctness of Kick's law, or of applications of it—we may take it either way.

LAW APPLIES TO ALL DEFORMATION OPERATIONS

It is well known that working machines cannot be built proportionate to the homologous dimensions of the working pieces, but these proportions can be determined by Kick's law. If for instance a new steam hammer is expected to perform analogous deformations on larger working pieces, the product of weight and height of fall of the hammer must be proportional to the weights or volumes of the working pieces.

The energy required to effect the discharge of plastic materials from geometrically similar vessels or cylinders (brick-making machines, etc.) under analogous working conditions is proportional to the volume of the masses or to the volume of the cylinders.

In punching of holes in steel sheets the hydraulic pressure varies as the square of the diameters and the relative time during which this pressure has to act under analogous working conditions, or the displacement of the piston varies as the thickness of the sheets. The work done, i.e., the product of pressure into displacement or water consumption, is therefore proportional to the

volumes or weights of the rods if, according to the requirement of geometrical similarity, the proportion of the diameter to the thickness of the sheets is the same in both cases. In armor plates, where not the penetration but the resisting power is the standard, the cube of the thickness of the plates of the same material must vary as the kinetic energy of the projectiles which they have to stand. The proportionality of the cube of the thickness is here essential because the other dimensions of the plate are, for such great velocities, of no influence. (Bauschinger found and proved that for the effect of a load confined to a position of the area, chiefly only that portion which is directly exposed to the pressure, is responsible.)

All these examples picked up at random clearly demonstrate the universal validity of Kick's law and point out that the mass factor which plays such an important part in laws of physics, governs also the law of crushing. In face of this array of facts and proofs derived from the rudiments of mathematics and physics it requires a

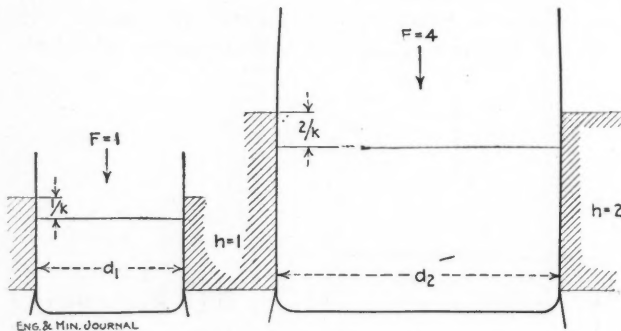


FIG. 8. VARIATION AS SQUARE OF DIAMETER

good deal of mental indolence to continue to uphold an obviously absurd theory which 30 years ago technological textbooks referred to in the words, "It was hitherto believed." Prof. Fr. Kick's works and experiments definitely closed the discussion on this old dispute.

(To be continued)

Tramming Methods in the Copper Country*

Power tramming in the Copper Country is not at all common. It is difficult to keep the track in shape on account of the tendency of the ground to move, and it is difficult, also, in the case of a conglomerate at least to concentrate enough traffic on one level to justify the initial installation, while the crookedness of the amygdaloid formations interferes with the use there. Mules are used to a certain extent, for instance, in the Ahmeek mine, the Isle Royale and the Osceola branch of the Calumet & Hecla. Where long trams were necessary in the conglomerate drifts, the Calumet & Hecla has used rope haulage. The Quincy is using electric haulage. Nevertheless, the bulk of the tramming at present is done by hand.

Working with the trammers are "rock busters" and "block-holers." The duties of the rock buster are to

*Taken from testimony offered by James MacNaughton, manager of the Calumet & Hecla properties, before the Congressional Committee investigating the recent strike in the Copper Country.

scrape and push the broken material down the bottom of the stope where the slope is too flat for it to run. The block-holer, as his name implies, drills and breaks massive pieces of rock too thick to be handled in the cars. Where it is possible, chutes are used for loading, but in many cases the dip is too flat to permit this. It has been attempted to develop a mechanical loading device, but so far without success, the size being limited by the cramped space available underground and the weight being limited to that which it is possible to move about readily.

The accompanying table, showing the length of tram and the tonnage per man in the various mines of the Calumet & Hecla, is of interest.

TABLE OF AVERAGE TRAMMING DISTANCES AND TONS HANDLED PER MAN BETWEEN JAN. 1 and JUNE 30, 1913.

Name of Mine	Average Length of Tram, Feet	Tons Trammed per Man
Ahmeek	563	16.07
Allouez	753	12.86
C. & H. Osceola lode	582	19.48
C. & H. conglomerate	171	14.53
Centennial	900	13.98
Isle Royale	750	14.14
North Kearsage	702	13.36
South Kearsage	444	14.79
Osceola	850	12.71
Superior	480	18.27
Tamarack	508	12.12

The tramming is in general done on contract. The rate is graduated according to the length of tram. In one case, the minimum rate is 25c. and the maximum 70c. per car, according to the length of haul. Many of the men prefer the longer tram, because it means less filling of the cars, which is the more arduous labor. The contract system is more correctly described as a bonus system, since the men are paid the minimum whether they make it or not, and they are paid so much per car when the total runs above the minimum.

For the first six months of 1913, the trammers on the Osceola amygdaloid averaged \$3.17 a day. These, however, were not all on contract. The 25% on contract during the same period averaged \$3.40 per day.¹

The trammer does the hard, back-breaking work and is the drudge of the mine. The bitterest complaints made before the committee were those made by trammers. The miners, however, are drawn in general from the trammers, so that the latter have always the hope of promotion.

Shannon Copper Co.

In the 16 months ended Dec. 31, 1913, the Shannon Copper Co., Clifton, Ariz., produced 18,793,724 lb. of copper, 3412 oz. of gold and 169,197 oz. of silver from 434,317 tons of ore. Of this ore, 361,084 tons came from the Shannon mine and 73,223 tons from its outside properties. The average price received for metals was 15.8696c. for copper and 60.683c. for silver. Miscellaneous earnings amounted to \$3036 and the Shannon-Arizona R.R. earned \$33,829 during the period. Development work totaled 13,600 ft. Experiments are being made to determine if a leaching process will be applicable to the mill tailings, of which there are now over a million tons averaging over 20 lb. of copper per ton; and semi-oxidized ore amounting to one or two million tons, averaging 2 to 2.5% copper. The report states that the cost of copper was 13.5c. per lb. for the period.

¹"Eng. and Min. Journ.," Aug. 1, 1914.

Modern American Rock Drills--VI

By L. O. KELLOGG

SYNOPSIS—The Chicago Pneumatic Tool Co. builds a stoper machine with hollow ball valve and reverse telescope feed. The DA-21, a typical Sullivan stoper, uses an axial spool valve. The butterfly valve is applied to one of the Ingersoll-Rand stopering drills.

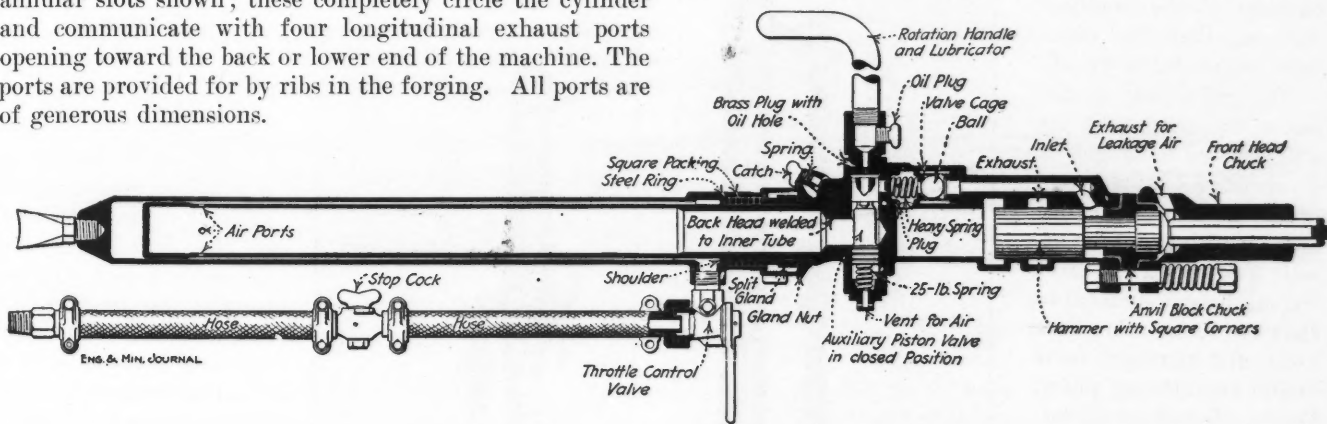
The Chicago Pneumatic Tool Co. builds a stoper which uses the ball-valve action described in detail as applied to the piston drill made by this company. The ball valve in the stoper operates in exactly the same way as in the piston machine, differing only in its size and in the manner of assembly. It weighs only one ounce and is 1 in. in diameter. The valve cage is set in a chamber formed on one side of the cylinder forging. It is held in position by a relatively heavy spring placed between the cage and a screw plug. The plug is screwed flush with the cylinder, so as not to interfere with the joint of the back head on the feed piston, and the heavy spring takes up possible discrepancies in fit. No motion of the spring is expected.

The exhaust of the cylinder takes place through the two annular slots shown; these completely circle the cylinder and communicate with four longitudinal exhaust ports opening toward the back or lower end of the machine. The ports are provided for by ribs in the forging. All ports are of generous dimensions.

above and slip through between the steel and the chuck to the end next the anvil block.

The telescope feed is of the reverse type. Air is admitted through a throttle constructed on the principle of a three-way valve. This admits air gradually by means of a flaring V-shaped annular notch in the plug. The supply of air to the machine is thereby increased slowly. The valve is provided with a small exhaust port, by which the air in the feed cylinder is allowed to exhaust to atmosphere when a run is completed. The air connection includes the two lengths of hose shown, with a stop-cock set between them, by which the air can be shut off when connecting or disconnecting the machine. The throttle is entirely distinct from the machine.

The air admitted to the throttle at first serves merely to extend the telescope feed. The lower end of the inner tube is enlarged slightly so as to have a guiding fit in the outer tube or cylinder and allow the air to pass below it and force it up in the cylinder. Just above the enlarged end are some radial ports which pass air to the inside



LONGITUDINAL SECTION, BALL-VALVE STOPPER MADE BY CHICAGO PNEUMATIC TOOL CO.

The hammer is symmetrical and has square corners instead of beveled. It was found by experiment that a square corner, as giving much less opportunity for cuttings to lodge and wear the cylinder and hammer, was superior to one with beveled corners. Rock, chips and dust are bound to enter to a certain extent at the anvil block, and these tend to pack in the corners formed by a beveled-edge hammer and the cylinder walls; on the other hand, a square corner tends to sweep the cylinder clean. Another feature which makes it unlikely that any foreign substance could lodge between the piston and cylinder walls consists of the annular grooves for exhaust, which completely surround the piston and sweep its entire surface; this, together with the blast of air, which occurs when exhaust takes place, insures thorough cleaning of the cylinder.

The front head consists of a chuck piece broached to fit the steel and a bushing surrounding the anvil block, both being held to the cylinder by short through-bolts working against helical springs, which absorb the shock of the hammer should it operate with no steel in the chuck. The head is drilled with inclined holes, as usual, to permit the escape of cuttings which naturally fall upon the chuck from

of the inner tube and to the auxiliary valve just below the cylinder. This is a cylinder valve, held shut normally by a helical spring, which requires about 25 lb. of pressure to compress it. The air enters the valve chamber around the reduced section of the cylinder valve, passes to the left through longitudinal ports in the left-hand head of the valve, and creates pressure against the left face. When this pressure overcomes the pressure of the spring, the valve moves to the right and the inlet to the cylinder-valve chest is uncovered by the head of the piston valve. The air then enters the cylinder freely and the hammer reciprocates. The right end of the piston-valve chamber is closed with a plug containing a small port; this permits exhaust to the atmosphere and prevents pressure from building up on the right face of the valve, which would cause interference with proper operation. When the throttle valve is open only a little, static pressure is sufficient to extend the telescope feed, but while it may build up momentarily enough to open the auxiliary valve, the supply is not sufficient to maintain pressure and operate the drill. A light drilling stroke can be had by opening the throttle so as to give an air supply somewhere between that sufficient for merely ex-

tending the telescope feed and that required for full-speed drilling.

Two passages lead from the auxiliary-valve chamber to the chamber containing the operating valve. This is for the sake of symmetry and to keep the contour of the cylinder within the smallest possible dimensions.

The telescope feed is packed against air leakage by five rings of square packing fitting against a steel ring, which is supported on a shoulder projecting inward from the inside of the outer tube. A screwed ring or gland nut upon the end of the outer tube brings a split gland to bear against the packing. When the feed is extended as far as it should be, the radial ports near the bottom of the piston tube come opposite the packing rings, which shuts off the air supply to the drilling cylinder. The ring referred to above, which supports the packing, prevents the passage of the enlarged end, so that the outer tube cannot be blown off.

The gland nut at the top of the outer tube has a rim which is caught by a spring-actuated snap hook to keep the tube from running out by itself. The construction of the machine is unusual in that the inner tube, back head, and auxiliary-valve chest are all one piece; this is effected by electrically welding the back-head portion to the seamless tube of the telescope feed. Lubrication is obtained by using the rotating handle for an oil reservoir. The handle is screwed into a plug which is itself screwed into one end of the auxiliary valve chamber. In the end of the larger plug is fitted a small brass plug with a $\frac{1}{64}$ -in. hole through which the oil enters the machine.

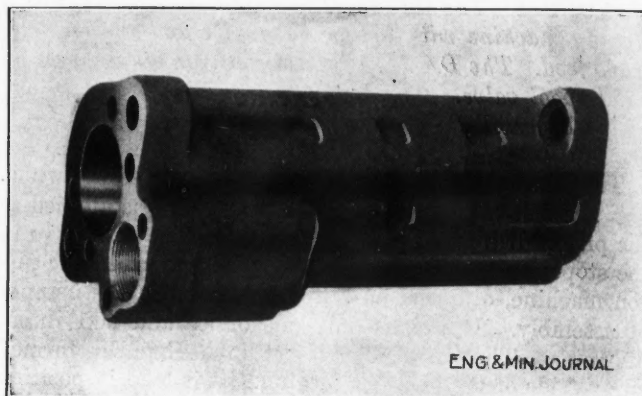
The machine weighs 70 lb., has a $2\frac{1}{8}$ -in. cylinder and a 4-in. stroke. Its overall length closed is 54 in. and open 76 inches.

THE SULLIVAN DRILL

The Sullivan stoper is perhaps best exemplified by the model called DA-21, here illustrated. The drilling end consists of a cylinder which is itself the front head, of a back head, and of a valve box held between the other two by through bolts.

The valve is a short, hollow, balanced spool valve. Its operation is too complex to be followed through in detail here, particularly in view of the fact that the ports do not all lie in the same plane. The spools are of different diam-

eter, so that by applying air pressure to their transverse surfaces in different combinations, differential pressure is obtained and the valve is thrown. The valve, like any spool valve, makes connection between the cylinder end



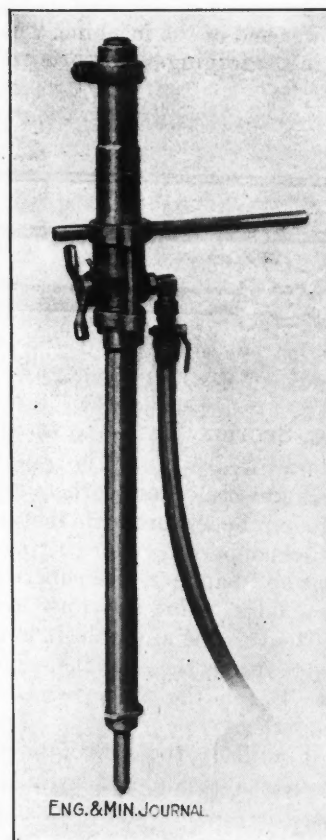
THE CYLINDER OF THE CHICAGO PNEUMATIC

and the exhaust and supply openings alternately. Ports in the walls of the cylinder afford communication between the valve chamber and the ends of the cylinder and between the exhaust and the ends of the cylinder. The al-

ternate opening and closing of these ports by the hammer in its reciprocations results in the applications of air pressure to the spool valve, by which it is thrown. All exhaust from both ends of the cylinder is conducted to a port pointing toward the feed end of the machine. The valve has end seats as well as circumferential fit, in order to prevent leakage.

The valve end of the piston is reduced in section and grooved. On the return stroke it enters the valve, and a certain amount of air is entrapped and is permitted to escape only slowly through the grooves. This retards and cushions the return stroke of the hammer.

The air is admitted through the hose connection, and is shut off and turned on by a stop cock on the hose line.



SULLIVAN STOPER DA-21

The hose connection ends in a screen which strains out any dirt particles that might interfere with the action of the machine. The throttle valve of the machine distributes the air to the drilling end and to the feed end. In its several positions, four in number, it admits air: (1) To the feed cylinder alone; (2) to the feed cylinder and in small quantities to the drilling cylinder; (3) in full quantity to both for full-speed drilling; (4) shuts

off all air. The throttle has two handles, one on each side, to balance each other, thus preventing the throttle from falling out of the position in which it has been set.

In the end of the cylinder a chuck bushing is bolted by means of a key bolt and clamp. The head of the bolt

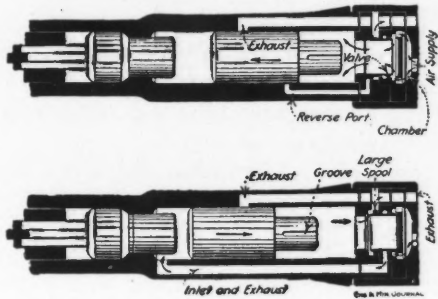


DIAGRAM OF THE SULLIVAN DA-21 VALVE ACTION

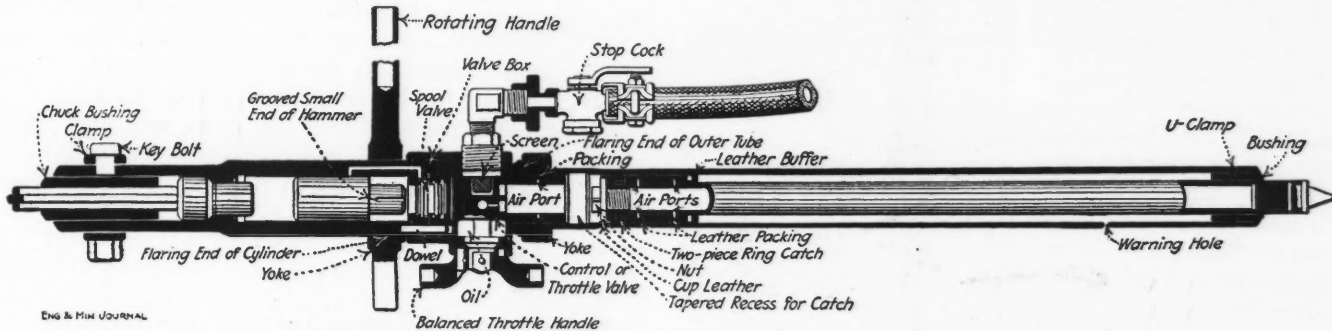
is beveled on the inside and the beveled part seats in a recess in the bushing so that by loosening the bolt slightly the chuck is freed without taking out the bolt altogether.

The back head containing the valves is joined to the cylinder by unsymmetrically placed dowels which prevent assembling in the wrong relation.

Lubrication is effected by an oil chamber surrounding the throttle valve; this admits a small quantity of oil to the machine whenever it is started. In the back head where it fits into the feed cylinder, an outside circumferential groove is cut and fitted with leather packing which is held against the feed cylinder by live air pressure applied through radial holes; this makes a tight joint.

The feed piston is kept tight in the cylinder by a cup leather held to the end with a nut and also by two packing leathers under air pressure arranged similarly to that just described.

In the feed-piston head there is also set a two-piece ring held out by a spring and having a beveled outer face; this is forced out into the tapered recess in the feed cylinder just below the back head and serves to lock the piston and prevent its slipping out except when air pressure is applied. A leather washer or buffer is inserted between the piston head and the feed-cylinder bushing at the bottom of the cylinder to take up any shock if the piston is driven out with full force by the machine falling away from the rock. In the feed-cylinder wall a small

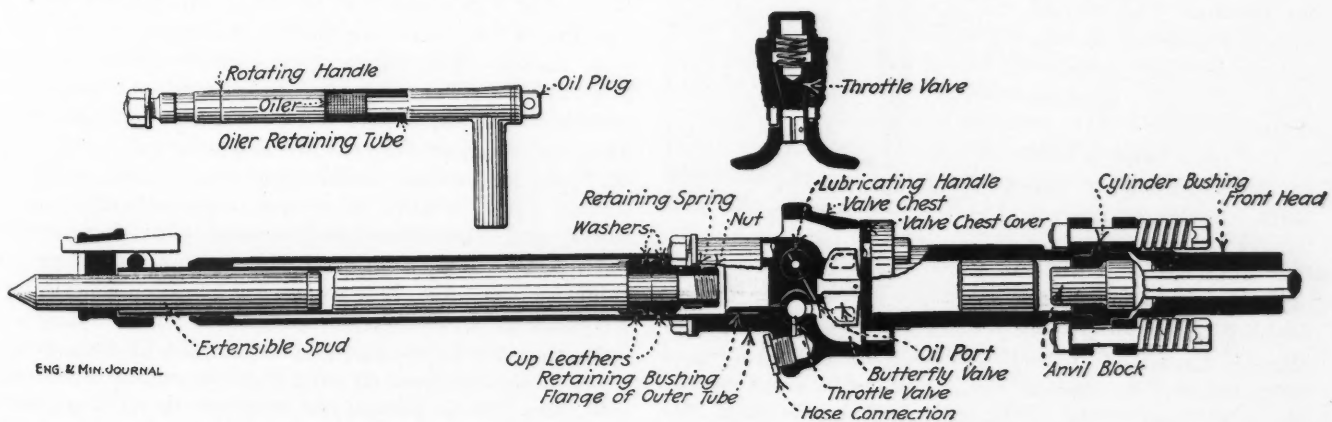


LONGITUDINAL SECTION OF THE SULLIVAN DA-21 STOPER

Vent ports are drilled through the cylinder wall just ahead of the anvil block, to remove cuttings that may enter the nose bushing around the steel.

The facing ends of the drilling and air-feed cylinders

hole is drilled which is passed by the piston head just as the feed piston reaches the end of its stroke; the hole is then open to live-air pressure and the hissing of the escaping air acts as a warning to the operator.



LONGITUDINAL SECTION OF INGERSOLL-RAND BUTTERFLY-VALVE STOPER

are flared slightly, and yokes bearing against these flares have lugs for insertion of the through bolts or side rods. The yoke on the drilling cylinder is extended on one side to form a rotating handle. A projection on the other side guards the operator's hand on the throttle handle.

The end of the feed cylinder is closed with a bushing through which the inner tube works. The bushing is held in by a U-clamp, the ends of which are bent over into recesses in the outer tube and the plug.

The machine weighs 84 lb., has a 2-in. cylinder and

about a 2-in. stroke. Its feed is 24 in. and its overall length when closed is 55 inches.

INGERSOLL-RAND BUTTERFLY VALVE

The string of parts, as it may be called, of the Ingersoll-Rand butterfly-valve stoper, consists of the front head and the cylinder bolted together, the valve chest, and the feed cylinder, the valve chest being held between the drilling cylinder and the feed cylinder by through bolts. The hammer in this machine is symmetrical; the cylinder is flanged at the end, so as to furnish lugs for bolting, and is of sufficient thickness to permit boring longitudinal supply and exhaust air-passages in its shell.

The air is admitted through the hose-connection opening shown in the assembled longitudinal section drawing. Its admission and distribution are controlled by a throttle valve which is part of the machine. It is essentially a three-way cock; it has spring stops for four positions; in one, air is shut off altogether; in another it is admitted to the feed only; in a third it permits slow drilling, and in the fourth full-speed drilling. The upper part of the valve chest carries the butterfly valve, of which the action has been described. Four sets of air passages communicate with the cylinder ends, two for live air and two for exhaust. These consist of holes through the valve-chest cover registering with holes extending longitudinally through the cylinder shell, and radial holes into the cylinder connecting with the longitudinal holes. The cycle of reciprocation proceeds as described in the case of the butterfly-valve piston machine. The exhaust is all conducted to one outlet on the opposite side of the machine from the inlet.

The front head is held to the cylinder by two bolts working against helical springs; between the front head and the cylinder is a cylinder bushing in which the anvil block is held. The springs take up the shock of blows delivered on the anvil block when there is no steel in the chuck. The front end of the front head is the chuck. No bushing is used. Its cross-section depends on what cross-section of steel it is desired to use. As is the usual custom, ports, not shown in the drawing, are drilled in the front head to permit the escape of air leaking past the anvil block.

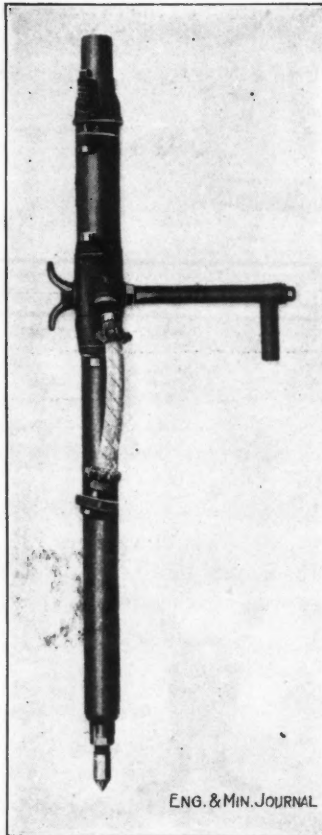
The telescope feed is of the ordinary type, the outer tube advancing with the drill as it feeds forward and the inner tube remaining stationary. This may be modified by attaching an extensible spud to the inner tube as shown

in the longitudinal section. The outer tube is flanged at its upper end to permit bolting to the valve chest. The piston carries two washers and cup leathers on its upper end, which are held on by a nut. The air pressure forces these leathers out against the inner wall of the outer tube, making a tight joint. The lower part of the nut is surrounded by a friction spring. Inside the end of the outer tube there is a bushing with a flaring lower end. When the inner tube is run in, the friction spring is gripped by this bushing and the tube is prevented from running out. The lower end of the outer tube is a sufficiently close fit over the inner tube to act as a guide.

Lubrication is effected by means of a device in the turning handle. The handle is hollow, and part of its length is filled with a porous plug composed chiefly of fine copper screen rolled to a cylinder. The rest of the handle acts as an oil chamber and is closed with a screw plug. The handle near its inner end communicates with the air supply through a very small port. The pulsations of air set up conditions of pressure and exhaust alternately, and draw the oil through the plug and the small port to the valve chest and thus to the cylinder. Means are provided to exhaust any pressure in the handle after the air is shut off, without drawing all the oil out of the chamber. The plug acts as a retarder and as a filter. The air inlet furnished for this machine consists of one short length of hose without an intermediate stop-cock.

The diameter of the cylinder is 2 in.; the length of stroke is 4 in.; the length of feed is 22 in.; the overall closed length of the machine is 55½ in. when the ordinary feed without extensible spud is used; and the weight of the machine is 81 lb.

(To be continued)



INGERSOLL-RAND BUTTERFLY-VALVE STOPER

Ancient Metallurgy in Egypt

Prof. W. M. Flinders Petrie visited Manchester, Eng., a short time ago and addressed members of the Egyptian and Oriental Society on "Metals in Ancient Egypt." He gave an outline of what we knew "for certain" of the use of the different metals in ancient Egypt. Copper, he said, was used throughout all the periods of civilization. When the Egyptians had scarcely any pottery and no weaving, when men were buried in goat-skins, the latter were fastened with copper pins. Gold did not come in earlier than silver and lead—in the second prehistoric period. Practically, gold did not appear throughout the whole of the first period of prehistoric civilization. In the royal tombs they found copper much used, including copper wire. Sheets of copper were cut into narrow strips, and these were then treated with the hammer. Bronze, Prof. Petrie pointed out, became much later the chief material used, but copper was always used for some purposes, as for domestic vessels.

In the second prehistoric period, gold, silver and lead came in all together. During the first and second dynasties there was a percentage of silver in what appeared to be the gold used to the amount of 13 to 19, showing that electrum was the standard material and not gold. Leaf gold in Egypt was not beaten out so thin as ours. Silver, it appeared, was on the whole scarce. Lead in the 18th dynasty came in in large quantities, and then became very common. Pure tin was not found before the 18th dynasty, and therefore the bronze found before that time was probably produced by the simultaneous

reduction of copper and tin ores together. Arsenic was used as a hardening material from an early period. The common use of iron, Prof. Petrie said, began about 1200 B. C. Antimony was practically unknown in early Egypt, and zinc was not found till Roman times. In the course of his address, Prof. Flinders Petrie suggested the various localities from which the different metals found in Egypt were derived.—*Manchester Guardian*.

818 long tons (£153,614); copper ore, ingots and matte, 4421 long tons; tin ore and ingots, 484; lead ore, 3169 long tons; silver, 188,020 oz.; all else valued at £3873.

Adolinite appears as an article of commerce in the Pilabara goldfield report.

The Opl System of Making Sulphuric Acid

K. Opl, in *Chemiker Zeitung*, 1914, XXXVIII, pp. 8-9, describes his tower system for the manufacture of sulphuric acid as carried out by the Oesterreichischen Soda-fabrik, in Hruschau, Austria.

The system comprises six towers, through which the sulphurous gases are drawn by means of a suction fan, a coke filter at the end of the series serving to retain sulphuric-acid mist. The first tower is sprayed with the nitrous-vitriol of the sixth tower, the second tower with that of the fifth, and the third with that of the fourth. Water is introduced into towers 2, 3 and 4 by means of atomizers operating in the roofs. For complete denitration, the acid overflowing from the towers 2 to 6 is reconducted over the first tower. The passage of the acid to and from the towers is effected by emulsifying the liquid with compressed air, the light froth which is produced rising to the required height and reacting rapidly owing to the large surface of liquor exposed. The reaction space is only one-tenth of that required by the chamber system, and the time required for the production of tower acid is only 20 minutes as against four to six hours in the case of chamber acid. For making sulphuric acid of 60° B. (sp.gr. 1.71), the consumption of nitric acid of 36° B. (sp.gr. 1.332) is 0.88% of such acid.

In *Chemiker Zeitung*, XXXVIII, p. 966, G. Schliebs states that the essentials of sulphuric-acid manufacture are: (1) The intimate mixture of the gases; (2) the dissipation of the heat of reaction without the adoption of special measures; and (3) the production of desired differences of temperature within the reaction space. These requirements are fulfilled in the chamber process, but are lacking in the ordinary tower process. By placing behind each tower an acid separator, capable of circulating the gases back to the tower, he claims that all the shortcomings of the tower system may be surmounted and advantages acquired as regards control and efficiency and also economy of nitric oxide.

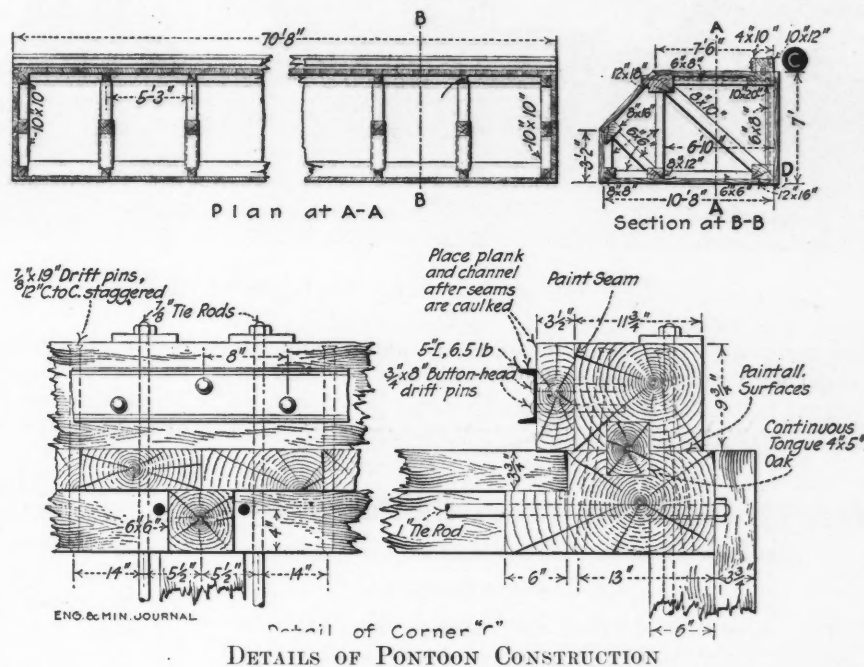
Mineral Production of Western Australia, 1913

The mineral output of Western Australia for 1913 was as follows, the items being arranged in order of descending value: Gold, 1,314,043 oz. (£5,581,701); coal, 313,-

Placing pontoons on a California Dredge

By W. H. WRIGHT*

Natoma No. 7 dredge of the Natomas Consolidated of California, in the Folsom field of the American River district, was finished June 14, 1913. It was built by the Yuba Construction Co., is all of steel, and has a bucket capacity of 9 cu.ft. The hull is 9 ft. 6 in. deep, 46 ft. 6 in. wide and 134 ft. 8 in. long. The dredge can dig to 55 ft. below the water line, and 613 hp. is required to operate.



After completion the dredge was found to have only a 6-in. freeboard at the bow and also a decided port list. To correct these faults, two pontoons, each 7 ft. deep, 10 ft. 8 in. wide, and 70 ft. 8 in. long, were constructed and placed one on each side of the hull. The length of the pontoons was divided by the center line of the upper tumbler into two sections of 31 ft. 11 in. and 38 ft. 9 in. long, the longer section being aft of this line.

When completed the pontoons were towed alongside and sunk to the proper depth, 18 tons of ballast being necessary to effect this. They were lashed to the hull by 1 1/2-in. wire rope fitted with turnbuckles to take up the slack. The water was then pumped out and the ballast removed. Before starting to place the pontoons all weight possible was removed from the dredge by taking off the stacker ladder and spuds and lowering the digging ladder to the bottom. The pontoons were placed in December, 1913, and have proved entirely satisfactory. The flotation was increased 15 in. and the list to the port side corrected.

In the illustrations above are shown a plan of the

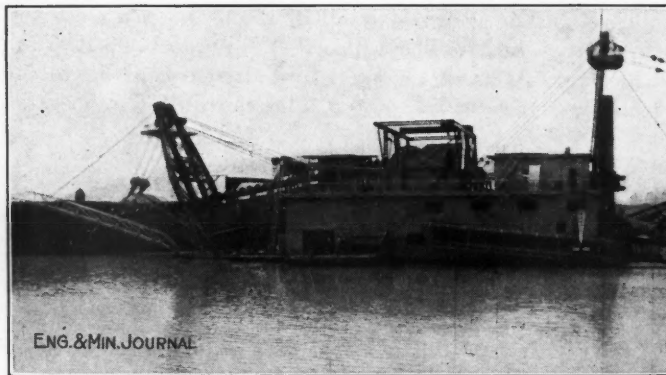
*Mining engineer, 408 Foxcroft Bldg., San Francisco, Calif.

pontoon, a section of it, and details of the unique construction of the corner *C*. The channel iron was placed at this point to catch the outer row of rivets of the bottom plates of the hull. A tongue of oak, 4x5 in., was placed in this corner to add strength to the joint. With the exception of this oak Douglas fir was used throughout and the whole covered with a 3/8-in. layer of Tallon compound. The placing of the pontoons along the sides of the hull made it necessary to extend the suction of all pumps. This was done by means of long-radius, special cast-iron ells. As a serious leak in either pontoon would prove disastrous to the dredge, the suction of the 6-in.

Nevada Consolidated Copper Co.

Report of the Nevada Consolidated Copper Co. for the third quarter of 1914 shows a production of 11,258,421 lb. of copper; 5,477,313 lb. produced in July, 3,062,637 lb. in August and 2,718,471 lb. in September. During the quarter, 599,126 tons of ore, averaging 1.52% copper, were milled, of which 96% came from the Veteran mine. In addition, 11,322 tons of Giroux ore were milled.

Cost per pound of copper produced, including Steptoe plant depreciation and all charges except ore extinguish-



TWO VIEWS OF NATOMA NO. 7 DREDGE ON WHICH PONTOONS WERE PLACED

fire pump and the 10-in. low-pressure pump were connected with the pontoons. This work was designed and constructed under the direction of George W. Elliott, engineer, of Natomas Consolidated, Natoma, California.

Northwestern Iron Co.'s Gröndal Plant, Mayville, Wis.

SPECIAL CORRESPONDENCE

The Northwestern Iron Co. operates two blast furnaces at Mayville, Wis., in which chiefly local ores are used. Before installing a briquetting plant, the furnace plant was commercially unsuccessful. The local Clinton ore runs about 46% in iron, with 0.035% sulphur. Exposed to the air, it falls apart in fine powder and therefore used to produce a large quantity of flue dust in the furnaces. Scaffoldings with subsequent slips and explosions were also a frequent occurrence, seriously interfering with the furnace operations.

A Gröndal briquetting plant was erected during 1911. It consists of four kilns, 195 ft. long, and 6 ft. 6 in. wide. The ore briquettes well, making firm, strong briquettes, with an iron content of 56% and 0.01% sulphur, a great improvement over the crude ore in the iron and sulphur contents. The present production is 70 to 100 tons of briquettes per day per kiln. Coke gas is at present used as fuel.

The use of the briquettes has been beneficial to the furnace operations. A mixture of 60% of briquettes and 40% of Lake ore, instead of 60% of crude Mayville ore and 40% of Lake ore, showed a reduction in coke consumption of 200 lb. per ton of pig iron, while the production of iron has been increased by 30 to 40 tons per day. The quantity of flue dust has been greatly reduced; what is made is sintered by the Greenawalt process.

ment, and after crediting miscellaneous earnings, was 9.59c. per lb. Earnings are based on a selling price of 12.486c. per lb. At the end of the quarter, 21,150,319 lb. of copper were on hand and in transit, including sold and unsold.

Credit to undivided profits for the quarter was \$258,244, after setting aside \$106,978 for depreciation and \$57,502 for ore extinguishment.

On Aug. 6 the decision was made to reduce operations to a 50% basis. On Sept. 8 the directors decided to defer payment of the dividend for the third quarter.

International Nickel Co.

According to its report for year ended Mar. 31, 1914, the International Nickel Co., New York, has capital stock outstanding to the amount of \$46,944,100, of this \$8,912,000 is preferred stock. The net profits for the year after deducting expenses, depreciation, exhaustion of minerals, and all other charges were \$4,792,664. This profit was accounted for in the following manner: Earnings from all properties after deducting manufacturing and selling expenses and ordinary repairs and maintenance, \$6,452,758; other income, \$114,028; total income, \$6,566,786. Deductions from total income were: Administration and head-office expenses, including taxes, \$437,812, and depreciation of plants, \$636,915; mineral exhaustion, \$687,395, and foreign companies not included, \$12,000. Dividends amounting to \$4,337,906 were paid, of which \$534,756 were on preferred stock. Current assets amount to \$7,384,561 over current liabilities. In addition to the depreciation charged in the profit and loss statement, \$369,920 was written off surplus account for deferred charges for development and diamond drilling at Mar. 31, 1914.

Details of Practical Mining

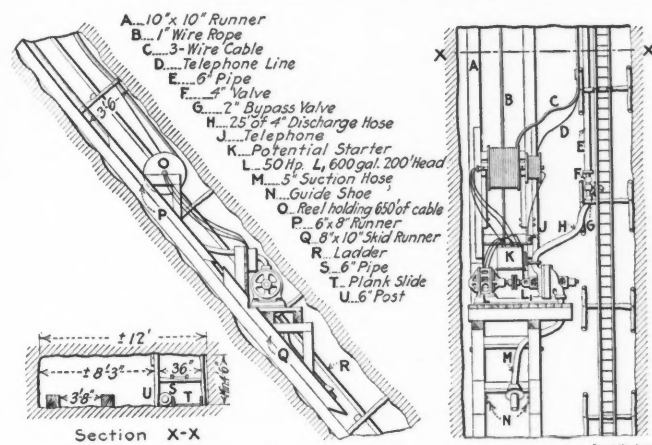
Unwatering Shaft with Horizontal Turbine Pumps

By L. C. MOORE*

The Dexter mine seven miles west of Ishpeming, Mich., was shut down in 1896 and the pumps were pulled. In the spring of 1914 the Cleveland-Cliffs company, now in control, decided to unwater it for exploration purposes.

The shaft is 12 ft. long and 3½ ft. in minimum width and dips at an angle of 54°. It is approximately 600 ft. deep on the incline and has eight levels. Most of the water enters on the second or 200-ft. level, but streams were encountered also on the third and seventh levels.

The pumping equipment when the job was completed consisted of one 200-ft. head, 600-gal. per min. turbine pump and two 400-ft. head, 300-gal. turbine pumps, with motors, starting boxes, etc., complete. The motors were 50-hp., 2200-volt, 60-cycle machines, interchangeable to make the outfit more flexible. The shaft pump was mounted on a skid, as shown in the accompanying illustration, while the lead-covered cable reel was mounted on a lighter skid just above the pump. The smaller reel



LAYOUT OF PUMP IN SHAFT ARRANGED FOR LOWERING

shown contains the duplex telephone wire, one telephone being placed on the skid and one in the engine house. All communication and signaling were carried on with the telephone.

Pumping operations started May 3 and the mine was completely unwatered on July 17. When the 200-ft. level was reached the 600-gal. pump was set off, a 300-gal. pump installed in its place and the work in the shaft completed with the latter. The third pump was installed on the third level to take care of the shaft water when the shaft pump got beyond its head and could not throw to the surface. The incoming water amounts to approximately 400 gal. per min.

Storms made some trouble; one break-down of the transmission line caused an eight-hour delay and a drowned pump. This happened on a Thursday, but by

the next Monday the pump was recovered and the motor dried out and back in commission again.

The advantages of the system lay in the ease with which the pumps handled the water with a variation in head from 50 ft. to 200 ft.; the low head room required; the light foundations needed for satisfactory operation; the quick changes that could be made in position; and the reliability of the turbine pumps under all conditions.

Wire Rope for Dredging*

In a dredging rope, subjected to heavy bending stresses, it is important not only that the wires should be tough but that they should be as fine in diameter as is practicable with due regard to other conditions. The construction of dredging ropes therefore is such as to result in a rope with finer wires, and one which will bend more readily than the construction used when rope of the same diameter is not subjected to bends, or when the bends have a much greater radius than is practicable in dredging.

A study of this problem in its different phases has resulted in the development of dredging ropes of what may be regarded as standard construction. There are three standard designs: one a rope with six strands of 19 wires each; one with eight strands of 19 wires each and the other with six strands of 37 wires each. The 8x19 rope is used more for steam shovels than dredges. In addition to the above constructions, wire rope made of six strands with 61 wires in each strand is used. This construction is not adapted to the smaller sizes of dredging rope.

All dredging ropes have a hemp core, around which the wires are twisted. When it is necessary to use rope of very large diameter it is customary to make the center an independent wire rope. This is a rope of standard construction with the usual hemp center. Around it are twisted the strands that make the larger rope in just the same manner that strands ordinarily are twisted around a hemp core. The wire rope used on the dredges in the Culebra cut was of this construction. The center is a wire rope 1½ in. in diameter, composed of strands of 19 wires each and a hemp core. Around this wire rope six strands of 37 wires each were twisted, the whole making a wire rope 3¼ in. in diameter. This is not only the largest dredging rope ever made, but the largest wire rope ever run over sheaves.

The successful operation of a dredging rope does not depend solely on the fitness of the rope to the conditions of use, although this is a factor of prime importance. If the rope is to serve satisfactorily it must be given reasonable care and attention. It is well to remember that a wire rope is a machine; the numerous wires form the parts, and these parts must work together without unnecessary friction or loss of energy.

Wire-rope failures are usually due to one of the following causes: heavy abrasion, over-strain, undue bending

*Assistant master mechanic, Cleveland-Cliffs Iron Co., Ishpeming, Mich.

*Excerpts from an article by C. C. Sunderland in the "Excavating Engineer," November, 1914.

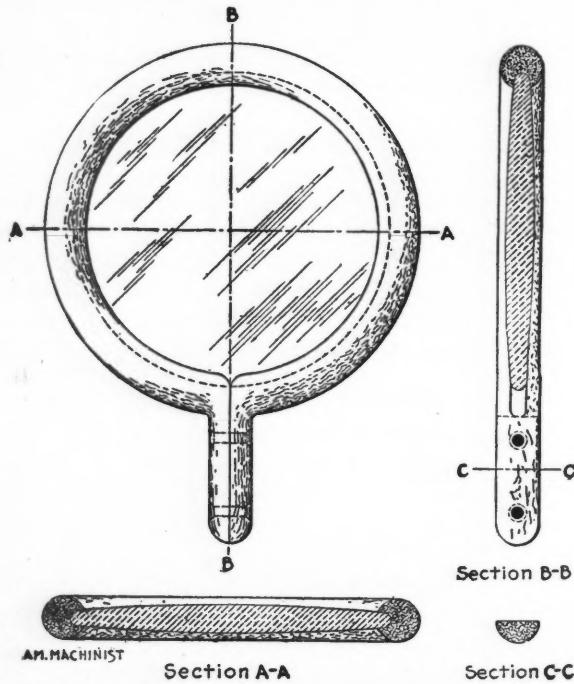
or corrosion. The appearance of the rope will indicate if failure is due to any one of these causes.

If the wires wear thin in a short time, the rope has been subjected to undue abrasion; if the wires are worn but little and are broken off squarely, sticking out all over the rope, it has suffered either from unduly severe bending stresses or over-strain; while if the wires are pitted and rusty, there has been a lack of proper lubrication.

The most common of all causes of wire falling short of the service expected is lack of proper lubrication. The lubricant should not only penetrate to the hemp center and thoroughly saturate it, but it should also coat thoroughly the inside wires. The lubricant while doing this should have sufficient consistency to cling to the rope and not to drop off and leave it practically dry after a few days.

Protecting Rim for Reading Glass

A protecting rim for a magnifying glass is shown in the accompanying illustration from the *American Machinist*. It is made of 1/4-in. round leather belting



ROUND-LEATHER FRAME APPLIED TO MAGNIFYING GLASS grooved to fit the edge of the lens. It is stated that a glass thus rimmed can be dropped from any reasonable height without breaking. The idea may contain suggestions for the mine surveyor.

Tunnel and Level Ventilation

Ventilation of underground workings is a problem that may be solved in many ways, the elected method depending on a number of existing conditions. The ventilation of workings reached through long tunnels, however, can probably be accomplished by no simpler means than that employed in one of the older Mexican mines. This mine was worked through a tunnel over a mile long. To establish a system of ventilation for reaching the workings inside, a decided channel was cut in the floor of the tun-

nel, and this channel was covered with flat stone, or *loza*, set in cement. In this way the water conduit was made to serve also as an airway. The water flow assisted in drawing out the air. Issuing from the tunnel the water conduit was connected with a length of nearly vertical pipe down which the water ran, acting as an aspirator and setting up a good circulation of air in the mine.

Portable Set of Level Maps

BY CHARLES H. SCHEUER*

At the Fayal mine in the Mesabi range, the Oliver Iron Mining Co. has for some time been reminding old caves; it was found that the ordinary methods of mapping used in this region were inadequate. I therefore devised a new set of maps, made on a good quality of waterproofed tracing paper put up in book form and inclosed in a suitable holder so as to be conveniently carried into the mine.

I obtained the idea of using such a book from the engineering department of the Fowler Estate, at Eveleth, but for our office I had the maps made slightly larger. Credit should be given to the Fowler Estate engineers as originators.

The general arrangement of the sheet used is shown in Fig. 2; it is 8 1/2 x 11 in. over all. The coordinate lines

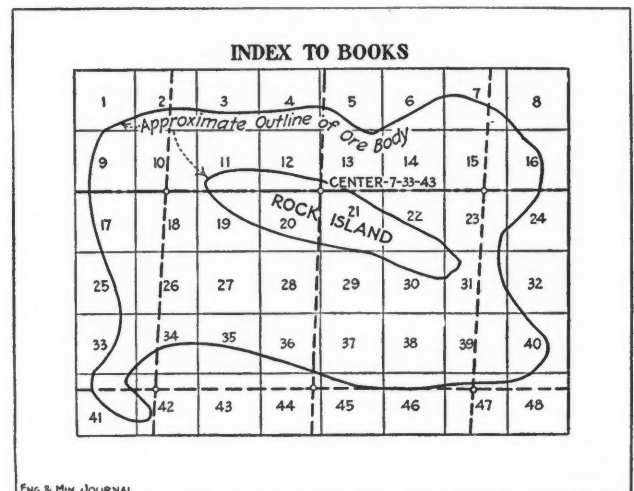


FIG. 1. INDEX SHEET SHOWING BLOCK NUMBERS

are so drawn that for a scale of 1 in. to 50 ft. there is a 1/4-in. margin with a 3/4-in. binding edge on the left.

The mine is divided into blocks as shown in Fig. 1, each block being 400 ft. north and south by 500 ft. east and west. For each block there is a set of these sheets, each sheet representing a sublevel; a top sheet shows the surface features, as in Fig. 3. On the margins of the sheets, as shown in Fig. 2 and 3, are given the numbers of the adjacent blocks. The number of the block itself is placed on each sheet at some convenient point, together with the number or letter of the sub it represents, as in Fig. 2. The top or surface sheet bears merely the block number.

"Sterling" tracing vellum sold by the E. Dietzgen Co. has been found satisfactory for this work during a period of three years. The coordinate lines are drawn in red to contrast with the workings, which are shown in black.

Elevations can be shown on the various subs and levels in colored ink and are so shown by us in red. Brown

*Chief engineer, Fayal district, Oliver Iron Mining Co., Eveleth, Minn.

ink is used for general information. Green ink fades to a muddy brown on the paper used and is unsuitable.

The set of sheets for each block is bound at the left by rivets. This allows of tracing on the sheets from the sublevel office maps. The covers used are H. Niedecken Co.'s aluminum loose-sheet holders.

On Fig. 2 the old workings are shown in dash line, and the mined area as traced from the old maps is cross-hatched. In place of crosshatching we have tried tinting the mine area with diluted drawing inks, with good results. Colored inks may be used to differentiate between old and new workings and give better results than the dash lines.

It is not to be supposed that this method of mapping is generally adaptable. Other and simpler methods are quite sufficient under many conditions. A composite map serves the purpose well in a regular orebody with a regular system of development, but in rocky orebodies where the workings are necessarily irregular, both as to grade of the drifts and as to alignment, these transparencies are at times almost indispensable. It is true that the books are not so convenient to handle and mining captains may at first object to them on this score, but the

All of this leads to a more intelligent operation of the mine. Information is valuable only as it can be used to save money and to do this it must be at hand at the proper moment. In mining this is peculiarly important since each pillar presents a different problem, especially in an irregular orebody, and there is always one best method of extraction. Lacking the information which would lead to the adoption of this best method, money is expended which would otherwise increase the net profit but which can never be retrieved, since that pillar of ore is gone.

So far I have considered the advantages merely from the standpoint of the operating men. It may appear to the engineer that this system would entail a large additional amount of work. Aside from making the book in the first place, the additional time required is small, and if the work be done by a man who studies the changes in conditions week by week with a view of assisting in the operations the time is well spent. In fact I find that one is made more observing in the examination of the working places by using the books underground. Occurrences of rock, sand or caved material in backs, sides or bottoms of drifts are more carefully noted. Often when

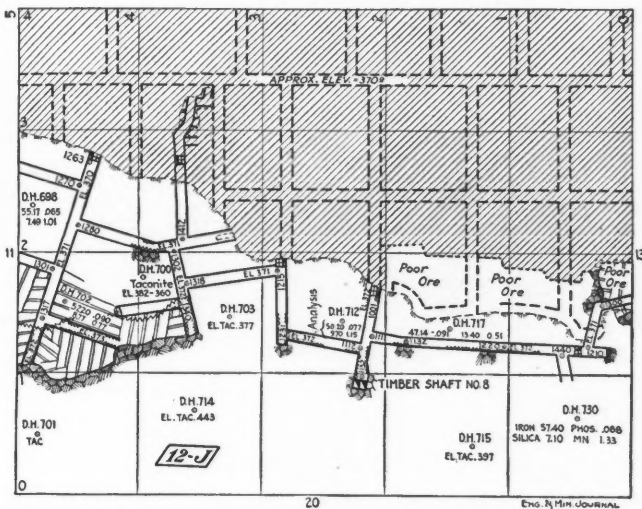


FIG. 2. ONE OF THE UNDERGROUND SHEETS

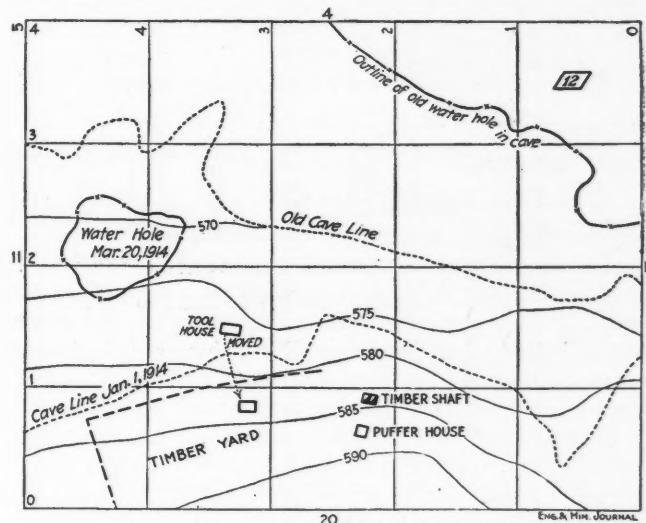


FIG. 3. A SURFACE SHEET

fact that they have found favor in spite of this objection is evidence that they are worthy of consideration.

In case an old mine is to be redeveloped they are especially useful in that both new and old workings may be shown in detail, together with the elevations of each. The surface map on the top sheets keeps before the operator the relative position of roads, buildings, ditches and other surface features. Water accumulates in ponds in the caves, making mining dangerous, and by means of the book it is easy to tell where such ponds are with reference to the working place so that they may be drained before work is begun beneath.

Drill-hole information is put on the several sheets. The elevation of top of rock is placed on the sheet for the sublevel in which rock is obtained. The analysis of the ore at each sub or level as shown in raise or drill hole is placed opposite the position of the drill hole on each sheet, as in Fig. 2. By means of a pencil outline the pillars may be shown on each sub and level. In fact an almost unlimited amount of detail may be added without causing confusion.

studying a place it occurs to one that information here or there will be of great value in the future, and it is gathered before the opportunity is gone.

When some improvement is proposed in a complicated layout, the books will make the matter clear to anyone, a thing impossible with the ordinary composite map when the person examining it is unfamiliar with the mine. In such cases, which arise frequently in old mines or rocky ones, the books save the time of making numerous special maps.

The maps are brought up weekly by tracing from the originals in the office, and any observations the captain or his assistant may make in the books from time to time are noted. In this way the management keeps closely in touch with the details of operations, while all the information is available for the mine captain.

Where a layout is made for a new orebody the work is planned in pencil in the books from drill-hole information. Later, as more information is gathered in the course of development and changes become necessary, these can easily be made. In this manner the engineers' complete

layout of the mine in continually subject to analysis and comparison with conditions as they arise, an arrangement that will lead to the elimination of many mistakes.

Standard Pipe Threads

The threads, as produced in the Briggs system, which is the standard for pipe threading, are shown in the accompanying illustration presented in *Power* for Nov. 3, 1914. The taper employed in the Briggs system has an inclination of 1 in. to 32 to the axis, therefore the total taper is 1 in. to 16 in., i.e., $\frac{3}{4}$ in. to the foot or $\frac{1}{16}$ in. to 1 in. The angle of the thread is 60° and its depth four-fifths of the pitch.

The first five threads *F* may be regarded as perfect at top and bottom. Back of these are two threads with

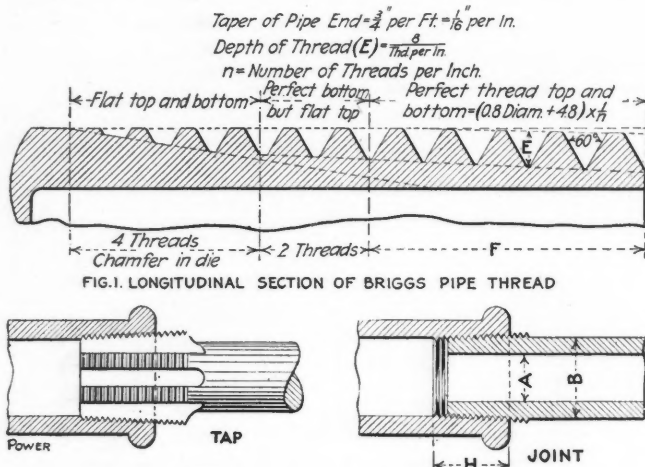


FIG. 1. LONGITUDINAL SECTION OF BRIGGS PIPE THREAD

BRIGGS' STANDARD PIPE THREAD

perfect bottoms but flat tops; behind these are the imperfect ones produced by the chamfer of the die.

PIPE THREADS		
Diameter	Threads per Inch	Diameter of Drill
3 to 10 inc.	8	2 1/4
2 1/2	8	2 1/4
2	11	2 1/8
1 1/2	11	2 1/8
1 1/4	11	2 1/8
1	11	2 1/8
3/4	14	2 1/8
1/2	18	2 1/8
3/8	18	2 1/8
1/4	27	2 1/8

It can be readily seen by the foregoing how necessary it is to have the pipe and fitting match, so that the full, perfect threads in each will register with the other. A thread made up more or less than the normal full length of the die will not result in a perfect joint.

Why Shovel Gears Wear Out

Not long ago, a steam-shovel manufacturer received a complaint from a contractor who was working a shovel in heavy rock, says the *Excavating Engineer*. The shipper shaft bearings apparently would not line up. They were rebabbitted again and again and trammed with the greatest care. One thrusting gear and pinion persisted in jumping. The boxes were condemned and returned to the manufacturer. An expert was immediately dispatched from the factory. He discovered that there had been some heavy blasting close to the shovel.

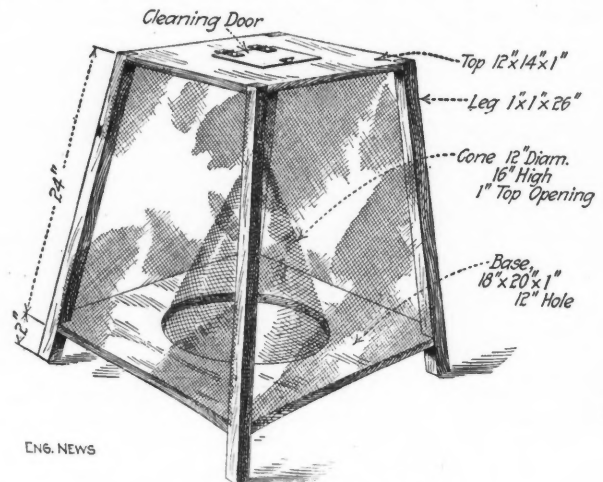
Instead of swinging the dipper to the shot, it was swung away, thus exposing the thrusting gear. The exposed

gear was covered with fine stone at every shot; some of this stone had also lodged in between the teeth. Here it became encrusted. Consequently, this gear wore out much more rapidly than the one on the opposite end of the shaft. This was the source of the whole trouble. The lesson is simple. It is far safer to make two or three small shots instead of one large one. When a large one is necessary, back up the shovel. When this is not necessary, take every precaution to protect the machinery. One precaution is, as shown, swing the dipper to the blast instead of away from it.

Fly Trap for the Camp

Sanitation in a mining camp in its early stages—and in its later—is frequently neglected. This is especially true of the isolated mine.

The most serious foe of the health of the camp is the fly. Latrines should be screened so as to minimize the possibility of fly-transmitted infection therefrom. Manure should be hauled away daily and garbage kept covered. The accompanying illustration shows a fly trap recom-



SERVICEABLE FLY TRAP

mended by a writer in *Engineering News* for use around construction camps. A few of these set around the camp are of great assistance in keeping down the number of flies. They should be emptied frequently, the trapped flies being stunned by dashing gasoline or distillate into the cage and then shaken out and burned.

An Investigation of the Strength and Durability of Wire Rope has been made by Prof. G. Benoit at the technical high school at Karlsruhe, Germany, and as far as completed, as reported in "Glückauf," is substantially as follows: The experiments were made with a patented cast-steel wire, 1mm. (0.0394 in.) diameter, which showed a strength of 247,000 to 255,000lb. per sq. in., with 227,000lb. per sq. in. guaranteed. The wire was tested singly, and also twisted to a strand of seven wires, 3.1mm. (0.1221 in.) diameter, there being six steel wires and a core of a softer wire of a strength of about 122,000lb. per sq. in. This rope withstood a pull of 1770lb. The soft core did not break, but stretched considerably. Three of the strands were then combined to a rope of 6.8mm. (0.2679 in.) diameter and five to a rope of 8.5mm. (0.3349 in.) diameter, the latter with a hemp core. The wires and rope were bent over a pulley through an angle of about 90 deg. at the rate of 1000 turns per hour, the turn meaning the bending of the wire from the straight and then back to the straight again. The stress to which the wire under test was generally subjected was 11,200lb. per sq. in. The single wires stood 198,710 bends; the twisted strand had one or two wires broken after 44,800 and 47,190 bends. The first experiment was carried on with a pulley 6 3/4 in. diameter, and a larger pulley was then substituted, 7 1/2 in. diameter. On this the single wire stood 122,000 to 200,000 bends; the twisted strand showed breaks in three wires after 40,860 bends. The cable of three ropes had one wire broken after 22,860 bends, and is said to have been practically done for after 36,440 bends. The five-rope wire began to fail after 35,000 bends, and was given up after 40,000 bends. The conclusion so far seem to indicate that twisting leaves considerable strains in the wire rope.

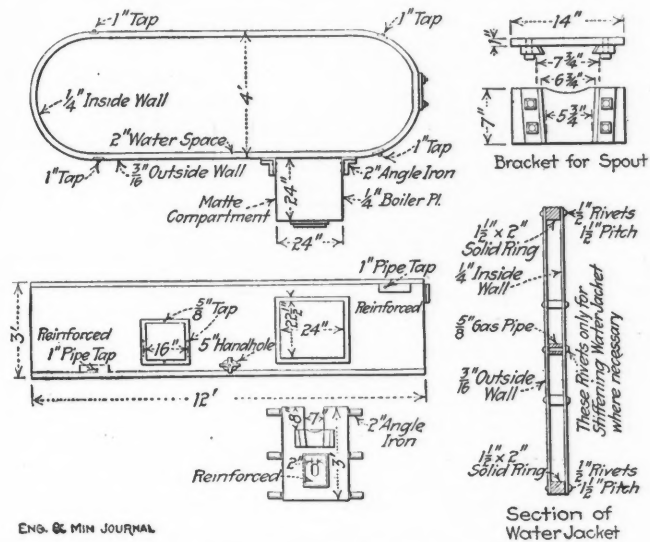
Details of Milling and Smelting

Continuous-Flow Forehearths at Ladysmith, B. C.

The continuous-flow water-cooled forehearths at the Ladysmith smelting plant of the Tye Copper Co. are larger than most continuous-flow forehearths. The Tye company ceased to operate the plant in 1911, but it was maintained in good order and for a period was under lease to the Ptarmigan Mines, Ltd., of Vancouver Island.

There are two blast furnaces at this works, one 42x120 in. and the other 48x160 in. The forehearths are an adaptation of the old Orford type of settler and were designed by W. J. Watson; they differ from the ordinary continuous-flow settler in that the matte-separating compartment is outside the main settler. It is possible to

and the outside plates are of $\frac{3}{16}$ -in. and $\frac{1}{4}$ -in. steel. The matte compartment is approximately 2 ft. square and is lined with 8 in. of firebrick. The opening between the settler and the matte pocket is 22x24 in., but in operation this space is closed with chrome brick except for a connecting channel, 6 in. square, at the bottom. The level of the matte may be controlled by adjusting the height of the slag outlet; to increase the flow of matte a ball of clay is pressed into the slag spout, and to reduce it the outlet is lowered. As far as possible, the depth of the matte in the settler is maintained at 10 in. When a sufficient amount of matte is being made the flow is continuous, but it is stated that the matte flow can be operated intermittently, at intervals of an hour or so when necessary. Among the advantages claimed for the continuous forehearth are that a much cleaner slag is obtained, a tapper is not needed, the element of danger to the men while tapping is removed, and there is a reduction in the wear and tear on the matte pots.



ENG. & MIN. JOURNAL

WATSON CONTINUOUS FLOW FOREHEARTH

remove this for repairs without shutting down the furnace, as ordinary tapping jackets, one on each side, are provided for use in such an emergency.

When the Tye Copper Co. was operating the plant, it treated a barytic copper ore. The slag in 1910 carried 23.7% BaO, 10% Al₂O₃, and 7.4% ZnO, and had a specific gravity of 3.66. In 1906 the slag had a specific gravity of 3.487 and the matte at this time had a specific gravity of 4.232, thus leaving a difference of only 0.745. Notwithstanding this small difference, the slag is reported as carrying only 0.37% copper.

The accompanying drawing shows the construction of the forehearth for the smaller furnace and was taken from the report of Alfred W. G. Wilson¹. The forehearth for the smaller furnace is 4 ft. wide, 12 ft. long and 3 ft. deep; for the larger furnace, 6 ft. 2 in. wide, 14 ft. long and 4 ft. 6 in. in depth. The smaller settler has a 2-in. water space and the larger one a 3-in. water space; the fire sheets are of $\frac{1}{4}$ -in. and $\frac{3}{8}$ -in. steel, respectively,

Pig Iron for Copper Precipitation*

When iron is mentioned for copper precipitation, no one in this country seems to consider anything but scrap iron as available for this purpose. It takes but a small amount of investigation, however, to find that pig iron is not prohibitive in cost at almost any point in the United States not remote from the railroad. It is reported that pig iron can be delivered on the Pacific coast from China or India at a cost of \$10 to \$12 per ton.

The use of ordinary pig iron requires long launders and more or less handling of the iron to effect complete precipitation of the copper. Of course, the rapidity of precipitation depends upon the surface exposed, so I granulated the pig iron I used. This can be done best by shattering a small stream of molten iron with a jet of steam, and then cooling in a stream of water. The product was very hard and compact, and most of it was in the form of shot or pear-shaped drops. It contained 93.5% iron.

Sponge iron from calcines, or even from iron ore, is attacked inside and out by the copper solutions, and each particle, large or small, is soon a mass of cement copper. Granulated iron is attacked only on the surface, and unless agitated continually during precipitation, it soon cements together into a solid mass which retards further action.

To overcome this difficulty, I made a tube mill out of an iron pipe 10 ft. long and 20 in. in diameter. It was fitted with 6-in. openings at each end for the admission and discharge of solution. It was filled to these openings with granulated iron and revolved at the rate of 12 r.p.m. The solution going into this tube mill was a neutralized lixivium from leaching the oxidized ores. It contained: Cu, 1.64%; Fe, 0.34%; free acid, trace.

¹"The Copper Smelting Industries of Canada," Mines Branch, Canadian Department of Mines.

*Excerpt from the paper by Stuart Croasdale, read at the Utah meeting of the A. I. M. E.

It was passed through at different rates of speed to get the precipitating capacity of the mill. The results obtained from the solution passing out of the mill were as follows:

Rate, Gallons per Minute	4	6	7	10	12
Cu, per cent.	none	none	none	0.06	0.09
Fe, per cent. ....	.....	.....	1.98	1.88	1.84
Free acid, per cent. ....	.....	.....	trace	trace	trace
Iron (100 per cent.) pounds consumed per pound copper precipitated .....	.....	.....	1.00	0.97	0.97
Granulated iron, pounds consumed per pound copper precipitated .....	.....	.....	1.07	1.04	1.04

The copper precipitate contained 73.6% copper. In a previous experiment, it contained 86.8% copper. By this method of precipitation, the iron remained in the mill, always bright and clean, while the precipitated copper passed out with the neutral solution, from which it settled rapidly and could be removed by decantation. The operation is continuous. As seen by these results, the consumption of iron need not exceed 1 lb. for each pound of copper precipitated, provided the solutions are neutralized before precipitation.

In a large plant, these mills should be made longer and of less diameter than an ordinary tube mill. The shell should be made of copper and lined with silex to prevent abrasion. The galvanic current set up by the copper and iron would hasten the precipitation.

Size of Centrifugal-Pump Motors

In reply to the criticism that "manufacturers sell pumps to be connected to certain types of motors, and when electrical troubles come up, they are glad to refer them to the maker of the motor, but are little interested

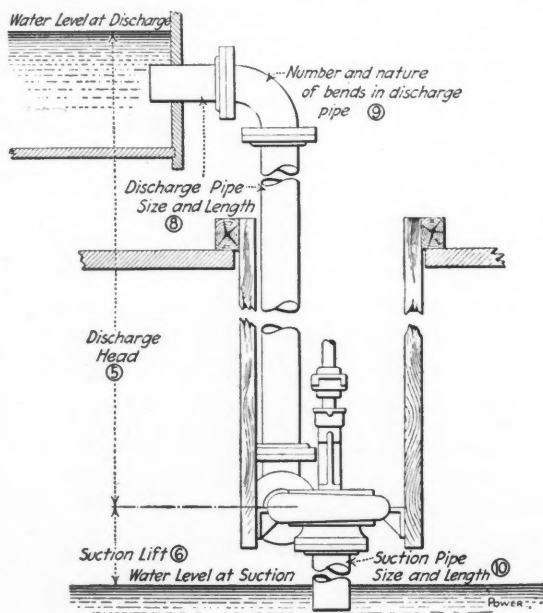


FIG. 1. MEASUREMENTS FOR VERTICAL PUMP

in securing and tabulating for future use the nature of the trouble and the remedy," E. C. Wayne, of the Goulds Manufacturing Co., says, in *Power*, Oct. 27, 1914, that "the pump manufacturer is often called upon to assume the account for both the pump and the motor, and we believe that the majority of pump manufacturers pay prompt attention to complaints in regard to motors driving their apparatus and that the motor manufacturers

in turn, when such complaints are put up to them, are only too glad to investigate.

"The various motor companies do a large resale business with pump builders, and naturally have to give good service. One particular reason why the motor builders like to sell their apparatus to pump builders is that the latter usually exert great care in seeing that the proper motor is applied for the conditions under which the pump is to operate.

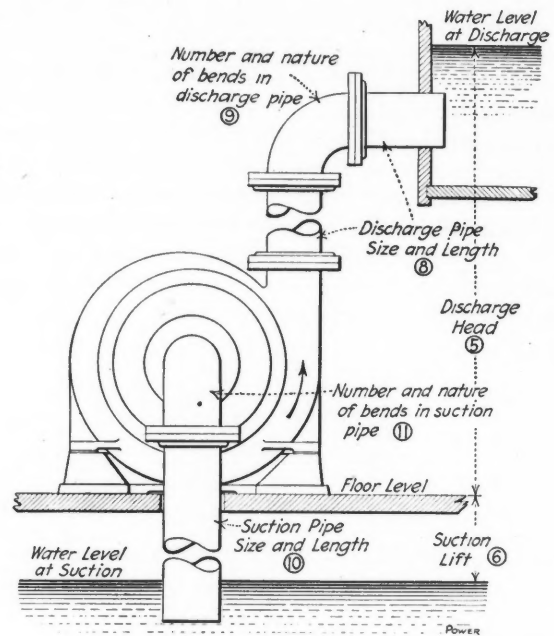


FIG. 2. MEASUREMENTS FOR HORIZONTAL PUMP

"It is our practice to have the purchaser fill out the 'Centrifugal Pump Data Sheet,' herewith shown, before

CENTRIFUGAL PUMP DATA SHEET

Shop Order No.

- Capacity of pump..... U. S. gallons per minute.
- Character of fluid..... salt, fresh, clean or dirty.....
- Temperature of the liquid..... °F. Specific gravity.....
- If solid matter is contained state size and character of largest pieces
- Discharge head... ft. (This is the vertical distance from the floor level of the pump to the point at which the water is discharged.)
- Suction lift..... ft. (This is the vertical distance from the floor level of the pump down to the level of water in pit from which it is pumped.) (See No. 7.)
- Suction head..... ft. (Sometimes the pump is placed so that the water will flow to it and in that case the pressure at the inlet to the pump must be given. Question No. 6 may then be omitted.)
- Discharge pipe diameter..... length.....
- Number of bends in discharge pipe..... State whether elbows are 45 or 90 degrees..... and of long or short radius
- Suction pipe diameter..... length.....
- Number of turns in suction pipe..... State whether elbows are 45 or 90 degrees..... and if long or short radius.....

Signed.....
Date..... Address.....

we start actual construction, provided the pump is to be directly connected to an electric motor. This enables us to check carefully the total head against which the pump is to operate."

Referring to the greater power required, due to increase of head caused by pipe friction, Mr. Wayne points out that the question of speed required for this greater head is likewise important in the case of a centrifugal pump.

Granulated Slag Is Used at certain metallurgical works for the covering of furnaces and flues wherein it is desired to retain heat. It is cleaner than ashes or sand, and because of its porosity is superior as a nonconductor of heat.

NEW PUBLICATIONS

MODERN TUNNELING: WITH REFERENCE TO MINE AND WATER-SUPPLY TUNNELS—By David W. Brunton and John A. Davis. 6x9 in., pp. 450, illus.; \$3.50. John Wiley & Sons, New York.

MINERAL RESOURCES OF ALASKA. REPORT ON PROGRESS OF INVESTIGATIONS IN 1913—By Alfred H. Brooks and Others. Pp. 424, illus. Bull. 592, U. S. Geological Survey, Washington, D. C.

GOLD FIELDS OF NOVA SCOTIA—By W. Malcolm. Compiled Largely from the Results of Investigations by E. R. Faribault. 6½x9¾, pp. 331, illus. Memoir No. 20-E, Canada Department of Mines, Geological Survey Branch, Ottawa.

DETAILS OF CYANIDE PRACTICE—By Herbert A. Megraw. 6x9¼ in., pp. 215, illus.; \$2. McGraw-Hill Book Co., Inc., New York.

A discussion of the methods followed at the principal cyanide mills of the United States, from information gathered during a tour undertaken for the "Engineering and Mining Journal."

HENDRICKS' COMMERCIAL REGISTER OF THE UNITED STATES (FOR BUYERS AND SELLERS).—7¼x10½ in., pp. 1596; \$10. S. E. Hendricks Co., Inc., New York.

The present volume is the twenty-third edition of this work, which is brought up to date and published annually. As is generally known, it gives complete classified lists of manufacturers in the various industries. The same general arrangement has been followed and no special changes or increase in size are noted. A detailed index, covering 138 pages, adds to the value of this work.

ENGINEERING GEOLOGY—By Heinrich Ries and Thomas L. Watson. 6x9¼ in., pp. 672, illus.; \$4. John Wiley & Sons, Inc., New York.

After extended experience in teaching engineering students, more especially civil engineers, the authors have brought together the materials of greatest importance for this group in the present admirably printed and illustrated work. Rocks are described at length, alike as regards their varieties and their forms in nature. Rivers and underground waters; landslides; wave-action; lakes and glacial deposits complete the general portion. These topics are followed by building stone; limes, cement and plaster; clay and clay products; coals; petroleum, natural gas and other hydrocarbons; road foundations and road materials; ore deposits. Each topic is treated in a careful and interesting way and with concluding bibliographies. A vast amount of valuable matter is rendered easily accessible in a condensed form, while much that receives attention in ordinary textbooks is cut out. Stratigraphical and historical geology receives at the close but two pages with little more than the names of the periods and epochs. The teacher who uses the work will need to amplify this portion for his classes. A list of the active state geological surveys concludes the book.

Treatment of Zinc Chloride Residues

According to the 50th annual report of the British Alkali Inspector (abstr. in *Journ. Soc. Chem. Ind.*) renewed attention has been paid to the arresting of fume produced in the condensation of zinc extracted from "residues" containing zinc chloride or zinc and ammonium chlorides. Opportunity was afforded for studying working conditions at three works where zinc "ashes" (containing volatile chloride) were in use for spelter making, and tables are given showing the relative fume-arresting efficiency of various types of "prolong," both as regards the weights of fume collected and its chemical composition. The prolongs consist of iron tubes, divided by a bridge into body and end portions; they are attached to certain selected receivers as soon as the "steaming stage" is over, so that the escaping fumes pass through them before being discharged into the air. The condensed fume collected is composed essentially of zinc chloride and metallic zinc or zinc oxide, and consists of fine dust mixed with "granular" matter (richest in chlorides) and "massive" metal in the form of shot and irregular particles; the

weights accumulating in the body and end portions of the prolongs were determined separately and the proportion of zinc and zinc chloride ascertained.

Analysis of the material skimmed at the first tapping showed a composition in respect of chlorine content very similar to that of the fume, but it was contaminated with a large amount of ash and finely divided breeze carried forward from the retorts. The return of fume and skimmings, without treatment, to the furnace with a subsequent charge, as commonly practiced, was found to involve an increase of about 25% in the volatile chlorine content of the charge, which could readily be prevented by washing the fume and skimmings with cold water. Washing gave a residue very suitable for admixture with a fresh charge and prevented loss of zinc chloride and unnecessary escape of noxious gases, but it is pointed out that in all cases the combustible gases leaving the prolongs should, if possible, be burned.

A study of the effect of "breezing-up" receivers showed that when properly worked and carefully fired, a furnace with breezed-up receivers should discharge no more fume than escapes when clay nozzles are in use. Preliminary experiments on the weight of spelter obtained did not support the view advanced by some zinc makers that clay nozzles are less efficient than breeze stoppers in preventing loss of zinc.

The Financial Position of Great Britain

In an address to the Investment Bankers' Association at Philadelphia, Nov. 13, Sir George Paish said in part:

The supply of banking money in London will, I am convinced, be as great as ever, but it will be obvious that the supply of capital in England cannot be as great as ever—at any rate not for outside purposes.

We calculate that the savings of the British nation are close to £400,000,000 a year. Last year we placed half those savings in foreign countries. We are now engaged in the greatest war the country ever has had to fight, and it will be obvious that we shall need our savings to pay for that war.

I am hopeful, indeed I have strong hopes, that we shall be able to pay for that war out of our growing savings, and will not have to encroach upon our capital. With the British nation carrying on its business as usual there is no reason why its income should not be maintained, and if its income is maintained it will have the savings and the money with which to pay for this great war out of its income.

This matter, I know, is of importance to this side, as there is a great deal of anxiety lest we in England should be compelled to send you back a large amount of your securities. I do not think there is any serious danger of this. I think the utmost extent of the danger is that we may not be prepared to renew short notes of various kinds, railway notes, New York city notes, and others.

Southern Aluminium Suspends Operations

The war has made it so difficult for the Southern Aluminium Co. to obtain funds that it has discontinued its construction work. The work was well along; the powerhouse was nearly up; 35,000 cu.yd. or more of concrete had been laid on the big dam; the electrode factory was nearly completed, and work had begun on the purifying plant.

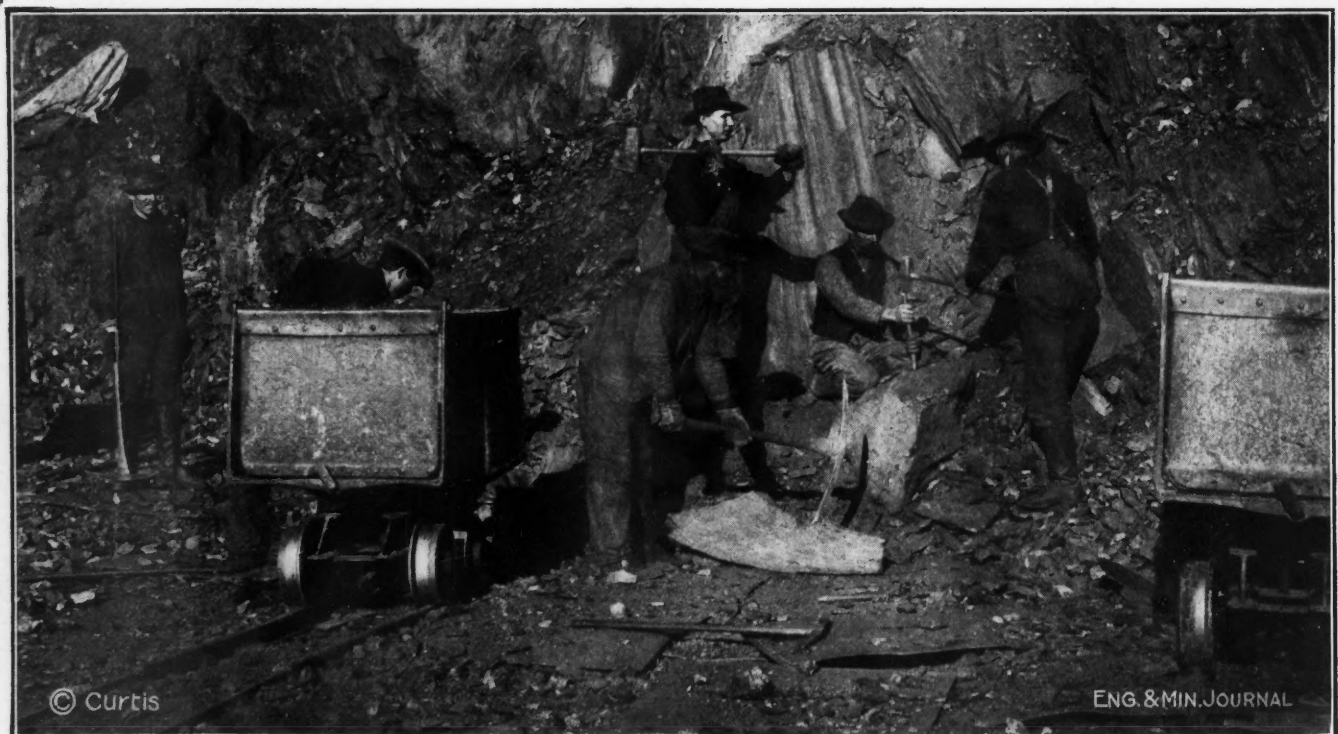
Mica Production in the United States in 1913 amounted to 1,700,677 lb. of rough-trimmed and cut mica, and 5322 tons of scrap mica, according to the U. S. Geological Survey. Only muscovite (potash) mica is mined in the United States, North Carolina being the chief producer.

Photographs from the Field

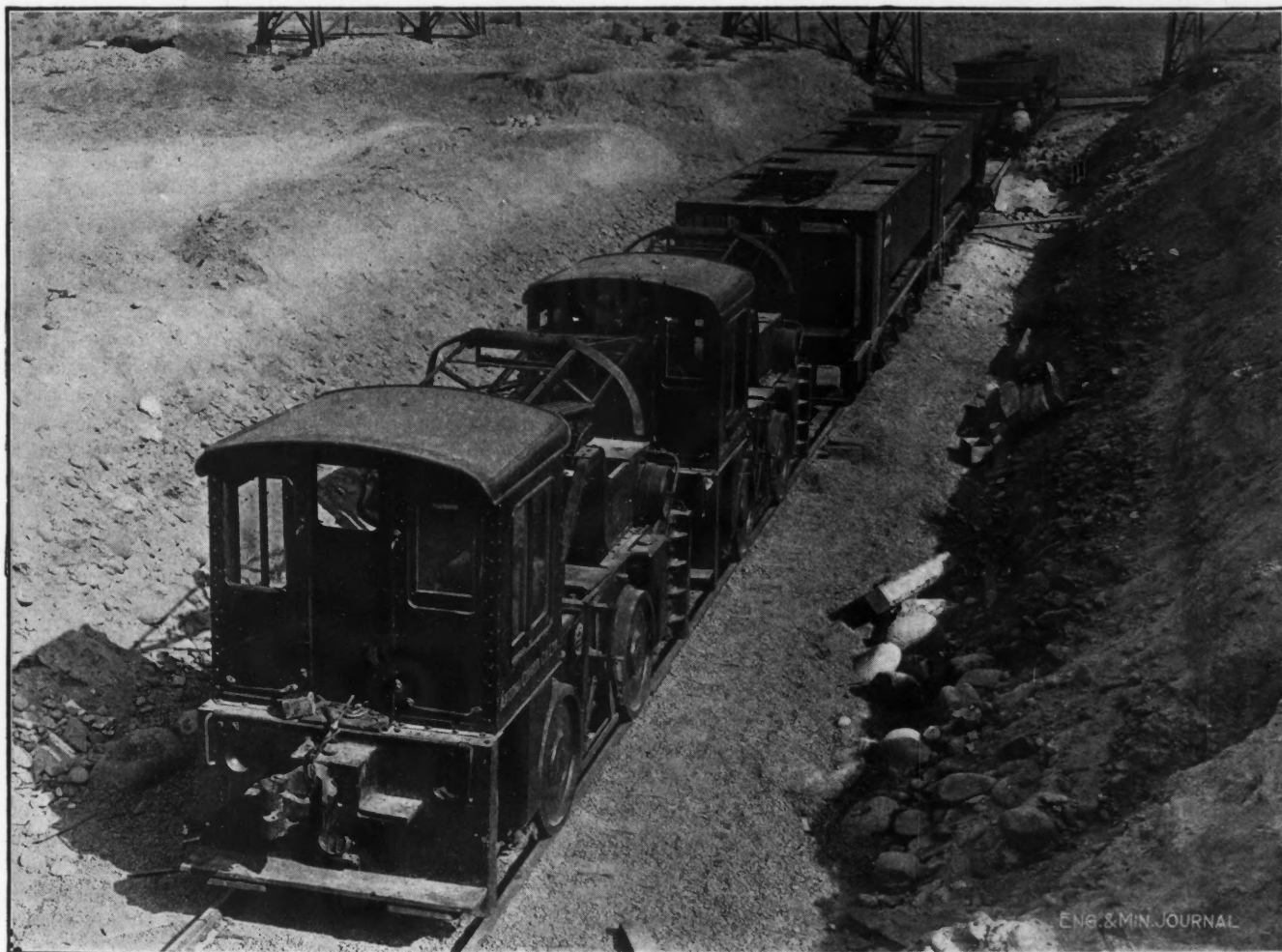
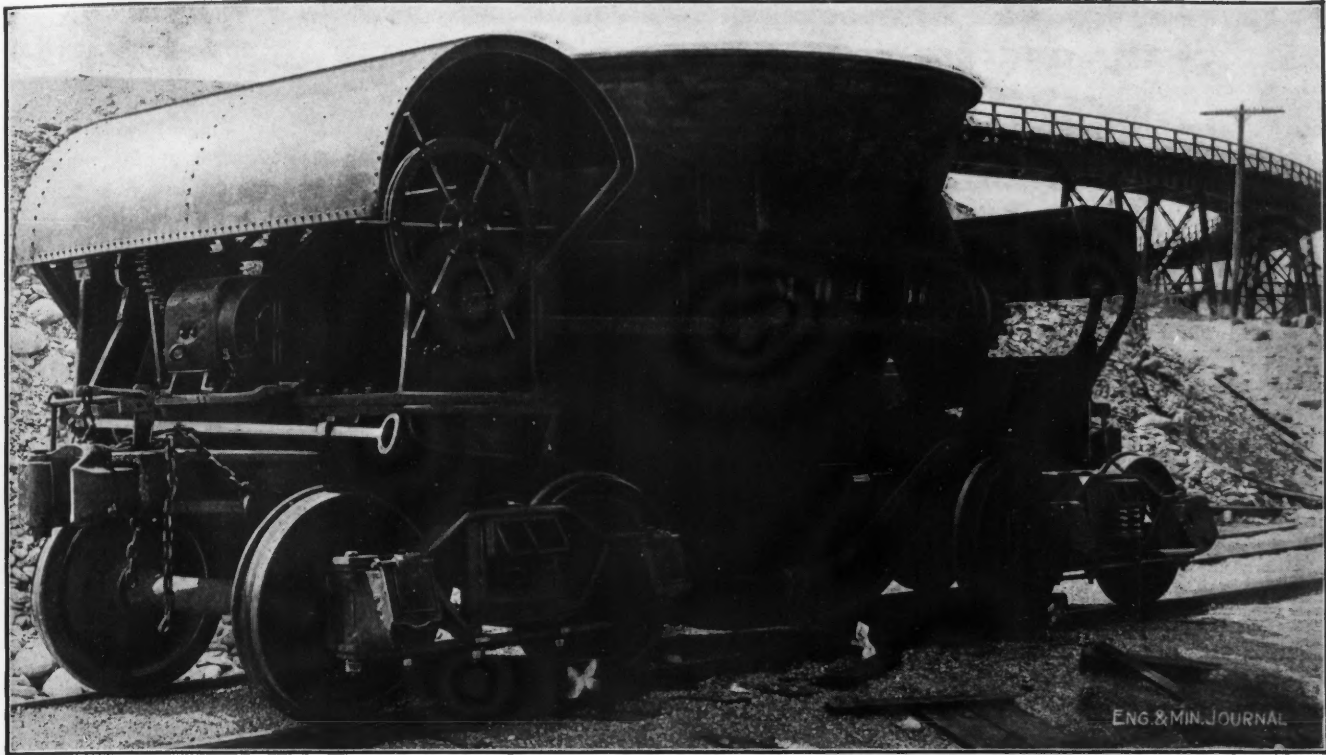


WASHING GRAVEL FOR GOLD IN THE SASKATCHEWAN RIVER AT EDMONTON, ALBERTA, CANADA

About 600 men are operating grizzlies and earning \$1.50 to \$2 per day. Unemployment, on account of the war, has stimulated the work.



OPENCUT MINING AT THE HOMESTAKE, S. D.



TRANSPORTATION EQUIPMENT AT THE ARIZONA COPPER CO.'S NEW WORKS, CLIFTON, ARIZ.

Above is one of the 225-cu.ft. slag-pot cars, made by the M. H. Treadwell Co.; in the lower picture the 18-ton Baldwin-Westinghouse electric locomotives; Kilbourne & Jacobs 20-ton larry cars for calcines; more slag-pot cars, and behind these one of the 165-cu.ft. larry cars for transporting clinker.

International Engineering Congress

A circular from the Committee of Management refers to a report recently circulated to the effect that the International Engineering Congress was to be abandoned, and states that this is not correct, but that the Congress will be held in San Francisco as scheduled, from Sept. 20 to 25, 1915. In view of the conditions now prevailing in Europe the governing bodies of the five national societies under whose auspices the Congress is to be held have recently given careful consideration to the feasibility of holding the Congress and to the probability of its success, with the result that each body has unanimously confirmed its original pledge to support the Congress. The Committee of Management is actively proceeding with arrangements, which are now well advanced, for meetings on the scheduled dates and for the publication of the transactions.

The Committee of Management is in receipt of a sufficient number of communications from various foreign countries throughout the world, including those located within the war zone, to indicate that a large majority of the papers originally requested for presentation at the sessions of the Congress and publication in its transactions will be handed in on time, and that the Congress will be truly international in character.

The general fee for membership in the Congress is \$5, which will entitle the member to receive the index volume and any single volume of the transactions he may select, together with the right of participation in all the general activities and privileges of the Congress. W. A. Cattell, Foxcroft Building, San Francisco, is secretary of the Committee of Management.

Additional Contraband of War

Additional schedules of contraband of war have been issued by the British government, according to the *Mining Journal*. The chief lines of interest to the mineral industry are the following:

Absolute Contraband—Sulphuric acid, armor plate, hematite ore and pig iron, iron pyrites, nickel ore and nickel, chrome ore and ferro-chrome, unwrought copper, lead (pig, sheet or pipe), aluminum, ferrosilicon, barb wire and cutters, mineral oils and motor spirit (lubricating oils excepted).

Conditional Contraband—Gold and silver coin or bullion, fuel other than mineral oils, lubricants, explosives (not specially prepared for war), sulphur, glycerin.

Ray Consolidated Copper Co.

Report of the Ray Consolidated Copper Co. for the third quarter of 1914 shows production of 12,475,153 lb. of copper from concentrating ores, which was produced 6,008,061 lb. in July, 3,229,401 lb. in August, and 3,237,691 lb. in September. In addition, 161,032 lb. was produced from ores shipped to smelters.

On account of unsettled conditions, production was reduced one-half in August, so that the ore milled for the quarter was 546,734 dry tons, averaging 1.61% copper. Mill recovery was 67.47%. Milling costs were 45.85c. per ton. Mining and coarse crushing cost 57.681c. per ton, of which 2.814 was for coarse crushing.

Average cost per pound of net copper was 8.849c. per lb., after allowing for smelter losses and applying the dividends of the Ray & Gila Valley R.R., but no other miscellaneous income, to credit of cost. Combined cost of net copper from both milling and shipping ore was 8.883c. per lb. This includes all operating and general charges, as well as 12½c. per ton of ore milled, which is applied to retirement of mine-development costs.

Underground developments for the quarter amounted to 10,626 feet.

No dividend was paid for the third quarter. Net surplus, over bond interest, was \$420,922. Earnings were based on copper at 12.4858c. per lb. The amount on hand and in transit, sold and unsold, at the end of the quarter was 24,405,739 lb. Reductions in cost, both at mine and mill, have been obtained.

New Source of Potassium Salts

Under the name of "salino potassico," the Italian distilleries have put a mixture of alkaline salts on the market which are extracted by distillation from the residues of fermented beet molasses, in the Dubrunfaut process. These residues, when suitably concentrated, are calcined, the composition of the ash obtained being as follows: K₂O, 47.20%; Na₂O, 9.35%; MgO, 0.50%; FeAlO₃, 0.55%; CO₂, 23.80%; SO₃, 3.80%; P₂O₅, 0.28%; Cl, 8.32%; H₂S, 0.15%; carbon and sand, 4.0%. Thus it is a similar product to that called "schlempekohle," the annual production of which is 25,000 to 30,000 metric tons. Its value depends upon a high percentage of potassium carbonate.—*L'Industria*.

Gas Power Plants

R. H. Fernald, in *Journ. of Franklin Institute*, 1914, pp. 161-179, says that the total horsepower of gas-producer power plants in the United States was 160,000 in 1911, of which 80,000 was obtained from bituminous coal, 70,000 from anthracite and 10,000 from lignite. The cost of producer-gas installations is about equal to that of reciprocating steam engines; the cost of maintenance is only about one-half, while the economy has been shown in several cases to be two to three times as great; the heat losses in typical steam and gas plants given are:

	Steam Plant	Gas Plant
Heat lost in ashes	2.00	1.10
Heat lost in radiation and cooling	4.60	18.60
Heat lost in smoke	24.60	..
Heat lost in radiation and friction	3.30	4.30
Heat lost in exhaust	53.50	23.70
Heat lost in jacket water .....	..	33.50
Heat lost in auxiliaries	7.30	..
Total losses in entire plant	95.30	81.20
Net efficiency of plant	4.70	18.20

Crushing at the McIntyre Mill

In the article on "Cyanide Development at Porcupine, Ont.—II," in the *JOURNAL* of Sept. 12, 1914, it was said that the ore feed to the Hardinge ball mill had been crushed to about ½-in. ring. This was officially stated by the company. Later information, however, shows that while the former practice was in accordance with that procedure, subsequent developments showed that the ball mill did better work on coarser feed, the mixture now containing 6.81% of +1½-in. and 16.62% of +1-in. material.

Correspondence and Discussion

Solubility of Sulphides in Cyanide Solutions

In his article on continuous counter-current decantation in the *JOURNAL* of Oct. 17, Herbert A. Megraw makes the following statement:

"Sulphide ores may, and usually do, require previous concentration, but it is nevertheless true that by grinding a sulphide fine enough, its values are very likely to be given up in about the same time required in the ordinary slimes treatments. To do this, however, sulphide slimes should be reground until they are in an exceedingly fine state of subdivision. In such case they may go through counter-current treatment along with ordinary slimes and have the metals satisfactorily extracted. Sulphides are, of course, governed by the same general laws as ores, so that what has already been said as to dissolution in the decantation circuit applies to them as well."

The qualifying phrase, that a sulphide's metals are "very likely" to be given up, saves this statement from being incorrect. And still it is so broad that it seems likely to lead to a misconception.

The solubility of the values in sulphide minerals depends upon the nature of the values and also upon that of the sulphides. It seems that gold may be recovered from almost any sulphide mineral by prolonged grinding and treatment, but silver only in exceptional cases. While at the Natividad mine in Oaxaca recently, I conducted a series of experiments on concentrates to determine that very point.

The concentrates consisted chiefly of clean galena and pyrite with a small proportion of blende and chalcopyrite. The galena and pyrite were so clean and bright that they could be taken off the Wilfleys in well defined and separate ribbons. The product of the tables carried from 8 to 10 kg. of silver and about 300 grams gold.

Experiments on these concentrates consisted of charging one kilo into an experimental tube mill with two liters of freshly made cyanide solution and grinding continuously for from one to three weeks, taking a sample of both the pulp and solution daily. In the course of several repetitions with solutions of various strengths and other modifications the following conclusions were reached.

The content of gold in the washed pulp fell rapidly at first, then more gradually until about the fourth day, when it had been reduced to from 3 to 15 grams. After that, even to the end of three weeks, neither the pulp nor the solution showed any further extraction of gold.

Nearly 50% of the total silver dissolved during the first 24 hr. After that it continued in a decreasing ratio until the fifth or sixth day, after which all effect of the treatment ceased. The residue, even after weeks of grinding in solution, never contained less than two kilos of silver and frequently as much as three kilos. Air agitation at intervals had no effect on the results.

Wet desulphurizing had no effect upon the silver extraction of the concentrates. Previous experiments had shown that this reduction treatment increased the ex-

traction on mill pulp to 85 and 90%, the normal extraction with straight cyaniding being only 40 and 50%. Wet desulphurizing had no effect on the solution of gold in slime or concentrates.

These results seem to show that the gold is all in the metallic state whether associated with the slime minerals or with the sulphides; that the ruby silver minerals, easily visible in the ore, do not enter into the concentrates, but are immediately reduced to powder under the stamps; and that the silver in the concentrates occurs in some form or forms not soluble in cyanide solution even when preceded by a reduction treatment.

It is interesting to find in Mr. Megraw's articles that cyanide men are beginning to doubt the value of air and air agitation as a cure-all. A few of my experiments are illuminating on that point. A kilogram of the sulphide ore from below water level was ground dry in a hermetically sealed tube mill. Sodium-hydrate solution and aluminum plates were then introduced and the mill set in motion until a considerable internal pressure, due to hydrogen, developed. Finally, the cover was removed just long enough to remove the aluminum plates and introduce a weighed quantity of sodium cyanide. The mill, tightly closed and containing a few pebbles to affect a mild agitation, was kept in motion for another 24 hr. This procedure, in which air and oxidation were carefully excluded, gave as high extraction as agitation with air pressure.

I have followed the articles on cyaniding by Mr. Megraw with great interest. My interest, at least, is increased by his manner of dealing with first principles. He does not constantly exalt the importance of any particular detail, or of some particular machine. It is pleasant to observe in the development of the process the steady movement toward more simple arrangement and more simple apparatus. The multiplication of complicated machines, each guaranteed to increase the extraction, seems to have ceased. Perhaps some day the cyanide man will not be expected to spend 18 hr. a day with a monkey wrench in his hand. When that time arrives he may be allowed to devote his time to his real business.

A. VAN ZWALUWENBURG.

Mexico, Oct. 29, 1914.

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Solubility of the gold or silver contained in sulphides has been discussed by cyanide operators for many years. Mr. Van Zwaluwenburg's objection to my statement that sulphides will usually give up their contained metal to cyanide solution if the mineral is ground fine enough is not surprising, but I am still of the opinion that my original statement is essentially true. The usual sulphide encountered in Mexican silver-bearing ores will give up its silver to cyanide solutions when the mineral is sufficiently fine, a fact which has been demonstrated by experiments at many places. At Guanajuato, Pachuca, Pozos, and many other camps, fine grinding has been found sufficient to insure high-percentage extractions on concentrates. Fine grinding in such cases may mean much finer than

—200-mesh size. The —200-mesh material often has to be reground, but in view of the friability of the sulphides the operation is not particularly difficult.

It is undoubtedly true that there do exist silver minerals which are not amenable to this treatment. Some of the lead-silver compounds belong to this class. The number of these compounds, however, is small in comparison to those which are amenable to cyanide treatment. As to the economy of such methods, I have said nothing. With some ores profits may be obtained, and with others there may be none. Each one presents a special problem which must be worked out in its own merits. The chemical fact that the silver in sulphides may be dissolved by fine grinding and ordinary cyaniding methods, however, remains. Attention may be called to the discussion by G. H. Clevenger on "Mill and Practice of the Nipissing Mining Co., Ltd.," in *Bull. of A. I. M. E.*, July, 1914, in which the opinion is indicated that fine grinding of heavy silver minerals is advisable.

As to Mr. Van Zwaluwenburg's remarks on the necessity of air as an aid to cyaniding, his opinion is becoming general. In some cases air or oxygen will aid in shortening the time of treatment. In a few cases it will increase the ultimate recovery, but in many cases it has no effect.

I heartily agree with Mr. Van Zwaluwenburg's final comment. When the cyanide director is permitted to be a technical director, rather than a roustabout, more of our puzzling problems will be solved.

H. A. MEGRAW.

New York, Nov. 7, 1914.

Ventilation of the Anaconda Mines

On reading the editorial in the *JOURNAL* of Oct. 10, 1914, on mine ventilation by mechanical means and the reference to Butte, it appears that the writer was not posted on what the Anaconda Copper Mining Co. is doing in mechanical ventilation in its mines.

Up to about eight years ago there was not much attention given to mechanical ventilation. The depths of the mines were not great, and with the great number of shafts besides those used for hoisting which were sunk by independent companies in former years and which were also necessitated by the topography of the camp, "natural ventilation" controlled by doors and canvas curtains was all that was necessary. Due to the increasing depth and the enormous quantity of timber used in the safe methods of mining, the temperature of the mine workings became a great deal higher. It is generally conceded by miners from all parts of the world that no company surpasses the Anaconda in the safety of its mining methods. The company then started to devise the best methods of improving conditions and different types and sizes of fans were brought into use.

At present there are 22 hoisting shafts of the Anaconda company, which vary from 600 to 3400 ft. in depth. Besides these, each mine, with one or two exceptions, has three shafts used exclusively as air shafts and some of the larger mines also have shafts that are used for handling timber, waste for filling stopes, etc. These air shafts are being continually sunk or raised to aid in ventilation.

The following table gives the type and number of fans used, their capacity and the power consumed in oper-

ating them. The fans installed on surface are placed over shafts that are used exclusively as air shafts.

Besides the fans here listed, there are a great many small ones used as blowers; these fans are connected to

THE ANACONDA FANS

Mine	Fan	No. of Fans	Installation	Cu.Ft. per Min.	Motor Hp.
Anaconda	Amer. Blower No. 100	1	Surface	110,000	150
Anaconda	Sirocco No. 4	2	Underground	9,820	20
Neversweat	Sirocco No. 11	1	Surface	53,600	75
Neversweat	Sirocco No. 4	2	Underground	9,820	20
High Ore	Sirocco No. 11	2	Surface	53,600	75
High Ore	Sirocco No. 6	3	Underground	19,500	30
High Ore	Sirocco No. 4	5	Underground	9,820	20
High Ore	Sirocco No. 3½	3	Underground	6,620	10
High Ore	Venture No. 6	2	Underground	.....	.....
Diamond	Sirocco No. 13	1	Surface	83,500	100
Diamond	Sirocco No. 11	1	Surface	66,000	75
Diamond	Sirocco No. 4	1	Underground	9,820	20
Diamond	Sirocco No. 3½	1	Underground	6,620	10
Gray Rock	Sirocco No. 11	1	Surface	53,600	75
Gray Rock	Sirocco No. 3½	1	Underground	6,620	10
Mountain Con.	Sirocco No. 13	1	Surface	83,500	100
Mountain Con.	Sirocco No. 4	2	Underground	9,820	20
Mountain Con.	Sirocco No. 3½	2	Underground	6,620	10
Mountain Con.	Sirocco No. 2½	1	Underground	3,636	7½
Steward	Sirocco No. 11	1	Surface	60,000	75
Steward	Sirocco No. 4	1	Underground	9,820	20
Steward	Sirocco No. 3½	1	Underground	6,620	10
Steward	Sturtevant	1	Surface	85,000	100
Original	Sirocco No. 11	2	Surface	60,000	75
Original	Sirocco No. 2½	2	Underground	3,636	7½
Original	Sirocco No. 5	1	Underground	.....	.....
Original	Sturtevant	1	Surface	85,000	100
Belmont	Sirocco No. 2½	4	Underground	3,636	7½
Nettie	Sirocco No. 2½	1	Surface	3,636	7½
Leonard	Sirocco No. 15	2	Surface	100,000	150
Leonard	Sirocco, mill type	3	Underground	9,820	20
Leonard	Buffalo	1	Underground	30,000	40
West Colusa	Sirocco No. 15	1	Surface	100,000	150
Mountain View	Sirocco No. 15	1	Surface	100,000	150
Mountain View	Buffalo	1	Surface	30,000	50
Pennsylvania	Buffalo	2	Underground	30,000	75
Pennsylvania	Sirocco No. 6	2	Underground	19,500	30
Berkeley	Sirocco No. 6	1	Underground	19,500	30
Mountain View	Sirocco No. 6	3	Underground	19,500	30
East Colusa	Buffalo	1	Surface	30,000	75
Ella	Sirocco No. 6	1	Surface	19,500	30
Tramway	Amer. Blower	1	Surface	110,000	150
Tramway	Sirocco No. 15	1	Surface	100,000	150
Tramway	Conoidal	1	Underground	60,000	50
Tramway	Conoidal	1	Underground	75,000	100
Tramway	Sirocco No. 4	2	Underground	9,820	20
Tramway	Sirocco No. 2½	1	Underground	3,636	7½

Total number of fans, 74.

Total horsepower used, 2921.2.

Total capacity, 2,170,108 cu.ft. per min. From surface, 1,380,936 cu.ft. per min.

galvanized-iron pipes from 12 to 18 in. in diameter which carry air to the drifts, crosscuts and stopes. Canvas piping is used to carry air to the faces of the drifts, being supported by ropes tied to the timbers. These canvas pipes are carried back from the face when blasting and hence are more practicable than galvanized piping.

It has been found from experience that it is much more efficient to use exhaust fans than pressure fans, but conditions will not allow the use of them in this way in all places. All surface fans are exhausters, however. One of many instances of efficient work done by a fan was on the 2800-ft. level of the Steward mine. A crosscut was being driven from the shaft to the main vein, the distance being 868 ft. After the crosscut was in about 200 ft. a No. 4 Sirocco exhaust fan was installed at the station, the pump compartment of the shaft being lined with 1-in. boards; 18-in. galvanized-iron pipe was connected to the fan carried to the crosscut and also from the fan to the pump compartment of the shaft. The air was carried to the level above, where it went through an air course to an air shaft. Before the fan was installed the temperature in the breast of the crosscut was 90° F., this was lowered to 75° F., and the place was made comfortable to work in.

In general the work done by fans all through the mines has been satisfactory, although no doubt there will be ways and means found to improve results right along.

J. J. CARRIGAN, Safety Engineer,

Anaconda Copper Mining Co.

Butte, Mont., Nov. 2, 1914.

Editorials

Alcoholic Liquor and Mining

At the last election two important mining states, viz., Arizona and Colorado, went "dry." This was no great ground for surprise, the incompatibility of whisky with efficient work in mining having long been recognized. Indeed, mine operators in Arizona, Colorado and Montana have lately been emphatic in deploring the evil tendency of the saloon upon the economics of the industry, especially in increasing liability to personal accidents and decreasing working efficiency. The direct waste of resources, the absence of thrift and the high cost of policing are further results to the community that may be traced to alcohol in a more or less degree, chiefly more.

John V. N. Dorr, a distinguished mining and metallurgical engineer, has furnished, in a letter to the *Evening Post*, some concrete evidence as to how this question is now regarded in Colorado, quoting from a communication received from a large machinery house in Denver as follows:

It was indeed remarkable to find how strong the various coal-mining companies were in favor of prohibition after having had a year of it under the federal authorities, who enforced the laws and made the coal-mining camps absolutely dry. It was reported a couple of weeks ago that the Colorado Fuel & Iron Co. had announced to its employees that it was in favor of having the state go dry, and we have talked to a great many operators who called at our office, and, one and all, they have agreed that the men were doing about 15% better work per dollar of wages paid to them and that their families were in much better condition than when liquor was sold. On election day and the day before it, the coal companies had a great many of their men out on the street talking prohibition, and I don't think I ever heard a better argument down the line in favor of it, simply on account of the better work that surrounded them.

This evidence is exactly in line with the experience in the manufacturing cities of Massachusetts, nearly all of which for several years have been "dry" under the local-option law of that state. It has been found there that by reduction of alcoholic drinking the efficiency of the labor is higher, that there is less work for the police and magistrates to do and that the local merchants suffer fewer bad debts.

The national prohibition movement was started largely on moral and sentimental grounds. Lately it has been advancing on economic grounds. The combination of the moral and economic will make it irresistible. The cause has been further promoted by the decree as a military measure of prohibition in Russia, where vodka has been a national curse. If the new rule be continued indefinitely in Russia, the economic benefit to that country may be sufficient to pay its share of the colossal cost of the war.

Montana Shows Its Independence

When we went to press last week, the vote on the Montana workmen's compensation law looked so close that it seemed likely that a recount would be necessary. Subsequent returns, coming in from the remote counties,

proved to be against the proposed law and when the vote was all in it was found that there was a majority of more than 4000 against it. Montana thus fell into line with other states in the recent election in defeating legislative proposals directed against one class of people in the interest of another class. This encouragement with respect to the public welfare of this country is one of the contributory factors in the optimism that has lately been growing. Legislatures may be frightened by the threats of labor unions into passing measures which the people with collective good sense defeat. The recent demonstrations of this may relieve legislators from one bondage of fear.

Some Comments on Copper Affairs

The Copper Producers' Association has made no report of copper production and stocks since last July. During the interval the officers of the association have not even made any compilation of figures for the private information of the members. Indeed, the members have not turned in their individual reports. Nor have the producers informally exchanged information with each other. In short, conditions have been exactly as they were before this statistical association was organized.

Our own opinion, based on information received from the principal refiners, is that the present stock of refined copper is less than is commonly supposed, whatever may be the accumulation of blister copper. Ever since Aug. 1 there have been regular deliveries of copper on old contracts, while the deliveries for export have been surprisingly large until lately; and in the latter part of October there developed a rather large volume of new business, which was checked but momentarily by the British seizures. Consumption has, in fact, been increasing in this country, especially in the brass business. On the other hand, the refiners did not wait to work up all the blister copper in transit to them on Aug. 1, but in several important instances inaugurated curtailment right away.

The net result is that some of the refiners are at present holding materially less stock of refined copper than on Aug. 1, while in one case where there was an increase during the three months things are now probably beginning to go the other way.

As to whether the Copper Producers' Association will ever resume the publication of its monthly statistical reports, or will put them on a different basis, or will simply fade away, nobody yet knows. The purpose of the producers, especially the stabilizing of the market by the communication of prompt and exact information, was defeated, partly by popular ignorance of the industrial conditions, partly by inherent difficulties. Whenever a bad report was published, advantage was taken of it to depress the market. When things turned in favor of the producers and there was a good report, the newspapers

and the public charged that the figures were doctored or else said with Cassandran forebodings that "Last month may have been good, but just wait for this month's figures; they'll not be good," etc. Thus with the producers it was nearly always a case of "Heads I lose, tails you win."

It may be that the Copper Producers' Association will at some time resume its statistics in the old way, but we doubt it. It may be that it will make a quarterly, semi-annual or annual statement. Or it may pass out of existence. Whatever may be done will be in the far-away future. At present there is not even any discussion of it.

Mines and Military Operations

We are not going to join the ranks of the military critics, whose essays adorn the pages of the metropolitan dailies, even if they do not always enlighten us. But we are going to venture the prediction that the Russians will direct a powerful attack upon those parts of Silesia and Galicia adjacent to the "Dreikaiserliche Ecke," where Germany, Austria and Russia join, for there are some great mines of coal, zinc, lead and iron, of which the Russians are probably in great need. Their own zinc mines of Olkusz and their important coal mines of the Dombrowa basin lie in this district, as do also their zinc smelteries at Bendzin and Dombrowa, which are the only producers of spelter in the empire. This district has been in German or Austrian hands ever since the beginning of the war, and Russia has been obliged to obtain her spelter from foreign countries, including the United States. Her deprivation of the Dombrowa coal mines has also been troublesome, the Donetz region being her only other source of supply, and it has been apparently insufficient. Anyway, the European papers have been reporting a serious scarcity of coal in Russia and poor chances of getting large quantities from England in the present condition of navigation.

Now, however, the Russian advance has reached this corner of Poland, and Russia is in a position to strike for the recovery of her own mines, if she has not already done so. A few miles further west she can seize, if she be strong enough, the great zinc, lead, coal and iron mines of Silesia, the zinc smelteries around Beuthen and Kattowitz, the lead smelteries at Rosdzin and Tarnowitz, and the iron and steel works at Königshütte, sulphuric-acid works, sheet-zinc rolling mills and many other kinds of useful factories. If successful, she will have all the zinc and lead she needs and will no longer have to buy them in New York. She will get coal, which is even more important; and with her own supply of copper and petroleum, will be in a comfortable position with regard to metals and minerals. Therefore, a violent attack in this direction is to be anticipated.

Other important mines of this region are the famous salt mines of Wieliczka and Bochnia, a few miles east of Cracow, in Galicia. The important petroleum fields of Galicia, which are near Drohobycz, have been in Russian possession for some time back.

Adirondack Gold Again

A correspondent in California writes us about a person who is circulating in that region, fishing for suckers with an Adirondack gold-mining hook. He has some reputable

persons nibbling, says our correspondent. This particular fisher pretends to have an amalgamator which saves more gold than the fire assay shows. (The same old story which may be traced back to the green-gold myth, which we have analyzed in previous critiques.) This new wizard pretends to do the trick by fine-grinding and electricity. He claims to have extracted \$6.50 per ton from Adirondack material, out of which Ricketts & Banks never got over \$3.50. (We do not believe that Ricketts & Banks ever got \$3.50 out of one ton—2000 lb.—of Adirondack material, anyhow.) Our correspondent suggests that we ought to issue a warning against this new faker. The present remarks must suffice. We have lost interest in Adirondack gold swindles. After the exposures that have been made by us, by the New York Geological Survey and by others, we are of the opinion that anybody who puts money into an Adirondack "gold mine" ought to lose it. Or rather, we should say, that any promoter of an Adirondack "gold mine" ought to be apprehended by the authorities on sight.

Trading with South America

One of our valued correspondents in Chile, an engineer who has been a resident of that country for several years and has been engaged in business there, writes us as follows: "If you Americans want business here, begin by buying the products of the country. Each of the South American republics has an urgent need—not for merchandise, but for someone to buy its products. Chile has nitrate of soda, copper and silver; Peru has copper, cotton and rubber; Bolivia has tin and rubber; and so with all of the countries, each one has products to sell before purchases can be made, or before even back debts can be paid. Everything in Chile is now on a strictly cash basis, so this would be an excellent time for Americans to appear. There are also many possibilities of obtaining interest in industries of the country, and this applies particularly to Chile. However, there is going to be a lot of disappointment for American manufacturers, if the advertisements we see are to be taken as a guide to the present opinion among them. Tell them to buy nitrate if they want business in Chile." This is advice that is founded on common sense. Unfortunately, we have already more copper and cotton than we know what to do with, wherefore we are not likely to buy them from Peru and Chile, but we need tin, rubber and sodium nitrate.

We hear from Colorado that the smelters there are getting more ore than they were four months ago. The explanation of this is that while the shipments of some of the larger companies have decreased, those by leasers and tributers have increased. When the Rocky Mountain miner loses his job and cannot obtain another one, he gets a lease somewhere and digs on his own account. If he can't get \$3 a day in wages from some corporation, he is glad to earn \$1.50 a day while being his own boss. Similar occurrences have frequently been noted in the Joplin district, Missouri, where it is notorious that in times of adversity and the closing of company-owned mines, the production of the district has been maintained by the aggregate of small outputs of little mines worked by three men with a windlass.

BY THE WAY

In these days of frantic appeals of "buy a bale of cotton," "why not buy a ton of copper" and "please buy a carload of coal," there is great consolation to be derived from the cheering thought that Uncle Sam is still doing business at the old stand and is paying the same old \$20.67 per oz. for the real stuff. Sell a gold brick.

✂

Marshall Field stated these 12 things to remember: (1) The value of time. (2) The success of perseverance. (3) The pleasure of working. (4) The dignity of simplicity. (5) The worth of character. (6) The power of kindness. (7) The influence of example. (8) The obligation of duty. (9) The wisdom of economy. (10) The virtue of patience. (11) The improvement of talent. (12) The joy of originating.

✂

An extra large blast was fired at Copper Flat by the Nevada Consolidated, the cost of which is said to have been \$10,000. Twelve holes ranging from 65 to 125 ft. deep, had been drilled back from the face of the bank on the Westphalia and Liberty claims, the average separating distance being about 100 ft. They were loaded with 58,050 lb. of explosives, mostly dynamite, and all fired together. The amount loosened by the blast was estimated at about 200,000 cu.yd.

✂

The refineries of the Union Sulphur Co. of New York, at Marseilles and Cette, France, were recently in danger of French seizure and destruction, and the State Department at Washington was asked to make representations to the French government for the protection of the two plants. In 1909, the Union Sulphur Co., finding production from its Louisiana deposits more than ample for domestic consumption, decided to sell some of its sulphur abroad. Accordingly it established at Marseilles and Cette the Raffineries Internationales de Soufre. While the owners are Americans, a German named Herman Hoechel was placed in the position of managing director, and another German named Zeise was his assistant. At the outbreak of the European War the Germans fled to their own country, but their previous direction of the works gave rise to French suspicion that the concern was German. After repeated warnings of the U. S. Consul at Marseilles, our Government finally took the matter in hand and satisfactory assurances of neutral ownership were presented to the French government.

✂

B. C. Forbes in the *American* gives this poem in prose and lesson in economics:

WHO AM I?

—I am the foundation of all business.
 I am the fount of all prosperity.
 I am the parent, most times, of genius.
 I am the salt that gives life its savor.
 I have laid the foundation of every fortune in America, from Rockefeller's down.
 I must be loved before I can bestow my greatest blessings and achieve my greatest ends. Loved, I make life sweet and purposeful and fruitful.
 I can do more to advance a youth than his own parents, be they ever so rich.
 Fools hate me; wise men love me.
 I am represented in every loaf of bread that comes from the oven, in every train that crosses the Continent, in every

ship that steams over the ocean, in every newspaper that comes from the press.

I am the mother of democracy.
 All progress springs from me.
 The man who is bad friends with me can never get very far—and stay there.
 The man who is good friends with me, who is not afraid of me, can go—who can tell how far?
 Who am I?
 What am I?
 I AM WORK.

✂

Some consideration of Mr. Forbes' teachings is recommended to the members of the American Federation of Labor, who made an effort at the recent convention in Philadelphia to start an agitation for a six-hour work-day in all organized trades. The United Brotherhood of Carpenters wanted the convention to exert its weight to establish the six-hour day in all trades, upon the ground that the eight-hour day is enervating and excessive.

✂

At the same convention there was a vigorous expression of the demand of the turbulent element in union labor that troops should be barred by law from upholding the civil authorities in disorders growing out of strikes. They would also disarm the courts. There was an angry protest against the right exercised by mining companies and other large employers to protect their own property with armed guards. Those parts of the Clayton act which make unionized workers a privileged class, immune from prosecution for acts made criminal when plain ordinary citizens are guilty of them were naturally extolled. As to this the *New York Sun* remarks that there is a distinctive spirit grown up in the labor organizations which affects all their ideas and relations and determines their opinions on every question and their relation to every public man. The spirit is that of class supremacy. Everything is measured and tested by its effect on labor interests. If it promotes and pampers the labor caste it is excellent; if it does not obviously hamper or delimit laborism it is tolerable; if it tends in any way to place the worker on the same plane of competition as other men or to curb his sweet will in any way it is anathema.

✂

Shivers which run up and down certain spines whenever possible reopening of the Stock Exchange is discussed, remarks the writer of "Wall Street Paragraphs," in the *New York Evening Post*, may be causeless. He illustrates his point by telling a variation of an old mining story which is always good in any form. These shivers, he says, are much like those of the Welsh coal miner who one night, walking home in the dark, stumbled into an abandoned pit. As he fell he clutched a beam, and with the strength given men in a desperate place, held on. Suspended by his fingertips over the black hole, he tried to peer into its depth. He could see nothing. Then he looked up; how far off the stars had suddenly retreated! His frightened mind pictured how much further they would retreat if he should let go the beam. Shivers chased up and down his spine as his fingers began to numb. Minutes passed. He calculated the time it would take for his mangled body to reach the bottom of the shaft. He pictured the faces of his mates when they found him in the morning. More shivers agitated his spine. More minutes passed. At last he could hold on no longer. He let go. He fell 12 in. He had been hanging over a shallow hole in the ground.

PERSONALS

Quincy A. Shaw, president of the Calumet & Hecla Mining Co., arrived in Calumet, Mich., Nov. 11, from Boston.

David S. Ross, of Milwaukee, Wis., organizer and first president of the Twin Buttes Mining Co., was recently at Tucson, Ariz., at a meeting of the directors.

Ralph S. Rainsford, until recently manager of the Argonaut mine, in California, was married Nov. 9, to Marguerite Le Breton, at Washington, D. C. Their home will be in Detroit.

B. R. Hatcher, of Hatcher & Carpenter, Tucson, Ariz., recently returned from an extensive trip through the northern part of Arizona, and reports activity among the small gold producers.

W. R. Bolley, for the last seven years connected with the Copper Range Consolidated Co. in varying capacities, but more recently as superintendent of the Baltic mine, has resigned.

Captain William McDermott, formerly of the United Verde, has just returned to Tucson, Ariz., from a business trip to Butte, Mont., where he visited most of the reduction plants of the district.

H. Harris has resigned his position with the Tasmanian Smelting Co., as general manager, and is now in London in charge of the works of H. J. Enthoven & Sons, Ltd., Upper Ordnance Wharf, Rotherhithe.

Arthur E. Woolsey, who for the last three years has been in India, engaged in starting the Tata Iron & Steel Co. plant at Sakehi, is returning home and is expected to arrive in New York about the middle of November.

The Japanese Mine Owners' Association will make an exhibit at the Panama-Pacific Exposition, which will be prepared under the direction of Dr. Wada and Dr. M. Otagawa of the Ashio copper mines at Shimotsuke, Japan, and will be in charge of their expert, Mr. Furikawa.

H. W. Turner writes us from Siberia that he is on his way to the United States by way of Petrograd, Norway and London. He has been engaged for a long time in geological work in the western foothills of the Altai Mountains. Mr. Turner expects to be in New York in November or December.

James Douglas has resigned from the Greene-Consolidated Copper Co. and affiliated concerns, both as general manager and vice-president. George Kingdon, who has been in charge of mining operations, has been made general superintendent of the Greene properties. No general manager will be appointed at present.

Albert Mendelsohn, for the last two years mining engineer at the Champion mine of the Copper Range Consolidated Co., has been appointed superintendent of the Baltic mine of that company, succeeding W. R. Bolley, resigned. Before his connection with the Copper Range, Mr. Mendelsohn was engineer at the Superior mine. He is a graduate of the Columbia School of Mines.

John Treadwell, one of the discoverers of what is now the Alaska Treadwell gold mine, has filed a petition in bankruptcy in New York, giving liabilities of \$2,391,660, with assets of uncertain value. The principal creditor is the California Safe Deposit & Trust Company, by Frank J. Symmes, receiver, with a claim of approximately \$2,000,000. Treadwell holds stocks in numerous mining companies, the value of which is unknown.

Henry M. Howe wrote a communication that was published in the "Tribune" this week, urging that the United States ought not to remain neutral in the Great War, but ought in self interest to join the Allies. J. R. Finlay some time ago advocated the cause of Germany, in a letter in the "Evening Post," on economic grounds. These are only two of the well known engineers who have figured in the forums of the press.

Charles M. Schwab, of the Bethlehem Steel Co., who has been in London on business concerning contracts for war material, says: "I hope before a great many years to write an autobiography and I trust that when I do so I can tell the full story of the last three weeks." In private conversation Mr. Schwab is said to have made the remark that "Lord Kitchener is the best president the United States Steel Corporation ever missed."

Dr. Robert Olson and Dr. Joseph Bolton, of the Public Health Service, Washington, are making a sanitary survey of the Minnesota iron ranges. This work is being done at the request of the Committee on Industrial Relations of the House of Representatives. The survey has to do with housing condi-

tions, ventilation systems, first-aid work and kindred welfare subjects. Work of a similar character has just been completed in the Copper Country.

John E. Sweet, president Straight Line Engine Co., Syracuse, N. Y., is to be awarded the John Fritz Medal this year, probably on the evening of Dec. 2, in the Engineering Societies Bldg., New York. The medal is awarded annually by four national engineering societies, for notable scientific or industrial achievements. Previous awards have been made to Lord Kelvin, George Westinghouse, Alexander Graham Bell, Thomas A. Edison, Charles T. Porter, Alfred Noble, Sir William H. White and Capt. Robert W. Hunt.

J. A. L. Waddell and John Lyle Harrington announce the dissolution of the firm of Waddell & Harrington, Kansas City, Mo. The firm's business will be conducted as usual till the conclusion of its affairs in July, 1915, except that it is accepting no new commissions. Dr. Waddell will give his attention to special engineering and financial matters and to important advisory work. Mr. Harrington will be joined by the firm's associate engineers, E. E. Howard and Louis R. Ash, in the establishment of the firm of Harrington, Howard & Ash.

OBITUARY

W. S. Hermany, constructing engineer with the Bethlehem Steel Co., died at Bethlehem, Penn., Nov. 7, from typhoid fever. He had direct charge of the erecting of the plant which the company is building at New Castle, Del., for the manufacture of fuses and projectiles.

William Sauntry committed suicide at the Ryan Hotel, St. Paul, Minn., Nov. 10. No reason for this act could be assigned. Mr. Sauntry had some valuable lumber interests on the Mesabi range in Minnesota, and some of his lands were later found to contain iron ore. On one of these tracts was opened the Sauntry-Alpena mine, which bears his name. It is one of the largest pits on the range, its estimated production for 1913 having been 1,600,000 tons. The mine is operated by the Oliver Iron Mining Co. under lease.

Hon. William Templeman, formerly minister of mines for Canada and proprietor of the "Victoria Times," died at Victoria, B. C., Nov. 15, aged 70 years. He was born at Pakenham, Ont., and was for many years engaged in journalism at Almonte, Ont. Removing to Victoria in 1884, he became connected with the "Victoria Times," of which he subsequently became editor and proprietor. He took an active part in politics on the Liberal side and was called to the Senate in 1897, remaining a member of that house until 1906, when he was elected to the House of Commons for Victoria, and was appointed minister of inland revenue. The year following he became minister of mines, being the first to hold that position. He remained a member of the Laurier administration until it was defeated in 1911. Mr. Templeman had always taken a keen interest in the mining industry, and his knowledge of its requirements was brought to bear in the organization of his department, which he was enabled to place on a satisfactory basis. In 1909 he was appointed a member of the Canadian Conservation Commission.

SOCIETIES

American Institute of Mining Engineers—The annual meeting of the Columbia Section will be held at the Spokane Hotel, Spokane, Wash., Nov. 20. The evening program will be: Dinner at 6.30 p.m. Business session at 8 p.m.; annual reports, election of officers, paper by Prof. F. M. Handy, "Notes on the Economic Geology of Eastern Washington;" discussion.

Mackay School of Mines—This school of the University of Nevada, at Reno, will give a four-weeks course in prospecting, in February, 1915. Lectures on prospecting, excavation of earth and rock, geology, assaying and mining law, and laboratory exercises in mineralogy, assaying, gas engines and first aid to injured will be given. Course open to all residents of Nevada; fee of \$5 will be charged to cover in part cost of supplies. The State Mining Laboratory, at the Mackay School, makes free analyses for Nevada prospectors.

Western Society of Engineers—At a meeting of the society, held in Chicago, Nov. 9, L. S. Marsh read a paper on "High Explosives." Mr. Marsh is a member of the Corps of Engineers, Illinois National Guard, also a member of the American

Chemical Society, and is an authority on the subject. His talk included a short history of the discovery and development of explosives, and a description of the methods of manufacture of the better known varieties of both explosives and detonators. He dwelt at some length on their use in engineering, also the proper handling and figuring of charges. The lecture was illustrated with lantern slides and a few experiments, and led to considerable discussion.

Teknik Club—The regular monthly dinner meeting of this club was held at the Shirley Hotel, Denver, Nov. 12. Dr. S. C. Lind, of the Bureau of Mines, described the methods of analysis for radium and the relative advantages of each. The importance of the ratio between radium and uranium in an ore was discussed and the interesting possibility was pointed out that a dependence on this ratio might be unsafe in connection with the purchase of radium ores due to the possibility of mixing uranium ores, from which the bulk of the radium has been removed, with the radium bearing ores offered for sale, which would result in an erroneously high report of radium content. The fact was announced that in the determination of small quantities of radium in ores the practice in the United States is farther advanced than in Europe. Mr. W. G. Swart presented a discussion of several interesting mathematical curiosities and fallacies. Mr. H. J. Baron discussed present conditions in Mexico.

Colorado Scientific Society—The 307th regular meeting of this society was held in the State Museum Building, in Denver, Nov. 7, Richard A. Parker presiding. O. F. Heizer read a paper on "The Milling Practice at the Argo Mill, Idaho Springs, Colorado." The Argo Mill is unique in that it treats custom ores by cyanidation and operates successfully on a feed from some 15 different mines which ship varying quantities of ores of varying composition. Preliminary announcement was made of the course of lectures to be delivered before this society on the subject of cosmic physics, by Dr. Lucien I. Blake.

INDUSTRIAL NEWS

The Hyatt Roller Bearing Co. announces the resignation of John A. Schroeder, formerly general sales manager of that company. His successor has not yet been appointed.

The Abbott Ball Co., Hartford, Conn., announces that it is now prepared to furnish all sizes of bearing balls from $\frac{3}{8}$ in. to $\frac{1}{2}$ in. in diameter, and will later be in a position to furnish all other sizes.

Floyd F. Woods has been appointed sales manager for the Epping-Carpenter Pump Co., of Pittsburgh, Penn. Mr. Woods takes the place of R. Bowen, who is no longer connected with the company.

Probably the greatest record of hoisting-engine production made by any one concern is that of the Lidgerwood Manufacturing Co., New York, which have built more than 37,000 steam and electric hoists during the 40 odd years that it has been in business.

TRADE CATALOGS

Link-Belt Co., Chicago, Ill., Book No. 124. Steel Chains and Sprocket Wheels. 40 pp., illus., 6x9 inches.

T. H. Proske, Denver, Colo., Catalog. The Imperial Drill Sharpening Machine. 16 pp., illus., 7x5 inches.

Smooth-On Manufacturing Co., Jersey City, N. J. Catalog. Smooth-On for Foundry Men. 8 pp., 3x6 inches.

Western Electric Co., New York, N. Y. Boletin S 1. Cuadros Conmutadores Pequeños de Magneto. 16 pp., illus., 10 $\frac{1}{2}$ x8 inches.

Quigley Furnace & Foundry Co., New York, N. Y., Bull., No. 6. Overfired Accurate Temperature Heat Treating Furnaces. 4 pp., illus., 11x8 $\frac{1}{2}$ inches.

Johnson & Johnson, New Brunswick, N. J. Catalog, No. 110. "First Aid" Cabinets for Mines, Railroad Shops, Factories, etc. 16 pp., illus., 6x8 $\frac{1}{2}$ inches.

Goldschmidt Thermit Co., 90 West St., New York, N. Y. Catalog, Thermit Insert Fully Welded Rail Joint. 8 pp. Illus. 9x4 $\frac{1}{2}$ in. Catalog. The Thermit Process of Pipe Welding. 24 pp. Illus. 9x6 inches.

Ingersoll-Rand Co., 11 Broadway, New York, N. Y. Form No. 3024. Ingersoll-Rogler Valves for Air Compressing Cylinders. 28 pp., illus., 6x9 in. Form No. 3030. Class ER-1 Ingersoll-Rogler Air Compressors. 20 pp., illus., 6x10 inches.

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.

AMALGAMATOR. Gustav R. Bauer, Oceanpark, Calif. (U. S. No. 1,114,573; Oct. 20, 1914.)

BLASTING—Miner's Blasting-Box. Joseph Beeneck, Nanticoke, Penn. (U. S. No. 1,114,096; Oct. 20, 1914.)

BRIQUETTES—Improvements in the Manufacture of Briquettes from Iron Ore and Flue Dust. M. Frieberger, Berlin, Germany. (Brit. No. 15,919 of 1913.)

CHROMIUM ALLOYS—Improved Manufacture of Chromium and High Percentage Alloys Thereof. C. A. Keller, Paris, France. (Brit. No. 23,566 of 1913.)

CLASSIFICATION—Process and Apparatus for Sizing or Classifying Comminuted Materials. Henry M. Sutton, Walter L. Steele, and Edwin G. Steele, Dallas, Tex. (U. S. No. 1,114,935; Oct. 27, 1914.)

CONCENTRATION—Support for Concentrating Apparatus. William F. Deister, Fort Wayne, Ind., assignor to Deister Machine Co., Fort Wayne, Ind. (U. S. No. 13,816; Oct. 27, 1914.)

CONCENTRATOR—Coal Washer and Ore Concentrator. Alonzo C. Campbell, Asheville, N. C. (U. S. No. 1,113,876; Oct. 13, 1914.)

CONCENTRATOR. Harvey W. Bailey, Portland, Ore., assignor to Harvey Bailey, Portland, Ore. (U. S. No. 1,111,687; Sept. 22, 1914.)

CONCENTRATOR. William A. Butchart, Denver, Colo. (U. S. No. 1,111,992; Sept. 29, 1914.)

CONCENTRATOR—Sluice and Ore Concentrator. Clarence Slocum Richardson, Los Angeles, Calif. (U. S. No. 1,110,824; Sept. 15, 1914.)

COPPER EXTRACTION—Chemical Concentration of Metals. Charles S. Bradley, New York, N. Y. (U. S. No. 1,114,726; Oct. 27, 1914.)

CRUSHING—Apparatus for Grinding Ores and Other Materials. Harry W. Hardinge, New York, N. Y., assignor to Hardinge Conical Mill Co., New York, N. Y. (U. S. No. 1,115,531; Nov. 3, 1914.)

CYANIDING—Filter Leaf. Newton A. Burgess, New York, N. Y., assignor to Butters Patent Vacuum Filter Co. (U. S. No. 1,114,224; Oct. 20, 1914.)

DRILL—Rock Drill. Daniel S. Waugh, Denver, Colo., assignor to the Denver Rock Drill Manufacturing Co., Denver, Colo. (U. S. No. 1,114,949; Oct. 27, 1914.)

DRILL BIT. Arthur L. Edwards, Lewiston, Mont. (U. S. No. 1,113,968; Oct. 20, 1914.)

DRILLING MACHINE. Mather W. Sherwood, Franklin, Penn., assignor to Chicago Pneumatic Tool Co., Chicago, Ill. (U. S. No. 1,116,138; and 1,116,139; Nov. 3, 1914.)

DRILLS—Apparatus for Lubricating Pneumatic Drills. Vincent J. O'Brien and George A. Oliver, Denver, Colo., assignors to The Standard Rock Drill Co., Denver, Colo. (U. S. No. 1,114,641; Oct. 20, 1914.)

ELECTRIC FURNACE for Melting and Refining Metals. James H. Gray, New York, N. Y. (U. S. No. 1,113,778; Oct. 13, 1914.)

ELECTROLYTE for Use in Electro-Metallurgy. Nicholas Henri Marie Dekker, Paris, France. (U. S. No. 1,113,456; Oct. 13, 1914.)

FURNACE-PORT COOLING SYSTEM. Frank E. Parks, Pueblo, Colo. (U. S. No. 1,113,245; Oct. 13, 1914.)

LAMP—Acetylene-Gas Lamp. Frederic E. Baldwin, New York, N. Y. (U. S. No. 1,115,157; Oct. 27, 1914.)

LAMP—Miner's Acetylene-Gas Lamp. Walter Harrison, Dewmaine, Ill. (U. S. No. 1,113,621; Oct. 13, 1914.)

LAMP—Miner's Acetylene Lamp. Joseph A. Wester, West Frankfort, Ill. (U. S. No. 1,114,208; Oct. 30, 1914.)

LEACHING - SOLUTION - HEATING SYSTEM. Frederick Laist, Anaconda, Mont. (U. S. No. 1,115,689; Nov. 3, 1914.)

MANGANESE—Method of Heating Ores in Two Chambers or Retorts Arranged Behind Each Other. Ernst Menne, Creuzthal, Germany. (U. S. No. 1,114,502; Oct. 20, 1914.)

MANGANESE STEEL—Manufacture of Manganese Steel. William Campbell, New York, N. Y., John H. Hall, High Bridge, N. J., and Henry M. Howe, Bedford Station, N. Y., assignors to Taylor-Wharton Iron & Steel Co. (U. S. No. 1,113,539; Oct. 13, 1914.)

MINE-CAR - DOOR FASTENER. Emanuel H. Owens, Moosic, Penn. (U. S. No. 1,114,510; Oct. 20, 1914.)

MUFFLE FURNACE. Edward Curran, Cardiff, Wales. (U. S. No. 1,114,587; Oct. 20, 1914.)

PRECIPITATION—Improvements in the Precipitation of Metals from Solutions of Their Salts and Apparatus Therefor. G. Jacquier, Johannesburg, Transvaal. (Brit. No. 17,790 of 1913.)

PUMPING—Method and Apparatus for Pumping Liquids. Henry M. Chance and Thomas M. Chance, Philadelphia, Penn. (U. S. Nos. 1,114,108 and 1,114,109; Oct. 20, 1914.)

REFRACTORY LINING MATERIAL. James R. Campbell, Scottdale, Penn. (U. S. No. 1,114,446; Oct. 20, 1914.)

REFRACTORY ORES—Treatment of Refractory Ores. John Foye, Henry Egert Moore and Robert Boyle, Johannesburg, Transvaal, assignors to Refractory Ores, Ltd., Johannesburg, Transvaal. (U. S. No. 1,113,323; Oct. 13, 1914.)

ROASTING—Process of Roasting Ores. Frederick Laist, Anaconda, Mont. (U. S. No. 1,114,372; Oct. 20, 1914.)

SCREEN or Separator. Thomas Leggett Sturtevant, Quincy, and Thomas Joseph Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Co. (U. S. No. 1,114,064; Oct. 20, 1914.)

Editorial Correspondence

SAN FRANCISCO—Nov. 11

Dredging put Sacramento County in third place among the gold-producing counties of California in 1913. Its total production was \$2,503,633. There is little quartz mining and only a small production from ordinary placer digging. In 1913 there were 12 dredges operating in the county, compared with 11 in 1912 and 10 in 1911. Ten of the dredges operating in 1913 were owned by Natomas Consolidated, one by the Ashburton company and one by the Union Dredging Co. The Ashburton closed down at the end of the year, having worked out the field. The Union did not operate full time, nor did the 10 Natomas boats, owing to necessary repairs. Sacramento County had not been classed as a gold producer after the pioneer days until dredging operations were instituted.

Mine-Rescue and first-aid training in connection with the model mine at the exposition has been definitely arranged by the U. S. Bureau of Mines. The features of practical instruction and demonstration will be in charge of George Steidle and A. A. Krogdahl. Mr. Steidle will have charge of the several exhibits, which will be similar to those in mine-rescue car No. 5, of which he has for some time been in charge; Mr. Krogdahl will give instruction in first-aid training, and will serve also as mine foreman of the model mine. This mine and the exhibits accompanying it will be constructed jointly by the Bureau of Mines, mine operators and mining-machinery men. The work and the exhibition will be under the general supervision of Dr. Frederick Cottrell, Dr. Irving C. Allen and H. M. Wolfkin.

State Inspection of mines in California is provided for in a bill which State Senator E. S. Birdsall may present in the next legislature. Senator Birdsall proposes the creation of a bureau of mine inspection to consist of a chief inspector, at a salary of \$6000, and four deputy inspectors at \$2500 or \$3000 per year each. The inspection of metal mines in California, as in all metal-mining states, is so serious a business that when undertaken by the Industrial Accident Commission it was deemed wise to practice the closest economy until a system conformable to effective laws and suggestive of new legislation, could be worked out, and to take the whole scheme of mine inspection entirely out of politics. The commission had a problem on its hands, which it undertook to solve by cooperating with the U. S. Bureau of Mines. It obtained as inspector, H. M. Wolfkin, mining engineer and a California citizen, suggested by the Bureau of Mines. The Bureau pays one-half of his salary and expenses, and the state pays one-half. The inspection conducted by the commission has been along advisory lines rather than mandatory. There is no inspection law in California. There are a few disconnected and inadequate laws on the books, which have to do with the safety of miners. Some of the later of these have rendered obsolete some of the older ones, but mine operators and owners have not taken the trouble to see that obsolete laws were repealed. The mine inspector who would undertake to enforce these dead laws would find his task difficult. The most that could be done in the way of mine inspection in California, under the present laws, was just what has been done, the investigation of conditions and the suggestion of improvement. No California inspector with four or any other number of deputies, in the absence of a definite, adequate and satisfactory inspection law, could accomplish anything more. The present inspector has visited nearly all of the large producing mines in the state, and many of the smaller ones. A record of the situation and conditions of mine operation in 90% of the mining districts of the state is in the hands of the California Industrial Accident Commission and the U. S. Bureau of Mines. Senator Birdsall's bill evidently contemplates taking the duties of mine inspection out of the hands of the Industrial Commission. If that be desirable, it would be best achieved by allowing the matter to rest as it is, until such time as the California Metal Producers Association can take it under consideration. [The "Journal" strongly advocates the employment of sufficient high-salaried inspectors to obtain adequate inspection. But such inspectors would be useless without an adequate inspection law, which California does not possess. Let the law come first.—Editor.]

DENVER—Nov. 12

The Prohibition against Mill-site locations on the part of the General Land Office is objected to by the Denver Chamber of Commerce. The directors of the chamber ordered a protest made to the Department of the Interior against the ruling which applies to land withdrawn by the Government as power-site reserves. Ernest Morris brought the matter to the attention of the board and considerable time was spent investigating it thoroughly before taking action. The views of the directors have been communicated to Secretary Lane and the Colorado congressmen, as well as to the other officials of the department. In addition, letters have been addressed to the governors of Western states, asking their cooperation in the matter. The directors contend:

(1) The Federal Government has caused withdrawals for power-site reserves to be made upon a very extensive scale throughout the mining regions of the West. (2) Mill sites are a recognized practical necessity to the successful and profitable operation of metalliferous mining lodes, and especially where the ore is low grade it is an economic necessity to treat or reduce the same at or near the place of production, which can only be properly done upon mill-site locations. (3) The decision of the commissioner of the General Land Office is against both the letter and spirit of the mining laws of the United States, and will tend to seriously obstruct and embarrass the metalliferous mining industry of the United States and prevent the proper development of the metalliferous mining resources of this country.

BUTTE—Nov. 12

The Compensation Law was defeated, it is now known, by upwards of 4000 majority.

Martial Law is at an end in Silver Bow County. By order of Governor Stewart, dated Nov. 7, the proclamation issued Sept. 1, declaring the county under martial law, was revoked. The order went into effect Nov. 12, and the military forces of the state, numbering 700 in the beginning and 160 in the end, were withdrawn from Butte. Not a shot was fired by the troops during their 10 weeks of stay and no serious encounter took place between the troops and civilians, a remarkable fact when compared with events in other districts where the militia has been called in to maintain order.

Now that the military regime is a thing of the past, one naturally asks: What good did it do, and what will be its effect on future events? The business cost the state not less than \$125,000. What did the state get in return for this outlay? Well, it may be said that primarily it was not planned to accomplish a definite task, nor to solve a definite problem, but rather to prevent consummation of the threats of violence made daily by agitators, threats that, if carried into effect, would in the end have cost the state and Butte much more than the military occupation did, to say nothing of the loss of life and bloodshed invariably following in the wake of mob rule. That martial law was justified and necessary under the existing conditions, is admitted by most fair-minded citizens. It is more than likely that but for the presence of a large armed force, the bands of I. W. W. headed for Butte, would have found it easy and profitable to congregate there and join their forces with the mob leaders and their adherents for the perpetration of violence. The prompt arrest of the mob leaders, the elimination of the street-corner orators who were loudly preaching violence, the closing of the saloons and the strict enforcement of city ordinances, without any doubt prevented the execution of destructive measures planned by the leaders.

The military regime demonstrated to the lawless elements that the patience of the law-abiding citizen is not unlimited and that any sustained efforts on the part of the advocates of direct action to obtain their objects will not be tolerated in a peaceful community. It has also resulted in a warning to county and city authorities that incompetence and neglect of duty on their part will result in their prompt removal.

The differences between the rival unions can probably never be adjusted. This practically means the end of unionism among the miners of Butte, a fact that is welcomed by a large percentage of honest and industrious workers who are satisfied with existing conditions and realize that in normal times there is no other center of industry where the laborer is

treated better and receives higher wages than he does in Butte. These men are only too willing to work wherever they can.

The mining companies have made extensive preparations to assure protection to their properties. They have built high board-fences all around their mines and provided them with electrical devices by which trespassing of unauthorized persons will be announced to those in charge of the respective properties. Walking delegates and other unwelcome meddlers will in the future be kept out.

SALT LAKE CITY—Nov. 12

Copper Shipments to neutral ports are a matter of concern to the Salt Lake commercial club which has sent a telegram and resolutions to Secretary Bryan urging that the United States take the necessary steps to have such shipments permitted. The resolution is signed by 17 prominent smelting, mining, and railroad officials. It points out that if Utah is unable to ship copper the industries concerned with its production will not be able to continue operations, that thousands of persons will be thrown out of employment, and that a population of 412,000 will be affected. There are about 16,560 persons directly engaged in the mining, milling, and smelting of lead and copper ores, and there are not less than 50,000 people directly dependent upon those so engaged. In addition to this there are not less than 20,000 persons indirectly dependent on the industry for their livelihoods. In 1913 \$17,000,000 in wages was paid out to those engaged in the mining, milling, and smelting industry of Utah; \$4,400,000 was paid in railroad freights; material and supplies valued at \$10,000,000 were purchased; and more than \$600,000 was paid out in taxes. Sixty per cent. of all this was expended by those engaged in mining, milling and smelting copper ores. If the inability to ship copper to foreign countries continues, the copper producing industries will be entirely stopped in Utah, throwing many more thousands out of employment and causing widespread disaster to the state.

SILVER CITY—Nov. 12

A Correction is necessary in the account of the Burro Mountain experimental flotation plant, published recently. It now appears that the Towne separator makes a product only of about the same grade as that made by the Minerals Separation unit, earlier installed.

SEATTLE—Nov. 11

Production figures for the placer districts can now be approximated. Nome reports a production of about \$3,000,000. Fairbanks production, it is estimated, will be about \$500,000 less than for 1913, due to both decreased placer and decreased lode production. The receipts at the First National Bank up to Aug. 1 were \$300,000 less than at the same period a year ago, but the late season may have been partly responsible for this. Placer production for 1914 is estimated at \$2,600,000; quartz, \$215,000.

The Ruby district is just now attracting the most attention of any of the newer camps in the Yukon drainage. Hitherto most of the ground worked has been comparatively low grade, but during the past season rich pay was found on several claims, notably on Windy Bench, where one operator alone is said to have won a profit of \$125,000. The known pay area has also been enlarged through important discoveries on new creeks. Operations have been handicapped and the production held down by the lack of suitable roads for transporting heavy machinery. It is probable that the 1914 production will pass the million mark.

The Circle district production will be in the neighborhood of \$250,000 according to conservative estimates. Conditions there, especially on Mammoth, Mastodon and Eagle Creeks, are better than ever before. Almost all of the hydraulic plants were able to work until Sept. 16 although there were a few compelled to close five days earlier. Practically all summer there was plenty of water, and continuous work was possible. The Berry interests during the winter will erect a new dredge the material for which was landed on the beach near Circle early in the season. James Hamil will superintend the work, remaining in all winter.

The Chisana output has now been pretty definitely determined, since sluicing has ceased. The estimates give a total for the season of \$251,000 divided as follows: Bonanza Creek, \$140,000; Little Eldorado, \$77,500; Skookum, \$24,000; Gold Run, \$1500; Big Eldorado, \$6000; Coarse Money, \$1000; all others, \$1000. There were about 14 outfits working on Bonanza Creek, three on Little Eldorado, one on Skookum, three on Gold Run, one on Coarse Money and two on Big Eldorado. Much prospecting on the benches will be done this winter. About 125 persons are remaining in the camp. The Government has provided a winter mail service from McCarthy and all mail from Dawson will be routed via Skagway, Cordova and McCarthy.

From the Willow Creek District, the 1914 yield of gold is conservatively estimated at \$400,000, and this will be increased to \$1,000,000 in 1915 according to the most authoritative reports obtainable. This gold field north and east of Knik, Alaska, officially known as the Knik mining and recording district, was first opened about eight years ago by E. H. and W. E. Barthoff and Bob Hatcher. Sixteen claims on Fishhook Creek were incorporated in the group now held by the Alaska Free Gold Mining Co., which was organized by the Barthoff brothers and others. William Martin has just returned from that district and brought out with him \$130,000 in gold bullion, most of the season's cleanup. He sent out \$30,000 earlier in the season. Mr. Martin now holds the lease to the Alaska Free Gold property. This, together with the Gold Bullion, the Mable, the Independent and the Rosenthal properties, which have undergone considerable development work this year, are expected to make up the \$1,000,000 yield prophesied for 1915.

The Nelchina district is condemned by most of those who left after the freeze-up. Many prospectors still have faith, however, and much work will be done during the winter. Only one-third of the ground is permanently frozen and prospecting is difficult, since in the absence of machinery a shaft must be abandoned as soon as thawed ground and the inevitable water are struck.

The Broad Pass region and nearby territory will eventually develop into an important district in the opinion of the most conservative Alaskans. There is no justification, however, for a stampede. In fact when the recent glowing reports were circulated the lessons of the Chisana stampede were still fresh in the minds of Alaskans and the reports were as heavily discounted as those of any other "sourdough." Consequently there was nothing approaching a stampede, though the number of prospectors going into the district increased considerably. The general opinion among mining men in the Territory is that the Susitna Valley, including the Broad Pass and Knik districts, is one of most promising fields in the North for the quartz prospector. The same type of schist exists there as at Dawson, Fairbanks, Ruby, and other placer camps of the North. Intrusive rocks of much the same kind as those found in the older camps are also found there. Furthermore, the slate that carries many of the gold veins of Prince William Sound and other southern Alaska districts, occurs at Broad Pass. Geologically, therefore, the area is one of great promise. Huge gold-bearing lodes have been known for years in the nearby Bonifield country. It is inferred from evidence afforded by prospecting done on Kantishna and from geological considerations that the ores will be complex and base, with antimony predominating among metallic minerals. Assayers who have seen specimens from the district report, however, that the ores are probably amenable to cyanidation. Quigley, on Kantishna, as noted in the news columns of the "Journal" last spring, has done considerable prospecting on a vein of antimonial silver-lead ore assaying \$7 in gold and about 100 oz. of silver to the ton. The antimony content is thought to be too low to interfere seriously with the precious metal extraction.

TONOPAH—Nov. 11

Recent Fires in Tonopah and Goldfield were of incendiary origin and the responsibility for them has been traced to members of the I. W. W., it is stated. Five members of this organization were arrested at Thorne in Mineral County, while trying to escape on a freight train, were placed in jail at Hawthorne and were later removed to Goldfield for safe keeping. One of them, after their conversation had been recorded by means of a dictograph, confessed to starting the fires and implicated two of his companions. Both fires, that of the Nevada Theater, in Tonopah, Oct. 29, and that of the hoist house of the Yellow Tiger Co. in Goldfield, Nov. 4, he stated, were started by means of yellow phosphorus.

LEAD—Nov. 13

Production of bullion in South Dakota, according to the report of the state mine inspector for the year ended Nov. 1, 1914, amounted to \$7,325,510. This represents the recovery from 1,987,088 tons of ore treated. Individual productions were as follows:

	Tons	Value
Homestake	1,587,000	\$6,046,000.00
Golden Reward	51,355	369,182.38
Trojan	79,626	357,229.80
Wasp No. 2	148,680	229,390.00
Mogul	21,770	141,298.28
Bismarck	65,630	83,919.06
Reliance	23,659	69,532.52
Deadwood-Standard	4,000	7,238.51
Placer		1,800.00
Miscellaneous	5,368	19,920.00

Under miscellaneous are included the productions of the Otho, Monarch, Limelight, First National, Deadwood-Heidel-

berg and Ironsides. Other minerals produced included mica, gypsum, tungsten ore, lithia ore, lead and beryl. The production for the year shows a decrease in value from 1913 but an increase in tonnage. A total of 3040 men were employed; four fatal and ten serious accidents occurred during the year.

CHICAGO—Nov. 14

Cuyuna Manganese ores continue a matter of interest and their availability for the direct manufacture of alloys is warmly debated. In a recent issue of the "Journal" mention was made of the furnace of the American Manganese Co. at Dunbar, Penn. This company, it will be remembered, in the spring of 1914, absorbed the Cuyuna-Duluth and the Cuyuna-Mille-Lacs mines at Ironton, Minn., and now these mines are shipping to the Dunbar furnace. These two mines contain some high manganese ore, but the manganese is pockety and shipments of a given analysis cannot be guaranteed. If the phosphorus and silica could be brought down to the proper percentage, the ore might be used as a manganiferous ore, or even a manganese ore. At present, however, the manganese is worth merely its equivalent in iron units. The question of a manganese supply in this country is becoming important, and especially so to the manufacturers of dry batteries. Some of the latter are directing experimental work on American ores; they formerly secured their manganese from the Caucasus, but this supply is, of course, shut off. It is understood that the situation for some is serious, since there is but a small supply of the imported ore on hand. It is hoped that before long the famous old Crimora mine in Virginia will again be marketing a large tonnage.

ISHPEMING—Nov. 14

The Iron-Mining Outlook for 1915 is as uncertain as the outcome of the war, on which it will largely depend. Mining men are wasting no time in making predictions, for they frankly acknowledge there is nothing to guide them. But they are not without hope that the gradual stabilizing of finance, as well as of business, will define the limits in which they can operate and will, on the whole, make 1915 a better year than that now drawing to a close. They note the gradual improvement of tone in Eastern financial centers, and they believe it carries fair promise for the future.

DULUTH—Nov. 14

Dry Towns will be the rule over most of the Minnesota iron country henceforth as the result of a supreme court decision, whereby much of the northern part of the state is declared to be Indian country, and subject to the provisions of a certain Indian treaty of 1855. All saloons in upward of 60 towns in an area embracing practically all of the Cuyuna range and a large part of the Mesabi, including on the latter, Hibbing, Chisholm, Coleraine, Grand Rapids and Nashwauk, will be closed Nov. 30, unless additional threatened litigation ensues. Mine operators generally express the belief that the change will result in raising the standard of employees and reducing the percentage of floaters.

Cuyuna Range operations are progressing steadily despite the poor market for ore. The E. J. Longyear Co. continues drilling, on the Crow Wing County poor farm. Hole No. 7 showed 50 ft. of ore, and a number of previous holes have shown ore, but the great depth of surface, about 250 ft., will militate against mining operations. Drilling continues because the company agreed to drill nine holes in consideration of the option given. At the Wilcox mine of the Canadian-Cuyuna Ore Co., the electrical pumping equipment is being put into service, although little water is encountered. The Brainerd-Cuyuna shaft has reached 62 ft and is going down slowly; 400 gal. of water per min. is being raised by three small pumps. The Croft concrete drop-shaft in Crosby is down 65 ft., with about 40 ft. still to go to the ledge. Operations here are being rushed. Shipping to the docks still continues from the Armour No. 2, Thompson, Cuyuna-Mille Lacs and Cuyuna-Duluth, the former two shipping daily production and the latter two shipping stockpiles. With normal trade conditions, the 1915 season should see at least a dozen shipping mines on the Cuyuna range, as against seven this season. The Soo Line has completed grading from Crosby to Ironton, and rails are now being laid. This gives both Crosby and Ironton service from the Soo and the N. P. Practically no other railroad construction is going on, although the Soo is at work securing right-of-way for a connecting line from its branch at Manganese to a point on the Rowe mine spur near River-ton.

HOUGHTON—Nov. 14

The Close of Navigation on Lake Superior will see the smelter warehouses and docks of the Copper Country fairly well cleared of copper. The largest cargo of copper ever taken from the district left recently on the "North Star" of

the Mutual Transit line. It came to 9,000,000 lb. with a value even at 11c. of close to a million dollars. It was consigned to Buffalo and included metal from all of the docks of the district, 3200 tons from the Calumet & Hecla docks at Hubbell, 500 tons from Dollar Bay, a smaller quantity from the Quincy dock and some from the Copper Range. While it is known that all of the metal being shipped by water has not yet been sold, it is cheaper to store it at Buffalo for reshipment than to keep it here during the winter and have to pay railway freight rates later in case of a domestic or foreign sale.

Construction Work in the Copper Country is being resumed. On Nov. 10, a crew of erectors from the American Bridge Co. arrived at Hubbell, Mich., to put up the steelwork on the new regrinding plant at the Tamarack mill. The same day three cars of steel arrived and work on the skeleton of the plant will start immediately. It is expected that this part of the work will require from two to four weeks. The foundation for the plant was built some time ago. This resumption should revive the spirits of those who see no cause for hope in the present copper situation. This mill is a plant for re-treating the sands previously discarded as waste. It is significant that the Calumet & Hecla should push the work on this plant now and it indicates a policy that might be followed with advantage by many producers that have been contemplating improvements or changes in equipment. A large manufacturer of mining and milling machinery recently remarked that never before in his long experience in the business was it possible to obtain machinery at such ridiculously low prices as at present. This is undoubtedly true. Many manufacturers are quoting prices actually below the cost of production, and it is not exaggerating to say that it would probably be possible now to equip an entire mill at 65% of the ordinary cost.

Animosities Toward the Congressional Subcommittee which investigated the late strike is being shown by miners, foremen and superintendents, as well as by the business interests of the Michigan Copper Country. Congress has adjourned and this committee has not even made a report of its findings. At the time Congress ordered the investigation the strike was about over and three-quarters of the men were back at work. Generally normal conditions were resuming. The strikers were convinced that they had been duped by the Federation agitators. The order for the Congressional investigation was accompanied by statements of the labor leaders that the President himself had ordered it and that if the companies did not turn the situation over to the Federation the Government would take the mines away from their owners and give them to the strikers. The committee spent a month here. It heard testimony most of the time and it furnished pages of newspaper copy. The actual cost to the people of the United States for this one isolated investigation was between \$30,000 and \$40,000. After taking more testimony in Chicago and Washington, the thing was dropped without even a report. The testimony was all published. But that was all. The miners here are not so angry at the lack of report as they are at the misrepresentation which kept them out of jobs. Hundreds of men were about ready to go back to work. They now are walking the streets without jobs. And their chances of getting them are slim indeed.

TORONTO—Nov. 14

Asbestos Manufacturing is to be carried on in New South Wales. The Canadian Department of Trade and Commerce has been advised of the formation of a company at Sydney which is erecting works for that purpose. Inquiries have been made with a view to obtaining supplies of the crude material from Canada, and it is contemplated to send a representative of the firm to Canada to study the situation.

Patents owned by Germans and Austrians have been the subject of considerable misapprehension, particularly as regards the action of the Canadian Government. It was supposed that they would be canceled, and many applications have been made to the patent office to secure the right to use the processes or inventions covered by the patents. It is now announced that the government will not declare the patents void, but that in cases where an applicant can show that he is in a position to manufacture advantageously, and that this will be in the public interest, the government will grant him a license, on the condition that he pay a royalty on the output. This amount will be held in the meantime by the government, and its final disposal will depend on the treatment accorded by the German and Austrian patent office to British patentees. If the rights of the latter are respected, the royalties will be turned over to the foreign patent owners at the end of the war. Where the exclusive right to use a patent is granted it is the intention of the patent commissioner to maintain control of the price of the product.

The Mining News

ALASKA

NEWSBOY (Fairbanks)—Contract given for driving 100 ft. into footwall on 215-ft. level. Hoped to cut new vein, indications of which have been found at surface.

MIDAS (Valdez)—Owing to tying up of British and Canadian capital and demoralization of copper market, this mine, controlled by Granby, closed down. Nearly 100 men were employed.

WILLIAM MARTIN, owning property at Knik, reports production of \$150,000 for season. Treating 75 tons per day; will continue work through winter and expects to put in cyanide plant to increase output.

ELLAMAR MINING CO. (Ellamar)—Company recently ordered steel chutes and gates, to permit more rapid loading of buckets on aerial tramway. With these installed, expected full capacity of 200 tons per hr. can be maintained.

WILD ROSE (Fairbanks)—Leslie M. Drury, formerly superintendent of Newsboy mine, given lease on Wild Rose claim, on upper Dome Creek. Planned to work from old Spalding shaft on adjoining Soo claim, using hoisting and pumping machinery already in place.

GOPHER (Ketchikan)—Chalcophyrite and pyrite discovery recently made on this property, formerly called the Hydah. Discovery made by Polson and Ickis doing assessment work for owners, Miners & Merchants Bank. Stated shoot of magnetite chalcophyrite ore also discovered.

BIG FOUR (Valdez)—This mine, owned by William Ritz and associates, under lease to some Valdez men. Small mill installed during summer and test runs made on outcrop ore. In spite of inefficiency of mill, results reported entirely satisfactory. Some tunnel work done and contract recently let to Charles Spalding and Sam Calvin for driving 100 ft. If showing holds up, when this is completed another contract will be given.

ARIZONA

Pima County

OLD YUMA (Tucson)—W. J. Laffey and others have taken bond and lease on this mine, 14 miles west of Tucson, and will work property for molybdenum. Mine recognized for years as one of largest deposits of wulfenite and vanadinite in Arizona, but never before worked for these minerals. New company expects to install concentrating plant at once. Purchase price said to be \$50,000.

Pinal County

VEKOL (Casa Grande)—Ninety-ton concentrator now completed and starts operation at once; will run two shifts for present on low-grade dumps.

BILLIKIN (Casa Grande)—E. E. Schmidt, of New York, arrived in Tucson, Nov. 12, en route to mine to begin operation. Property situated 50 miles southwest of Casa Grande in Salt Well district. Has gold ore with some copper content. Intention of Mr. Schmidt to develop mine with small crew and ship some high-grade gold ore.

MAMMOTH (Mammoth)—Old mill tailings of this mine now being reworked for third time. Robert O. Boykin & Co. has taken lease on dumps and is concentrating wulfenite left from previous amalgamation and cyanidation. Plant equipped with Overstrom and Card tables, handling about 50 tons in two shifts, making about 1500 lb. of concentrates per day, averaging about 24% MoO₃. Fifteen tons of concentrates shipped to Pennsylvania this month.

CALIFORNIA

Amador County

FREMONT (Drytown)—Regular monthly dividend 2c. per share suspended for October. Mine doing well, but improvements and extra expense entailed by compensation law and provision for impounding of tailings necessitate suspension of dividends temporarily.

KENNEDY EXTENSION-ARGONAUT SUIT—Motion for new trial submitted to Judge Wood, in Superior Court, Nov. 5, taken under advisement. Plaintiff claims to have new testimony to offer showing Argonaut vein does not extend at certain points which were not open at time of trial, on account of foul air.

Butte County

PAY GRAVEL reported at Chico in well sunk on State Normal campus; depth 85 ft. Reported to pan 30c; some lower grade found at 20 ft. Pay gravel in the neighborhood of Chico long known; three dredges now operating on Butte Creek about 10 miles east of Chico.

LAVINIA CRABBE VS. MAMMOTH CHANNEL—Supreme Court sustained Superior Court, which found verdict in favor of plaintiff and assessed damages at \$20,000. Plaintiff's husband killed by falling rock in tunnel at Magalia. Was earning \$3.50 per day.

Calaveras County

ROYAL CONSOLIDATED (Hodson)—Four-ft. vein high-grade quartz reported at depth of 200 ft. in shaft. Unwatering of lower levels progressing. Stamp mill being overhauled, should be in operation by end of year.

Eldorado County

MAMELUKE HILL (Georgetown)—Property leased to Joe Helmas, will be immediately developed and put in operation.

Imperial County

GYPSUM DEPOSITS in Coyote Hills being developed by George L. Campbell, of Seeley. Shipping contemplated by first of year. Machinery shipped in by way of El Centro.

Mariposa County

VIRGINIA (Coulterville)—William Angus, resident of Hayward and principal owner of property, killed by powder gas on 500-ft. level, Oct. 30. Joseph Garino, mine foreman, in the level with Angus, survived for time, but reported he will die.

San Bernardino County

PHOENIX (Johannesburg)—C. G. Illingworth and Barney Osdick have installed 25-ton cyanide plant. Believed that large saving will be made over former method of leaching tailings. Mine owned by Burcham estate; operated under lease.

Shasta County

DREDGING GROUND in vicinity of Igo and along Clear Creek being examined by engineers said to represent John Hays Hammond interests. Ground recently prospected by Oroville men and option said to have been surrendered because of recent financial stress.

MANGANESE DEPOSITS on Peterson claim near Heroult being developed; reported Noble Electric Steel Co. is constructing road to deposits and expects to ship ore to its plant within 60 days.

SHASTA EXPLORATION CO. (Redding)—Surveying and other preliminary work being carried on in region of Balakala, under direction of M. E. Dittmar. Holdings of company extend along copper region west of Sacramento River, in neighborhood of Coram and Kennett.

Siskiyou County

LUCKY STRIKE (Scott Bar)—Good vein disclosed in lower levels, which it is believed will warrant installation of milling plant.

HYDRAULIC MINERS at Scott Bar preparing for winter, recent heavy rains having replenished rivers and creeks and given promise of plenty of water. Mine property putting flumes in shape. Large body of good gravel was got ready during the summer. Pay gravel in Crawford & Nesbit drift mine encountered and large body of new ground opened up.

Trinity County

ENTERPRISE (Helena)—Extensive repairs being made to water-power plant. Ten-stamp mill overhauled; large amount of development disclosed good ore. Mine operated for 23 years past; reported to have produced well in last three years. R. A. Skinner manager.

BONANZA KING (Trinity Center)—Orebody encountered about 200 ft. below winze sunk from No. 3 level, stated similar to ore mined in upper levels. Reported 10-stamp mill will be moved nearer to mine in order to receive ore direct from No. 3 tunnel, doing away with use of long aerial tramway operated at heavy cost.

Tuolumne County

HEARST AND JACOB properties on Cow Creek recently examined by R. E. Parker and Clarence Woods, of Louisiana mine, and George J. Benny, of Soulsbyville, with view to beginning development.

SANTA YSABEL (Sonora)—J. A. Prentice, formerly interested in If-I-Can gravel mine, negotiating for option on this property with view to reopening it.

HOPE (Sonora)—Property recently operated by company with head office in Salt Lake. Five-stamp mill installed, but trouble ensued between owners and mine shut down, leaving several men unpaid for two months' labor. Recently men were paid in full, and reported mine will be reopened.

COLORADO

Clear Creek County

JO REYNOLDS (Idaho Springs)—Discovery of 18-in. streak of pitchblende reported, valued at "many million dollars"—by newspapers and possibly by owners.

San Juan County

SILVER LAKE VIEW (Silverton)—This property in Arastra Basin secured by local operators under long-term lease. Crosscut tunnel now about 130 ft. long will be advanced 400 ft. Supplies laid in for winter and lessees have begun development work.

San Miguel County

NATIONAL RADIUM INSTITUTE (Norwood)—About 20 men employed at mines in Ford district. Buildings for new concentrating plant nearing completion. Plant will be ready for operation in about six weeks. During past three months about 200 tons of shipping ore mined. Mr. Thompson superintendent.

STANDARD CHEMICAL COMPANY (Naturita)—Buildings for new concentrating mill on San Miguel River partially completed and some machinery installed. Power canal finished and some tests made. On account of lack of demand for radium ores company will temporarily postpone active operations.

IDAHO

HUNTER MINING CO. (Mullan)—New Callow flotation system and increase of milling-plant capacity to about 150 tons per day authorized by President Thomas F. Keeley during recent visit at property. Flotation unit now being installed under direction of Otto Trojownowsky. Capacity increase taken care of in present building, which has extra floor space. New 100-hp. motor ordered.

MICHIGAN**Copper**

SOUTH LAKE (Greenland)—Work in sandstone for last 60 ft., wider stratum than usual at that depth. Crosscut now in 1000 ft., 200 ft. more to cut lodes.

WHITE PINE (Ontonagon)—Construction of dam for mill water supply under way, will be finished in month. All-year-round stream supplies more than enough water. Mill interior work progressed to point ready for installing steam-heating plant.

OSCEOLA (Osceola)—Refined-copper production from three branches of company about 1,100,000 lb. per month. Producing from five shafts, one at old Osceola, two at South Kearsarge, two at North Kearsarge. Total daily rock production about 4200 tons.

VICTORIA (Victoria)—Crosscut on 26th level, lowest point in mine, not yet to main vein but in hanging-wall formation looking like branch of vein and carrying commercial copper; while not so rich as streak above on 25th level, indicates presence of good orebody.

NEW ARCADIAN (Houghton)—Company one of few exploratory undertakings continuing development work. Opening up fair-looking lode rock at three different places, on line and short distance from shaft. Lode has shown up as well as drilling indicated, at three different points, the 300-, 400-, and 600-ft. depths, all attacked with upraises. Still in good ground.

FRANKLIN (Demmon)—Operations confined to two crosscuts and one raise, expenses kept down to such point that work can continue at present rate for next eight months without exhausting treasury balance. Work of limited scope, but of utmost importance to future of Franklin company as it shows mineralized formation equal to anything Franklin has heretofore mined. Crosscut went through formation at 32d level and continued in fair commercial ground.

ALLOUEZ (Allouez)—Producing more than 750,000 lb. mineral per month, cost lower than ever in history of property. Rock tonnage better than 1500 dally and grade of rock up to best Allouez ever yielded. Company operating 35 drills and maintaining advance work. Following policy of running laterals to property limits or limits of trammings economy and then stopping back towards shaft. No. 1 shaft bottomed at 10th level and No. 2 at 21st. Neither shaft yet reached one-third of possible depth and mineral reserves above present depth are of such quality and quantity as to insure certain successful future for Allouez.

HANCOCK CONSOLIDATED (Hancock)—No intention of reopening until war ends or there is decided improvement in financial and metal situation in this country. Hancock operating on borrowed capital when copper market broke, shipments of Pewabic lode rock being made to Calumet & Hecla subsidiary stamp mill at Point Mills. Copper was just about returning new dollar for old one but gave promise of real profit upon increase in tonnage or in metal price. Looked as if company had reached turning point in career. At present water kept out of shafts but no other work done. No need for additional development. Enough faces in commercial copper rock to provide large tonnage when needed.

Iron

ROSE (Wakefield)—Hanna company stopped shipping from this openpit. Output about 300,000 tons; could have been doubled had market conditions permitted.

MINNESOTA**Cuyuna Range**

CUYUNA-SULTANA (Ironton)—No. 2 shaft reported through quicksand strata and anchored in hardpan. Surface of property cleared of underbrush; is planned to put shovel on stripping work if winter season does not set in too early. Company is stock company, with offices in Duluth. Annual stockholders' meeting, held Nov. 11, elected following directorate: E. Y. Sarles, Hillsboro, N. D.; W. W. Fegan, Grand Forks, N. D.; T. W. Stevenson, Minneapolis; George H. Lyons, Omaha; E. A. Lamb, Ironton, Minn.; D. S. Clark, Eau Claire, Wis.; E. J. Bunker, George P. Rosenblad, George Waters, William Yale and L. L. Culbertson, Duluth; last named is president.

Mesabi Range

GUTHRIE & CO., near Calumet, has started night crew. Seven locomotives and four steam shovels now at work. Company contemplates erection of 30 additional cottages next spring for employees.

Vermilion Range

SIBLEY (Ely)—Cave-in Nov. 9 caught six miners in main shaft; due to failure of timbering. Shaft nearly filled with debris, and four 6-hr. shifts now working to recover men or bodies. First serious accident occurring in Sibley mine.

MONTANA**Beaverhead County**

OREWAY (Jackson)—Supt. S. J. Scott reports extraction of high-grade copper ore rich in silver, gold and lead. Crew of 20 men being worked. Property includes six claims.

Deer Lodge County

BUTTE-PACIFIC MINING CO. (Warm Springs)—Active operations in progress on this group of claims owned by Dr. J. M. Scanland and others and situated about four miles east of Warm Springs in new district that has strong showing of copper ore in granite formation. Common belief Butte

orebodies extend into this section of mountains, theory which Butte-Pacific intends to test out. Six men engaged in development work.

WASHOE WORKS (Anaconda)—During period of curtailed production general overhauling of old equipment and installing of new being carried on. New floors have been laid in four sections of mill. Over Wilfley tables, steel cone classifiers installed in place of old spitzkasten. Two Wilfleys added to each row, addition of 12 in all. Improvements in processes and equipment will increase daily capacity to 12,500 tons. Automatic sprinkling system being extended to all buildings for fire protection. Steel workers putting up frame for 2000-ton leaching plant building, foundations laid for precipitating building. Experiments in flotation being made by staff experts to ascertain most satisfactory treatment for tailings from round table slime-plant. New coal-dust fired reverberatory furnace being built.

NEVADA**Esmeralda County**

YELLOW TIGER (Goldfield)—Hoist house destroyed by fire, Nov. 4; new compressor and shaft damaged. Fire confined to hoist house; headframe and shaft not injured. Compressor only recently installed and operations resumed short time ago; much development work planned. Fire believed incendiary; blaze started between shifts.

Humboldt County

LIMERICK CANON PLACER MINES, in Rochester district, being operated at profit. Present scarcity of water makes operation difficult, but this condition will be relieved by winter snows. Gold occurs both as nuggets and fine dust. Some nuggets include pieces of rose quartz, but original lode not found.

Nye County

MANHATTAN-DEXTER (Manhattan)—Operations of sublessees on southern portion of Union Nine claim proving a great deal of good mill ore available through old Plamenaz lease workings. Meissner & Cochran developed fine shoot in More vein north of the Plamenaz vein, 325-ft. level; new ore leads into virgin ground. Pumping operations from 400-ft. level of main working shaft on Union Nine furnishes water for Mushett & Wittenberg mill. At present, direct-connected Fairbanks-Morse electric triplex pump installed on 400-ft. level handles about 70 gal. per min., holding water level at that point. For new mill, Mushett & Wittenberg intend to have special pump installed in Union Nine shaft, which will handle flow of water from bottom of shaft, 600 ft. on the incline; pump built to handle 200 gal. This pump will drain mine to bottom level and permit sublessees to pick up downward extensions of new orebodies mentioned.

Storey County

CON. VIRGINIA (Virginia City)—Conditions steadily growing better. Ledge now 7 ft. wide. Ore assays over \$15, chiefly gold.

MEXICAN (Virginia City)—Management seeking to reach scene of fire trouble in 2500 stope, through 2000 level winze. Latest reports state 2100 level reached and progress toward 2200 level encouraging. Levels being cooled and ventilation restored.

LIZARD MINE—This property, 13 miles northeast of Dayton, purchased recently and work resumed. Mine operated several years ago, but abandoned on striking fault which cut off vein. Vein found in recent work and shoot of milling-grade and some high-grade ore opened.

White Pine County

NEVADA CONSOLIDATED (Ely)—Experiments on flotation are being made with promising results, but so far no definite conclusions reached.

NEW MEXICO**Dona Ana County**

RIVERVIEW MINING & DEVELOPMENT CO. (Rincon)—Company recently incorporated for \$10,000. Organized among claim holders of Caballo Mountains. Claims pooled and \$5000 cash contributed. Demcy Lewis statutory agent; Clyde M. Becker vice-president.

Grant County

C. & O. MINING & MILLING CO. (Pinos Altos)—Nine sacks ore weighing 640 lb. taken from Langston vein yielded over \$16,000 net at San Francisco refinery. Mining forces slightly decreased. Believed another high-grade shoot encountered.

OREGON

D. B. MINING CO., capitalized at \$50,000 has filed articles of incorporation; incorporators are Robert J. Upton, R. H. Bailey and George R. Mokol, all of Portland, Oregon.

GOLDEN GATE MINE (Greenhorn Camp)—Heavy boiler and other machinery being moved from Whitney to this mine. New mill will have 10 stamps; construction work progressing satisfactorily.

HIGHLAND GOLD MINES CO.—(Rock Creek District)—Suit brought by Eastern Oregon Light & Power Co., against this company and Highland Development Co. to collect \$4185. Power company claims amount named is balance due upon electrical energy and electrical machinery purchased.

SOUTH DAKOTA

INCA (Mystic)—J. T. Harrington, owner, says has large quantity of free-milling ore blocked out, is erecting five-stamp mill.

ANACONDA (Roubaix)—Machinery being installed; shaft will be sunk on northerly section of orebody. South shaft 500 ft. deep.

LISTON (Keystone)—Ten-stamp mill being erected and should be in operation by end of year. Mine has good surface showing of free-milling ore.

ECHO (Maitland)—Orders placed for air compressor, hoist and pumps, all electrically driven. New shaft will be sunk at point between two large mineralized lodes.

NEW RELIANCE (Trojan)—Plant working full complement of 30 stamps, after considerable difficulty. Delays occasioned first by breakdowns and later fire destroyed hoist house.

CUMBERLAND (Hill City)—Litigation involving this property appears in fair way toward settlement; tentative plans for resumption under consideration. Property equipped with small mill, hoisting plant, etc. On 460-ft. level good shoot of high-grade ore exposed.

MONARCH (Deadwood)—Lessees Sweet & Hanson getting out third car of high-grade ore for shipment to smelting plant. Since shipping second car porphyry dike encountered, about 12 ft. wide, which cut off ore; beyond dike ore again found.

HOMESTAKE (Lead)—Contributions not exceeding \$1 each being received at Homestake office to be used in erecting memorial to late superintendent, T. J. Grier. Fund already amounts to over \$1500. Plans and expenditures will be under supervision of Homestake Veterans association, of which Mr. Grier was member.

McNISH & MILLS (Hill City)—Small mill equipped for handling tin ore in active operation. Treatment involves crushing dry with rolls, mixing with water, agitating, and concentrating on two tables. Saving of tin concentrate made on tables and in carpet-bottomed launders. Only best grade ore handled and operations said to be profitable although no slime treatment attempted.

UTAH

Beaver County

HORN SILVER (Frisco)—Item in "Journal," Nov. 14, p. 896, erroneous. Mine not closed down; merely curtailed output to point sufficient to pay expenses and no more. Prefers not to ship and deplete metal resources at present low prices. Information received from Jacob Neadle, president.

Juab County

GEMINI (Eureka)—Owing to low prices of metals, ore shipments discontinued, and lessees suspending operations. All leases expired. Company will carry on development both for itself and Ridge & Valley, which operates through Gemini shaft.

UTAH MINERALS CONCENTRATING (Eureka)—New mill to treat Chief ores being warmed up, construction and installation of machinery having been completed within two months. Capacity 100 tons, and if desired new units can be added to increase output. Electric power used.

CHIEF CONSOLIDATED (Eureka)—Shipments suspended for time being, and working force reduced. Shaft being repaired and on completion, considerable force will be put on development. Diamond-drill operations will not be interfered with by these repairs. Company has been shipping extensively and making satisfactory profits in spite of low metal price. During October 129 cars shipped.

Salt Lake County

CARDIFF (Salt Lake)—Orebody recently opened followed 113 ft. Teams hauling about 40 tons daily from strike. About 300 tons of ore on dump.

OHIO COPPER (Bingham)—Ernest Bamberger, Duncan MacVichie, and H. L. Lambrecht appointed appraisers to place valuation on all tangible assets of company.

Summit County

DALY WEST (Park City)—Machinery started at new mill. Everything ready for installation of electric hoist expected shortly.

WASHINGTON

GOLDEN EAGLE (Blewett)—F. Le Roi has five-year lease on this property. Latest clean-up 13 oz. gold from 35 tons ore. Expects to work on higher-grade stuff. Employing four men, hopes to run mill to capacity next year.

CANADA

Ontario

FROM COBALT LAKE preliminary pumping operations about to begin. Expected water will be lowered 6 ft. before end of month. Additional heavy pumps to be installed and will be in operation before end of March.

SCHUMACHER (Schumacher)—Plans in preparation for 150-ton mill with cyanide treatment.

NIPISSING (Cobalt)—Hydraulicicking has disclosed two new veins, one 2 in. wide, other varying up to 6 in., opened for 150 ft. and shows several patches of high-grade.

NORTH THOMPSON (Timmins)—On Nov. 5 final payment made on the property by English interests represented by Dr. J. M. Beil. Amalgamation with Porcupine Crown still under discussion.

TEMISKAMING (Cobalt)—Underhand stoping in progress on new orebody at 750-ft. level; now opened up for 50 to 60 ft., close to shaft. Not yet settled whether to sink new shaft to 825-ft. level, or develop new showing by winze. Vein still shows strong in face at 750-ft. level.

DOVE LAKE (South Porcupine)—Mill running regularly, treating about 40 tons of ore per day, so far mainly for sampling purposes. Expected to obtain extraction of 80 to 85% without cyanide treatment. Bumping table being installed to sort ore from waste; until this is in operation mill grade cannot be determined definitely.

HOLLINGER (Timmins)—Second unit new compressor plant started; provides air for 45 drills. Smaller machines will not be used now. Underground vein No. 10 reached at 200-ft. level and southern extension of vein No. 2 cut by cross-cut on 300-ft. No. 1 vein on 550-ft. yielding high-grade ore in south drift.

BEEDERMAN CLAIMS—These properties, lying in new district about eight miles west of Sesekinika, between Porcupine and Kirkland Lake, being developed by Buffalo capitalists. Diamond drilling outfit being taken in. Claimed wide vein of high-grade quartz discovered and extensive exploration work will be carried on during winter.

LA ROSE (Cobalt)—Surface operations successful recently in picking up stringer paralleling No. 6 vein and showing several patches of high-grade. Does not show at tunnel level and will be developed by raising and crosscutting from No. 6. New shaft on Extension belonging to the property has reached depth of 50 ft.; being sunk to prospect some favorable conglomerate ground on this area.

Yukon

BOYLE DITCH just completed, contractors turning over last shovelful of gravel, Oct. 20. One of most extensive mining improvements ever undertaken in district; four miles long from mouth of Henry Gulch, up Hunker, around Dago Hill up side of Last Chance where water will be used for hydraulicicking. Has capacity of 1000 in. Water will come from Klondike River in ditch dug some time ago from Klondike Bluff near Rock Creek running around base of Australia Hill.

MEXICO

Sonora

SIERRA MADRE MINING CO. incorporated in West Virginia, U. S. A., to operate in Arizpe district. Home office, Buckhannon, Upshur County, W. Va.

SOUTH AMERICA

Bolivia

COMPANIA HUANCHACA—At annual meeting, held in Valparaiso, June 10, following officers and directors elected for ensuing year: Arturo Alessandri, president; George Matte, vice-president; Martial Edwards, Eugene Schneider (president of the Creusot works), Edmond Delvincourt. Purpose of new board to cease shipping silver ore unless a price of at least 20¢ per oz. for silver in ore can be realized; and also to discontinue shipping raw material, build necessary plants and export concentrates; this in view of high freight rates. Inflow of water always perplexing problem, but with improvement of power plant and installation of large compressors, difficulty will in great measure be remedied. Cyanidation plant much needed and estimates will probably soon be made on one.

ASSESSMENTS

Company	Delinq.	Sale	Amt.
Amador, Ida.	Oct. 31	Nov. 28	\$0.01
Annie Laurie, Utah (old stock)	Nov. 9	Nov. 28	0.004
Annie Laurie, Utah (new stock)	Nov. 9	Nov. 28	0.001
Atlantic, Ida.	Nov. 28	Dec. 28	0.0005
Austrian, Calif.	Sept. 29	Nov. 28	0.02
Beaver Copper, Utah	Dec. 3	Dec. 22	0.005
Black Bear, Ida. (post)	Oct. 30	Nov. 28	0.01
Brooklyn, Utah	Nov. 19	Dec. 4	0.0025
Bullion, Ida. (post)	Nov. 4	Dec. 7	0.005
Confidence, Nev.	Nov. 11	Dec. 2	0.10
Consolidated Ores, Utah	Dec. 4	Dec. 20	0.25
Continental, Ida. (post)		Dec. 5	0.016
Con. Virginia, Nev.	Nov. 27	Dec. 18	0.10
Copper Chief, Ida. (post)	Nov. 4	Dec. 7	0.005
Copper King, Ida. (post)	Oct. 1	Dec. 1	0.01
Copper Plate, Ida.	Aug. 29	Nov. 29	0.002
Crown Point, Nev.	Dec. 8	Dec. 29	0.05
Davis-Daly, Mont.	Oct. 15		0.25
Eagle Bird, Calif.			20.00
East Hercules, Ida. (post)	Dec. 1	Jan. 2, '15	0.001
Echo, Ida.	Nov. 20	Dec. 15	0.0015
Ely Con, Nev.	Oct. 15	Dec. 2	0.03
Emerald, Utah (three installments)		June 9, '15	0.08
Federal Ely, Nev.	Oct. 21	Nov. 24	0.115
Gold Bond, Utah	Nov. 24	Dec. 24	0.001
Gold Mountain Champion, Utah	Nov. 14	Dec. 2	0.0025
Greenhorn, Utah	Oct. 26	Nov. 30	0.005
Hider Nevada, Nev.	Nov. 24	Dec. 10	0.015
Hilarity, Ida.	Oct. 12	Nov. 23	0.003
Idaho-Nevada, Ida.	Nov. 7	Dec. 1	0.001
Imlay, Nev.	Nov. 15	Nov. 26	0.01
Indian Pete, Utah	Nov. 30	Dec. 15	0.01
Little North Fork, Ida. (post)		Dec. 12	0.001
Lynn Big Six, Utah	Nov. 21	Dec. 26	0.005
Mammoth Gold, Nev.	Nov. 23	Jan. 4, '15	0.02
M. & P. Gold, Utah	Nov. 10	Dec. 1	0.0025
Maxfield, Utah	Dec. 9	Dec. 30	0.0016
National Copper, Ida. (post)		Dec. 5	0.03
Nevada Silver Reed, Nev.	Nov. 24	Dec. 14	0.0015
North Bunker Hill, Ida. (post)		Nov. 23	0.002
North Scranton, Utah	Nov. 3	Dec. 3	0.002
Ophir, Nev.	Nov. 19	Dec. 11	0.10
Pacific Slab, Calif.		Dec. 1	0.06
Phoenix, Ida.	Oct. 26	Nov. 26	0.005
Rainbow, Ida.	Nov. 30	Dec. 31	0.002
Barus, Utah	Nov. 13	Nov. 30	0.001
Reindeer-Queen, Ida. (post)	Sept. 21	Nov. 28	0.002
Revelator, Utah	Nov. 9	Dec. 8	0.005
Rexall, Utah	Dec. 1	Dec. 21	0.002
St. Francis, Calif.	Dec. 8	Dec. 28	0.0025
Sonora, Ida.	Nov. 30	Dec. 30	0.002
Sunset Banner, Ida.	Nov. 26	Dec. 17	0.0005
Sunset Development, Ida.	Nov. 7	Nov. 30	0.003
Sunshine, Ida.	Nov. 23	Dec. 22	0.001
Syndicate, Ida.	Nov. 26	Dec. 28	0.001
Tarbox, Ida. (post)	Nov. 25	Dec. 28	0.0025
Tuscumbia, Ida.	Nov. 20	Dec. 21	0.002
United Tintic, Utah	Nov. 7	Nov. 23	0.01
Wasatch, Utah	Oct. 26	Nov. 26	0.01
Wilbert, Utah	Dec. 3	Dec. 16	0.01
Wisconsin, Ida.	Nov. 18	Dec. 21	0.003
Yellow Jacket, Nev.	Nov. 5	Nov. 25	0.05
Zella, Utah	Oct. 25	Nov. 25	0.0025

The Market Report

METAL MARKETS

NEW YORK—Nov. 18

Copper and lead have been remarkably strong, domestic consumers having been large purchasers. Spelter has been a little stronger; there has been a resumption of large sales for export. Tin remained about stationary until the end of the week, when it declined.

Copper, Tin, Lead and Zinc

Copper—The improving tendency and substantial demand for copper noted in our last report, continued right through the week of present record. On Nov. 12 there were sales at 11½@11¾c., regular terms, and from that time onward there was an advance of nearly ¼c. per day. Certain sellers kept out of the market, expecting still higher prices. Those who supplied the demand sold moderately at one level, then raised their prices and so on, the demand being sufficiently strong and genuine to permit this. It is beyond doubt that domestic consumption is improving. This had previously been remarked in the brass business, which has reflected the filling of orders for war material, and is now becoming apparent in other directions. The improving financial conditions are leading to a resumption of building. Another factor in the copper market is the sound statistical position.

On Nov. 16 and 17 the market scored sharp advances between the beginning and end of the days and on Nov. 17 sales were made at 12c., regular terms. On Nov. 18, that price was fully established as a basis with domestic consumers, while 12c., cash, New York, was realized on sales for export. The noteworthy feature of the latter was the demand that suddenly developed in France, which for a long time has been conspicuous by its abstention from copper buying. The new demand began to appear on Nov. 17 and attained large proportions on Nov. 18, it being characterized in one quarter as being urgent.

The aggregate of transactions from Nov. 12 to 18, inclusive, amounted to many millions of pounds, 40 to 50 millions being a reasonable estimate. Probably the larger part of this business was for domestic consumption, certain agencies reporting all sales as domestic. Another noteworthy feature was the willingness of domestic buyers to contract for supplies well ahead, a fair volume of business for January delivery having been done. Sellers have asked about 5@7½ points advance for December and 5@7½ points more for January contracts.

The A. S. & R. Co. has announced 11.10c. as its copper settling price for October.

Henry Gardner, chief of Henry R. Merton & Co., Ltd., London, visited New York to get the copper producers to put the foreign sales of their copper in the hands of his company. Important producers were unwilling to do that and his mission failed.

The British have made more copper seizures at Gibraltar from steamships bound for Italian ports.

Base price of copper sheets is now 16½c. per lb. for hot rolled and 17½c. for cold rolled. Full extras are charged and higher prices for small lots. Copper wire is quoted at 12@12½c. per lb. for carload lots at mill.

Visible Stocks of Copper in Europe on Nov. 15 are reported as follows: Great Britain and France, 20,906; Rotterdam, 1150; total, 22,056 long tons, a decrease of 551 tons from the Oct. 31 statement. In addition to the stocks above, 200 tons are reported afloat from Chile and 4200 tons from Australia, making a total of 26,456 tons.

Tin—The better tendency exhibited generally also had its effect on the tin market, which was recorded as being strong on the London Metal Exchange for the larger part of the week. On Nov. 18, however, the market declined suddenly about £4 for Straits tin and closed weak. In this market the only interest was shown in spot tin, which is held at a slight premium. The close of the market in London is £137½ for spot and £137 for futures; 31¾c. here.

Lead—A big business has again been done in this metal, and the A. S. & R. Co. having apparently disposed of all it wanted to at 3.50c., raised its price to 3.60c. on Nov. 12. Although this had been foreshadowed in the St. Louis market,

the advance took sellers there by surprise and there was a considerable tonnage sold there on that day at the old price before the news was received. The St. Louis price then rose again above the normal differential, foreshadowing another advance by the leading interest, but when that happened on Nov. 17 outsiders were once more taken by surprise, there being sales in the morning at about 3.52½c. while 3.62½c. was realized later in the day. In spite of the sharp advances of the week, the market continues strong and active, certain important interests being quite reserved about talking business, while others are sold out and consequently unable to talk business anyhow. The lead market is therefore, for the moment, chiefly in the hands of the principal producer.

Spelter—There has been an advance in this metal, but the demand was freely met by the producers, who still have large unsold stocks, and consequently the market had none of the snap exhibited in copper and lead. A considerable tonnage of spelter was sold from day to day for domestic consumption, but the aggregate of these transactions was not sufficiently large to cause special comment. The especially noteworthy feature of the week was the resumption of sales for export on a large scale. We estimate the export sales of the week at about 5000 tons. On Nov. 17 and 18 there were sales at 5c. and sellers over at that price.

Zinc dust is quoted at 9@10c., New York.

DAILY PRICES OF METALS

NEW YORK

Nov.	Sterling Exchange	Silver, Cts. per Oz.	Copper		Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
			11½			3.40		4.80
12	4.8813	48½	@11½	33½	3.60	@3.50	@4.95	@4.85
13	4.8725	47½	@11½	33½	3.60	@3.47½	@4.95	@4.80
14	4.8825	47½	@11.45	33	3.60	@3.50	@5.05	@4.90
			@11.55			@3.55	@5.10	@4.95
16	4.8775	48½	@11.75	33½	3.60	@3.50	@5.05	@4.90
			@11½			@3.55	@5.15	@5.00
17	4.8700	49	@11½	32½	3.70	@3.62½	5.15	5.00
			@11½			@3.60		
18	4.8700	49½	@12	31½	3.70	@3.65	5.15	5.00

The quotations herein 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. Some current freight rates on metals per 100 lb. are: St. Louis-New York, 15c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12c.; New York-Bremen or Rotterdam, 15c.; New York-Havre, 16 @ 17c.; New York-London, 16c.; New York-Hamburg, 18c.; New York-Triests, 22c.

LONDON

Nov.	Copper					Tin		Lead		Zinc	
	Silver	£ per Ton	Cts. per Lb.	3 Mos.	Best Sel'd	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
12	22½	51½	11.23	53	*	138½	*	17½	3.89	24½	5.26
13	22½	51½	11.32	53½	*	139	*	17½	3.89	24½	5.32
14	22½	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16	22½	52½	11.48	53½	*	139	*	17½	3.89	25	5.43
17	22½	53	11.51	53½	*	138½	*	18	3.91	24½	5.40
18	22½	53½	11.68	53½	*	137½	*	18½	3.96	25½	5.46

*No quotations.

Other Metals

Aluminum—Business has improved somewhat recently. The domestic market is still rather quiet, though buying is on a little larger scale. It is reported that some purchases have been made for export. Quotations for No. 1 ingots are 18 @19c. per lb., New York, according to size and terms of order.

Antimony—Domestic business has been on a moderate scale only, but there are still inquiries for export, although no large quantities have been taken for that purpose during the present week, so far as known. Ordinary brands are quoted at 13½@14½c. per lb. Cookson's is held at 17@18c. and is very strong at these figures, stocks being low.

Quicksilver—At the beginning of the week sales were made at \$47.50; in the latter part, transactions were reported at \$50. The agents for the California producers have raised their asking price and the market is exhibiting a stronger tendency. This is probably explained by the stronger market in London and the disappearance of the Italian quicksilver offered here. It is understood that the Italian supply has been disposed of. The London price is reported as £11, which is equivalent to about \$55, London.

Minor Metals—Quotations for **Bismuth** are now \$2.75 per lb.—**Magnesium**, \$1.50 per lb., New York.—**Selenium**, \$3@3.25 per lb. for lots of 100 lb. or over, \$5 per lb. for small quantities.

Gold, Silver and Platinum

Gold in the United States, Nov. 2, is estimated by the Treasury Department as follows: Held in Treasury against gold certificates outstanding, \$946,979,869; in Treasury current balances, \$222,582,210; in banks and circulation, \$665,854,219; total, \$1,835,416,298, a decrease of \$26,421,966 during October.

Gold production in the Transvaal in October was \$15,166,523. For the 10 months ended Oct. 31, the total was \$153,960,970 in 1913, and \$144,011,300 in 1914; a decrease of \$9,949,670, or 6.5%, this year.

Iridium—This metal is still rather scarce and quotations vary widely. The range seems to be about \$78@83 per oz., New York.

Platinum—The market is quiet and a little lower. Dealers ask \$45@46 for refined platinum and \$53 for hard metal, 15% irridium. Sales are reported at \$44 and \$44.50 per oz. today.

Our Russian correspondent writes under date of Oct. 16, that the market does not change. No sales or prices are reported at Petrograd. From Ekaterinburg it is reported that the starateli and small producers are in straitened circumstances and are willing to sell small lots at low prices to get money for their immediate needs. The larger producers are holding their platinum, with the assistance of the banks, which have made heavy advances on the stock of metal.

Silver—Owing to purchases account of the Indian Bazaars, silver has had a little tonic added to it and under moderate buying has advanced to 22½d. in London.

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

	1913	1914	Changes
India.....	£9,001,500	£4,679,500	D. £4,322,000
China.....	752,000	42,000	D. 710,000
Total.....	£9,753,500	£4,721,500	D. £5,032,000

Coined silver in the United States on Nov. 2, is estimated by the Treasury Department as follows: Standard dollars, \$565,886,478; subsidiary coins, \$183,644,414; total, \$749,530,892. Of the Standard dollars \$493,813,000 are held in the Treasury against silver certificates outstanding.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Nov. 14

The base price paid this week for 60% zinc ore was \$44 per ton; \$42 per ton was offered for 80% lead ore. No sales of lead ore were reported.

SHIPMENTS WEEK ENDED NOV. 14

	Zinc Ore, lb.	Lead Ore, lb.	Sulphur Ore, lb.
Week	4,312,790	.....	205,200
Year	144,937,290	4,444,950	29,974,750

Shipped during week to separating plants, 3,664,740 lb. zinc ore.

JOPLIN, MO.—Nov. 14

Blende, high price \$47; assay base, 60% zinc, \$41@44; metal base, \$40@41; calamine, base 40% zinc, \$21@23; average, all grades of zinc, \$40.66 per ton.

Lead, high price, \$45; base, \$42 per ton of 80% metal content; average, all grades of lead, \$42.78 per ton.

This district is running behind an average production by 5000 tons per month. Reports received from Wisconsin are that the northern field is short 4000 tons per month, and reports from Montana show 5000 tons per month shortage in zinc-ore production in the Butte district, a total of 14,000 tons, or approximately 10,000 tons of spelter short each month. Producers are figuring that with the continued exportations of spelter there will be a shortage of metal early in next year.

SHIPMENTS WEEK ENDED NOV. 4

	Blende	Calamine	Lead	Values
Totals this week...	8,532,990	889,370	1,192,820	\$217,070
Totals this year....	452,393,930	34,192,330	78,252,570	\$11,235,160
Blende value, the week,	\$180,720; 46 weeks,			\$9,009,330.
Calamine value, the week,	\$10,830; 46 weeks,			\$400,330.
Lead value, the week,	\$25,520; 46 weeks,			\$1,825,500.

IRON TRADE REVIEW

NEW YORK—Nov. 18

With no material change in actual conditions, there is slightly more activity in the market, and a good deal of discussion over possible improvement before long.

There has been a little more contracting for structural steel, several orders of fair size having been placed. A little more movement in bars and wire is noted, but no large orders.

The pig-iron market shows some demand for basic iron. In the East there is some movement in foundry iron, but orders are generally for small lots.

The British Government has put an embargo on exports of ferromanganese from the United Kingdom. It is reported that buyers of ferro now afloat will be required to give guarantees that it is to be consumed in the United States and not reexported.

Imports at Baltimore for the week included 4925 tons ferromanganese and 30 tons silicospiegel from Great Britain. Imports at New York for the week included 1300 tons manganese ore from Lisbon.

Foreign Trade in the United States in iron and steel, including machinery, is valued as below for the nine months ended Sept. 30, by the Department of Commerce:

	1913	1914	Changes
Exports.....	\$226,482,431	\$152,776,838	D. \$73,705,593
Imports.....	25,716,327	22,877,803	D. 2,838,524
Excess, exports.....	\$200,766,104	\$129,899,035	D. \$70,867,069

This shows a decrease in exports of 35.3% in 1914, as compared with 1913; and a decrease of 11.4% in imports.

PITTSBURGH—Nov. 17

While there have been only slight increases in the buying of some steel products, the general tone of the market has experienced further improvement. It is believed that the decrease in buying has run its course and that very soon there will be a definite though probably small increase, while after the turn of the year there will be a large improvement. Some well trained observers are predicting that by the beginning of the second quarter of the new year the steel industry will be running very nearly at capacity.

Daily newspaper reports of various steel plants resuming operations are incorrect in substance. The tendency in steel production is still toward decreases, except possibly in a few isolated instances. This declining tendency is due to the exhaustion of old orders, for current bookings are not sufficient to support even the present rate of operation, which averages not over 40% of capacity.

Steel prices are fairly steady, and there does not seem to be room for further declines of consequence, unless mills are willing to lose money, apart from not making their fixed charges. The last very low point in steel prices was in November, 1911, three years ago. Prices then averaged less than a dollar a ton below the present level, but the mills were operating at about 75% of capacity and wages were lower, so that the cost of production now is \$2 to \$4 a ton higher.

Pig Iron—Consumers are showing decidedly more interest in the market, but are not inquiring much more freely. They seem to be getting to the point where they will definitely decide whether to take hold. Actual sales are only fair in point of number and are very small in point of tonnage. About one-third of the merchant furnaces in this general district are in blast, and some of them are piling iron, while

most of the furnaces that recently went out of blast are carrying large stocks. In the absence of large sales or inquiries, prices are more or less nominal, as follows: Bessemer, \$13.75; basic, \$12.50; No. 2 foundry and malleable, \$12.75@13; gray forge, \$12.50@12.75, at Valley furnaces, 95c. higher delivered Pittsburgh.

Ferromanganese—Before the announcement of the English Government's provisional embargo on exportations of ferromanganese, there were many lots of prompt material offered for resale, and no inquiry. Now there are many inquiries and hardly anything offered. Consumers are well stocked, but might buy at attractive prices to protect the future. The regular contract market, subject to possibility of making shipment from England, is \$68, Baltimore, while the prompt market lies somewhere between this and \$75 per ton.

Steel—The market for billets and sheet bars is altogether inactive. We quote billets at \$19 and sheet bars at \$19.50, maker's mill, Youngstown, and billets at \$19.50 and sheet bars at \$20, maker's mill, Pittsburgh, but these prices are practically nominal, and on inquiry for any desirable tonnage would probably be shaded about 50c. Rods are nominal at \$25.50, Pittsburgh.

IRON ORE

Some sales of Cuban low-phosphorus ore to an Eastern furnace are reported. The quantity is said to be 30,000 tons.

Shipments of iron ore from the Lake Superior district in October were 4,242,392 tons, a decrease of 2,283,711 tons from last year. For the season to Nov. 1, the total shipments are reported as below, in long tons:

Port	1913	1914	Changes
Escanaba.....	4,914,342	3,440,992	D. 1,473,350
Marquette.....	2,942,897	1,651,579	D. 1,291,318
Ashland.....	4,056,754	3,229,746	D. 827,008
Superior.....	12,858,975	10,920,469	D. 1,938,506
Duluth.....	11,520,153	6,197,043	D. 5,323,110
Two Harbors.....	9,506,399	5,511,976	D. 3,994,423
Total.....	45,799,520	30,951,805	D. 14,847,715

The heavy decrease in Duluth shipments and the comparatively light one from Superior indicate that the Steel Corporation has been working hard this season on its Hill leases.

Of the total shipments of iron ore from the Lake Superior district in October 3,526,795 tons, or 83.1%, were sent to Lake Erie ports.

Imports and Exports of Iron Ore in the United States nine months ended Sept. 30, in long tons:

	1913	1914	Changes
Imports.....	1,916,733	1,095,752	D. 820,981
Exports.....	826,584	536,115	I. 290,469

The more important imports of iron ore this year were 631,214 tons from Cuba, 262,519 from Sweden, 47,326 from Spain, 38,515 from New Foundland and Labrador, 33,625 from Canada. Exports were chiefly to Canada.

COKE

Coke production in the Connellsville region for the week is reported by the "Courier" at 211,554 tons; shipments, 203,743 tons. Production of Greensburg and Upper Connellsville districts was 30,853 tons

Foreign Coal Trade of the United States nine months ended Sept. 30, in long tons:

	Exports		Imports	
	1913	1914	1913	1914
Anthracite.....	8,173,002	3,062,057	836	18,257
Bituminous.....	13,793,963	10,902,780	1,035,887	990,234
Coke.....	662,863	485,171	58,838	83,980
Bunker coal.....	5,763,584	5,711,948	.....	.....
Total.....	23,393,412	20,161,956	1,095,561	1,092,521

The bunker coal, or coal furnished to steamships in foreign trade, is practically all bituminous. Most of the trade, both imports and exports, is with Canada.

CHEMICALS

NEW YORK—Nov. 18

The general market is quieter and less unsettled than it has been, but shows no great activity

Arsenic—The market remains dull and unchanged. Quotations are around \$3.75 per 100 lb. for both spot and futures.

Copper Sulphate—Business is steady and on a fair scale. Prices are a shade firmer than reported last week, \$4.35 per 100 lb. being asked for carload lots, and \$4.60 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is quiet, as is to be expected at this season. Prices are a little softer 1.85c. per lb. being quoted for November and December, and 1.87½c. for 1915 deliveries.

PETROLEUM

The monthly statement of the "Oil City Derrick" shows new wells completed in October as follows: Pennsylvania grade, 292; Lima-Indiana, 66; Central Ohio, 80; Kentucky, 8; Illinois, 98; Kansas-Oklahoma, 491; Texas-Louisiana, 129. This shows 1173 wells completed, a decrease of 261 from the September report. New production amounts to 105,332 bbl., a decline of 26,578. Among the completions were 216 dry holes and 222 gas wells. At the close of October the new work was made up of 466 rigs and 1477 wells drilling, an increase of 30 wells.

Production figures as issued monthly by the Standard Oil Co. for nine months ending Sept. 30, 1914, show a grand total for all fields in California of 79,305,083 bbl. There were 340 new rigs built; 343 wells completed and 40 wells reported abandoned. Stocks reported were 55,027,328 bbl. at the end of September.

STOCK QUOTATIONS

The trend toward normal conditions is reflected in the gradual opening of the mining-stock exchanges, so that we again resume stock quotations after over three months' intermission. It should be noted that the marked (†) quotations represent those of July and should not be taken as in any wise indicative of present market prices.

COLO. SPRINGS Nov. 16		SALT LAKE Nov. 16	
Name of Comp.	Bid.	Name of Comp.	Bid.
Acacia.....	.02½	Beck Tunnel.....	.04
Cripple Crk Con.....	.006	Black Jack.....	.02½
C. K. & N.....	.04	Cedar Talsman.....	†1.00½
Doctor Jack Pot.....	.07½	Colorado Mining.....	.08
Elkton Con.....	.38	Crown Point.....	.00½
El Paso.....	.95	Daly-Judge.....	4.10
Findlay.....	†.006	Gold Chain.....	.07
Gold Dollar.....	.02	Grand Central.....	.62
Gold Sovereign.....	.07	Iron Blossom.....	1.10
Golden Cycle.....	†1.00	Little Bell.....	.10
Isabella.....	.11½	Lower Mammoth.....	.01½
Jack Pot.....	.06	Mason Valley.....	†2.12½
Jennie Sample.....	.02	May Day.....	.08
Jerry Johnson.....	.02½	Opohongo.....	.01½
Lexington.....	.003	Prince Con.....	2.35
Old Gold.....	.01	Silver King Coal'n.....	2.25
Mary McKinney.....	.36	Silver King Cons.....	1.42½
Pharmacist.....	†.009	Stoux Con.....	.01
Portland.....	1.03½	Uncle Sam.....	.02
Vindicator.....	1.07	Yankee.....	.02½

SAN FRANCISCO Nov. 16 N. Y. CURB Nov. 16 BOSTON CURB Nov. 16

Name of Comp.	Bid.	Name of Comp.	Bid.	Name of Comp.	Cig.	Name of Comp.	Bid.
Comstock Stocks..		Misc. Nev. & Cal.		Beaver Con.....	.21	Bingham Mines... .	.04½
Alta.....	.03	Belmont.....	4.67½	Big Four.....	.06	Boston & Corbin... .	†.25
Becher.....	.75	Jim Butler.....	.65	Boston Montana.....	†91	Boston Ely.....	.10
Best & Belcher.....	.05	MacNamara.....	.02	Braden Copper.....	.51	Butte & Lon'n Dev..	.22
Caledonia.....	.36	Midway.....	.07	B. C. Copper.....	†11	Calaveras.....	.93
Challenge Con.....	.04	Mont.-Tonopah.....	.37	Buffalo Mines.....	.60	Calumet-Corbin... .	.07
Chollar.....	†.02	North Star.....	.19	Can. Cop. Corp'n... .	†2	Chief Cons.....	.65
Confidence.....	.19	West End Con.....	.53	Can. G. & S.....	.03	Corbin.....	†.90
Con. Virginia.....	.03	Atlanta.....	.29	Caribou.....	.64	Cortez.....	.10
Crown Point (Nev.)	.28	Booth.....	.04	Chambers Ferland..	†.12	Crown Reserve.....	.65
Gould & Curry.....	.01	C.O.D. Con.....	.04	Con. Ariz. Sm.....	†.75	Eagle & Blue Bell..	.80
Hale & Norcross... .	.02	Comb. Frac.....	.10	Cons. Nev.-Utah... .	†.1	First Nat. Cop.....	.95
Mexican.....	.24	Jumbo Extension... .	.95	Coppermines Cons..	†.1	Houghton Copper..	1.00
Occidental.....	.85	Pitts.-Silver Peak..	.17	Davis-Daly.....	.52	Iron Cap Cop., pt..	†4.75
Ophr.....	.11	Round Mountain... .	.28	Diam' field-Dalsy... .	.05	Majestic.....	.12
Overman.....	.13	Sandstorm Kendali..	.07	Ely Con.....	†.05	Mexican Metals... .	.16
Potosi.....	†.01	Silver Pick.....	.07	Florence.....	.38	Nevada-Douglas... .	.43
Savage.....	†.05	Argonaut.....	†2.50	Goldfield Con.....	1.06	New Baltic.....	.70
Sierra Nevada.....	.24	Brunswick Con.....	†1.50	Greene Cananea.....	†28	Oreco.....	.30
Union Con.....	.05	Central Eureka.....	.22	Kerr Lake.....	4½	Raven Copper.....	.10
Yellow Jacket.....	.35	So. Eureka.....	1.80	La Rose.....	.73	Smokey Dev.....	.15

TORONTO Nov. 16

Name of Comp.	Bid.	Name of Comp.	Bid.	Name of Comp.	Cig.
Balley.....	.01½	Foley O'Brien.....	.18	Puebla S. & R.....	†21
Conlagas.....	5.50	Hollinger.....	18.00	Stand'd Oil of N.J.	371
Peterson Lake.....	.23	Imperial.....	.00½	Stand'd Silver Lead	11½
Right of Way.....	†.02	Jupiter.....	.12½	Stewart.....	7½
T. & Hudson Bay..	30.00	Pearl Lake.....	.02½	Tonopah.....	2½
Timiskaming.....	.09	Porcu. Gold.....	†.05	Tonopah Ex.....	2½
Wettlaufer-Lor.....	.03½	Preston E. D.....	.00½	Tonopah Merger... .	.32
Big Dome.....	6.20	Rea.....	.10	Tularosa.....	†.75
Crown Chartered... .	†.00½	Swastika.....	†.01	West End Ex.....	.02
Dome Exten.....	.05½	West Dome.....	†.05	Yukon Gold.....	.2

LONDON July 30

Name of Comp.	Cig.
Camp Bird.....	£0 7s 0d
El Oro.....	0 12 3
Esperanza.....	0 10 7½
Mexico Mines... .	4 7 6
Oroville.....	0 8 9
Santa Ger'tis... .	0 10 0
Stratton's.....	†0 0 6
Tomboy.....	0 18 9