

ENGINEERING AND MINING JOURNAL-PRESS

A CONSOLIDATION OF ENGINEERING AND MINING JOURNAL AND MINING AND SCIENTIFIC PRESS

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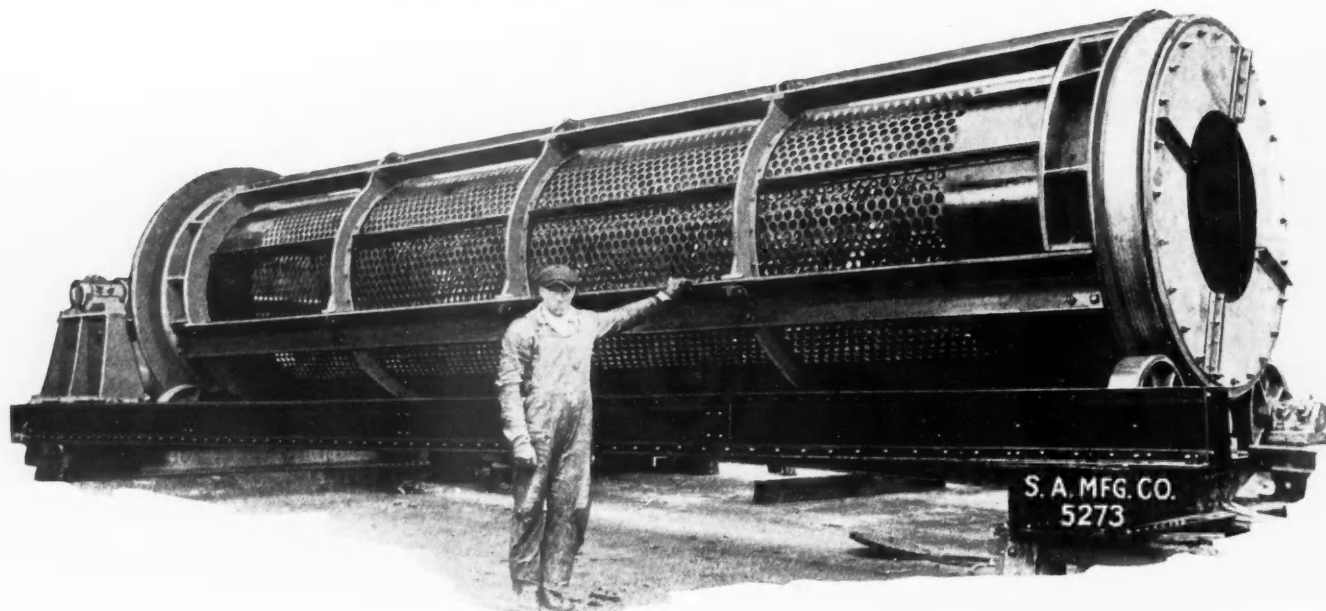
By George J. Young

Cost of Producing Copper

By Arthur Notman

The new reinforced concrete stack now being erected at the Trail smelter of the Consolidated Mining & Smelting Co. of Canada will rise 400 ft. above its foundations, the tallest one of its kind in the world. The view shown was taken at 105 ft. See page 164





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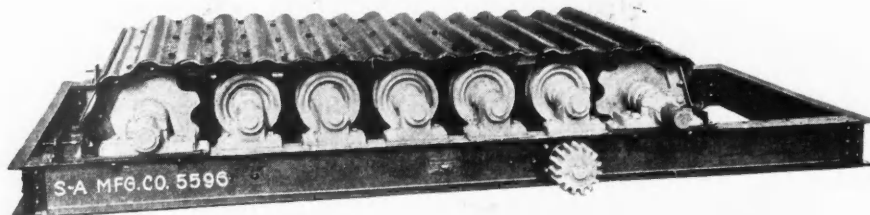
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ENGINEERING AND MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

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Troubles With the Mining Law

CASES continue to be reported where miners and prospectors have suffered injustice through the operation of the existing mining laws, especially through the overriding of mining rights by the laws allotting the public lands for agricultural or forestry purposes. So long as mining claims are otherwise worthless lands, the old habit of reporting a fictitious discovery will still work, and it is a nominal fraud that is sanctioned by long usage, and that has the excuse of necessity. But when the land has a potential value for a truck garden, or dry farming, or has a few sticks of stunted pine growing on it, the conflict that results may shut out the prospector and miner, even though he has held the fort without challenge for many years. It may happen, of course, even among miners and prospectors, that the mining claim has been a convenient pretext for holding down land desired for other purposes. The platinum claims that plastered land valuable for scenic and tourist purposes at the head of the Bright Angel trail in the Grand Canyon afford an example. The courts have thrown out these mineral claims, and very properly. A somewhat similar case was fiercely contested at Aspen, in Colorado, many years ago. Certain land in the valley bottom adjoining the town had been located as placer ground, and another claim had been made to it as being agricultural ground. Both claims were pretexts. The mineral locator had no illusion that the ground was placer; it was underlain by deep gravels where it was difficult if not impossible to get even a color, by panning. And the agricultural locator knew that no crop of value could ever be grown on these gravel heaps. The real value appeared to be for building lots; yet the claimed rights did not cover this phase. Eventually the courts, virtually tossing a coin, decided in favor of the mining claimant. Both parties to the suit were mining men; but neither had any intention of planting alfalfa or washing gravel.

This does not obscure the fact that more and more in the near future the real miner and prospector will and should explore ground where no bona fide ore outcrops, wherewith to make strictly legal "discoveries." As the reserves of outcropping ore are depleted, ore masked by a barren overburden or capping must be hunted for. Unquestionably there is much available ore of this type undiscovered, even though a great deal of this masked ore has already been taken out, by working laterally out from known ore deposits that did outcrop. How is the miner to be protected in this necessary work? Truth to tell, he has only himself to blame for his difficulties with the Land Office and the Forestry Service. He has declared the existing mining laws are good enough for him. Painstaking plans for revising and improving the mining laws were greeted with ribald animosity by the booster mining press; timorous politicians, self-serving, scuttled to cover, declaring they had no intention of altering the mining law; mining organizations, apathetic or

shrewdly political, turned an unfriendly shoulder. So everything is as it was, and everyone should be happy, with the good old spelling of Shakespeare, the good old geology of Moses, and the good old mining laws of Stewart. When the miners want a new mining law, they can have it. Meantime, since they do not want it, why complain about it?

Underground Mechanical Loading

MECHANICAL LOADING is discussed in a most conscientious way by Charles E. Van Barneveld in his treatise on mechanical underground loading in metal mines recently published by the School of Mines and Metallurgy of the University of Missouri in co-operation with the U. S. Bureau of Mines. We are impressed with the amount of work that mining companies, engineers, and mining men have put upon this subject. Important machines have been developed, and many are now well past the experimental stages. The treatise in question is a historical document giving an insight into the wide variety of conditions faced by the metal miner and the ingenious ways by which he has sought to minimize manual effort.

The position of the mechanical loader in Western metal mines is not as critically important as in coal mining, as the metal miner has used chute loading in stoping operations and in undercut-caving. Only in development operations, drifting, and crosscutting is there need for mechanical loading. As the volume of broken rock from development workings is only about one-tenth that afforded by stoping and even less in certain instances, it can be readily seen that most metal miners are not seriously in need of mechanical loaders. Nevertheless, many of them are interested in small, compact loaders that will be reasonably free from mechanical troubles and will enable them to make a reduction in development costs. Such a machine will undoubtedly be developed and will result in a further systematization of mining. At present the power-operated scraper is the most important mechanical appliance that has been recently introduced in metal mining. In conjunction with various types of slides it is being successfully used for loading in development operations. Flat workings, from 20 to 30 deg. slope, have always presented a difficulty, but this seems to have been removed by use of the scraper rig. Top slicing as originally practiced required shovel loading, and to avoid this several kinds of inclined slides were invented and introduced, finding favor in certain copper mines. The scraper has obviated the necessity of these methods, which were objectionable chiefly for the reason that miners had to work on an incline. The successful underground mucking machine will have to compete with the simple rig devised by the miner and it will have to be light, portable, and efficient. Its first cost is of importance, but if it complies with other conditions, first cost is not a serious limitation.

A Distinction but Not Much Difference

VALUATION based on the capitalization of net earnings is no longer to be the method used by the State Tax Commission of Arizona in determining assessment levies on operating mines. The reason assigned for the change is that the Legislature failed to make any appropriation to pay attorneys' fees for defending suits against the commission. The latest attack is the starting of injunction proceedings brought by the United Verde Extension Mining Co. to enjoin the commission from the use of the capitalization of net earnings method. Presumably the issue has been avoided, so far as 1925 is concerned, by the changing of the method of determining valuations. Parenthetically it might be suggested that a lot of futile litigation might be avoided if more discrimination and restraint were exercised by everybody in the matter of appropriating funds to pay fat fees to attorneys.

However, it seems unlikely that any material difference in the net result will be effected by the so-called new method. Capitalization of net earnings is to be one of the factors considered in arriving at the "full cash value" of the mines; but in addition the commission will take into consideration "all other information" obtainable that may have a bearing on the matter. Not much imagination is needed to surmise that the other factors will not have great moment.

That the principle of capitalizing profits operates to place the tax burden where it can best be borne, and to reduce the burden at times when the mining companies are less prosperous, is a point in its favor. The gross taxable valuation of Arizona's producing mines for 1925 is \$259,566,465, compared with about \$469,000,000 in 1919. The directors of the mining companies involved would hate to admit that the actual value of their properties had depreciated to this extent; in fact, many of them are worth more today than ever before, although depletion of reserves has reduced the value of many others. Following are the current valuations, including mines and plant, placed on the properties of the seven leading companies: Inspiration, \$33,243,000; Phelps Dodge (Copper Queen), \$26,651,768; United Verde, \$23,054,770; United Verde Extension, \$20,920,000; Calumet & Arizona, \$19,946,408; New Cornelia, \$19,311,043, and Ray Consolidated, \$18,389,372.

The Inorganic Origin of Petroleum

THE EVIDENT FACT that hydrocarbons are of organic origin has tended to obscure in the minds of geologists the less patent but important fact that some hydrocarbons are of magmatic origin. Methane (CH₄) is one of the principal gases exhaled from volcanoes and volcanic fumaroles.

In the case of certain other minerals it will be seen, on reflection, that dual origins, by organic and by inorganic means, do indeed exist. An especially close coupling seems to exist between organic and magmatic origins. For example, calcite is of organic origin, and also of inorganic (including magmatic) origin. Phosphate of lime in commercial quantity is both organic and magmatic. Iron oxide ore deposits are in some cases organic and in others magmatic.

The evidences of the magmatic origin of certain hydrocarbons is so strong that many physicists, chem-

ists and geologists have leaned toward the view that this was an important factor producing the commercial supplies of petroleum. In North America Eugene Coste has distinguished himself by a persistent and lifelong devotion to the theory of the magmatic origin of petroleum in general. His views have not received much support from petroleum geologists; nevertheless, the school he represents is entitled to a hearing, for the matter is far from being settled. For the organic origin the evidence seems inescapable; but that organic phenomena alone account for the whole petroleum problem is improbable. For that reason we welcome Prof. J. Volney Lewis' clear and conservative reminder, in our last issue, of certain facts, showing the great abundance of hydrogen, carbon, and hydrocarbons in volcanic emanations. If the organic argument is difficult to sidestep, the facts of vulcanism are equally difficult to ignore. The problem is not a closed one on either side; when the facts are all weighed, the apparent preponderance of evidence may be replaced by a stronger preponderance on one side or the other. And in the case of organic petroleum, it may be found that in some cases it has been distilled and collected into commercial bodies through the heat of magma injections.

Science and Religion

THE TENNESSEE SCOPES TRIAL and its outcome has offered an astounding spectacle of the popularity of ignorance. All over the country men are at the old job of reconciling religion and science; while a yet uncounted mass have decided that there is no reconciliation possible and that science must accordingly go. In the national capital a taxpayer has appealed to the courts to stop the salaries of the superintendent of schools and of the science teacher in the high school, on the basis of a clause in the Congressional appropriation for education which provides that none of the money shall be spent in teaching anything inculcating "disrespect of the Bible." In support of his plea he cites Scripture as opposed to many of the elements of science now taught. Many of his points have not so much to do with evolution as with astronomy. The teaching of the spherical earth and its revolution around the sun is one of the heretical points: the taxpayer cites Scripture to show that the earth is flat and rests on a foundation. This indeed harks back to the days of Galileo, who backed out of the argument with the Bryanesque churchmen; and whose example of more or less dignified ducking has been followed by astronomers and other scientists ever since. As another example, a correspondent of the New York *Sun* points out that, according to Genesis, the earth was created on the second day, but the sun on the fourth; and inquires what the earth, which astronomy holds to be dependent upon the sun for its very existence, did in the meantime. Evidently the twentieth century American demagogues are pressing for a final showdown on the debate which the Italian prelates dropped in Galileo's day. Unquestionably they should have it. There is no problem of reconciling science and religion; no need to proscribe science on the one hand or to condemn religion on the other. Religion advances step by step with science and becomes more and more revealed thereby; and ever nobler and purer. The conflict that has been waged from Galileo to

Scopes is between science and an ancient Jewish folk-myth, belief in the serious nature of which was perforce abandoned before modern science could begin: a myth which has no claim upon the intelligence, and whose only hold upon the affections of the people is that it falsely masquerades as religion.

The Human Element in Safety

SINCE the U. S. Bureau of Mines was established the gospel of safety first has been consistently kept before the mining industry. The bureau has been successful in rendering a useful service, which has been extended by the safety organizations established by various mining companies. However, the fact remains that safety rules, safety devices and preventive measures generally are only part of the problem. Alex McDonald, in the *Anode*, puts the other part of the problem in the following:

"Neglect, carelessness, indifference, violation of rules, recklessness, chance taking, overconfidence, curiosity, and hurry may be enumerated as the real causes of about 90 per cent of preventable accidents that are happening every day.

"What we need is an awakening to the fact that the greatest enemy to our safety is ourselves. We are notoriously a nation of chance takers, careless and thoughtless even when we know quite well that the things we are doing are dangerous. We grow to have contempt for hazards with which we are familiar. When we see a warning sign, or rule, posted, 'Don't do so and so,' we refuse to be don'ted and immediately proceed to do it. Nobody is going to interfere with our liberties; oh, no! We respect the 'stop, look and listen sign' at the railroad crossing by stepping on the gas and trying to beat the train.

"Why do we deliberately do a hazardous thing when we know that others have been injured or killed just because they did that very same thing? Why take these foolish chances? Why so ready to gamble with limb, or eyesight, or life at stake if we lose, and nothing of value to be gained if we win?"

Mr. McDonald stresses personal caution as the critical factor in reducing the number of accidents, and we agree with him that further progress in accident prevention must largely come from individual workers. This has been fully recognized by the educational campaign that is being conducted in many different ways. The *Anode* is one of the conspicuous publications having for their purpose the getting under the skin of the indifferent and careless individual. Many other publications are doing the same thing. The *Reef*, published at Johannesburg, South Africa, is a virile little paper that hits the ball every time it appears. Here is what its editor says in the April number:

"There are no differences of position or pay in the fight for safety. Bosses and workmen must share responsibility. Each has his part to play in the exercise of foresight, good judgment, and care. If one man in or about a mine should fail to observe the rules of safety, some innocent fellow-worker may be the one to suffer. If ever there was an occupation in which all men should pull together, it is mining. In that hazardous business there can be no place for disagreement or strife. All share the same risks; all are liable to the uncertainty of working conditions. The laws of Nature are unchangeable; rocks will fall, gas will ignite, and no man can successfully defy those laws. Each man is his brother's keeper. Humanity demands that men shall, by alert senses and conscious and active minds, assist in preventing hurt to their fellow-men. It is not yellow to refuse to work under dangerous conditions. The safety movement is designed to obviate danger points, and if a man be plucky enough to refuse to risk the lives of himself and his 'boys' by entering a perilous working place, none

will give him greater credit than his boss, who is anxious to remedy the danger.

"Taking a chance' is a demon accident getter; fatalism is as bad. The happy-go-lucky idea possessed by some men that their life history is mapped out, that they will 'get it when it comes,' and that nothing they can do in the meantime makes any difference, has added more men to the injury list than did the bullets in the Boer War. It may be possible to escape for a while, but unless unceasing vigilance, a clear mind, and a healthy body work together in the prevention of accident, sooner or later the penalty of negligence will be paid. Let those who have no responsibilities take a chance. If you have pride in yourself or your mine, you will walk warily and cautiously, and play the safety game. If you are married, each time you take a chance your family is beside you, taking the same chance."

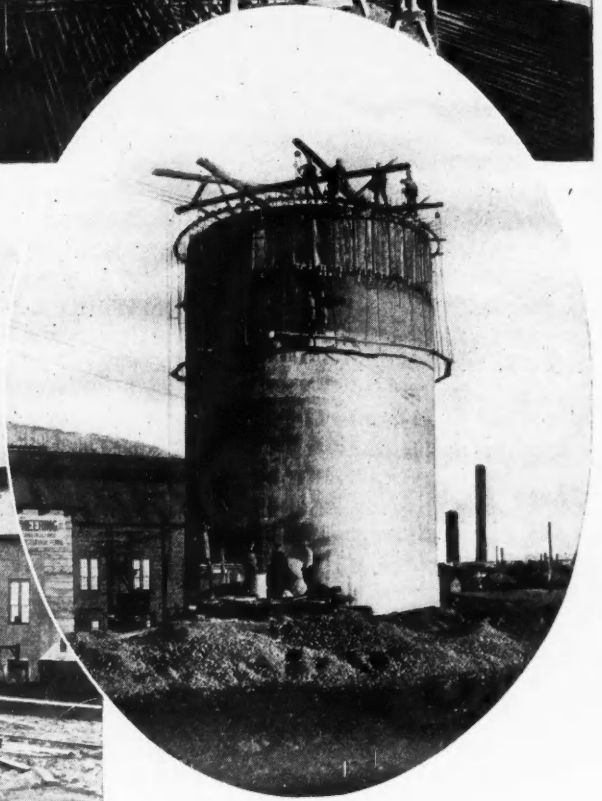
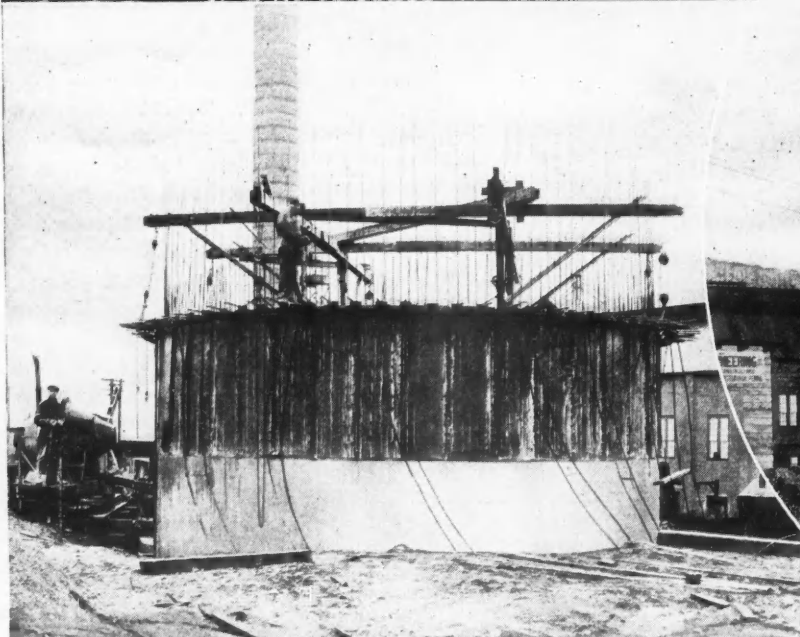
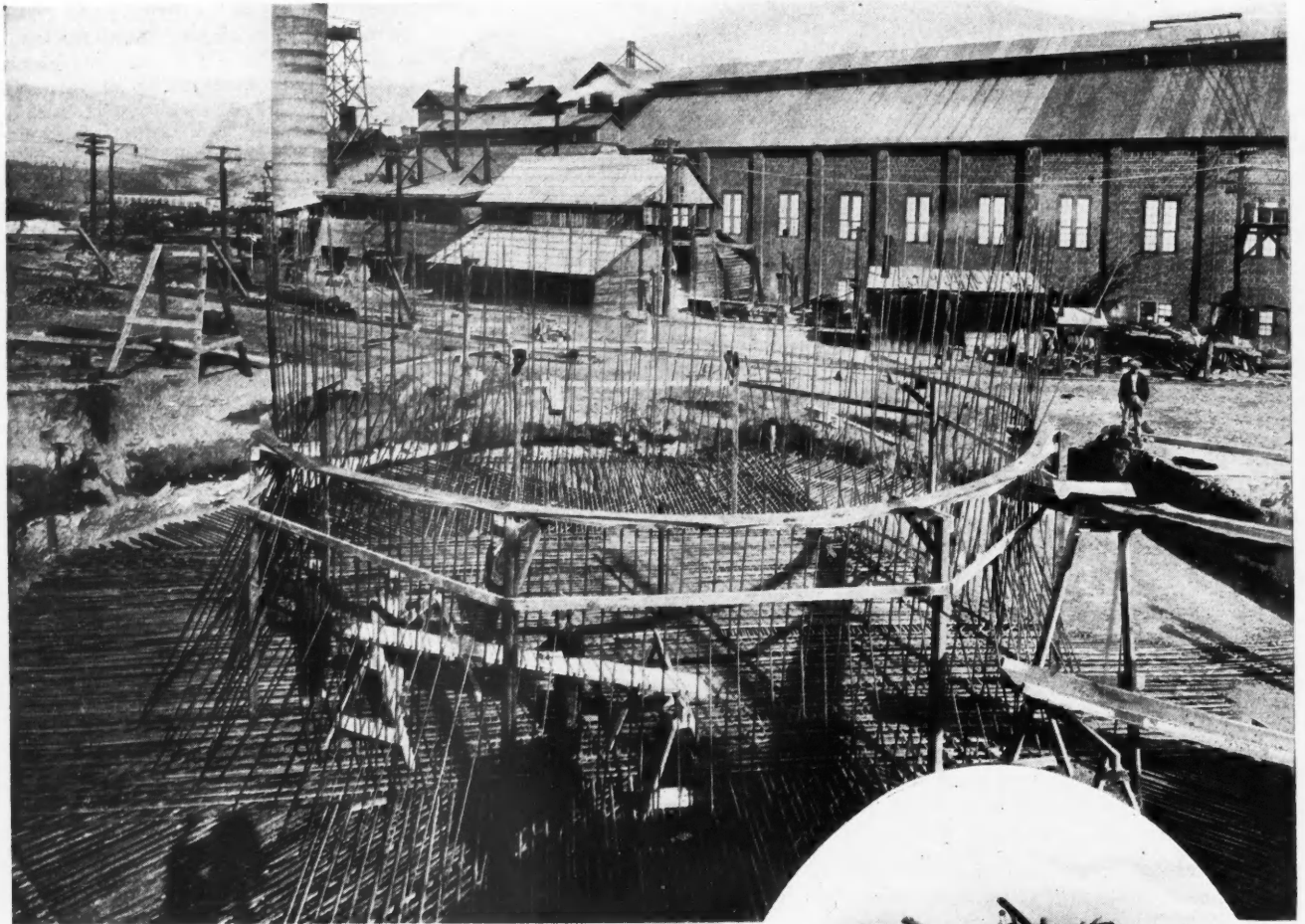
What Price College Education?

FOLLOWERS of what the sporting-page scribes call the "fight game" lay great store in the belief that "a good little man can never whip a good big man"; or, conversely, that a good big man always has a decided advantage over an equally good little man. If it is permissible to draw a comparison with the "manly art," a parallel may be found in the game of life: A college education gives much the same advantage as an extra twenty pounds of bone and muscle. Comparing men of equal native intelligence, alertness of mind, moral courage, and qualities of leadership, the one who has been through college has the advantage that the bigger prizefighter has over the smaller.

These observations are provoked by reading in the last issue of the *Mining Journal-Press* the sketches of the careers of three men who recently have been promoted to the position of assistant general superintendent, each in charge of a group of mines at Butte. The Anaconda company, with a view to gaining closer supervision, has rearranged its twenty-five mines into seven groups instead of four, thereby creating three new general superintendencies. These places were filled by selecting for promotion three of the mine foremen. Of the men available for advancement all were experienced miners and competent foremen. All had worked many years underground, most of them for long periods at Butte. Some of them had been through college and some had not. All of them had learned mining by mining; the college men had taken a post-graduate course in the well-known university of hard knocks. But the records show that the three men selected for promotion had degrees from the more conventional schools as well; one from the Michigan College of Mines, one from the Montana State School of Mines, and the third from the University of Minnesota. The most recent graduate left the Minnesota institution in 1911 and for fourteen years has been engaged in really learning mining engineering. No doubt some of the Anaconda's foremen who had never been in a college were endowed by Nature just as generously as the lucky three; as men they were just as good, but, like the smaller pugilist, they were handicapped by that lack of avoirdupois represented by spending four years in a college.

One of the best mine superintendents who ever sent a shift underground makes hard work of signing his name to the reports his assistant writes for him. But he is wise, very wise; more than once he has been heard to say with a mixture of envy and disdain, "If I had only had a few years in a school of mines I'd show some of these experts where to get off!"

World's Tallest Reinforced Concrete Stack Nearing Completion at Trail, B. C.



These views, with that on the front cover of this issue, show four different steps in the construction of the 400-ft. stack, now being erected for the Consolidated Mining & Smelting Co. of Canada by the Rust Engineering Co., of Pittsburgh, Pa. The chimney will be brick lined and will have a 21-ft. inside diameter at the top. The foundation block is 9 ft. high. Photos by courtesy of C. F. Wieland, San Francisco representative of the construction company.

Checking Supplies Underground at Pilares Mine

*A Smoothly Working Plan That Keeps Careful Control
Over the Use of Materials*

By E. Leland

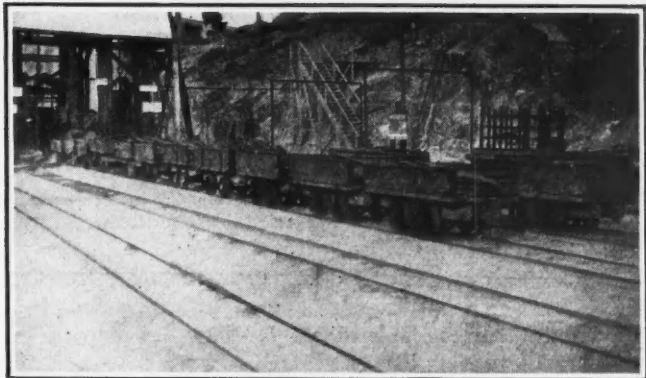
Mine Superintendent, Moctezuma Copper Co., Pilares de Nacozari,
Sonora, Mexico

ALL MINE SUPPLIES at the Pilares mine of the Moctezuma Copper Co., in Nacozari, Sonora, are purchased by the supply department. The local supply manager at the mine is directly responsible to the Nacozari supply department manager, and he, in turn, is responsible to the manager of the company. It is the duty of the supply department to keep on hand, and maintain at all times, an adequate supply of material, such as mine timber, powder, fuse, caps, carbide, fuel oil, drill steel, mine rails, pipe and pipe fittings, drilling machine repair parts, air and water hose, shovels, wheelbarrows, picks, hammers, and other material.

Through the various department heads and the mine superintendent, the supply department is kept advised of future plans in order that supply department stocks may be maintained at the proper amount, and everyone co-operates to guard against overstocking. The supply department operates without profit or loss, hence it is up to the mine department at all times to use the material in the warehouse. No drastic changes in operations that would cause any class of supply stock to become obsolete are considered until the stock of this commodity has been depleted. For instance, should the mine department decide to change the size or design of the shovels, or wheelbarrows, the superintendent would so advise the supply department and request that the next order placed for these articles conform with the new size or kind desired.

All special orders that cover new equipment, repairs for equipment, or special material for experimental or testing purposes, are ordered on a special material order blank which is either signed or "okayed" by the mine superintendent. The mine department takes the

To guard against the over-use of supplies and fix the responsibility for their use, the mine superintendent furnishes the supply department with a list of department heads authorized to sign requisitions for supplies.



Loaded drill-steel trucks for delivery to central mine tool rooms

Further to check the use of underground supplies and give the mine department the best supply service possible, an underground supply department has been organized, the operation of which will be described in detail.

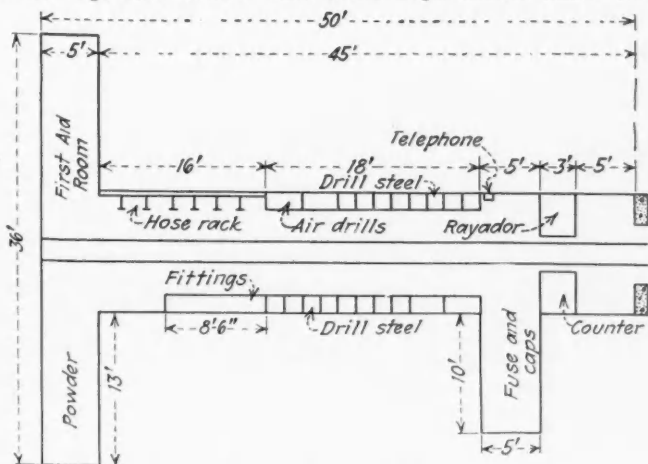
The accompanying sketches of the Pilares and Porvenir patios show the general arrangement of the supply warehouses, yards, and mine plant, and the accompanying flow sheets explain, in a general way, the flow of material from the time of its arrival in Nacozari until it is used in the mine.

The underground supply department takes care of and handles part of this flow of material from the time it is drawn from the supply department stock until it is placed on the mine level stations for delivery to the tool rooms and underground supply stations. From that time until the supplies are placed in the hands of the workmen who are to use them, the flow of material is in the hands of the division foreman.

Underground supply stations of standard design, centrally located, are maintained on each operating level. These tool rooms contain a stock of all material used in mining operations, excepting pipe, rails, and timber. Special storage places are provided for extra pipe and rails on the levels, and on the 300, 400, 500 and 600 levels timber stations have been cut near the New Pilares shaft for timber storage. Eventually, similar stations will be provided for the lower levels.

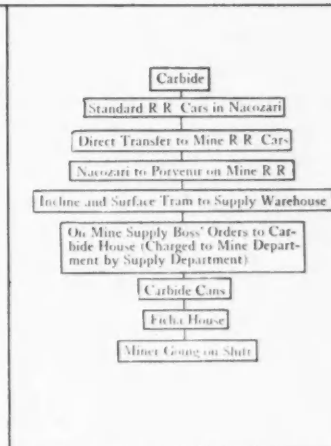
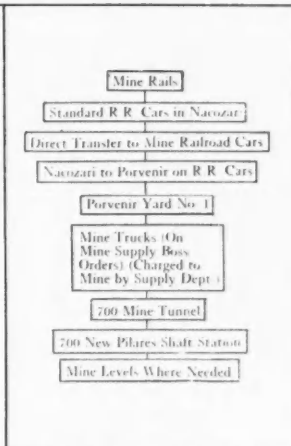
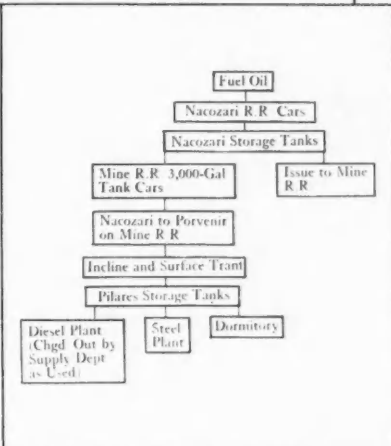
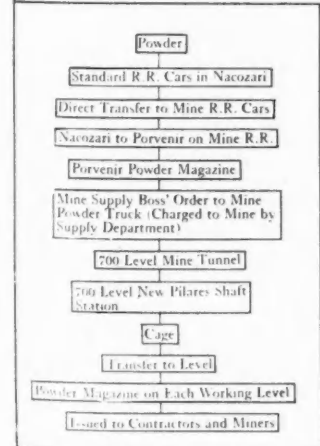
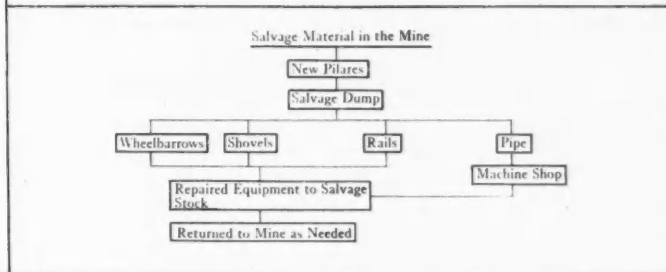
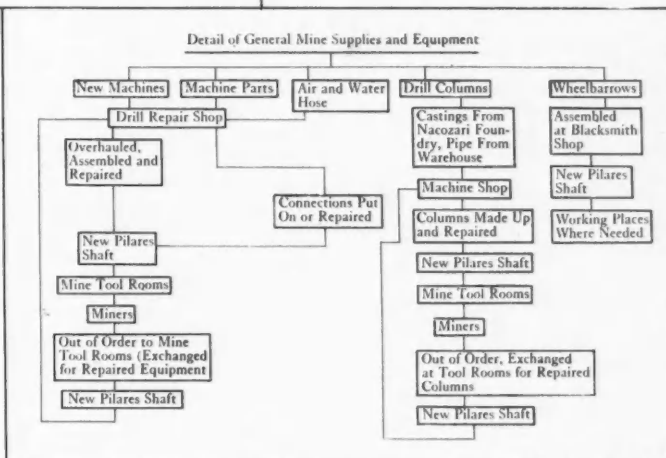
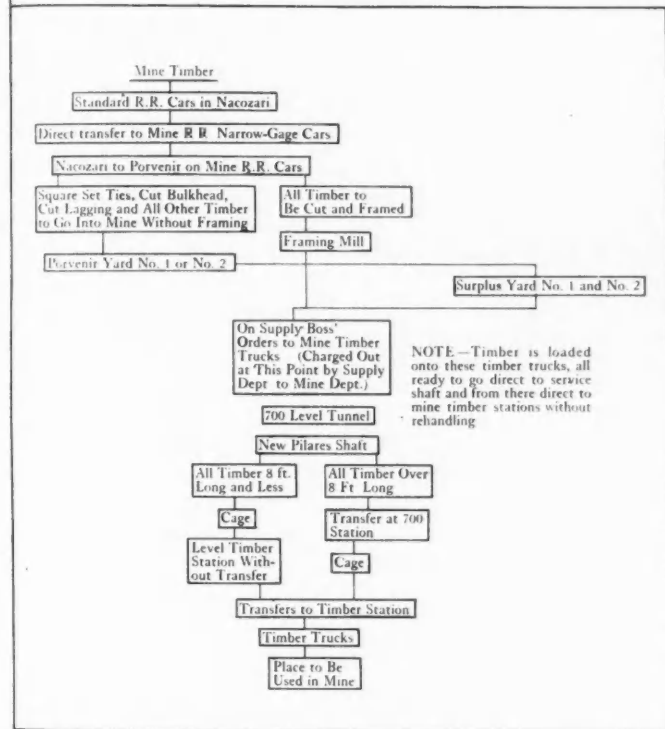
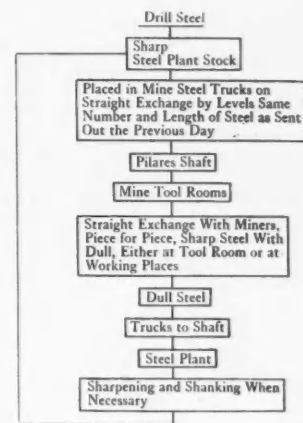
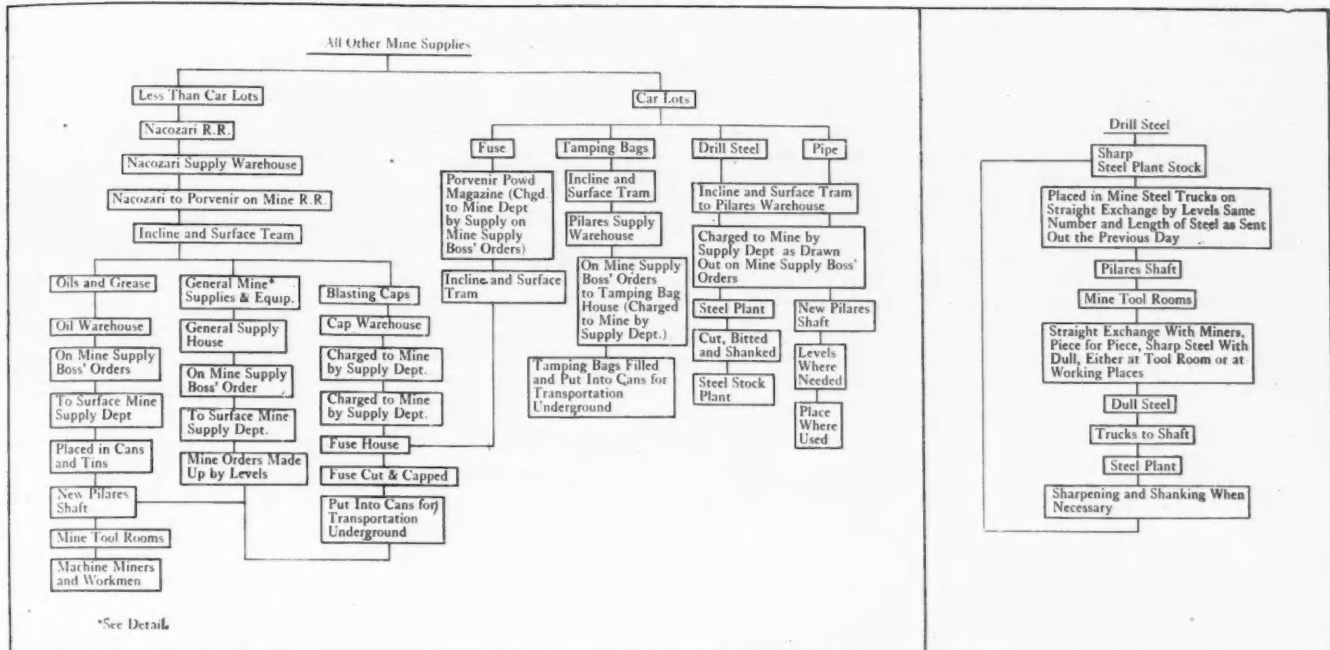
The personnel of the underground supply department consists of a supply boss, an assistant supply boss, warehouse man, surface nipper, tamping-bag man and carbide attendant.

The mine supply boss, who is the head of this department, is directly responsible to the general mine foreman. All orders for mine supplies are placed with the



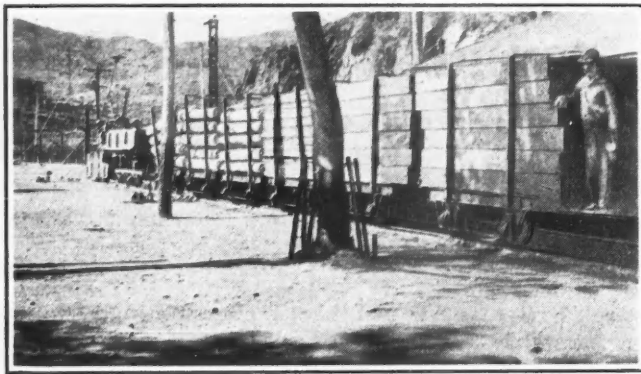
Standard underground tool room

responsibility on these orders and it is understood that material so ordered will not go into supply department stock, but will be charged out and put into service on its arrival.



How Material Is Distributed at Pilares Mine

These flow sheets show, in a general way, the path taken by the various articles of mine supplies and equipment from the time of its arrival in Nacozari until it is used in the mine



Loaded train of mine timber at Porvenir for delivery to mine timber stations without transfer

supply department by the mine supply boss. He also places with the master mechanic all orders originating within the mine department and "okayed" by the general mine foreman for material or equipment to be made or repaired by the mechanical department. In this way the mechanical department is able to plan its work and arrange the sequence of jobs according to their relative importance.

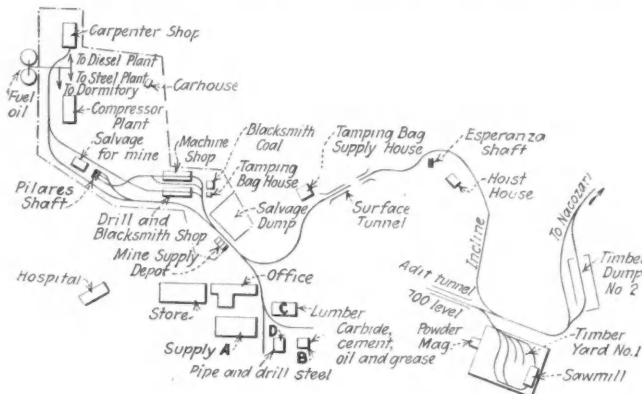
The chief duty of the underground supply boss, in addition to maintaining an efficient organization, is to determine the amount of extra material needed for each level and keep this stock replenished, for no matter how small the article, if not on hand when needed, it may cause a serious loss to the company. On the other hand, it is not a wise policy to have an oversupply of material on any level, as that means extra money tied up in material not in use.

The supply boss is not responsible for the use or issue of material from, or the operation of, the various tool rooms. However, he does act in an advisory capacity and notifies the division foreman of any over-issue or over-use of supplies, or any laxity on the part of the tool-room man and nipper.

The supply boss roughly checks the timber each day and writes orders on the supply department for timber needed. It is also necessary to see that a sufficient supply of material is kept on hand on the surface to supply the demands of the mine.

Another important duty of the supply boss is to see that all old material in the mine is salvaged and sent to the shop for repair and again returned to the mine for service; also that any material out of service in the mine is moved to some other part of the mine where it can be used.

The supply boss also compiles a monthly statement

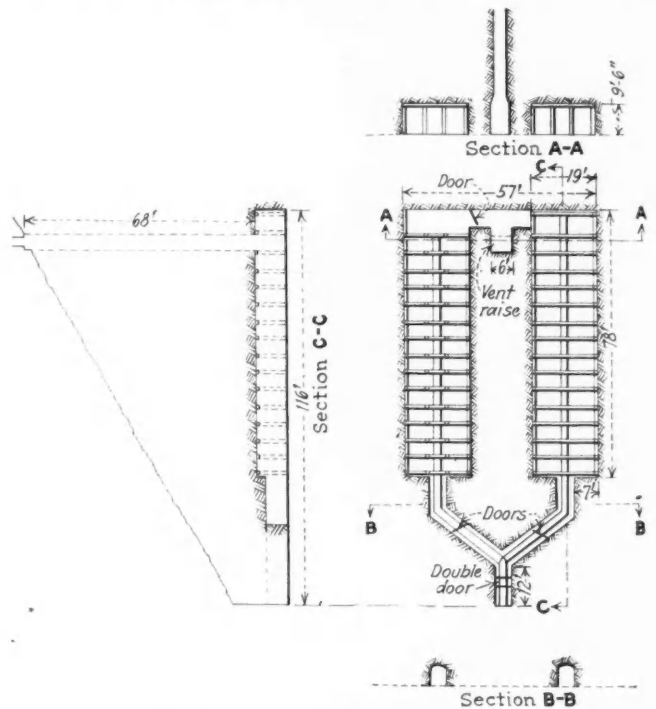


Diagrammatic sketch of Pílares patio and Porvenir patio

showing the total issue of supplies through each tool room. This information is turned over to the general foreman and mine superintendent, who are in this way kept informed as to the use of supplies by the various mine foremen.

The assistant supply boss closely supervises the arranging of supplies and their distribution, checks material ready in the shops, takes charge of the powder car and makes the proper distribution of powder to each level, and assists in the salvage work and the moving of material from one part of the mine to another. He also checks the tool rooms in the mine to determine if they have a sufficient supply of all articles on hand and to see that the powder and fuse accounts balance. When cars that have been sent out for repairs are ready, the assistant supply boss lowers them to the respective levels from which they came.

It is the duty of the man in the small warehouse to make a list each morning of material requested on the "requisitions for material" forms that were made out



Powder magazine at Porvenir

the previous day by the tool-room timekeepers and turn it into the supply boss, write requisitions for stock material, and arrange the material for distribution to the different levels in the mine. This material is put into empty carbide cans and the level to which it is going is marked on the cans. Fuse and caps are placed in lined carbide cans with hinged tops, in order that they may be locked and sent to the various levels. In the afternoon the warehouseman assists the fuse cutter and turns into the office a daily report of the fuse and caps sent into the mine, in order that the accounts of the various levels may be checked.

Articles to be sharpened or repaired are sent from the mine to the warehouse. From there they are taken to the shops and later returned for redistribution in the mine.

Each morning the surface nipper takes the machines and hose that have been sent out from the mine on night shift and delivers them to the drill-repair shop. He then takes any machines or hose that may be ready

other came. In the event of new work commencing and more steel being needed, the foreman will advise the supply department and the required number of pieces of extra steel will be issued. It is the duty of the underground supply department to see that the steel is properly exchanged and sent down in the morning immediately after the lowering of the shift.

At present there are two systems in vogue for distributing the steel underground; one, where the miner brings dull steel to the tool room and exchanges it, piece for piece; the other, where the tool nipper takes the sharp steel to each working place and delivers it directly to the miner. The latter has the advantage in that it saves the time of the miner going from the

working place to the tool room, and also saves the time he loses conversing with the friends he meets on the way. The first has the advantage over the second because all the dull steel is not returned to the tool room, whereas in the first case it must be brought in for exchange in order to obtain sharp steel. It is entirely optional with the foreman which system is used.

After the shift has been lowered in the morning the large cage is turned over to the supply department. Steel is sent down first, then machines and hose, followed by supplies and tamping material. In the afternoon any articles such as repaired cars are lowered and material brought to the surface for repairs.

Calculating Abandonments of Mining Plant

A Task Made Important by the Incidence of High Income Taxes

By Charles W. Tandy

Chief Designing Engineer, Utah Copper Co.

THE LEVYING of high federal income taxes in conjunction with the taxes assessed by the state necessarily has increased the duties of accountants for large industrial corporations, including mining companies. A part of these duties consist in calculation for the abandonment of retired structures and equipment. Generally, the original and the present values, in absence of definite figures, must be estimated. The making of "abandonments" based on an estimate is a duty commonly assigned to the engineering staff, the members of which are better versed in the arts and costs of construction than is the accountant.

To the veteran accountant, the principles of abandonments, from long acquaintance, are simple; but to the uninitiated, the principles are anything but clear. Experience has shown that most of the apparent stupidity exhibited by persons being instructed in the fundamentals of abandonments is due largely to faulty instruction rather than to dullness. There is no mystery to the subject when it is properly presented. To those members of engineering staffs who are not familiar with the procedure in making abandonments, the following brief discussion should be illuminating.

According to the rulings of the Interstate Commerce Commission, the abandonment of a property consists of four elements—namely, the cost, the depreciation, the salvage value, and the demolition charges. These

elements, when properly combined, show the profit or loss on the transaction.

The cost of property includes all material, labor, supervision, and overhead charges that are justly chargeable during construction and subsequently as increasing the value of the property. If the subsequent improvement is relatively small, both in amount and by comparison with the first cost, it is permissible to allow the amount to be absorbed in maintenance charges. Just what limitations are to be placed on the word "small" is, to a considerable extent, a matter of opinion and "policy"; but the permission must not be construed as a license to build up property values in detachments at the expense of maintenance. Ledger values are preferable to estimated values, and should be used unless it is evident that the ledger values are false.

Depreciation is the decrease in valuation after use. Its measure is determined by the actual and nominal service, which varies with the type of property. All methods of calculating depreciation are subject to criticism, in that the depreciable period covered is largely a matter of opinion. The method of a uniform yearly rate of depreciation for all property, in theory, is not strictly correct, but it has the great advantage of simplicity. The law recognizes 5 per cent per year as fair. Whatever amount is assigned, it must not be

Golden Dream Copper Co. Engineering Department of Mills

Estimated Abandonment of Two 400-hp. "Ajax" Boilers, in Boiler Room. Estimate No. 276 for Filters at Juniper Plant

Made by S. K. F.

Date 5/1-25

Correct:

Checked by U. M. C.

Date 5/3-25

Roy P. Biv,

Chief Draftsman

Item	Ledger or Estimated Value			Salvage		Depreciation		Demolition Expense		Total Chargeable Profit and Loss	
	Quantity	Labor	Material	Total	Quantity	Value	Per Cent	Value	Labor		Material
Grading	72 cu. yd.	\$108.00		\$108.00		None	60	\$64.80			\$43.20
Concrete	52 cu. yd.	208.00	\$416.00	624.00		None	60	374.40			249.60
Superstructure											
Brick	70 M	1,416.23	2,100.00	3,516.23	35 M	\$350.00	60	2,109.74	\$210.00		1,266.49
Mechanical Equipment											
Boilers	2	500.00	7,840.60	8,340.60	Salvage	5,125.00	60	5,004.36	200.00	\$25.00	*1,563.76
Stokers and Pumps		225.00	2,826.12	3,051.12	Dprc. Val.	1,220.45	60	1,830.67	100.00		100.00
Engineering and Supervision				1,920.10		None	60	1,152.06			768.04
Totals		\$2,457.23	\$13,182.72	\$17,560.05		\$6,695.45		\$13,536.03	\$510.00	\$25.00	\$863.57
			Plus \$1,920.10								

* Pr. fit.

and delivers them to the steel trucks for the various levels from which they were taken. As soon as the material is ready in the warehouse, it is delivered to the various levels and is followed by the tamping material. The nipper then brings to the surface all machines, hose, and other material sent out for repairs and also the empty carbide cans sent out to be used in sending down mine supplies.

The fuse cutter cuts the fuse into the required lengths, places the caps, and crimps them. He uses a fuse cutter and cap crimper and can cut, cap, and crimp 1,800 pieces of fuse per day.

The tamping-bagman fills 1x8-in. cylindrical paper cartridges with dried screened flotation slimes, closes the ends of the cartridges and puts them into cans to be sent into the mine. One man is able to fill 925 tamping-bags per day.

The carbide man fills 9-oz. carbide cans with carbide. These cans are issued to the miner at the "ficha" office as he goes on shift and each man must turn in his empty can on going off shift. If he fails to do so, it is charged to his account and a new one is issued. One man is able to fill 850 cans of carbide per shift.

A standard form is used for requisitioning most of the material issued to the miner from the tool rooms on each level. The timekeeper on each level fills out one of these forms each evening before going off shift and turns it over to the supply boss. In the morning the requisitioned material is sent down. If a miner needs a new air hose, shovel, or pick, the old one must be turned into the tool room before a new one is issued. It becomes the duty of the underground supply department to see that tool rooms do not become flooded with material and also that the straight exchange system is adhered to as closely as possible.

Any material needed, such as frogs, switch throws, rail points, and chute doors, is requisitioned by the foreman. The supply boss writes the orders for this work and delivers them to the shops. These requisitions are checked daily, and material that is ready, if satisfactory and made according to specifications, is sent into the mine. Any stock material, such as rails

or rope, is ordered from the warehouse and delivered to the levels.

Powder is ordered twice a week by the timekeepers on each level. These orders are filled at the main powder-magazine at Porvenir and sent into the mine on Tuesdays and Fridays. The supply department takes charge of the car upon its arrival at the 700 station and makes proper distribution to each level.

Fuse and blasting caps are ordered as needed and sent to the fuse-cutting house on the surface, where the fuse is cut into proper lengths, the caps placed, crimped, and held in readiness to be sent to the different levels as requested on the "form for ordering material."

The slimes for tamping are ordered from Nacozari through the warehouse at Pilares. The tamping bags are ordered directly from the warehouse. The bags are filled at the tamping house on the surface and sent to the small warehouse for distribution in the mine.

The timber for the mine is ordered every day by the supply boss. He roughly checks the timber in the mine each day and writes the orders according to the needs of each level. These orders are written in the evening in order that they may be ready for the mill the first thing each morning. In ordering timber, consideration is given to the fact that the mill can operate much more efficiently if only one kind of timber is ordered out and framed each day, such as square-set posts one day and square-set caps the next. The stock timber can be ordered any time as needed.

On the first of each month a timber inventory is taken of the timber not in use in the mine. This report is turned in to the time office in order that the timber account may be balanced. An inventory of all material in the mine is taken twice a year in order to obtain data for records and statements.

Dull steel on each level is brought to the stations by the steel nippers and is hoisted and taken to the blacksmith shop during the night shift. In the morning it is counted and exchanged, piece for piece, for sharp steel by men in the shop, and the sharpened steel is returned to the respective levels from which the

Form for Ordering Material

Level			Date					
Article	Stock	Needed	Article	Stock	Needed	Article	Stock	Needed
Pipe			Nails and Track Material			Spuds	6	
Nipples, 1/2 in.	10		Wire nails, 10d, kilos.	2		Solid wrenches for columns.	2	
Valves, 1/2 in.	5		Wire nails, 40d, kilos.	40		Steel pullers.	2	
Bushings, 1x1 in.	10		Wire nails, 60d, kilos.	40		Tamping sticks.	6	
Nipples, 1 in.	10		Track spikes, 3/8x2 1/2 in. K.	40		Blowpipes.	2	
Valves, 1 in.	10		Track spikes, 3/4 in. K.	40		Punches for cleaning steel.	6	
Ells, 1 in.	5		Track bolts, 1/2x2 1/2 in. K.	40		Oil cans.	2	
Unions, 1 in.	10		Track bolts, 1/2x3 in. K.	40		Grease guns.	2	
Tees, 1 in.	5		Fish plates for 16 lb. rails.	24		Powder sacks.	2	
Plugs, 1 in.	5		Fish plates for 25 lb. rails.	24		Scrapers.	2	
Couplings, 1 in.	5					Ladder rungs.	12	
Bushings, 1 1/2x1 in.	5		Oils and Fuse			Pipe clamps, 1/2 in.	6	
Valves, 1 1/2 in.	5		Fuse of ft.			Pipe clamps, 1 in.	6	
Nipples, 1 1/2 in.	5		Fuse of ft.			Pipe clamps, 1 1/2 in.	6	
Ells, 1 1/2 in.	5		Fuse of ft.			Rubber sheet packing.		
Unions, 1 1/2 in.	5		Tamping, kegs.	6		Bolts for pipe clamps.	12	
Tees, 1 1/2 in.	5		Grease, kilos.	5		Shovels.	6	
Plugs, 1 1/2 in.	5		Castor machine oil, gal.	10		Picks.	6	
Couplings, 1 1/2 in.	5		Black oil, gal.	5		Hammers, 10 lb.	6	
Forms			First Aid			Point bars.	6	
Cars of ore.			Roller bandages, 1 in.	6		Other Material Needed		
Notice of change.			Roller bandages, 2 in.	6				
Permission to lay off.			Roller bandages, 3 in.	6				
New carters.			Triangular bandages.	10				
Powder used, days pay.			Gauze compresses.	6				
Powder used, contract.			Splints, sets.	1				
For ordering material.			Cotton batting.					
"Split sheets".			Miscellaneous					
Shipping tags.			Arm bolts for columns.	4				
Accident reports.			Saddle bolts for columns.	2				
Scratch pads.			Nuts for columns.	4				

NOTE: This list with the numbers under heading "stock" is the standard list of material which is supposed to be in each underground tool room. When material is ordered on this sheet, quantities are put in the "needed" column to bring stock up to what it should be.

forgotten that the amount is an estimated quantity, and is to be regarded as value received, which allows a like amount to be set aside from the profits as a sinking fund for replacement. Further, as long as property remains in service, it is not proper to depreciate more than 100 per cent. In time past, the government allowed a depreciation up to 80 per cent for property actually in service, since the contention was that any property in service is certainly worth 20 per cent of the original cost.

The salvage value of equipment that has had service is its second-hand value, which might be greater or less than its depreciated value. When equipment is to be abandoned for the purpose of transferring the amount from one account to another, it is proper to make its salvage value the same as its depreciated value. Some companies forbid making the salvage value exceed the depreciated value, as they wish to show a profit in their salvage department. In every case, when a sale is made from salvage stock, the difference between the sale price and the assigned salvage value is to be charged to the profit and loss account. The estimation of the salvage value depends upon the ultimate disposal to be made of the salvage; naturally, if the disposition is for salvage stock with no immediate sale in sight, one would be inclined to give the salvage a low valuation.

A demolition charge is the estimated cost of removing a property from its present site, with sufficient neatness as to be pleasing to the eye, so that a replacement by other equipment may be made. In other words, it is a wreckage and clean-up charge, which in application is always kept a minimum. The procedure necessary to make an abandonment follows:

From the accountant's viewpoint:

$$\begin{array}{r} A \\ \text{Ledger Value} \end{array} \text{ minus } \begin{array}{r} B \\ \text{Depreciation} \end{array} = \text{"Book" Value}$$

$$\begin{array}{r} C \\ \text{Salvage Value} \end{array} \text{ minus } \begin{array}{r} D \\ \text{Demolition} \end{array} = \text{"Realized" Value}$$

$$\text{"Book" Value} \text{ minus "Realized" Value} = \begin{array}{r} L \\ \text{Loss (or Profit)} \end{array}$$

In symbolic form the expression is:

$$(A - B) - (C - D) = L$$

From the manager's viewpoint:

$$\begin{array}{r} A \\ \text{Ledger Value} \end{array} \text{ plus } \begin{array}{r} D \\ \text{Demolition} \end{array} = \text{"Investment"}$$

$$\begin{array}{r} C \\ \text{Salvage Value} \end{array} \text{ plus } \begin{array}{r} B \\ \text{Depreciation} \end{array} = \text{"Return"}$$

$$\text{Investment} \text{ minus } \text{Return} = \begin{array}{r} L \\ \text{Loss (or Profit)} \end{array}$$

In symbolic form the expression is:

$$(A + D) - (C + B) = L$$

For use on a calculating machine the symbolic form is:

$$A + D - C - B = L$$

To make the above clear, let us take, for example, the abandonment of a Ford truck, which after four years of service was considered suitable for retirement. In order to enhance the salvage value the truck was repainted.

From the first expression:

<i>Ledger Value</i>	<i>Depreciation</i>		<i>Book Value</i>
\$600	4 yr. @ 20% = \$480	=	\$120
<i>Salvage Value</i>	<i>Demolition</i>		<i>Realized Value</i>
Sale Price, \$200	Repainting \$40	=	\$160
<i>Realized Value</i>	<i>Book Value</i>		<i>Profit</i>
\$160	\$120	=	\$40

From the second expression in symbolic form:

$$(\$600) \text{ minus } \text{Repainting } (\$40) = \text{Profit } (\$40)$$

$$(\$600) \text{ plus } \text{Repainting } (\$40) = \text{Profit } (\$40)$$

In the making of abandonments it is very important that the work be done methodically. A convenient form is indicated in the accompanying illustration.

The demolition of a building or similar property is to be regarded as complete when it has been razed to the ground. The foundation has no salvage value or demolition charge. In this connection it cannot be too strongly emphasized that an abandonment is not closed until the structure or machine is removed from its site or rendered entirely unsuitable for a new or former use. Engineering and supervision charges have no salvage value, except when the property is salvaged as a unit without being broken into parcels.

Before closing this subject, a few words upon the ethical phase of an abandonment will not be amiss. The "juggling" of the four makeup elements of abandonments, each in itself being estimated to indicate a profit or loss, involves experience, training, intelligence, and honesty. The duty to your government, the loyalty to your employer, and your self-respect are at stake. Place a high valuation on the latter, and the duty to your government and the loyalty to your employer will automatically adjust themselves. Finally, remember that all estimates are liable to error, and that, although honestly made abandonment is not necessarily a correct one, a dishonest abandonment surely is not a correct one.

A New Term to Measure a Hard Winter

The "degree-day" is a new term invented by gas and fuel engineers for the purpose of measuring heating requirements, and appears for the first time in "House Heating," a book recently published under the auspices of the American Gas Association. With the increasing demand for city gas for house heating and industrial heating purposes, it became necessary to have some word or phrase that would enable engineers to make comparisons between heating loads under different climatic conditions or at different points. The "degree-day," which was the result, is the product of a degree of temperature and a time factor of one day.

In studying actual domestic heating conditions, the American Gas Association determined that the minimum temperature of bodily comfort in the home is passed when the mean daily temperature falls below 65 deg. F. In other words, below this point heat is required, as the average day-time temperature in the house drops below 70 deg. F.

If, then, we have a mean daily temperature of 60 deg. F., it is evident that, for this day, we can measure the heat requirements by the figure "5 deg.-days," whereas, had the mean temperature been 55 deg. F., the requirement would be measured by "10 deg.-days," or would be twice as great. For a week or a month or a heating season, the aggregate heating load of any locality may be expressed in units that permit comparison with that of any other point. Likewise the heating requirements at any given place during the heating season may be compared with those of any other heating season by the "degree-day." So a "mild winter" or a "hard winter" becomes definable in accurate units that may be translated into B.t.u. Basing these units on the very accurate data of the Weather Bureau, a high degree of accuracy results.

The Cost of Producing Copper

More Than 60 Per Cent of World's Supply Now Put on Market for Less Than 10c. Per Pound, Excluding Depletion, but Metal Should Sell at 15c.

By Arthur Notman

Consulting Engineer, New York

OVER THE LIFE of any ore deposit, the cost of producing the metals extracted therefrom is measured by the difference between the receipts from sales of product plus cash subscriptions for securities issued, less expenditures for property, plant and equipment, development, mining, milling, smelting, transportation, selling, administration, taxes, etc. Usually, this difference is distributed wholly or in part, during the exhaustion of the deposit, in bond interest and dividends. Any undistributed portion will appear as an excess of current assets over current liabilities. It follows logically that over a period of years the bond interest and dividends paid per unit of product, deducted from the price received per unit, plus or minus any change in net current assets during the period, gives the true measure of the average cost to produce during that period, with the exception of the item to cover amortization of capital. In other words, all capital expenditures, including the original investment, must eventually be taken up in cost, prior to exhaustion of the deposit. If this were not done, there would be the spectacle of a property that had paid bond interest and dividends throughout its life showing book assets representing the cost of property, development, plant and equipment but no more income forthcoming from production and hence no means of meeting the balancing liabilities for bonds, stock, etc. The only capital expenditures that may be exempted from this category are those that result in the acquisition and development of additional reserves of ore; all others must be met, in the final analysis, from the sales of product before there is any real profit. Though these facts should be constantly in the minds of mining investors, they are rather too easily lost sight of in periods of extraordinary profits. However, they never fail to present themselves with renewed vigor in times of depression for the industry as a whole or any particular unit therein.

BOND ISSUES RARELY RESORTED TO

Prior to the development of the domestic "porphyries," the copper industry, so far as United States interests were concerned, was financed almost entirely by stock issues. To attract sufficient capital to meet the large advance expenditures for the development and equipment of these mines, some relatively small issues of convertible bonds were sold, which, however, were all converted into stock a few years after the properties had been established on a producing basis. In the development of the large South American units, a still greater proportion of the necessary capital was derived from the sale of bonds. These, too, have been converted or retired, so far as the producing companies are concerned, with the exception of \$35,000,000 of 6 per cent bonds of the Chile Copper Co. still outstanding.

Some of the smaller North American units still have small funded debts outstanding. With the entrance of Anaconda into the manufacturing business in the East

through its purchase of the American Brass Co. and its expansion through acquisition of control of the Chile Copper Co., the amount of funded debt outstanding against that portion of the industry controlled in the United States has largely increased. This condition makes it necessary, in comparing present with past results, to include the interest paid on this debt as part of the margin between operating cost and selling price, as well as the dividends paid.

It would be difficult to compile the capital expenditures made by the industry since its inception, but a search of the records of such representative companies as the Calumet & Arizona, Inspiration Consolidated, Miami Copper, and Utah Copper reveals that approximately 75 per cent of their earnings after depreciation have been available for distribution, or 70 per cent of their earnings before depreciation charges. In other words, a dollar of operating profit in the past was distributed about as follows:

Depreciation charged	7c.
Bond interest and dividends paid.....	70c.
Capital expenditures	23c.

The purpose of these capital expenditures in general was to lengthen the life of the operations by the acquisition of new reserves of ore, or the improvement of method and equipment to reduce cost or lengthen life by lowering the grade of material that could be profitably treated, or for the expansion of capacity to increase the volume of annual earnings.

To what extent these objects have been accomplished only a careful and intelligent study of the individual properties would reveal. Considerable evidence, however, supports the opinion that the charges for depreciation have been entirely inadequate to meet that portion of the capital expenditures on plant which have been necessary to maintain relative competing power in operating costs, aside from expansion of output or increased life.

In the accompanying table I have tabulated, in the order of their performance, the bond interest and dividends distributed per pound of copper produced by periods since 1911 for a group of companies that has made 60 per cent or better of the world's output since that year. In addition, for 1924, five columns are shown: (1) the earnings per pound reported available for distribution; (2) the bond interest and dividends paid per pound produced; (3) earnings available for stock per share; (4) current dividend rate per share, and (5) the total changes in net current assets for 1924. At the bottom of the table I have shown the average prices received for the metal in the various periods, and by subtracting therefrom the amount distributed, have arrived at an average cost per pound, exclusive of return of capital or depletion. It should be noted that in calculating the average margin distributed for the group, I have corrected for all duplications of production, earnings, and distributions due to interlocking ownership. In calculating the average cost

for 1924, one must first determine what proportion of these earnings can be safely distributed. If, to the bond interest and dividends paid, is added the increase in net current assets, and the production is then used as a divisor, one arrives at a figure of 3.35c. per lb., or practically the same as the reported earnings. The amount actually distributed in the year was 2.75c., or 82½ per cent of the earnings.

DEPRECIATION CHARGES RIGHTLY INCREASED

Since the enactment of the income tax law, and more particularly in the past few years, the companies have had a much clearer understanding of the large amounts of money required to keep their plants and methods up to date. As a result, depreciation charges have been largely increased and brought more in line with the actual depreciation cost shown by history. In the past only about 6½ per cent of income before depreciation was charged to that account, while in 1924 the total amount charged as depreciation was 23.7 per cent of income, or 1.04c. per lb. If this practice be maintained, it would be reasonable to expect that in the future 95

Company	Bond Interest and Dividends Paid Per Lb. Produced 1924, Cents	Earnings Available for Stock Per Share 1924, Dollars	Current Dividend Rate Per Share June, 1925, Dollars	Increase or Decrease in Net Current Assets During Year 1924, Dollars
Cerro de Pasco.....	6.38	5.38	4.00	3,653,287
Mother Lode.....	5.97	0.84	0.75	325,602
Chile.....	6.15	2.58	2.50	-1,845,288
Kennecott.....	3.15	5.11	3.00	-1,071,470
U. V. X.....	5.93	2.34	2.00	1,143,181
United Verde.....	3.45	N.A.	N.A.	N.A.
Anaconda.....	3.78	2.36	3.00	-5,568,705
Arizona Commercial.....	3.41	1.10	1.00	99,510
Utah.....	3.03	5.55	4.00	804,404
Braden.....	0.23	2.03		6,586,341
Magma.....		2.34	3.00	226,439
New Cornelia.....	2.11	1.14	0.75	906,221
Nevada.....		0.84		425,655
Calumet & Arizona.....	1.50	2.61	4.00	16,703
Inspiration.....		1.44	2.00	920,043
Copper Range.....	2.62	0.72	1.00	-110,502
Miami.....	2.47	1.49	1.00	576,705
Calumet & Hecla.....	1.34	0.62	0.50	N.A.
Mohawk.....		2.15		66,604
Phelps Dodge.....	1.14	4.18	4.00	989,434
Ray Chino.....		0.32		444,759
Granby.....	0.78	deficit		N.A.
Old Dominion.....		0.34		172,916
Greene Cananea.....		0.11		N.A.
Quincy.....		deficit		N.A.
East Butte.....		N.A.		N.A.
Average.....		2.75c.		

In above table, N.A. stands for not available, N.P. for not producing, and where no figures appear no interest or dividends were paid. Figures include proportion of production, interest, dividends and earnings (1924) represented by stock ownership in other copper-producing properties. Where recent consolidations have taken place, figures for earlier periods have been combined for comparison with present performance. Earnings are in all cases after depreciation charges. In the case of the Lake Superior companies, which do not report depreciation and depletion separately, I have estimated depreciation at 1c. per pound. There are two other cases where I have been obliged to estimate this figure for similar reasons. If these estimates are incorrect, the 1924 earnings per pound and per share will be in error. In these cases I have used the figures of the preceding year which were available. All data are taken from the published annual reports of the companies. All income from whatsoever sources derived has been credited against cost of producing lake, electrolytic or standard casting copper. In the case of Anaconda, this includes gold, silver, lead and zinc production, custom smelting, wire drawing, brass manufacturing, etc. Cerro de Pasco includes production of about 1 oz. silver to every pound of copper. Other companies, similar credits constitute very much smaller proportion of income.

Company	1911-15 Cents	Company	1916-20 Cents
Nevada Consolidated.....	5.10	Mohawk.....	9.05
Phelps Dodge.....	4.91	Copper Range.....	8.71
Calumet & Hecla.....	4.78	Inspiration.....	8.53
Calumet & Arizona.....	4.66	Utah.....	8.30
United Verde.....	4.25	Nevada Consolidated.....	7.84
Old Dominion.....	4.00	Phelps Dodge.....	7.58
Mohawk.....	3.92	Chino.....	7.46
Anaconda.....	3.89	Miami.....	7.16
Utah Copper.....	3.66	United Verde.....	6.68
Miami.....	3.46	Calumet & Arizona.....	6.43
Chino.....	3.38	Anaconda.....	6.29
Copper Range.....	3.31	Ray Cons.....	6.15
Quincy.....	2.52	Cerro de Pasco.....	6.12
Magma.....	2.45	Kennecott.....	6.02
Ray Consolidated.....	2.09	Calumet & Hecla.....	5.81
Greene Cananea.....	1.99	Greene Cananea.....	5.73
Granby Consolidated.....	1.90	U. V. X.....	5.38
Inspiration.....	N.P.	Quincy.....	5.22
Kennecott.....	N.P.	Old Dominion.....	4.79
Mother Lode.....	N.P.	Arizona Commercial.....	3.71
New Cornelia.....	N.P.	Magma.....	3.54
U. V. X.....	N.P.	Granby Consolidated.....	3.42
Arizona Commercial.....		Chile.....	2.64
Braden.....	2.82	East Butte.....	1.65
Cerro de Pasco.....	N.A.	Braden.....	1.55
Chile.....	N.P.	New Cornelia.....	0.92
East Butte.....		Mother Lode.....	
Average price.....	15.37	Average price.....	23.35
Average margin, omitting duplications.....	3.76c.	Average margin, omitting duplications.....	7.24c.
Per cent of gross income.....	24.5	Per cent of gross income.....	31
Average cost.....	11.61c.	Average cost.....	16.11c.

Company	1921-23 Cents	Company	1924, Cents
U. V. X.....	7.02	Cerro de Pasco.....	8.45
Mother Lode.....	6.53	Mother Lode.....	6.66
United Verde.....	4.93	Chile.....	6.30
Chile.....	4.92	Kennecott.....	5.34
Anaconda.....	4.63	U. V. X.....	5.30
Utah.....	3.93	United Verde.....	N.A.
New Cornelia.....	3.61	Anaconda.....	5.17
Kennecott.....	3.60	Arizona Commercial.....	3.74
Calumet & Arizona.....	3.22	Utah.....	3.61
Braden.....	3.04	Braden.....	3.58
Magma.....	2.72	Magma.....	3.39
Miami.....	2.42	New Cornelia.....	3.21
Phelps Dodge.....	2.40	Nevada.....	2.39
Cerro de Pasco.....	2.05	Calumet & Arizona.....	1.96
Calumet & Hecla.....	1.66	Inspiration.....	1.88
Mohawk.....	1.47	Copper Range.....	1.88
Copper Range.....	1.41	Miami.....	1.84
Inspiration.....	1.02	Calumet & Hecla.....	1.65
Arizona Commercial.....	0.89	Mohawk.....	1.62
Granby Consolidated.....	0.61	Phelps Dodge.....	1.19
Chino.....		Ray Chino.....	0.73
East Butte.....		Granby.....	0.53
Greene Cananea.....		Old Dominion.....	0.47
Nevada Consolidated.....		Greene Cananea.....	0.02
Old Dominion.....		Quincy.....	0.03
Quincy.....		East Butte.....	N.A.
Ray Consolidated.....			
Average price.....	13.68	Average price.....	13.02
Average margin, omitting duplications.....	2.94c.	Average margin, omitting duplications.....	3.34c.
Per cent of gross income.....	21.6	Per cent of gross income.....	25.6
Average cost.....	10.74c.	Average cost.....	9.68c.

per cent or more of the income after depreciation might safely be distributed. On the basis of the margin of 3.34c. earned in 1924, 3.17c. could be distributed, or 24.3 per cent of gross income—a figure in accord with history. From this, one can arrive at an average cost for 1924 of approximately 10c. per lb. for the group considered. The estimated cost for the pre-war period is doubtless somewhat too high, and correspondingly that for the war period too low. Unquestionably the porphyry companies, which were then new in the business, were wary of distributing earnings until satisfied that they had accumulated ample working capital. Distributions during the war period probably exceeded a safe proportion of current earnings. However, after due allowances for these factors, it is evident that the average cost of copper for the group in 1924 was more than 1½c. per pound lower than in the pre-war period. The distributable margin of 3.17c. is equivalent, however, to only 2.06c., measured in pre-war purchasing power. Therefore, to restore the pre-war margin of distribution (3.75c. to 4.25c.) the metal would have to sell at 14.75@15.25c. per pound. There is little reason to suppose that such a price level would have any serious effect on consumption. With European recovery the price may be expected to rise to that level.

Before admitting the logic of such a conclusion, the history of production and consumption should be studied. The results of such a study may be found in the following articles that I have written: "The Proposed Tariff on Copper," in *Mining and Metallurgy*, for March, 1925, and one on the general copper situation in the International Monthly Section, for March, 1925, of the *Daily Metal Reporter*. The facts there set forth indicate that the world's annual requirements by

1935 would increase about 65 per cent, or 2,000,000,000 lb., providing the rate of increase continues as in the past. A study of the assured, probable, and possible increases in annual production might appear as follows:

Companies and Countries	Increase (Lb.)
Andes Copper Co.....	200,000,000
Braden Copper Co.....	100,000,000
Cerro de Pasco.....	50,000,000
Chile Copper Co.....	200,000,000
Katanga.....	500,000,000
Northern Rhodesia.....	150,000,000
United States.....	200,000,000
All others.....	200,000,000
Total increase.....	1,600,000,000

These figures represent capacity production for the Andes company's mines and plant as now planned; a 60 per cent increase for Braden; 50 per cent increase for Cerro de Pasco; 100 per cent more for Chile; 250 per cent increase for Katanga; a return to war-time figures for the United States; a substantial production from Rhodesia; and 15 per cent increase in the rest of the world. This would leave an apparent shortage of about 400,000,000 lb., or 9 per cent of total requirements. To meet these needs, a substantial increase in selling price from the present level would be imperative. Such a rise would doubtless restore not only the pre-war margin of 3.75@4.25c., but enough more to make up for the loss in purchasing power due to depreciation of the dollar.

COPPER PRICES LIKELY TO ADVANCE

Some may claim that there will be a slowing down in the rate of expansion of consumption so that one is not justified in assuming that the rate that has held good for the last eighty years will continue for even another ten years. They may point to the fact that there has been such a slowing down in the rate of increase in steel consumption in the United States since the task of establishing the main transportation lines of the country and the main mass construction of the cities has been completed. Although this is a sound argument so far as domestic consumption is concerned, it does not hold good for the world as a whole. But returning to the case of copper: the promised expansion of the electrical industry in the United States, but more especially abroad, backed up by the relative per capita domestic and foreign consumption, might, not unreasonably, be interpreted to mean an even higher rate of increase in the next ten years. As pointed out in the articles referred to, the ten years 1870-80, following the close of the Civil War and the Franco-Prussian War, was marked by a decline in the rate of increase to one-half the average, or about 32 per cent. It was followed, however, in the next ten years by the record rate of 86 per cent. The ten years ended with 1924 show a similar and even greater decline, the rate falling to 26 per cent, in spite of the fact that domestic consumption doubled during the decade. I am inclined to believe that history will repeat itself and that there will be an increase in the rate of expansion to at least the average of the past, and a gradual stiffening in the price of copper over the next ten years. The increase in dollars of earnings may be lessened by some increase in their purchasing power, but the net result will be a real increase in the value of the earnings to the pre-war level as measured in terms of other commodities.

Many divergent views have been publicly expressed in recent months as to the cost of producing copper and the value of copper production as an industry. It goes without saying that such widely different opinions are

based on different data. As stated above, the total cost of producing copper from any deposit is not known until the deposit is exhausted. Published statements necessarily give actual figures for partial costs only; the additional items may be omitted entirely or estimated. These estimates may be high or low, depending on the particular bias of the authority, or the object to be served by the statement. The result is confusing. Still, the history of the industry does furnish a mass of indisputable evidence on the question, all of which indicates that costs are now substantially lower than in pre-war times; in other words, intelligent management has succeeded, with the aid of greatly increased capital investments in plant, in offsetting the handicaps of rising wages, dearer material, and lower-grade ores.

METALS WILL GET SCARCE BEFORE FOOD

On the other hand, it must be realized that the number of deposits traces of which appear on the surface of the earth as now exposed by erosion, not already contributing to the world's needs, is extremely limited. The number of these that are sufficiently accessible to insure their exploitation in the next ten years is even more limited. Meanwhile, the drain on the present producers proceeds at an accelerated rate. Finite in extent and incapable of reproduction, however slowly, they approach exhaustion. In the future, the intelligence of the industry must be more and more directed to learning the secret of locating deposits where the present land surface bears no direct traces of what may lie beneath. If this problem is unsolvable, our present civilization, so dependent on the use of metals, must inevitably decline with the steadily increasing population. Much of significance has been written about the ultimate food supply that the world can furnish and the dismal fate that awaits future generations. It seems to me entirely probable that long before the increase in population reaches the limit of our agricultural resources it will have passed that of our mineral resources, unless such secret stores can be disclosed. The financial rewards to be won by those that have the intelligence and courage for the search should be obvious, to say nothing of the service to mankind they would render by success.

Just what is the present value of that portion of the copper industry that produced an income after depreciation of \$65,000,000 in 1924? There are many possible answers to this question, and it will be a matter of interest to study some of them. Let me assume that the life of these deposits will be approximately forty years. Then an annual dividend of 8 per cent will yield 7 per cent and an annual installment which, reinvested at 4 per cent, will amortize the capital. The present value of reserves to be mined forty years from now is too small to be worth considering. Therefore, capitalizing the income shown at 8 per cent, there is reached a value of \$812,500,000, or 41c. per lb. of annual capacity, with copper at 13c. With the metal at 15c., one might reasonably expect that 28 per cent of gross income would be available for distribution. Gross income on two billion pounds at 15c. would be \$300,000,000, and the income available for distribution would be \$84,000,000. Again capitalizing this amount at 8 per cent, there results a value of \$1,050,000,000.

At the high point for the copper stocks in January, 1925, the group I am considering sold on the market for about \$1,130,000,000. At that time the metal was

selling at 15c. Since the slump and recovery, the metal has been quite firm at from 13½ to 13¾c., while the stock market value of the group at the moment (middle of June) is about \$950,000,000. Perhaps 26 per cent of gross income at this metal price is available. Two billion pounds output on this basis would yield an income of \$70,850,000, which, capitalized at 8 per cent, gives a value of \$885,625,000. In other words, the present stock market level is still anticipating an increase in metal price. With the recent resumption of dividends on Anaconda and Inspiration and the recent increase in the rate on Calumet & Arizona, disbursements are running at about \$68,000,000 annually, or 95 per cent of present earnings after depreciation.

PUBLIC CONSIDERS ONLY CURRENT RETURN

Apparently the public is willing to invest in copper stocks on the basis of something less than 7 per cent interest and return of the capital, probably with the feeling that long before there is danger of exhaustion they will sell out to somebody else. The purchase of one-half of the stock of the Chile Copper Co. by the Anaconda for \$77,000,000 places a value on the present annual capacity of that company of about 80c. per lb., and perhaps 40c. on its potential capacity. Naturally, the cheaper the production and the longer the life the higher the price one can afford to pay. The principal copper mines of the United States were all acquired by the original exploiters for a small fraction of their present values. Many of them paid their own way from the beginning, but the possibility of duplicating their history in the future, anywhere in the world, seems quite remote. Any increases in the output of the present mines would undoubtedly increase the available income, although not in direct proportion. Such increases would necessarily raise the value. The figures given in this article deal with the group as a whole. There is ample evidence that the public's estimate of value, in the case of individual units, is materially in error.

Finally, there is nothing in the record of 1924, of itself or in comparison with previous figures, to justify the statement that the copper companies as a whole are dissipating their assets without return. Nevertheless, to restore them to their full earning power in pre-war dollars, compared with other commodities, will require an increase in the price of the metal to 15c. The law of diminishing returns will soon definitely limit further increases in metallurgical recoveries. This is extremely unlikely also with a group of deposits similar to the porphyry deposits of the United States and South America and now lying idle awaiting metallurgical discoveries of equal economic significance to those of flotation and leaching. The tendency in South America in the next ten years will be toward higher wages and higher taxes through the impulse toward industrialization given by these large mining enterprises themselves. Perhaps it would not be too much to say that copper is being produced cheaper relatively now than it ever will be again.

In closing, I want to refer to the recent article in *Mining Journal-Press* by William Spence Black. I have read it with great interest and find myself in entire accord with his views on the present cost of producing copper. It will be evident from the above, however, that I am not in accord with his estimate of the future.

German Production of Non-Ferrous Minerals

Of the mineral resources belonging to Germany in 1913, only the copper-ore reserves remain intact to that country since the post-war corrections of boundaries, and even in the case of copper, potential supplies were removed with Germany's loss of its African colonies, according to Trade Commissioner W. T. Daugherty at Berlin. The copper reserves within Germany center in the Mansfeld-Hettstedt area, west of Halle-on-Saale, where operations of the Mansfeld A. G. für Bergbau u. Hüttenbetrieb are conducted. These works produce about 1,000 tons of copper monthly from their low-grade native ore. Some production elsewhere, as that in the Harz, augments this figure.

In 1913 the production from native ore amounted to 26,900 tons, but in 1923 it reached only 17,000 tons. The decrease is partly accounted for by the decline of output per unit of labor, and it is also true that 1923 was an abnormally low production year on account of the industrial disorganization following the Ruhr occupation. In view of the great importance of copper in industry, Germany was and is a potential importer, purchasing about 80 per cent of its foreign supplies from the United States. Germany's copper-ore reserves were once more important, but their exhaustion by mining has been progressive.

The zinc ore abundantly available in upper Silesia has been lost to Poland, which acquired approximately 80 per cent of Germany's zinc reserves by the partition of that state. German production, amounting to 250,300 tons of zinc content in 1913, dwindled to only 35,000 tons in 1923, the latest year for which production figures are public. Germany is importing Polish zinc ore heavily for refining in its remaining smelters, located chiefly in western Germany in the region of Aachen-Stolberg.

German lead supplies from deposits in upper Silesia were similarly cut down with the partition. A 1913 production of 79,000 tons lead content dropped to 28,000 tons in 1923. The remaining industry is also centered in western Germany, in the Bonn area on the left Rhine bank.

In compensation for its copper shortage, Germany has developed a considerable aluminum industry, aluminum now being used to a great extent to replace copper in that country. Production by one plant (Rheinfelden Werke in Baden) has grown from 800 tons in 1913 to 20,000 in 1924. Four works, three of them built during the war, contributed to this output. With a new works on the Inn River in Bavaria now in operation, a considerable increase in the future production should be recorded. Imports of copper from the United States, accordingly, can be expected to decline. While the cost of aluminum by weight is about twice that of copper, aluminum's lower specific gravity (three and one-half times lighter than copper) makes it by volume about 40 per cent cheaper. There is, however, another consideration—the electrical conductivity of copper is about twice that of aluminum.

Bauxite, the raw material for aluminum production, is neither abundant nor of high grade in Germany. The only local deposits in the Vogelsgebirge district are an aluminum hydrosilicate structure with 15 to 20 per cent metal content, the imported bauxite, mostly French and Istrian, being composed of alumina hydrate and iron hydroxide with 25 to 30 per cent metal content.

Requirements of an Accurate Mechanical Sampler

Principles of Design and Operations of Devices for Cutting a Stream of Ore

By Robert K. Warner

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THE SELECTION or design of a sampling device for securing a representative portion of a quantity of ore, concentrate, tailing, or other mineral product depends largely on the object of the sampling and the conditions under which it is done.

The two general types of sampling operations are the determination with commercial accuracy of the metal content or some other function of (1) a certain definite lot of material that is to be sold or to be an important factor in some other financial transaction or (2) a stream of ore, as for example the feed to a mill. In practice the degree of accuracy obtained in these two types of operations varies widely. The determination in the first type of sampling usually concerns two parties with opposed interests, hence any lack of care causes complaint from the side injured. The second type of sampling is usually valuable only from an accounting standpoint and great refinement may justly be considered too costly. The value, however, of accurate sampling of mill heads and products and of the mill pulp at different points in the flow sheet is becoming more widely recognized, and poor sampling may be worse than none at all.

BASIC THEORY OF ORE SAMPLING

All correctly designed machine samplers that have been developed are based on this theorem: The sum of a sufficiently large number of small portions, each of a proper weight, properly taken at regular intervals through a mass of material will correctly represent the mass. This, it should be noted, is also the basis for mine sampling and hand sampling. Sampling machines when properly designed, however, differ from all other applications of this theorem because: (a) The ore is presented to the machine as a moving stream of crushed material; (b) the cuts are taken mechanically, so that there need be no opportunity for violation of the theorem either by irregular intervals between cuts or by the introduction of a non-compensating error due to the selection of too great a proportion of fine or coarse ore in each cut; (c) the operation of the machine can be observed and any tendency to error noted and corrected; (d) there is facility for resampling by identical methods.

The requirements given hereafter apply directly to the first sort of sampling, which will be called "custom" sampling, as distinguished from the latter, to be called "mill" sampling. The nearer mill sampling practice approaches the requirements of custom sampling the less will be the troubles of the calculator of mill performance and the less will be the chance for apparently inexplicable metal losses. Some of these requirements affect the cutting device itself; others the general arrangement of the plant. They are as follows:

I. In making each cut, the sample opening must be arranged to take all of the stream of ore for a portion of the time, not a portion of the stream all of the time.

The operation of a mechanical sampler may well be studied by considering the stream of ore as a ribbon from which certain portions are removed to form the

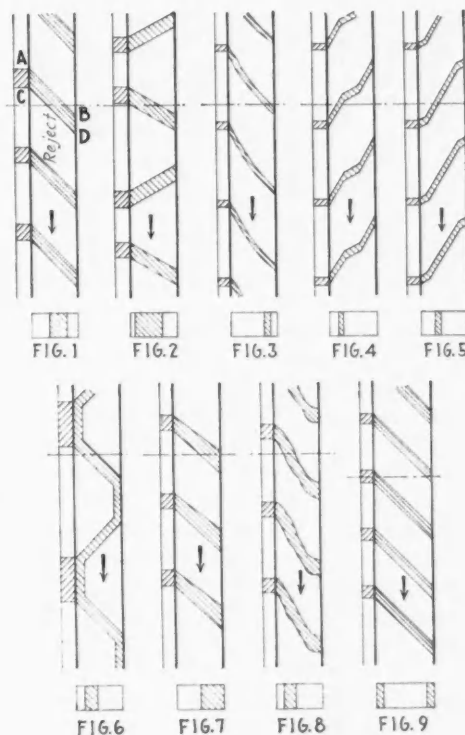
sample. Referring to Figs. 1 to 8, this principle means that the shaded strips representing the material cut at each passage of the sample cutter must pass from side to side of the stream and contain some ore from each point in its cross-section. The reason for this is that every ore tends to segregate whenever it falls through the air or runs down an incline. The pieces of the same size or weight will tend to concentrate along certain parts of the stream in a definite and constant manner. If the same portion of the stream always goes to the sample and the remainder is always rejected, there will be created a non-compensating error in the sample.

II. The cuts must be spaced at equal intervals along the stream—that is, they must be equally timed.

Because the ore as fed to the sampler is not and cannot be thoroughly mixed, there is always variation in the grade of the material passing at any instant. If the distance along the ore ribbon between successive cuts is not equal, the fundamental theorem of sampling will be violated and too large a proportion of the cuts may be taken from a low-grade or a high-grade section of the stream.

III. Each cut must contain an equal proportion from every part of the ore stream, or, in other words, the sample opening must be under each part of the stream for an equal time interval.

This requires that the cutter be operated at a constant speed while in the stream; that it pass completely



Diagrammatic illustration of the operation of mechanical samplers

Figs. 3 to 8 represent faulty work. The small blocks are sections across the stream at the point indicated by the dotted lines

through and out of the stream at each cut; that the cutting edges be so designed that every part of them will pass through an equal space, or angular distance in the case of a revolving cutter, in a given time interval; and, finally, that the sample openings retain the same dimensions throughout each cut and during the sampling of each lot of ore. The segregation in the ore stream is the reason for this, as for the first requirement. Turning to the diagrams, we find that this requirement means that the lines *ab* and *cd* in Figs. 1 and 2 must be straight, parallel, and run all the way across the stream. If constant speed is not maintained, the cut taken may be as shown in Figs. 3, 4, and 5. If the cutter does not leave the stream, the cut shown in Fig. 6 may be taken. Failure to have every part of the cutter move at the same rate would give a condition as shown in Fig. 7; whereas an irregularly shaped cutter, whether the distortion was due to clogging or to wear, would give a cut as shown in Fig. 8. In all of the cuts shown in Figs. 3 to 8, a larger volume of ore, represented by area in the diagram, is taken from some parts of the ore stream than from others.

NO DISCRIMINATION BETWEEN FINE AND COARSE

IV. The cutter must be designed to select both coarse and fine ore as it is presented, without discrimination. This result can be obtained if:

1. The sample opening at the narrowest part that passes under the ore stream is wide enough to permit free passage of the largest piece in the feed; that is, at least three, and better four, times the diameter of the largest piece.

2. The sample opening permits a free fall of the ore through it down to a point where large pieces cannot bounce out.

3. The speed of travel of the cutting edges is so slow that coarse lumps do not tend to be knocked away from the sample opening; or else the cutter travels so fast that everything, both coarse and fine, is knocked out of the stream and into the sample container.

4. Dusting, or at least leakage of dust from the machine or between the sample and the reject, is reduced to a minimum.

5. The ore as fed to the cutter travels in the same direction and at substantially the same speed as the cutter and is falling freely when the cutter strikes it.

Anything that makes it easy for the sample to be separated and difficult for it to escape after being cut is desirable, and is essential in spotty ores or those in which the valuable mineral is markedly brittle.

V. The sampler must be fed regularly. The whole simile of comparing the feed to a ribbon as shown in Figs. 1 to 8 depends for its accuracy on considering the ribbon as continuous and of constant thickness. If ore is fed to a sampler in surges or with occasional gaps, as is the case when the product of one sample or an intermittent crusher goes directly to another cutter, the result is always loss of accuracy. The greater the frequency of passage of the cutter the less serious will be this difficulty. It can be cured by placing a feeder with some storage capacity ahead of the sampler.

VI. Each cut should contain a weight of ore suited to the material sampled. The weight of each cut is a function of the proportion the sample represents to the whole lot of ore, the rate of feed to the sampling machine, and the time interval between cuts.

In the sixth requirement the greatest latitude in correct design is permitted. The proper weight of sample

required to furnish a correct measure of the value of the lot is related to the richness, regularity of arrangement, and size of the valuable mineral in the ore. This point has been fully, but somewhat inconclusively, discussed by many authors. Practice has been to take as large a sample as was considered justified and assume that the results were as nearly correct as necessary. Without a discussion of the matter in detail, it may be said that ores containing a very high-grade mineral such as gold, those in which the aggregation of the mineral is coarse rather than finely disseminated, and those which therefore have been called "rich" and "spotty" require larger weights than other ores crushed to the same limiting size.

THE SIZE-WEIGHT RELATION

Two factors make formulas applying to this size-weight relation difficult to derive. One is that when the size of the ore is greater than the largest occurring piece of valuable mineral, every large piece is a true middling and therefore in itself more nearly a representative sample than a smaller piece. The other is that, though the final analysis or assay will be made on only a few grams of material, the difficulty of handling so small a weight in the mill and the danger of salting, which increases as the sample weight decreases, make it necessary to take larger numbers of grains of finely crushed ore than would be required of the coarse ore. These factors, together with the cost of handling a large sample of coarse ore in a separate crushing plant, may justify smaller first cuts and larger later ones than theory would direct. Where fines are undesirable in the reject, the necessity for a small first cut is increased.

The minimum weight of sample to be taken at each size having been determined, the rate of feed and the frequency of the cuts must be selected. The rate of feed is usually fixed in the case of mill sampling, but may be varied within limits in custom sampling. With a fixed rate of feed, the weight (that is, the proportion cut) taken by a given sampling device is either fixed by the construction of the machine, or else varies directly as the frequency of the cuts. In general, it may be said that the smaller the weight taken at each passage of the cutter and the larger the number of such cuts, the total weight being the same in each case, the more accurate will be the sample. In mill sampling, where the mill feed for the day, week, or month is the material to be valued by each sample, the actual percentage of the feed cut by the first cutter is small, and an accurate result is possible only when the number of cuts is large. The accuracy in the mean obtained by a large number of very small samples will be great providing nothing in the method of taking violates the first five requirements stated in this paper. The attempt should therefore be made to make the frequency of cuts in any sampling device as great as is consistent with accuracy of cutting and reasonable bulk of final sample.

In addition to the above-mentioned requirements, there are several other desirable features of a sampling machine. Some of these are corollaries of the above, and others are needed for its efficient mechanical operation. These are:

A. The machine must be easy to inspect and clean.

B. There should be no tendency for fines, rags, fuse, etc., to build up on the cutting edges. Otherwise requirement III and perhaps requirement IV may be violated.

C. It should be of simple and rugged construction.

D. It should consume as little headroom, vertical fall, as possible.

E. The cutting edges should be so designed that they will not be bent or their shape rapidly changed by wear while in use.

F. The size of the maximum grain in the cut should be reduced, before the sample is again reduced in weight.

It may be said that the closer a given sampling installation comes to meeting the above requirements the better will be the results. It is possible to trace most sampling errors directly to the violation of one of these principles.

Dolomite as Refractory Material

ATTENTION IS CALLED by T. N. Leslie, in the *South African Journal of Science*, November, 1924, to the Transvaal dolomite as an economic factor in the development of industry in South Africa, and more particularly as a refractory material for use in furnaces requiring such a high temperature that fireclay ware is insufficient. Mr. Leslie's paper is abstracted in the following:

It has long been known in great steel-producing countries, such as Great Britain and the United States, that dead-burned dolomite mixed with some impurity was the best refractory available. An English authority says:

"In making the hearth of the Siemens furnace several methods are in use. As a matter of actual practice no material has been found so generally suitable as the burned dolomite, as it is sufficiently infusible for the purpose and at the same time sufficiently fusible just to frit together and form a hard mechanical strong bottom at Siemens furnace temperatures."

In the United States dolomite is also the standard material, but exhaustive research has recently been carried out by the U. S. Bureau of Mines in co-operation with the Ohio State University into the best way of utilizing dolomite as a base material for the manufacture of refractories. The result shows the effect of using pure dolomite mixed with varying proportions of some impurity such as silica, iron oxide, roll scale, flue dust, alumina, oxides of manganese, cobalt, nickel, and many others. The best results were obtained from a mixture of 90 per cent dolomite and 10 per cent flux, the best fluxes being iron oxide (Fe_2O_3), alumina (Al_2O_3), and silica (SiO_2). Manganese delayed air slaking, which, by the way, is one of the objections to

using dolomite. They report with regard to the varying percentages of the above fluxes:

"Thus it appears that with 10 per cent of flux and 90 per cent of dolomite, the percentage composition of the fluxes may be varied slightly among themselves without making any very noticeable change in the air-slaking resistance of the calcined mixture."

Fortunately this combination is found naturally in the composition of the Transvaal dolomite. The magnesian limestone of the Transvaal, known as the dolomite, occurs in a huge belt around and above the older Witwatersrand series over a great part of the Transvaal, occupying an area of approximately 8,500 sq.mi. Its principal components are carbonates of lime and magnesia, silica, alumina, iron, and manganese oxides. Many analyses have shown nearly every gradation in the three first-named, ranging from 54.46 per cent $CaCO_3$ to 9.07 per cent; 44.23 per cent $MgCO_3$ to 3.01; and 0.69 per cent SiO_2 to 62.16. The rocks of the northern area from Lydenburg to Ramoutsa have the largest silica contents, long stretches appearing to be almost pure chert beds. The rocks of the southern limb from Lichtenburg to Pretoria are high in content of carbonates of lime and magnesia. Analyses of ten samples from this area are given in the accompanying table.

It will be seen from the table that the lime magnesia contents varied between 74.3 and 94.1, with an average (leaving out No. 9, which is the most northerly sample) of 87.5. Normally, the rock of the southern limb is a dense, hard, dark blue material, and, in the area examined, has many crystalline forms. One of the varieties, which had the nearest approach to 90 per cent lime magnesia and 10 per cent flux in silica, iron oxide, alumina, and manganese, is now being used in the steel and iron furnaces of the Transvaal in the following manner:

For open-hearth furnaces the raw dolomite is crushed to a coarse powder, without previous burning, and spread over the bed of the heated furnace in a bath of molten iron, where it forms a solid mass. In the electric furnaces, in both the Siemens and bessemer processes, the procedure is different. The dolomite is first dead-burned by repeated calcining in kilns until the stone has shrunk completely and until it is quite hard and rings with a metallic note on impact. In so doing the self-contained impurities, the silica, iron, and alumina are fused. It is then ground in edge-runner mills until the whole will pass through a $\frac{1}{4}$ -in. mesh sieve. Tar is boiled with continued stirring until completely anhydrous and mixed while hot and fluid with the dead-burned and ground dolomite, and the hearths are laid with this composition.

This has proved the most satisfactory material so far, and although extended research may improve the present combination, there is no doubt that a first-class refractory material is available at a very low cost and in unlimited quantities in the Transvaal dolomite. The dolomite has another potentiality. One or two of the varieties given in the table of analyses have almost identical combinations with those of the most extensively used dolomite of the United States in the manufacture of paper pulp. P. A. Paulson, consultant engineer in the paper industry, says that when straight calcium lime is used, the resultant pulp is harsh, hard, and transparent, and it is more difficult to make a straight calcium acid of high test than to prepare a similar liquor from a magnesian lime.

Analyses of Samples of South African Dolomite

	No. 1	No. 2	No. 3	No. 4	No. 5
Silica and insol. gangue.....	4.02	4.48	1.40	0.48	1.17
Iron oxide and alumina.....	2.76	1.86	3.06	2.38	2.28
Manganous oxide.....	1.89	1.41	0.98	2.56	1.86
Lime.....	29.68	29.54	29.45	29.96	30.24
Magnesia.....	18.49	18.96	19.42	19.23	29.94
Carbon dioxide.....	43.66	44.11	44.51	44.70	46.92
	No. 6	No. 7	No. 8	No. 9	No. 10
Silica and insol. gangue.....	1.18	1.74	3.00	8.80	2.54
Iron oxide and alumina.....	0.86	3.12	1.52	3.20	1.54
Manganous oxide.....	0.35	3.62	2.02	2.02	1.30
Lime.....	30.24	22.96	28.14	27.86	29.68
Magnesia.....	20.41	22.79	20.03	16.64	19.31
Carbon dioxide.....	46.22	43.12	44.15	40.21	44.57
Composition after burning					
	No. 1	No. 2	No. 3	No. 4	No. 5
Lime.....	52.7	52.8	53.0	54.1	54.9
Magnesia.....	32.8	33.9	34.9	34.7	34.9
	No. 6	No. 7	No. 8	No. 9	No. 10
Lime.....	56.2	40.3	50.3	46.5	53.5
Magnesia.....	37.9	40.0	35.8	27.8	34.8

Magnesite Mining at Red Mountain, Calif.

Network of Veins in Serpentine—Shrinkage Stopes and Glory Holes—Shaft and Rotary Calciners—Long Haulage by Motor Trucks

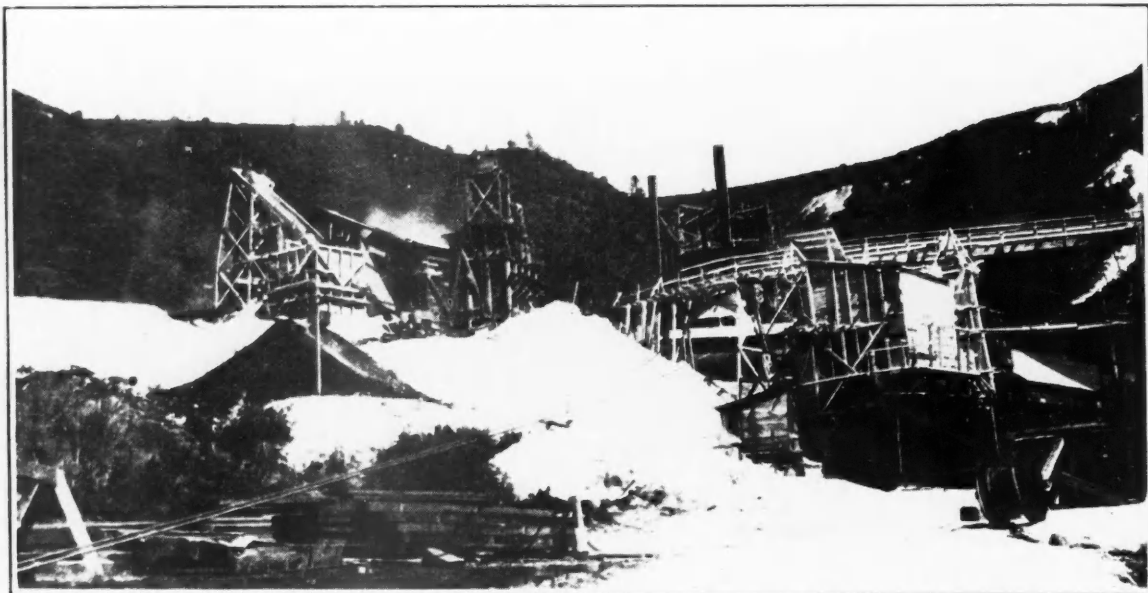
By **George J. Young**

Associate Editor

THE MAGNESITE MINES operated by C. S. Maltby of San Francisco near Red Mountain, Santa Clara County, Calif., are thirty-two miles from Livermore, Calif. Livermore has two railroads, the Southern Pacific and the Western Pacific. All supplies to the mines and the product, calcined magnesite, are hauled by automobile trucks to and from Livermore. The road is a dirt road over which it is difficult to haul in wet weather. Operations at the mine are therefore suspended during that part of the year which is the slack period in the magnesite trade. Development is, however, continued during the entire year.

The larger fractures often have branches also filled with magnesite. The vein system is apparently a route for underground water, and as a consequence springs are generally found below the magnesite deposits. The sheared serpentine gradually alters along the fractures, and where the conditions are favorable, it is entirely replaced by nearly pure magnesite and in other places by an impure chalcedony. A deep red soil is conspicuous on the hills in and about the locality.

In the area designated as the White Diamond mine, seven distinct veins have been worked. These with their connecting branches form a complex vein system.



General view of calcining plant at Red Mountain, Calif.

The properties were originally opened up in 1905 and in 1912 were operated by the American Magnesite Co., which was succeeded by the Western Magnesite Development Co. This company went into the hands of a receiver, who operated in 1917-18. C. S. Maltby leased the property for five years in 1919 and has successfully operated it since that time. Improvements in plant and equipment have been made from time to time, as well as improvement in the calcination practice.

VEINS OF THE LENS TYPE IN SERPENTINE

The magnesite occurs as a series of veins on the west slope of Red Mountain and on the south slope of a spur extending from the mountain. The altitude of the plant is about 3,000 ft. and the veins occur well above this point. Serpentine is the prevailing rock, the magnesite being derived from the alteration of the serpentine, which extends over a large area in this region. The magnesite occurs in veins of the lens type along strong fracture zones cutting the mountain in a prevailing northerly and southerly direction; and the dip of the veins is steep and westerly in direction.

Another system of veins near by, the White Queen mine, has also been worked. The dip, length, and width of the veins vary widely. Roy H. Clark, who successfully managed the property for some years, stated to me that the Diamond vein, at a depth of 375 ft. below its outcrop, has been stoped continuously for over 700 ft. in length. The Smith vein, 300 ft. west of the Diamond, has been stoped for a length of 400 ft. and work is continuing on its north end at the same elevation. Thus the deposit appears to be essentially a near-surface deposition represented by concentrations in close proximity to the rocks from which they were derived. Large masses of unusual size occur.

White outcrops in a dark red soil indicate the position of certain veins, and open cuts have been made on these outcrops. Drifts were then extended on the veins, and crosscutting resulted in the discovery of more veins. Eventually three or four levels were established, the lowest level being used for loading and being connected with the upper levels by raises through which the magnesite is dropped to the loading level. The drifts or levels connect with the surface. A roadway



Entrance to drift, showing magnesite on both sides

connects the two lowest levels, which are 167 ft. vertically apart, with the calcining plant. Trails lead to the various openings on the hillside. The loading level is served by a homemade gasoline locomotive and a train of four Koppel side-dumping "V" cars. This is loaded at the chutes and hauled to a bin on the hillside. The magnesite is transferred to the calcining plant by a two-bucket wire-rope tram.

SHRINKAGE STOPING

The many stopes vary greatly in size, the length in some cases reaching a large figure, as in the case of the Diamond vein. The veins reach a stoping width of 25 to 35 ft. or more in places, and in the case of one large stope these figures were considerably exceeded. Shrinkage stoping is practiced generally, the stope being opened from a wide drift by cutting into the footwall and raising up to the vein where the stope is started. One or more manways are carried up with the stope. Chutes are omitted where the vein contains a large proportion of waste, the broken magnesite and waste rock coning out on the floor at the footwall, where it can be conveniently sorted. Magnesite is picked out by hand and loaded into cars for transportation to the raises leading to the lowest level. In addition to shoveling, a fork with tines spaced $\frac{3}{4}$ in. apart is used to remove the coarser material from which the waste or the magnesite is picked out. Approximately one-half of the broken material is removed as waste, although this contains a considerable proportion of magnesite.

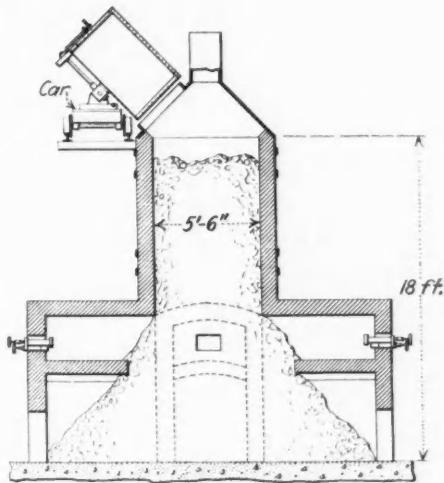
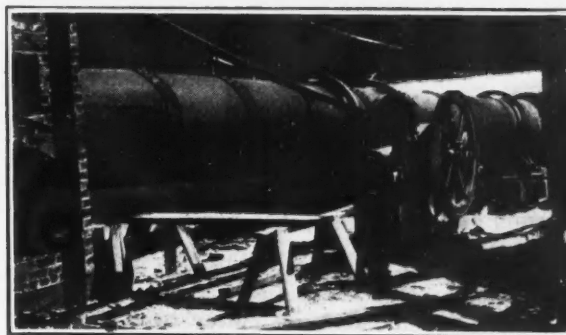


Fig. 1—Sectional view of shaft furnace for lump magnesite

Stoppers are used for raising and Jack-hammers for drilling underhand in the pits and stopes and for bulldozing. The magnesite and serpentine drill readily. Very little timber is required in the stopes and other openings. A tool-sharpening shop is available on the lowest mining level. All drifts and crosscuts are equipped with tracks, and gasoline locomotive service is maintained on the haulage level and the level immediately above.

VARIOUS FURNACES IN CALCINING PLANT

Picked magnesite from the White Diamond mine is discharged into a receiving bin at the calcining plant by the bucket tram. Two other wire-rope tramways deliver magnesite from the White Queen mine on the west slope of Red Mountain to the same bin. The calcining equipment consists of four shaft furnaces for lump ore and one rotary furnace, 55 ft. long, for calcining fine magnesite. In addition, there is a rectangular shaft furnace patterned after the Scott quicksilver furnace. When I visited the property, the rotary furnace was being installed, together with its crushing equipment, and the Scott furnace had been temporarily shut down. Two of the four shaft furnaces were being



Rotary calciner and crusher in front

operated, one was being repaired and the other was in reserve. All of the shaft furnaces are charged intermittently by a car on the receiving bin level. At regular intervals the calcined magnesite is withdrawn from the furnace and a fresh charge dumped in. All of the furnaces are fired with crude oil.

Three different designs of shaft furnace are in use, all, however, being similar in principle. One type is provided with four firing chambers, distributed at right angles to one another about the central shaft, as shown in Fig. 1. Another type is constructed with three fireplaces, spaced 120 deg. apart, the brickwork being inclosed in a sheet-steel shell. The third type is circular in section, the firing ports being arranged 90 deg. apart on the lower part of the furnace. Ports for the withdrawal of the calcined magnesite are below at each firing port. All withdrawal ports are protected from inrush of cold air by sheet-steel plates. The arrangement of these furnaces is such that the lump magnesite is subjected to a slow heating in the shaft of the furnace, and as it descends into the firing zone it is subjected to a much higher heat, after which it remains in the draw-out pits until it is removed. It is withdrawn by long-handled hoes, shoveled into wheelbarrows, and dumped upon the cooling floor.

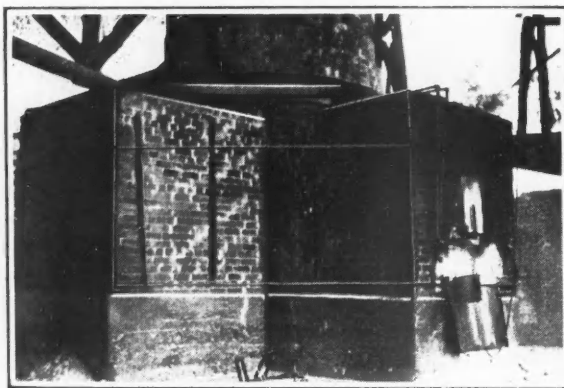
From the cooling floor, the calcined magnesite is shoveled upon a belt conveyor, which extends along the edge of the cooling floors and delivers the product to

the trommel (1½-in. holes). En route the calcines are picked, the colored pieces, unburned cores and extraneous material being removed and dropped into separate bins. The undersize from the trommel is discharged into a separate bin and the oversize into the unburned core bin, from which it is returned by truck to the calciners. Two grades of calcine are shipped: No. 1, which is white, and No. 2, slightly colored. The No. 1 grade is sacked when ordered for shipment via Panama and the No. 2 grade is shipped in bulk. The trucks are backed in under the bin and loaded from spouts. A receiving bin is at Livermore.

The magnesite for the rotary furnace is sent from the receiving bin to a second bin, being hand picked en route for the removal of waste rock. From the second bin the magnesite is fed to a rock breaker of the jaw type. This discharges into a bucket elevator and this in turn to a trommel (1-in. holes). The oversize is spouted to a second rock breaker and returned to the elevator. The undersize is received in a third bin and fed to the rotary by a plunger feeder. The rotary furnace discharges upon an incline cooling floor, constructed of sheet steel supported upon rails. The cooling floor is divided into two compartments, each of which is used intermittently. The cooled calcine is discharged into a bucket elevator and delivered into the shipping bins. The capacity of the furnaces is as follows: The four lump furnaces, 60 tons per day, or 15 tons each; the rotary, 20 tons per day; and the Scott furnace, 20 tons per day. The aggregate calcining capacity is 75 to 80 tons per day, which requires from 150 to 200 tons of crude magnesite per day. The consumption of fuel oil is 50 gal. per ton of calcine.

POWER EQUIPMENT

The comparative isolation of the property and the relatively small amount of power used has precluded the construction of a power line connecting with the various electric transmission lines to the north, south,



Base of shaft furnace, showing bottom of stack

and east. As a consequence, during the development of the plant, several kinds of prime movers were installed. Present equipment consists of two oil-fired steam boilers, which supply steam for engines and burners; three Chicago Pneumatic straight-line oil-engine compressors for supplying compressed air to the mine, and several gasoline engines. A steam engine and generator supply electrical current for lighting. A 20-hp. Western gasoline engine drives rock breakers, feeders, screen, elevator and the rotary furnace. A small steam engine drives the belt conveyor and screen receiving the calcines.

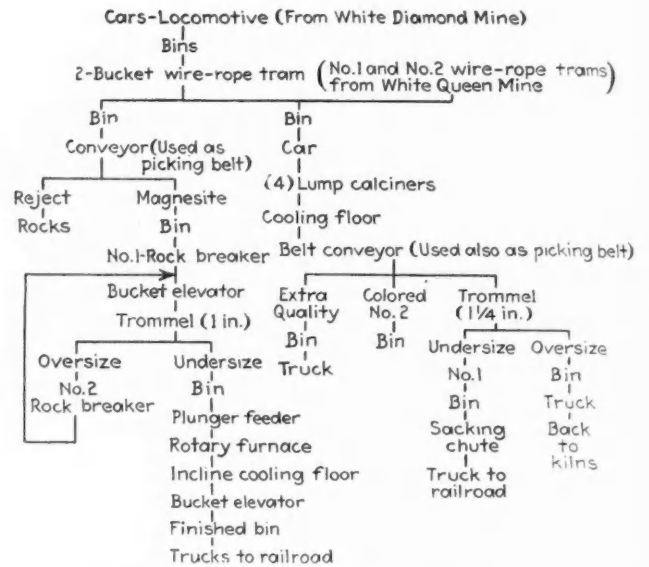


Fig. 2—Flow sheet of magnesite plant

The necessity of hauling all supplies and fuel oil (6,000 gal. per day) a distance of thirty-two miles over an indifferent road and returning with calcined magnesite (80 tons per day) increases the cost of operation. Transportation costs \$4.25 per ton, with a 25 per cent return haul free. From ten to fifteen trucks are employed during the shipping season. The hauling is contracted. The high quality of the product and its suitability for plastic purposes is an important factor in the success of this enterprise, which cannot depend entirely upon the California and Pacific Coast market, but must also compete with plastic manufactured from foreign magnesite in the Mississippi and Eastern territory. By cutting corners and restricting the financial input to necessities, the enterprise was nursed along until markets were secured and the outward flow of the product was established. This appears to be the experience in other kinds of non-metallic mineral enterprises. The available tonnage of the individual magnesite deposits in California is a factor to be reckoned with in selecting equipment and in operation. Excessive capital expenditure may cripple such an enterprise at the start. In this instance conservatism has been instrumental in developing, equipping, and operating successfully.

Acknowledgment is made of the courtesy of C. S. Maltby and his superintendent, W. T. Lewis, who is in charge of operations on the property.

The Broken Hill Lead-Zinc Field

The tonnage of ore raised in the Broken Hill field in Australia during 1924 was 1,050,674 long tons, comprising 13,431 long tons of carbonate and siliceous ores and 1,037,243 long tons of sulphide ore. The greater part of the carbonate and siliceous ore is sent to Port Pirie, in South Australia, for treatment by the Broken Hill Associated Smelters Proprietary, Ltd. The remainder of the ore from these mines is concentrated on the field, and the silver-lead concentrates obtained are despatched to Port Pirie, for smelting and refining. A portion of the zinc concentrates produced is treated in Australia at Risdon (Tasmania) by the Electrolytic Zinc Co. of Australasia Proprietary, Ltd., the remainder being exported overseas.

Discussion

Price Quotations for Lead and Zinc

Further Correspondence That Has Passed Between the Tri-State Zinc and Lead Ore Producers Association and "Mining Journal-Press"

In the June 6 issue of *Mining Journal-Press*, pages 931 and 932, was published a letter from Julian D. Conover, Secretary of the Tri-State Zinc and Lead Ore Producers Association, inquiring about how the zinc and lead quotations published in the market report were obtained and suggesting the desire of the association for as complete and accurate data as possible. To this letter the following reply was made:

HOW THE PRICES ARE COMPILED

Sir—The lead and zinc prices published in the *Mining Journal-Press* are compiled by a committee composed of two of the editors who specialize in this work, assisted by a representative of the U. S. Department of Commerce, who makes a special trip from Washington for this purpose. The editors canvass the market on Wednesday of each week, calling on the following firms for information on lead and zinc:

St. Joseph Lead Co. Lead.
U. S. Smelting, Refining & Mining Co. Lead.
American Smelting & Refining Co. Lead and zinc.
American Metal Co. Lead and zinc.
International Minerals & Metals Corporation. Zinc.
New Jersey Zinc Co. Zinc.
National Lead Co. Buyer of lead.
Standard Underground Cable Co. Buyer of lead.
United Metals Selling Co. Lead and high-grade zinc.

Most of these companies give a detailed record of their individual sales, omitting, in most instances, the names of the purchasers. The two buyers interviewed are consumers of large quantities of lead and keep in active touch with the market, giving confidential information as to quotations made them and lead actually purchased. Much valuable comment on market conditions is also interchanged, it being thus possible to check up much of the data and thus insure its accuracy. The prices actually obtained for the metals, based on reported sales, are then studied and compared and the quotations as published in the *Mining Journal-Press* are made up. Consideration is given to tonnage: for example, if 300 tons of lead is reported sold on one day at 8c. and 100 tons at 8.10c., the quotation would be 8.025c. rather than 8.05 or 8.00@8.10c. The problem is usually not so simple as this, however, and requires judgment and a market sense rather than mere arithmetical ability. Sales for delivery far into the future are given little weight, the quotations reflecting the major market, which is usually for delivery within forty-five days for lead and within two or at the most three months for zinc. Bid or asked quotations are also not considered, except when no sales at all are reported for any given day, which rarely happens.

Weekly, monthly, and yearly averages are not weighted; they are merely the arithmetical averages of the daily prices.

As to how much of the production is reported: the following companies smelt zinc, though not all of them

sell all their own product. Those marked with an *, for example, probably manufacture most or all of their zinc into finished products themselves. The retort capacity is also given. Those underlined [*italics*] give us a substantially complete record of their sales.

<i>American Metal Co., New York</i>	23,000
Athletic M. & S. Co., Fort Smith.....	2,500
<i>American S. & R. Co., New York</i>	11,000
*American Zinc, L. & S. Co., New York.....	10,000
*Eagle-Picher Lead Co., Chicago.....	8,000
Falcon Zinc Co., Van Buren, Ark.	3,000
Fort Smith Spelter Co., Fort Smith.....	2,500
Grasselli Chemical Co., Cleveland.....	18,000
Hegeler Zinc Co., Danville, Ill.	5,000
Illinois S. & R. Co., Chicago.....	
*Illinois Zinc Co., Peru, Ill.	5,500
<i>Int. Minerals & Metals, New York</i>	8,000
*Matthiessen & Hegeler, LaSalle, Ill.	6,000
* <i>N. J. Zinc Co., New York</i>	22,000
Quinton Spelter Co., Quinton, Okla.	2,000
United Zinc Smg. Corp., Moundsville, W. Va.	2,000
Weir Smelting Co., Pittsburg, Kan.	2,000
*American Steel & Wire, Donora, Pa.	9,000

It is evident that Grasselli is the only big seller that we do not reach. This company and the other smaller sellers have their offices outside of New York, which is why we do not reach them. Perhaps we could arrange to get their sales by mail or wire.

As to lead, it has been estimated that we have accurate reports of about four-fifths of the lead that is sold. We get no reports from Eagle-Picher, which uses most if not all of its lead itself; from Desloge, Pennsylvania Smelting, nor Balbach. We also do not cover the Pacific Coast sales of the Bunker Hill & Sullivan.

In the above summary, producers only are considered, and not dealers. Dealers must buy from producers, and we consider only the primary market for carload lots or more.

As to "wash sales," it is possible that at times we may be imposed on, but we have reasons to think that the business reported to us is bona fide. Should there be any question about a quotation, we make it a rule to investigate the sales upon which the quotation is based, if necessary getting the name of the actual buyer and the exact terms of the sale, so that if we were misled, our informant would lose a good deal of his reputation with us. We are glad to entertain all complaints made by responsible parties. Most such complaints are made by those who are trying to buy for resale, in excessively small lots, for spot delivery or for far-forward delivery, by those whose credit is poor, or who are otherwise in such position that they are unable to take advantage of the ruling market price. It also occasionally happens that a sale of a large tonnage may be made at an inside price. This will have much weight in our quotation, and yet a small buyer may not be able to get metal without paying more.

We should be only too glad to expand our marketing service if it could be arranged. It would be agreeable to us, for instance, to have reports from all sellers of lead and zinc, those that are out of town reporting

by mail or wire so that their sales could be included in our compilations. We should also be glad to publish the tonnage reported to us as sold, either day by day or for the week, should the sellers be willing to have us make this figure public. We approached the copper producers some months ago with the suggestion that we publish each week the tonnage reported to us as sold, but found two or three that thought no good would come from the plan, as it would give buyers too much information about the sellers' business.

Although *Mining Journal-Press* quotations do not include every sale of slab zinc in the United States, we believe they are based on more sales information, by far, than any other slab zinc quotation in the country. When a comparison with other quotations is made, that fact should be kept in mind.

As to supplying quotations daily to the zinc miners, together with the totals of sales reported: inasmuch as *Mining Journal-Press* prices are gathered weekly only, the service would have to correspond. One would think, however, that the monthly statistics of the American Zinc Institute would serve all practical purposes.

Your letter will be published in our "Discussion" department, and if it seems advisable we may circularize all sellers of lead and zinc, suggesting that every producer report his sales, and that we publish tonnages as well as prices, as you mention.

Engineering and Mining Journal-Press.

New York City.

MORE DATA WANTED ON ZINC

This letter brought the following reply from Mr. Conover:

THE EDITOR:

Sir—From the facts given, we would judge that the lead quotations of the *Mining Journal-Press* are based upon much more nearly complete market information than the quotations for zinc. Your suggestions that the sales of zinc-producing companies which do not now report to you be obtained by wire, and that all sellers of lead and zinc be circularized, with the request that they report both tonnages and prices for publication by you, seem to us excellent. If fully carried out, this procedure would give to the producers of zinc and lead ores in the Tri-State District some of the information which they feel is of great importance to them in the conduct of their business, and which they have never thus far been able to obtain. We believe that the entire industry would be benefited thereby. The monthly statistics of the American Zinc Institute which you mention are, of course, of well-recognized value, but are not issued with sufficient frequency to be of maximum service to the zinc ore producers in their weekly markets, and have not thus far dealt at all with prices and tonnages of metal sold.

In addition to market information secured by a complete canvass of the various zinc smelters and covering their sales of the metal which they produce, it occurs to us that it would be very interesting and important to know more about the prices for resales of zinc. It is our understanding that certain of the large zinc-smelting interests not only sell their own metal but also buy a large part of the metal produced by some of the smaller companies and resell it to consumers—often on contracts extending over periods of several months. Possibly the amount of metal thus resold is a very substantial portion of the total metal sold. In order for the ore producers to have confidence in the published metal market information, it would seem that the facts

concerning these sales should also be reported, and included in the compilations of prices and tonnages sold. In this connection, would it also be possible to obtain from the large buyers of slab zinc information as to prices paid, as a check upon reports of sales, in the same manner as you now do in the case of certain large buyers of lead?

Our great desire is to obtain the *facts* concerning the zinc industry, and we appreciate highly your evident desire to furnish all those at your command.

Picher, Okla.

JULIAN D. CONOVER,
Secretary, Tri-State Zinc and
Lead Ore Producers Association.

RESALES ALREADY COVERED

The reply to Mr. Conover's second letter follows:

Sir—Acceding to the suggestion made in the second paragraph of your letter of July 11, we shall be glad to approach some of the zinc-producing companies that we do not now obtain market information from, to see if they are willing to give us a report of the metal that they sell. Of course, we can bring no pressure upon them to do this, but can call attention to your letter published in the *Mining Journal-Press* and suggest that the more complete our sources of information are the better everyone will be satisfied.

With reference to the third paragraph of your letter, pertaining to resales: It is our belief that we already obtain and report on a large percentage of the metal so sold. The American Metal Co. is probably the largest interest that buys zinc from small producers with the object of reselling it, and this company gives us full information regarding both purchases and sales. Also, the International Minerals & Metals Corporation both buys and sells zinc, and we also get reports of both purchases and sales from this company. In writing to some of the other companies, as mentioned above, we shall mention that we should also like to have information on resales as well as on primary sales by producers.

We doubt whether it would be possible to get complete information regarding purchases from many or possibly from any of the principal zinc consumers. We have found a much greater aversion to the release of information regarding purchases than regarding sales. Most of the large consumers apparently feel that what they buy and the price they pay for it is a personal matter which should not be reported to us. However, if you can get the names of any firms likely to give us this information we shall be glad to write to them.

Engineering and Mining Journal-Press.

New York City.

Tariff on Graphite

THE EDITOR:

Sir—Referring to your recent article by Paul Wooton, "Domestic Graphite Producers Study Possible Tariff Increase," I feel that more light on this subject would be very beneficial to those interested in the graphite business. As a matter of fact, there is less competition now from Madagascar flake graphite than there has been for the past fifteen years, and prices obtained for Madagascar flake are the highest known, except during the war period.

What is said about determining the classification is certainly uncalled for, as there never has been any question with the appraisers classifying the several grades. We are personally acquainted with the graphite appraiser in New York, and the several grades

can easily be classified by this person, who is well acquainted with the work. Every graphite producer or manufacturer knows amorphous graphite from crystalline, and the fine flake from large flake, so this possible difficulty can easily be dismissed.

There never has been any prejudice against the use of American flake graphite by crucible manufacturers, except for the reason that in the experiments made by crucible manufacturers since the war, and many years previous, a satisfactory plumbago crucible was never made using only American flake graphite. I have been informed that the few experiments referred to by Mr. Wooton were never completed on a commercial scale by the government and that there are no definite records in existence to prove these statements.

We agree with the statements of your correspondent as to the production of American flake graphite. The amount produced even in the high-priced war period was never enough to furnish the 20 per cent which the crucible manufacturers were ordered to use by the War Industries Board. At that time we paid a minimum price of 14c. per pound. Prior to the war Madagascar flake could be bought for 6c. per pound, free New York; today the price is about 9½c., including duty. There is, therefore, not the usual competition from foreign graphite.

This tariff discussion appears to me like data compiled by one who is not very well acquainted with all the different grades of graphite. Artificial graphite has its particular use as well as the Mexican, both being of the amorphous variety. What might be good for making pencil leads is not suitable for making crucibles, and what may be suitable for making crucibles is not good for making lubricants, pencil leads, etc. It seems to me that your recent article may have been prompted by one of the old-time promoters of graphite mining propositions, which never, to my knowledge, were profitable to the investor.

Experience has conclusively shown that the United States cannot produce grades of graphite to compete with the foreign graphite production, and because of this and many other good reasons, the tariff on graphite should be eliminated.

HARRY DAILEY,

Secretary, Joseph Dixon Crucible Co.

Jersey City, N. J.

World's Records for Loading

THE EDITOR:

Sir—On page 66 of your issue of July 11, 1925, there appeared an article headed "Is this the world's record for loading?" the body of the article containing the statement of a record made with a Model 350 Marion shovel at the Chino mines of the Ray Consolidated Copper Co.

"World's records" are largely a matter of limiting definitions, and the record for loading which you quoted is probably a "world's record" for the character of material moved and physical conditions encountered. On the Mesabi Range in Minnesota, many large shovels of the Marion 300 and 350 models, and Bucyrus 225 model, are in operation, and I believe records have been established there digging heavy Mesabi Range glacial drift that are perhaps "world's records" for loading on land, barring nothing as to character of material and nothing in the way of a digging machine, except the large floating dredges.

The Model 300 and 350 Marion shovels and the 225

Bucyrus shovel, are all about of a size as to dipper capacity, vertical lift, and horizontal reach, and I should like to know if the following may not be considered, in discussing the world's record for loading:

One 10-hour shift; model 300 Marion shovel; Danube mine, stripping; 357 16-cu.yd. cars; A. Guthrie & Co., Inc., contractors.

Six 10-hour shifts, consecutively; model 300 Marion shovel; Danube mine, stripping; 1,904 16-cu.yd. cars; A. Guthrie & Co., Inc., contractors.

One calendar month; model 300 Marion shovel; Scranton mine, stripping; 243,778 cu.yd. engineers' estimate; Winston-Dear Co., contractors.

Five calendar months, consecutively; model 300 shovel; Hill Annex mine, stripping; 1,020,000 cu.yd. engineers' estimate; A. Guthrie & Co., Inc., contractors.

I have not quoted any season or annual record figures, as they are all more or less involved with the output of second or third shovels working on the same job, and are therefore not exactly determinable for one shovel.

J. C. BAXTER.

St. Paul, Minn.

Chalk Marks, Bubbles, and Mine Prospects

THE EDITOR:

Sir—I have read many articles appearing in your journal about the prospector, and financing the prospect. Being a prospector and having arrived at a stage in the game where I am seeking development money for a real mine prospect, I wish to call attention to some of the difficulties that beset the prospector.

The first real jar one gets is on approaching a promoter. He will say frankly that he is not interested in mines or making mines, but wants a wildcat near a boom center for blowing stock bubbles to finance his personal expenses. I witnessed one boom camp in which there was one mine and 240 wildcat companies. These gentlemen tell one to wait until the new camp makes good and then there might be some money for mine prospects. It is surprising to learn the number of semi-professional promoters who are looking for bubbles that can be bought for a few dollars, to sting their friends and the public. One reason why the wildcat promoter shuns a mine prospect is that it usually calls for the payment of a bond if the property makes good. He does just enough work to keep out of jail and most of the money is velvet or clear profit.

The second shock one gets is that blue-sky laws prohibit the financing of legitimate mining as well as the fraudulent promotion. Perhaps a change will be made in these laws when prospecting becomes a matter of history. A federal law could be enacted that would really prohibit the sale of all sorts of fraudulent stocks. Federal officers do not wait until the country is flooded with counterfeit money before making arrests. It is poor satisfaction to the investor to hear of a promoter receiving a light jail sentence after the investor's money is gone.

It is hard to understand the investor. If he is promised impossible profits on a cat with invisible orebodies, he falls for it, but bump him into a real prospect and he begins to view you with doubt and suspicion. Some investors also believe that prominent names on the board of directors are a security for investment. Commercial ore or real wealth is the only thing that gives mining properties and stocks a fixed value. There is another class of investor, legions in number, who thinks

he is speculating while watching brokers move stocks up and down by making chalk marks on a board. Selling chalk marks is an old game that makes millions for manipulators every year.

Prospecting for and developing ore does not pay. The only thing worth while these days is free-milling gold or ore that ships from grass roots. A wildcat in a boom center with nothing on the surface will sell for more real money than mine prospects with croppings of commercial ore. One can work from one to forty years on a prospect and not get enough in a first payment to buy one's breakfast. Low-grade ores or ores that require expensive milling plants might just as well be located in the moon so far as the prospector is concerned. He can't work them and has to wait for the capitalist to make an offer and take it on his terms, which are usually not attractive.

We may some day get back to the old system of putting money into miners' wages and powder, following the ore without the heavy overhead expenses of modern mining promotion. That kind of mining has made many great fortunes in the past. The mining engineer should remember that orebodies are not visible to him without exploration, and knocking the prospect does not make new mines or jobs for his profession. Blue-sky laws have driven the legitimate promoter and prospector from the field. Unless conditions change, our production of precious metals will dwindle to an insignificant sum, and the development of mine prospects is the only source from which new mineral wealth can come.

Tonopah, Nev.

A. B. ANDREWS.

Earthquake Vibrations

THE EDITOR:

Sir—Your editorial in the issue of July 11 on "More Earthquakes" is not entirely in accord with the facts as I observed them a few days after the Santa Barbara earthquake, on July 4 to be exact. I refer particularly to the sentiment, "Better in that day for the man who has builded his house upon sand than for him who has founded it upon a rock." The greatest destruction at Santa Barbara was upon the soft sandy alluvium along and near the coast and along an ancient alluvium-filled gorge which approximately follows State St. In the foothills, where the formation is sandstone and shale, but little damage was noted—an occasional chimney down. The buckled concrete sidewalk at the sea wall, shown in the accompanying photograph, shows the effect of the earth wave in the soft sandy soil along the coast. Nothing like it was observed in the harder formation in the foothills, where the pavements are not even cracked.

Los Angeles, Calif.

S. L. GILLAN.

THE EDITOR:

Sir—The general tenor of the editorial on earthquakes, in your issue of July 11, is somewhat at variance with the concepts of modern seismology; and especially so is the statement that a solid foundation constitutes an earthquake menace, in contradiction of which may be cited the following paragraphs from Davison's "Manual of Seismology" (Cambridge University Press, 1921):

"In all earthquakes, the shock is felt more severely on soft ground than on hard, compact rock. Milne, in his seismic survey of Tokyo made in the years 1884-1885,



How the earthquake spoiled a cement sidewalk

showed that the period of the more prominent earthquake-vibrations was greater on soft than on comparatively hard ground, that the range of motion was greater in moderately strong earthquakes, although not always in slight earthquakes, and that the maximum acceleration was also greater.

"The most detailed study of the relation of the nature of the ground and the destructive power of the shock is that made by H. O. Wood of the damage wrought at San Francisco by the Californian earthquake of 1906. The city of San Francisco lies between about 1 and 9½ miles east of the great fault that gave rise to the earthquake. On the whole the intensity of the shock decreased with increasing distance from the fault, but it was subject to many variations evidently connected with the nature of the ground.

"The shock was slightest, resulting in the occasional fall of chimneys, in a few small areas which are invariably those occupied by hard rock (chert, sandstone, etc.) with a level surface. A higher degree of intensity, corresponding to general, but not universal, fall of chimneys, with cracks in masonry and brickwork, marks ground consisting of hard rock with an inclined surface, or hard rock with a thin coating of soil. On thick beds of naturally formed alluvium, old and well compacted, brickwork and masonry were badly cracked, some gables were thrown down, and chimneys generally were destroyed. The worst damage occurred on newly made land, especially on that filling up marshes and creeks. Here, brick and frame buildings generally collapsed, the surface of the ground was thrown into broad undulations, and sewers and water-mains were broken."

Furthermore, I can attest, from personal observation, that the earthquake damage at Valparaiso in 1906 offered abundant evidence of the greater stability afforded by solid rock, compared with softer formations.

San Francisco.

ROBERT HAWXHURST, JR.

News of the Week

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Summary

IDAHO MINERS see no need for revision of mining laws, but feel there should be a more liberal construction of existing laws.

Interstate Commerce Commission issues ruling affecting freight rates on California-Nevada ores.

World's record for underground radio reception made at Warren, Ariz., at a depth of 2,200 ft. and distance of 400 miles.

Lead shortage stimulates Arizona lead-producing mines. Old mines being reopened and tailings dumps reworked.

Kirkland shaft sunk 1,000 ft. without serious accident. Banquet given shaft crew by company officials. Shaft sunk at rate of 100 ft. per month.

Experiments made by University of Minnesota to utilize low-grade Mesabi iron ore indicate possible treatment on commercial scale.

Stockholders' meeting, West End Consolidated, postponed.

Seventy-five mile mineral railroad projected to Hornbeck, Siskiyou County, California.

Germany's representatives visiting Coeur d'Alene district in quest of zinc ore for German industries.

Plan to sell White Caps Mining Co. approved by stockholders. Property to be financed by Thomas F. Cole and associates.

Low-grade manganese from Arkansas finding a market. Mining and washing methods crude.

Shaft Sunk 1,000 Ft. Without a Serious Accident

Formal Dinner Given Sinking Crew, at Which Many Company Officials Were Present

There is always something new in mining, but that it is not always a question of mining methods is shown by the dinner given to the shaft-sinking crew of the Kirkland Lake Gold mine in Kirkland Lake, Ontario, by the directors of the company. The shaft has just been completed from the 1,000 to the 2,000 foot level, sinking having been carried on continuously. The average speed, including station cutting, was about 100 ft. a month, and the average cost for the three-compartment shaft was \$89 a foot. Neither speed nor cost, of course, broke any records, although they were very good for a two-shift operation, but the shaft was put down with an entire absence of accidents, except those of a very minor nature.

The directors wished to signify their appreciation of the fact that this shaft had been completed without any accidents and gave a formal dinner to the shaft-sinking crew, at which practically all the directors of the company and other prominent men were present. They considered it better to advertise a record for safety rather than a record for speed. This dinner was unique in Ontario mining history and it not only set a good example but established the most friendly relations between the men and the company. It is of particular significance at this time when compensation costs are so serious a

Projected Northern California Railroad

A NEW MINERAL RAILROAD PROJECT is being initiated by J. E. Sexton, former general manager of the Eureka Nevada Railroad. The new railroad is to extend from Hornbrook to Happy Camp, Siskiyou County, Calif., a distance of seventy-five miles. The road is to be financed by Sexton and his associates and will be primarily for the purpose of providing transportation facilities for the mines in the vicinity of Happy Camp, of which the Gray Eagle mine is the principal property. This mine is said to have about a million and a quarter tons of low-grade copper ore which was developed by the Gray Eagle Mining Co. The property is owned by the Mason Valley Mines Co. The Blue Ledge mine, close to the Oregon boundary, is also in the same general region. This property is owned by the A. S. & R. Co.

matter for consideration by mine operators in Ontario. At the annual meeting of the Ontario Mining Association held in Sudbury, a short time ago, the question of accident rates and the cost of compensation was the principal matter discussed. A committee of engineers was appointed to study the whole question and see if some remedy could be devised which would result in cutting down the number of accidents and their seriousness.

No Need for Mine Law Revision Felt in Coeur d'Alene

Managers, Lawyers, Engineers, and Prospectors Agree—Suggest More Liberal Construction of "Discovery"

Revision of the United States mining laws is not popular in the Coeur d'Alene district, Idaho. A broader and more liberal interpretation of the present laws, particularly in connection with granting patents for mining claims, is needed, rather than changes in the law. This in substance was the unanimous opinion expressed at a meeting of mine managers, mining engineers, and mining attorneys held at Wallace, Idaho, on July 17. This meeting was called upon the suggestion of P. F. Cutter, mineral examiner for the general land office, with headquarters at Portland. He said that a Congressional committee would hold a hearing in Salt Lake City some time in August on the question of a general revision of the land laws, and that the chief of his division would be called before the committee to make recommendations or suggestions respecting changes in the laws, which would include mining. It developed in the beginning that the only change desired had to do with a change in procedure rather than the law. This was a more liberal construction of the law defining "mineral discovery" in passing upon applications for patent, and relief from the annoying protests almost invariably made by the forestry service against issuance of patent to mining claims on forest reserves. Sentiment was unanimous in opposition to proposed revision.

Stockholders' Meeting, West End Cons., Postponed

The stockholders' meeting of the West End Consolidated Mining Co., scheduled to be held in Oakland on July 15, was again postponed, this time to Sept. 1, due to lack of a quorum. The F. N. ("Borax") Smith interests were not represented at the meeting and the opposition was unable to assemble enough proxies to hold a legal meeting.

It is rumored that financial support to the so-called minority stockholders' group is being extended by the Pacific Coast Borax Co., which was at one time controlled by "Borax" Smith. The West End Chemical Co., which was financed by and is controlled by the West End Consolidated Mining Co., is probably the most important competitor of the Pacific Coast Borax Co. Rumor states that the latter company seeks to gain control of the West End Consolidated in order thereby indirectly to obtain control of the West End Chemical, and that if such control is acquired the West End Chemical operations at Las Vegas will be curtailed so long as sufficient borax products can be obtained at the mines of the Pacific Coast company.

Stockholders in the West End Consolidated are in a quandary as to which faction to support with their proxies. On the one hand, they are not entirely satisfied with the present management, due to the expenditure of the large earnings of the past six years on purchase and equipment of the West End Chemical properties at Las Vegas and elsewhere. On the other hand, they are confronted with the possibility that with a change of management West End Chemical operations may be curtailed. This would decrease the value of West End Chemical stock, which was issued as a dividend to West End Consolidated stockholders, at a time when unconfirmed reports from the West End Chemical properties indicate that profitable operations can soon be expected.

Tonopah District Shows Decrease in Production

June production of the Tonopah mining district was below normal, although there was some increase over that of May. Incomplete figures indicate the total as about 230,000 oz., valued at \$200,000.

The Tonopah Extension bullion shipments for June increased \$14,000 above that of May, to \$69,000. The May report showed a loss of \$45,659 for that month, which would indicate that June loss will be around \$30,000. Conditions in the Tonopah Extension have depressed the entire district. The decrease in production, with consequent operating loss, came as a surprise even in Tonopah, after the usual optimistic reports from the management regarding mine conditions.

The Tonopah Divide Mining Co. is sinking a winze from the 1,600 level of its Midway mine, following a large vein that had been slightly developed on that level. This vein, which was cut about 500 ft. north of the shaft on the 1,600 level, is up to 40 ft. in width,

and its value appears to be increasing with depth. The quartz occurs on the contact between Extension breccia as a footwall and West End rhyolite as a hanging wall, which is considered a favorable condition geologically.

The Richmond Eureka Mining Co., controlled by the U. S. S., R. & M. Co., beginning Aug. 1 will ship 50 tons of ore daily to the smelter from its Eureka, Nev., mine. The ore is of fair grade and is desirable by the smelter at present on account of its high iron content. Preparatory work is being carried on by both company

United Verde Extension Wins Tax Injunction

THE FEDERAL CIRCUIT COURT in Los Angeles, Calif., on July 15 granted the application of the United Verde Extension Mining Co. for a temporary injunction against the State Tax Commission, to restrain it from the collection and assessment of alleged illegal excessive taxes against the mining property of the company.

Following the hearing of the case and when the findings of fact have been submitted, the hearing on a permanent injunction in the matter will come before the Circuit Court.

and leasers above the 900 level of the Logan shaft.

June production by the Eureka Holly was approximately \$40,000, which is practically the same as in May. About 25 tons of ore per day is being shipped to the Midvale smelter from the high-grade orebody recently opened on the 500 level.

Placer Deposits Reported in Snake River Plains

Idaho mining men are highly interested in the announcement that important placer discoveries have been made 50 miles northwest of Pocatello, where three streams, the Big Lost River, the Little Lost River and the Birch Creek, sink in the sands of the Snake River plains.

Heretofore, signs of placer gold in these rivers have been scant, the theory being that these three torrential streams flow with such speed that they fail to drop the more precious metals on higher levels but carry them down to the sink. Early miners also subjected sands solely to the color tests, which were wholly inadequate.

Grizzly Hill District, Idaho

Idaho Falls men are financing development of the Grizzly Hill mine, situated in Lemhi County, 8 miles southeast of Leadore on the dividing line between Idaho and Montana. Ore is loaded at Wyo., Mont., on the Pittsburgh & Gilmore Railroad.

The Grizzly Hill is an old property which in the early days produced a considerable amount of high-grade ore. Three other properties are being worked in the Grizzly Hill district.

Lead Shortage Gives Arizona Mines a Market

Possibility of a world shortage of lead is given in recent statistics published by the Southwest Mining News Service. According to these figures, the world production in 1914 was 1,457,351 tons, as compared with 1,317,353 tons in 1923.

The announcement reads, in part:

"Reliable figures of consumption for 1924 in the United States are not yet available, but it is interesting to note that figures were set at 767,000 tons, or approximately 60,000 tons more than all the lead produced in 1924 by smelters and refineries in this country, both from foreign and domestic ores. The story is the same from all parts of the world—no new mines in sight and production going on at top speed. More than that, there does not seem to be any reasonable possibility of the discovery of new districts of potentiality in the future. Meanwhile consumption is moving ahead with leaps and bounds.

"Three Western states — Missouri, Idaho, and Utah, in the order named—produce 73 per cent of all domestic output, Missouri's total being 32.4 per cent, Idaho's 21 per cent, and Utah's 20 per cent.

"In Arizona, the Copper Queen has been a steady producer of lead for many years, its Southwest Division having held a record of 1,000,000 lb. a month over a considerable period of time. The Shattuck production of lead ores now far exceeds its copper, and the flotation mill at Lowell is working very satisfactorily. The Hilltop mine, in the Paradise section, is making regular shipments to Rodio on the El Paso & Southwestern Railroad; and the Contention Mill, near Fairbanks, operating on the old Grand Central tailings dump, is putting through approximately 150 tons a day.

"Inasmuch as the consumption of lead in batteries alone reached 170,000 tons last year—twice as much as the entire production of the United States in 1880—and as consumption in several other lines has increased with the same rapidity, it would appear that the world faces an imminent shortage of lead."

Keystone Lead Silver Co. to Develop Mine Near Paradise

The Keystone Lead Silver Co., of Douglas, Ariz., has been incorporated, with a capital stock of \$1,000,000, for the purpose of developing lead-silver properties in the Hilltop mining district, a few miles from Paradise, Ariz. The property is said to have been discovered by a German prospector about thirty years ago, and since that time some exceptionally valuable ore has been taken from the several shafts and tunnels that have been sunk by those attempting to develop the mine. The silver ore is said to be of high grade.

The company is contemplating extensive development work in the near future and is laying plans for the handling of a considerable tonnage of ore. Officers of the company are: E. D. Welch, of Warren, Ariz., vice-president; C. R. Knutsen, of Douglas, president; and C. E. Welch, of Paradise, secretary and treasurer.

Low-Grade Arkansas Manganese in Better Demand

Open-Pit Mines Operated by Plow and Scrapers—Crude Log Washers and Hand Jigs Used in Cleaning Ore

By Tom Shiras

THE INCREASED USE of manganese in pig iron by the Birmingham furnaces has given an impetus to low-grade manganese-mining operations in the Batesville-Cushman (Ark.) manganese field. In former years practically all efforts were directed to the production of the high-grade ores. With the strongest demand for low-grade ore the field has ever experienced, a number of operators are turning their efforts in that direction, and the production of this grade of ore is increasing. Conditions are much better now for mining the lower priced ore

the top of a low mountain down to a depth of 80 ft. It is worked in a series of four large open cuts, one above the other. The extent of the orebody has not been fully determined. Much of the mining is being done with teams, plows, and scrapers.

The crude ore is hauled by wagon from the mine to a small washing plant on Sullivan Creek, a quarter of a mile away. The average recovery is approximately 50 per cent. The washing plant is a crude affair, consisting of two 10-ft. logs, a small centrifugal pump, and two small gasoline engines,



Crude washer at Roach mine



Log washer driven by Ford automobile

than they formerly were. Road conditions have improved 100 per cent, permitting the use of trucks in getting ore to shipping points, whereas in former days teams and wagons were necessary. This has made quite a difference in the cost per ton.

During the last few years a number of large modern washing plants have been constructed, but have not proved successful if production can be construed as success. Small plants, on the other hand, have been successful. This was aptly demonstrated the first six months in this year by the operations of Shell and Beatty, who have made a big production of low-grade ore from the Roach mine, on Sullivan Creek. Favorable ore contracts, an immense deposit of low-grade ore, plenty of water for washing purposes, and good roads to shipping points have been the predominating factors of their success.

With two small washing plants consisting mostly of scrap, both worth less than \$1,500, they have produced and shipped 185 cars of ore. Of this production 154 cars was low grade, averaging 25 points manganese and 15 points iron. The remaining thirty-one cars contained 47 to 48 points manganese. The average carload amounted to 28 tons.

The Roach mine is on Sullivan Creek, 8 miles from Pfeiffer, the nearest railroad point. The orebody extends from

one of which operates the pump, the other the logs.

Most of the high-grade production has come from the Ozark mine, also near Pfeiffer. The washer at this place is much cruder than the one at the Roach. It is about 100 yd. below a spring that affords enough water for washing purposes except during extremely dry periods. The plant here consists of one 10-ft. log, which is operated by a Ford roadster. One hand jig is used as a cleaner. The pipe line from the spring to the plant is made from old boiler tubes joined together with pieces of old automobile inner tubes. The log was made from a white oak tree, with old harrow teeth for the teeth. The Ford roadster that furnishes the power also takes the foreman to and from his work. A pulley wheel bolted to one of the rear wheels, as pictured in the accompanying illustration, shows how power is obtained.

In these operations there has been no effort to save the fine ore, and a considerable profit seems to be going into the waste. In an interview with Tom Shell on their operations he said: "We had everything but the capital and we fell back on the old maxim that 'necessity is the mother of invention.'" Pointing at the crude washer driven by a Ford, he continued, "You wouldn't think it possible, but some days we make 10 tons of clean ore with that plant."

Federal Mining & Smelting Co. Acquires Quapaw Property

The 2,360 acres of lease obtained some months ago in the vicinity of Quapaw, Okla., by the Quapaw Mining Co., representing the Charles M. Schwab interests in the Joplin-Miami field, have been turned over to the Federal Mining & Smelting Co. under a drilling option contract. The Federal, with the acquisition of this acreage, maintains its position as one of the dominating companies in the Joplin-Miami district.

New Orebodies Encountered at Coeur d'Alene

Reports are that milling and smelting ore has been encountered at a new point on the Tamarack & Custer Consolidated Mining Co.'s property in the Coeur d'Alene region in Idaho. The

orebody is said to be from 7 to 8 ft. in width. The disclosure is in the Carbon vein, reached through workings on the No. 7 tunnel level, the deepest in the mine. One side of the crosscut through a fault is reported to have revealed 2½ ft. of rich lead-silver ore and the other side of the crosscut 10 in. of the same grade.

Development on the Star drift of the Sullivan Mining Co.'s mine in the Coeur d'Alenes, Idaho, shows that ore has been followed 1,000 ft. at a depth of 4,000 ft. in the dip of the vein. The shoot continues to have a good width and contains ore of much the same grade as disclosed earlier in the operation. The ore broken in the course of drifting is concentrated at Kellogg. The lead-silver goes to the Bunker Hill smelter, and the zinc to Portland, Ore., for shipment to Belgium.

William Shannon, of Wallace, Idaho, reports that he and Edward Latta recently found galena 2 ft. in width on their property, northwest of the Weber mine and five miles from Lakeview. The estimated content is 12 per cent lead and 30 oz. of silver to the ton. The vein is 7 ft. in width and the drills have disclosed another shoot which Mr. Latta says may be as good in quality as the body he is following. Arrangement has been made for the shipment of a carload of ore from the dump to the Bunker Hill smelter.

Plan to Sell White Caps Mining Co. Approved

At a stockholders' meeting of the White Caps Mining Co., which operates a gold mine at Manhattan, Nev., held in Tonopah on July 15, the plan to sell the property to the White Caps Gold Mining Co., a new incorporation, was ratified without opposition on the part of any stockholder.

The White Caps Gold Mining Co. is capitalized for 1,000,000 shares, non-assessable, of which 550,000 shares are treasury stock. Present stockholders in the White Caps Mining Co. will receive one share of the new stock for four shares of their White Caps stock.

Arrangements for financing operations without the customary assessments have been made with Thomas F. Cole and associates, who have taken options on three blocks of the treasury stock as follows: To purchase 100,000 shares at 60c. per share, a sixty-day option to purchase an additional block of 50,000 shares at 80c. per share, and a further 120-day option to purchase 50,000 shares at \$1 per share. If these options are exercised, a fund of \$150,000 will be available for development and other work, and there will still remain 350,000 shares of treasury stock for future needs.

The White Caps mine is opened to 900 ft. deep by a vertical shaft and to the 1,220-ft. level by incline. The east and west orebodies are being developed on the 1,120 level and both show ore of good grade. The east orebody should be cut before the end of July, although progress is slow due to water and heavy ground.

Curtailed Production at Michigan Copper Mines

The Calumet & Hecla Consolidated is in position to enlarge production considerably, but will continue its policy of curtailment until demand and price warrant an increase. Output is at the estimated rate of 105,000,000 lb. of refined copper per year. It could be brought up, it is believed, to from 140,000,000 to 150,000,000 lb. A vast amount of available ground, both in working units and idle mines, is in reserve. Production could be increased, if necessary, at Ahmeek, the Conglomerate and Osceola lode departments, and Isle Royale. In addition, the Kearsarge lode properties could be mined to advantage. Since the close of the war, Calumet & Hecla has been endeavoring to lower costs of mining, pumping, power, and general overhead, the full effect of which will be apparent in future operations. Extension of Ahmeek drifts into Allouez territory and North Kearsarge openings into Allouez will give the company a long stretch of workable ground along the strike of the Kearsarge formation. Extension of North Ahmeek levels at depth also gives promise of a rich yield in this portion of the property. The large acreage on the strike of the Kearsarge lode insures an output far in excess of that when the mines were operated as separate units, for it is possible now to permit lean areas in the vein to stand.

The Mohawk Mining Co. has its

Tailings Mill to Be Constructed by Hecla Mining Co. at Gem

THE Hecla Mining Co., of Wallace, Idaho, will proceed at once with the construction of a tailings mill to treat the material rejected by the jigs in the present mill. It will be situated just across the railroad tracks from the present mill at Gem. The mill will have two units, each consisting of a Hardinge mill in closed circuit with a Dorr classifier, and an 18-in. Minerals Separation flotation machine. Each unit will have a capacity of about 300 tons per day. The flotation product will be lead-silver concentrates, which will be treated by the decanting and filtering equipment in the present mill. The plant will be served by traveling cranes, and all machines will be operated by individual motors through gear reducers. The building will be thoroughly fireproof, with concrete foundation, structural steel frame, hollow tile walls, and asbestos roofing.

Michigan mine, purchased in 1923, in reserve for the time when the copper market warrants resumption of operations. Some of the supplies and machinery at the mine have been sold, but the equipment at "E" shaft on the Butler lode is intact. "E" shaft is down 879 ft. When work is resumed at the Michigan, the management purposes to sink the shaft 1,200 ft. further and at that depth, approximately 2,000 ft., explore the Butler lode by long drifts both east and west along the formation with an occasional crosscut to test other lodes.

All of the Lake mines are well supplied with coal and there is no danger of a shortage even in event of a tie-up in the bituminous fields. Receipts last year were unusually heavy and considerable stocks were carried over. Calumet & Hecla Consolidated has received its first cargo for the present season and deliveries have been made to other docks.

Victoria Copper Company Levies an Assessment

The Victoria Company has levied an assessment of 25c. per share (not a dividend, as stated in these columns last week) to provide funds for insurance, taxes and general expenses. It has valuable assets in its water power, which the directors hope can be developed or sold to good advantage. There is no expectation of resuming mining operations in the near future, it is said, unless copper reaches a price level that would insure profitable operation.

Engineer Merger Gold Mines, Ltd.

The Corporation Trust Co. of America has filed with the Secretary of State (Dover, Del.) a certificate of the incorporation of Engineer Merger Gold Mines, Ltd., Inc., capital 1,000,000 shares without par value.

Extension of Orebodies Proved at Verde Central and Kay Copper

Reports coming from Jerome, Ariz., state that the 1,105 drift on the 1,100 level of the Verde Central mine has penetrated 75 ft. into a ledge of high-grade chalcopryrite ore. The ledge is the same as that which was recently discovered on the 1,000 level. The width of the vein on the 1,100 level is not yet known, but is expected to be from 20 to 40 ft. On the 1,300 level the 1,301 drift has entered the same ledge, and on the 600 level a new crosscut will be started with the same orebody as its objective.

As a result of Dr. Weed's report on its property, the Kay Copper Corporation, Canon, Ariz., has commenced sinking a winze from the 1,200 to the 1,700 level. Three diamond drill holes show good ore for 400 ft. below the 1,200 level. The company at present has sixty men on the payroll, but this force will be increased if development work continues to open up ore and active production is decided upon. In his report Dr. Weed emphasizes the similarity between ore occurrences at Canon and those at Jerome. He also expresses the opinion that the Kay orebodies are not eroded remnants and that the mine's lowest level has merely cut the tips of ore shoots of commercial value.

Drop in British Foreign Steel Trade

Reports from the Department of Commerce state that exports of iron and steel from Great Britain during June amounted to 275,652 gross tons, a loss of nearly 15 per cent from the volume of foreign shipments for the preceding month.

Experiments Made to Utilize Low-Grade Mesabi Iron Ore

Due to a desire to prolong the life of the iron-ore industry indefinitely in Minnesota, the legislature at its last session set aside an appropriation of \$15,000 a year to be used for investigation and experimentation on direct production of pig iron from the low-grade ores. Authorities on iron ore realize the peak of high-grade ore production has been reached and that steps must be taken to secure a cheap process to utilize the millions of tons in the state ranging in iron content from 25 to 45 per cent. E. W. Davis, superintendent of the Mines Experimental Station at the University of Minnesota, is in direct charge of this work and has just returned from a trip to Spain, where he and H. H. Wade, metallurgist, investigated a new process of making steel. With this process as a basis, experiments in utilizing these low-grade iron ores will be made. J. J. Craig, a graduate of the university, will have supervision of the work, with the School of Mines giving all assistance possible. From experiments already conducted, Mr. Davis and Dean Appleby of the School of Mines are very optimistic that the laboratory process can be transformed into actual working methods adaptable to commercial operation.

Stimulating Mine Safety by Contests

TO STIMULATE INTEREST by providing competition among the employees of each division and branch of the Phelps Dodge Corporation properties, the safety department has inaugurated a contest system of keeping their men informed as to the number of accidents that occur daily among all of the men employed by the company. The contest will include every division of the Copper Queen branch and that division which has a record of no accidents within a month will be rewarded with a gold star placed after the name of the division. Large blackboards are being placed at various points around the plants, where the records will be made public. Two large circles will be located in the upper portion of the blackboards, one to show the daily casualty list of each division, the other to show the monthly standing of each division throughout the year. Below the circles figures will be tabulated in squares showing the monthly average of each of the four Phelps Dodge branches—Copper Queen, Morenci, Globe, and Nacozari.

Germany Seeking American Zinc

Eric E. Walter, representing the Metallgesellschaft, of Frankfurt on the Main, Germany, recently spent several days in the Cœur d'Alene district, Idaho, investigating the zinc situation with a view to securing contracts for zinc concentrate for shipment to the plant in Germany. He went from the Cœur d'Alenes to British Columbia for the same purpose. So far as could be learned, Mr. Walter was not successful in closing any contracts, as the coming of the German representative had been forestalled by the Vieille-Montagne Zinc Co., of Belgium, which, with the Anaconda company, now takes all the zinc produced in the Cœur d'Alene district. However, from present indications the next few months will see several new zinc producers, and Mr. Walter established connection with these, though to secure the contracts his company will have to compete with the Belgians and possibly with Anaconda also. The Ore & Chemical Corporation, of New York, is the resident American representative of the Metallgesellschaft. The increasing demand for zinc is having a most beneficial effect in the Cœur d'Alene district, and the time may come when the zinc output will reach proportions comparable with the production of lead.

Hartley Mine Sold for \$300,000

One of the most interesting transactions in the Joplin-Miami district for many months was announced recently, when E. H. Gibb and associates of New York City purchased the Hartley mine and mill, located near Baxter Springs, Kan., for \$300,000. This is said to be highest ever paid for an abandoned property in this field.

World's Record for Underground Radio Reception in the Warren District

A world's record for amateur radio reception underground was established recently by Meade W. Powell, amateur operator of Warren, Ariz., and an employee of the Calumet & Arizona Mining Co. According to information received from the Washington radio news service, Mr. Powell's feat of receiving radio information while 2,200 ft. below the surface, in the Junction mine of the C. & A. Co., has established the record.

Mr. Powell reports reception from a distant naval radio station, 400 miles from Warren, while 2,200 ft. underground. Experimenting late one night in June, Mr. Powell took two receiving sets down to the 2,200-ft. level in the mine, but was unable to pick up any station with either set, using a 100-ft. copper trolley wire antenna on a ten-wire loop. Using a 100-ft. lead-covered No. 14 copper wire cable, strung along a 6-ft. gallery, midway between the roof and the ground, however, he and his assistants picked up NPL, the naval Point Loma, Calif., station, on a regenerative three-tube set. This station is more than 400 miles from the mine. The other set, a five-tube radio frequency receiver, failed to bring in any signals.

Moving up to the 1,400-ft. level, they again used the same aerial and brought in NPL and also two ships on the Pacific Ocean, with the regenerative receiver. The five-tube set still refused to function.

Reception at a depth of 2,200 ft. from a station 400 miles away, is believed to be a record for underground listening-in. Bureau of Mines officials fail to record anything similar, although successful experiments 1,000 ft. below the surface have brought in medium distant broadcasting stations, which they believe is more difficult.

Increased Efficiency in Mesabi Ore Transportation

A recent experiment conducted on the Iron Ore Division of the Great Northern Railroad demonstrates clearly why railroad earnings are increasing. One of the railroad's twenty-five articulated compound engines of the 2-8-8-0 type with cylinders 28-48x32 in. was changed to two high-pressure cylinders 28x32 in. and a feed water heater added. Its old load from Kelly Lake, the collecting center on the Mesabi range, to the Allouez dock at Superior, Wis., a distance of 101 miles, was 140 75-ton cars. After the changes in engine were made, it hauled 170 loaded ore cars and improved the time schedule from fourteen hours for the round trip to twelve hours, which includes an hour at Kelly Lake for cleaning fires and changing trains. This means that five trains will do the former work of six with no additional cost for labor and less chance for crew overtime. With this change one train can haul 11,000 tons, or a boatload of ore. The freight rate is 90c. per ton, making the income from each train that is hauled approximately \$10,000.

Baltimore Mining Co. Gives Lease for Three Years on Chihuahua Property

William Kent, president of the Baltimore Mining Co. and formerly with the International Nickel Co., has leased the silver-lead deposit owned by the Baltimore company in Chihuahua to Carl P. Halter. The mine is adjacent to the Hearst holdings at Santa Eulalia, and it is the intention of the lessee to carry on active development work. The lease is for three years, with privilege of one-year renewal.

New Mill in Operation on Katherine Mine

The double drum for the new 50-hp. hoist has been received at the Katherine mine, near Kingman, Ariz., and will be installed immediately. With the new hoist in operation it will be possible to supply the mill with enough ore to operate it at its capacity of 150 tons per day. The construction of the mill was started on Feb. 24 of this year and was completed on June 24. It is now running three shifts and is concentrating 75 tons of ore per day. The property is at present giving employment to forty-five men.

Sand Filling Used at Copper Range

Copper Range Consolidated, in the Michigan copper district, has completed the installation of an electric pump of 2,400 gal. per minute capacity at the third level of No. 4 Champion shaft. It will take care of the excessive flow of water into this shaft. The pump at the sixth level will be used as an auxiliary. Copper Range is gaining in production and will show an increase during July. This is due to the fact that men formerly engaged in waste rock filling are now available for mining. Sand now is being used in the filling of old openings. Trimountain is steadily adding to the Copper Range reserves.

Silver Producers Directors Will Convene in Salt Lake, Aug. 10

A MEETING of the board of directors of the American Silver Producers Association has been called for Aug. 10 at Salt Lake City by W. Mont Ferry. The principal question for consideration will be the proposed reopening of federal income tax matters. The producers were heard at Washington during the week of July 13. The views of the Internal Revenue Department were presented by the officials, and answers were made by the silver miners. The matter is now under advisement by D. H. Blair, the Commissioner, and a ruling is expected prior to the Salt Lake meeting, at which time further action, if any, on the part of the producers will be considered.

News From Washington

By PAUL WOOTON
Special Correspondent

Changes in Freight Rates Affecting California-Nevada Ores

Interstate Commerce Commission Renders Decision in Case of
Mason Valley Mines vs. Western Pacific R. R. Co.
Regarding Freight Rates

LATE CHANGES affecting the movement of ores and concentrates in the West have been ordered by the Interstate Commerce Commission in a decision recently handed down in the case of the Mason Valley Mines Co. vs. the Western Pacific Railroad Co.

"We find that the rates on ores and concentrates, in carloads, minimum weight 40,000 lb.," reads the opinion, "from Paxton, Spring Garden, and Engels, Calif., to Wabuska, Nev., for the future will be unreasonable to the extent that they exceed those shown in the following scale:

To, Wabuska, Nev., from—	Value									
	\$20	\$30	\$40	\$50	\$60	\$70	\$80	\$90	\$100	
Paxton and Spring Garden, Calif.	\$2.40	\$2.70	\$3.00	\$3.30	\$3.60	\$3.90	\$4.20	\$4.50	\$4.80	
Engels, Calif.	4.40	4.70	5.00	5.30	5.60	5.90	6.20	6.50	6.80	

"We further find that the failure of defendants and respondents to provide and maintain from Paxton and Spring Garden, Calif., to Wabuska, Nev., rates on ores and concentrates, in carloads, similar in all respects as to the conditions under which such rates are applicable to those contemporaneously maintained and applied by them or any of them on like traffic from Spring Garden to Garfield and International, Utah, but not in excess of 60 per cent thereof, will for the future be unduly prejudicial to Wabuska and unduly preferential to Garfield and International.

"We further find that the rates on ores and concentrates, in carloads, from Engels, Calif., and other local stations on the Indian Valley Railroad to Wabuska, Nev., will for the future be unduly prejudicial to Wabuska and unduly preferential to Garfield and International, Utah, to the extent that they may exceed the corresponding rates from Paxton, Calif., to Wabuska by more than the amount by which the corresponding rates contemporaneously maintained on like traffic from the same points of origin to Garfield and International exceed the corresponding rates from Paxton to Garfield and International.

"We further find that the failure of defendants and respondents to provide and maintain from Engels, Calif., and other local stations on the Indian Valley Railroad to Wabuska, Nev., rates on ores and concentrates, in carloads, similar in all respects as to the conditions under which such rates are applicable to those contemporaneously maintained and applied by them on like traffic from the same origin points to Garfield and International, Utah, but subject to the restriction prescribed in the next preceding paragraph hereof, will for the future be unduly prejudicial to Wa-

buska and unduly preferential to Garfield and International.

"We further find that the divisions accruing to the Indian Valley Railroad out of the joint rates on ores and concentrates, in carloads, from Engels, Calif., and other local stations on its line to Wabuska, Nev., will for the future be unjust, unreasonable, inequitable, and unduly prejudicial as between the carriers parties thereto to the extent that they are greater or less in amount than those out of the corresponding rates contemporaneously maintained on like traffic from the same

points of origin to Garfield and International, or either of them."

The opinion is expected to have a bearing on the reopening of the Wabuska smelter, concerning which the commission makes the following reference in its decision:

The Smelter at Wabuska

"The smelter at Wabuska is of the blast-furnace type, built in 1912, and is the only one in western Nevada. It was operated until the depression of 1919, and has since been kept in condition. It has a replacement value of \$1,800,000. Complainant desires to install a reverberatory furnace for the reduction of concentrates, if a sufficient supply can be obtained. As the Engels and Walker mines are the only properties in the district geographically tributary to Wabuska which produce any substantial volume of concentrates, complainant seeks an adjustment of freight rates which will make its smelter accessible to their products. During the period of its operation the Wabuska or Thompson smelter handled ore from 256 different properties, and produced 35,500 tons of blister copper from 1,315,000 tons of ore, and considerable gold and silver. During the last twelve months of its operations this smelter, on smelting account alone, paid freight charges amounting to \$668,231.23. Due to their low value, ores produced in western Nevada and eastern California can not be shipped profitably to distant smelters. It is probable that reopening the smelter at Wabuska would stimulate numerous small producing properties. Inability to market the low-grade oxide ores doubtless will tend to discourage development of mines that would later produce sulphide ores."

Tariff Commission Recommends Increased Duty on Gold Leaf

The Tariff Commission has sent to the President a report of its investigation of gold leaf under the flexible tariff. It is understood that the report is in two sections, one indicating the necessity of a maximum increase in the present duty, and the other, signed by one Commissioner only, indicating that a slight reduction should be made in the present rate.

The application in the gold leaf case was filed more than a year ago by domestic producers through their association and a similar application was filed by the gold beaters' union. The union through its officials strongly urged an increase in the duty, in order to protect American workmen against the products of cheaper labor in Germany.

Under the existing tariff, the duty on gold leaf is 55c. per 100 leaves of standard size, with a proportionate increase for leaves of larger dimensions. If the President follows the report of the majority of the Tariff Commission and increases the duty by 50 per cent, the new rate will be 82½c. per 100 leaves of standard size.

Granite Producers Seeking Higher Import Duties

As the result of an application for an increase in duty in the tariff on monumental granite under the terms of the flexible provisions of the law, filed by the National Committee of Granite Industry, Boston, the Tariff Commission has ordered an investigation in the cost of production of this commodity. The present duty is 50 per cent ad valorem on rough granite plus 15c. per square foot if polished. The applicants seek an increase of 50 per cent.

Heavy importations of granite for monuments are coming from Sweden, the applicants assert, being sold at prices with which the domestic industry cannot compete. Most of the Swedish granite is imported in the rough condition. There also are considerable importations of finished granite from Germany.

Secondary Recovery of Tin as a Metal

The secondary recovery of tin as metal was 7,700 short tons in 1924, as compared with 7,892 tons in 1923, but tin recovered in alloys and chemical compounds increased about 6 per cent. For the first time in many years no tin was recovered from old tin-coated containers, as the high cost of collecting and shipping old cans precluded their use.

Metallurgical Strike Clouds Belgian Prospects

The metallurgical strike in Belgium continues to place a heavy strain on business and has resulted in decided slowing up in both domestic and export trade.

Government intervention is expected if a settlement cannot be reached otherwise.

London LetterBy W. A. Doman
*Special Correspondent***Electrolytic Copper Refinery
Being Erected in Belgium****Mining Shares Neglected for Rubber
Stocks—Katanga Copper Pays Divi-
dend—Porcupine Goldfields Co.
to Be Reorganized**

London, July 14—Relatively little business is being transacted in mining shares owing to the boom in rubbers. The public easily switches from one market to another when there is a possibility of making quick profits, as certainly is the case at present as regards rubber. Platinum nevertheless continues prominent; new companies are being formed and new firms are taking an interest in it, the latest among the latter being Sir Abe Bailey and Lewis & Marks. Platinum, according to reports, is being discovered on farms in South Africa and it is expected to build up as big a platinum industry as the gold-mining industry of the Witwatersrand.

The Union Minière du Haut Katanga has declared a dividend of 138 fr. (Belgian) net in respect of last year, as hinted in my letter of June 30. The production was 85,750 tons copper, or 27,000 tons more than that of the previous year. Work on the new leaching and reverberatory plants has begun, this being the first part of the extensions for increasing the output to 200,000 tons yearly. A refinery is being erected in Belgium to convert Katanga bars into electrolytic copper. A hydro-electric subsidiary company is to be formed. A brief cabled report of the proceedings at the annual meeting in Brussels yesterday adds that the future development of the Union Minière and of the entire Katanga province depends not only on the completion of the Bas Congo Katanga Railway but especially on the earliest possible connection with the Benguela Railway, which forms part of one scheme with the Union Minière.

While Minerals Separation fared rather better last year than in the previous period, it still suffered from misfortunes. These were principally in the direction of its coal processes, partly owing to the depressed condition of the coal trade. The venture in France in conjunction with Baldwins is closed down, and another plant is to be erected in this country. The company is now experimenting with platinum in South Africa, and claims to have achieved a certain measure of success. As the pilot plant installed last year gave good results, the Union Minière has decided to treat the whole of its current tailings by the Minerals Separation process.

It would appear that the differences between the members of the board of the Porcupine Goldfields Development & Finance Co. have been smoothed out, for the expected official statement is now available. It will be remembered that some time ago the representatives of the New Consolidated Gold Fields and the National Mining Corporation

resigned from the board, although these two corporations were responsible for introducing the Porcupine company to the British public. It is now officially announced that J. A. Agnew, F. W. Baker, and Lord Braybourne have rejoined the Porcupine company but only on condition that a scheme of capital reduction is submitted to the shareholders. The capital is to be written down by 12s. per share and the shares at present unissued will be offered to existing shareholders at 8s. The National Mining and the New Consolidated Gold Fields will take up any shares not applied for in consideration of an option for three years at par on 200,000 unissued 8s. shares. The company will write off the cost of acquiring six mining properties in the Porcupine Goldfields; 100,000 one dollar shares fully paid in the Canadian Gold Mines Corporation, and the option to take a further million shares in the same corporation. The properties were not taken up and the shares were not applied for, owing to results not coming up to expectations. The new money to be raised will be devoted to developing the Ankerite mine and for other purposes. Lieutenant-Colonel Morden has not so far rejoined the board.

Austria Adopts Gold Balance Law

The final adoption by the Austrian Parliament of the gold balance law is the last important step in the process of reorganizing the currency and finances of the country, necessitated by the depreciation of the currency and the consequent inflation in the years following the war. Briefly, the gold balance law calls the past a dead letter so far as companies' balance sheets are concerned, prescribing the formulation of new balance sheets on the basis of gold values. Values introduced into the balance sheet must not exceed the current market appraisal of the properties in question, although the value used may be set at any desired figure below the market. No minimum limit is established. The new law, therefore, permits companies to maintain "hidden assets," as hitherto.

Burma Corporation, Ltd., India

During the month of June 27,580 tons of ore was mined; 19,100 tons of ore was milled, and 10,450 tons of lead-bearing material, including 3,388 tons of high-grade ore, was smelted in the blast furnaces, producing 3,648 tons hard lead. The refinery products were 3,504 tons refined lead and 383,264 oz. refined silver. In addition to the above, 718 tons of copper matte was produced from the treatment of accumulated smelter byproducts and 3,792 tons copper ore.

**Flotation Plant of U. S. S., R. &
M. Co., at Midvale**

The progress of construction of the new oil flotation plant of the United States Smelting, Refining & Mining Co. at Midvale, Utah, is steady. This plant represents an expenditure of approximately \$650,000 and should be completed about Dec. 1.

**Buenos Aires 10-Mile
Water Tunnel**

By Mark R. Lamb

The Board of Sanitary Works of Buenos Aires has opened bids for the construction of a 10-mile water tunnel in the foothills of the Andes. The New York Steel Exchange is low bidder. It is expected that the tunnel will require at least four years for completion, and will cost in the neighborhood of \$3,000,000.

H. A. Barker, of London, New York, and Buenos Aires, left recently for an examination trip to a silver-tin mine in Bolivia. The examination is being made at the usual period—that is, after the owners have spent \$400,000 on development without the assistance of an engineer, and are now beginning to wonder if they really have ore which corresponds to Rickard's definition. They have a lot of the other kind.

A contract has been let to remodel a sulphuric acid plant built eighteen years ago. The lead chambers are in excellent condition, after eighteen years. Steam will be replaced with sprays, the old furnace with a modern sulphur burner, and the Gaillard tower with a modern concentrator. Sulphuric acid cannot be imported economically, on account of the high freight rates. The total acid consumption in Argentina, outside of the acid produced by the government for the aluminum sulphate for the city water purification, does not exceed 30 or 35 tons per day. Sulphur is imported from the United States and a supply other than from the trust would be joyfully welcomed.

The marine department of the government is looking for a manufacturer of explosives who would be inclined to erect a plant in this country on the basis of an increase in duties and an over price for all materials purchased by the army and navy. The constructor must remain the owner and must provide all the capital. This is desired so that the plant will be kept up to date at all times. As specified, the factory will cost something over a million dollars.

**Helium Supply at Petrolia, Tex.,
Is Waning**

With the view of developing additional sources of helium-producing natural gas supply an immediate survey of the natural gas fields of Texas is to be made under the direction of R. A. Cappell, chief of the helium division, United States Bureau of Mines. At present all of the supply of natural gas from which helium is extracted at the government plant comes from the Petrolia field. The helium plant at Fort Worth was transferred from control of the Navy Department to the United States Bureau of Mines on Aug. 1. This plant is the sole source of helium production except in laboratories. When the plant was first started, in 1919, the cost of helium was \$450 per 1,000 cu.ft., according to the Navy Department. Continued research, however, during the past six years has decreased the cost to \$25 per 1,000, the figure at which the record production of June was made.

Lead-Zinc Manufacturing Plant on Ottawa River

Power From Hydro-Electric Plant Near Chuts Falls to Be Used

It is announced that a large lead and zinc manufacturing plant in connection with a power development is to be established near Chuts Falls on the Ottawa River at an estimated cost of about \$2,000,000. The Kingdom Mining, Smelting & Manufacturing Co. has purchased power rights and property near mines owned by the Pontiac Mining Co. and Louis Simpson of Ottawa. The James Robertson Co., of Montreal, which controls the Kingdon Mining, Smelting & Manufacturing Co., has plans prepared and intends to start construction work shortly. Negotiations are pending between the Kingdon company and the Ontario Hydro-Electric Power Commission to have the dam of the power plant constructed as a joint undertaking, the company's plant to be built on the Quebec side of the river and that of the Hydro-Electric Commission on the Ontario side.

Development Work Begun in Beardmore District

Following the discovery of gold in the Beardmore district, 130 miles east of Port Arthur, Ont., on the main line of the Canadian National Railways, a rush of prospectors has set in and many claims have been staked. Among the prospectors are a number of engineers representing large Canadian and American companies. Development work has been commenced on some of the claims. The Neelon claim at Mile 18 has been stripped and will be the first to be examined by the engineers.

New Orebodies at South Lorrain

At the Keeley mine in South Lorrain, Ont., two new high-grade shoots have recently been encountered. One shoot is on the new tenth level, at a depth of 740 ft. This is the greatest depth yet attained in the South Lorrain district and the question as to whether or not ore would be found at that level was problematical. Another shoot has been found on the fifth level 360 ft. east of the Woods vein.

At the Mining Corporation property in South Lorrain, ore has been found so rich that it goes straight from the mine to the melting pots in the refinery. Old methods have been resorted to in an effort to break up the vein matter to take it out of the shaft; and, to crack it, it has been necessary to heat the ore by fire and then pour cold water on it. It is then split up by wedges and chisels. Some of this ore is understood to run higher than 20,000 oz. per ton.

Canadian Steel Plant Reduces Activities

The British Empire Steel Corporation, Ltd., recently announced that it would curtail operations by closing the blooming and billet mills, blast furnaces, and open hearths. The rod and wire mills are to begin operation on a four-day-a-week basis.

Granby Officials on Inspection Tour

J. T. Crabbs, president, and Charles Bocking, general manager, are making an inspection of the Granby Consolidated Mining, Smelting & Power Co.'s properties in British Columbia. They are at the Allenby Copper Corporation's mine and mill, where 160 men now are employed. More men will be employed and shipping will begin as soon as the repairs to 12-mile branch of the Kettle Valley Railway from Princeton to the mine has been completed. The branch line has been out of use since October, 1921, and in places is in bad condition; its reconditioning is taking longer than was expected. According to present plans, D. C. Jackling, a director of the company, will join Colonel Crabbs and Mr. Bocking at the Coast, and will accompany them to Anyox.

Peat Fuels, Ltd., Acquires Government Peat- testing Plant

The peat plant at Alfred, Ont., near Ottawa, where experiments were carried on for some years by the Dominion and Ontario governments to demonstrate the commercial feasibility of producing peat as a substitute for coal for domestic purposes, has been taken over by Peat Fuels, Ltd., a Montreal company. The company has opened up the plant and is preparing to put 5,000 tons of peat on the market at Ottawa and Montreal. While this quantity is too small to have any effect on fuel conditions during the coming winter, it is expected to determine the commercial possibilities of the enterprise in competition with imported coal. The retail price will probably be from \$11 to \$12 per ton.

Record Helium Production

A record for helium production was made during June by the helium production plant, Fort Worth, Tex., when it produced 1,228,000 cu.ft. of helium, as announced by the Navy Department.

Teck-Hughes Mill at Kirkland Being Enlarged

Good progress is being made with the new mill construction at the Teck-Hughes property in Kirkland, Ont. The building to house the new crushing equipment is completed, as are also the buildings for the tanks, and some of the tanks have been installed. Two large sets of rolls have been ordered and it is proposed to obtain a product from the primary crushing of approximately quarter-inch size. It is not as yet known what effect this will have upon the tonnage and a conservative estimate of the capacity of the enlarged mill is 200 tons a day. The enlarged mill should be in operation some time in October. The new shaft is down 1,350 ft. and will soon be completed to the 1,600 ft. level.

Consolidated M. & S. Co. Erects New Offices at Trail

The Consolidated Mining & Smelting Co. of Canada will erect a two-story reinforced concrete building, 100 ft. square, on Cedar St., Trail, to house all its activities in that town. Though the company's smelter and executive offices usually are referred to as being at Trail, they really are at Tadanac, an adjoining, though distinct, municipality.

Shipments of ores and concentrates received at the Consolidated Mining & Smelting Co.'s smelter for the first half of the present year totaled 180,039 tons, of which 139,334 tons came from the company's own mine. The other principal shippers were: Silversmith, Sandon, 3,045 tons; Knob Hill, Republic, 2,633 tons; Emerald Salmo, 1,005 tons; Quilp, Republic, 598 tons; Paradise, Lake Windermere, 592 tons; Standard, Silverton, 542 tons; Sally, Beavertell, 440 tons; Ruth, Sandon, 273 tons; Lucky Thought, New Denver, 245 tons; and Bosun, New Denver, 209 tons. Besides the company's own mines, there were fifty-eight shippers on the list.

Gold Placers on Babine River, B. C.

Two prospectors, F. M. Burke and Charles Ek, have uncovered a rich placer gold deposit on the Babine River, near where it flows into the Skeena River, about 70 miles north of Hazelton, British Columbia. They panned out \$45 worth of gold in a day and a half, and then went to Hazelton to record their leases and get supplies. About thirty men have left Hazelton for the new diggings.

First Shipment of Ore From Indian Mine, B. C.

The first shipment of 50 tons of high-grade silver-lead ore is now being made from the Indian mine, near the Premier mine, Portland Canal division, B. C., to Swansea, South Wales.

A deal has just been completed whereby the Imperial Oil Co. has acquired a 51 per cent interest in the properties owned by Southern Alberta Oils, Ltd., in the Turner Valley oilfield.

L. A. Levensaler, Seattle representative of the American Smelting & Refining Company, has made an examination of the Rabine Bonanza mine, Omineca division, British Columbia. H. H. Armstead, who promoted the Canadian Mines Merger Co., is making an examination of the Gleaner group, which adjoins the Engineer mine.

Dome Production Shows Increase Over Previous Year

During the six months ended June 30, the Dome mill of Porcupine, Ont., treated 263,300 tons, as compared with 236,500 tons in the corresponding period of the previous year. The average recovery was \$8.12, as compared with \$8.99, and the total recovery was \$2,137,000, an increase of \$17,000. Costs were reduced from \$4.78 to \$4.24 and the net earnings were \$1,045,494, a decrease of \$8,000.

Men You Should Know About

W. J. Loring, of Los Angeles, has been made a director of the Big Jim Mines, Inc.

Charles Hardy has returned to New York after a two months' business trip in Europe.

A. A. Heller, treasurer and general manager of the International Oxygen Co., has returned from an extended trip abroad.

Theodore Pilger, mining engineer and geologist, who is American trade com-



Theodore Pilger

missioner, located at Berlin, Germany, has recently made an extensive trip through the Rhineland, Westphalia, and western Germany. He visited the Krupp works at Essen. This organization is carrying about 36,000 employees at the present time. About 65,000 is considered normal. At the high point during the war in 1918 the concern had 115,000 employees. The management claims that its operations are greatly handicapped by the French occupation and by the Allied insistence upon the scrapping of practically any machine that might be used for the manufacture of guns or munitions. Many thousands of machines have already been scrapped to meet the requirements of the Allied Disarmament Commission. This commission continuously maintains a British army officer in the Krupp factory. Western German business people complain of the shortage in liquid capital and its consequent depressing effect upon business. The uncertainty under which all German business must be conducted, due to political moves, is undoubtedly an extremely serious handicap to the re-establishment of German production.

W. W. Fondren, vice-president of the Humble Oil & Refining Co., Houston, Tex., and family have sailed for Europe, where they will spend their summer vacation.

L. C. Penhoel, of the Southwestern Engineering Corporation, Los Angeles, recently made a business trip to the Panamint mine, near Ballarat, Calif.,

and en route visited the Darwin mine, a Darwin, Calif.

Kirby Thomas, of New York, is engaged for several weeks on an investigation of lead and zinc conditions in Missouri.

Forest Rutherford, consulting mining and metallurgical engineer, 50 Broad St., New York, has returned to the city from the northern Quebec mining fields of Canada.

W. F. Vane, manager of the land department, and **Reginald Stoner**, assistant general manager of production, Standard Oil Co. of California, inspected the holdings of their company in west Texas recently.

Hamilton M. Brush, vice-president, and manager of the sales department of the American Smelting & Refining Co., and **Joseph Clendenin**, of Guggenheim Brothers, arrived on July 21 on the "Majestic" from an extended trip abroad.

Philip S. Smith, head of the Alaska branch of the U. S. Geological Survey, sailed from Seattle on July 18, to visit parties and make geologic investigations in southeastern Alaska, Prince William Sound, and the Matanuska region.

D. W. Leeke, who was mining engineer for the Benguet Consolidated Mining Co., Philippine Islands, is now with the American Cyanamid Co.

The Humphreys Corporation has moved its offices from Dallas to Houston, Tex. The reason ascribed is the shifting of the company's wildcat exploration work from the Mexia fault zone territory to the Gulf Coastal area. The chief officials who will reside in Houston are: **Judge J. A. Elkins**, general manager; **Frank W. DeWolf**, chief geologist; **S. A. Judson**, assistant chief geologist; **Carl A. Meyer**, head of the land department; and **J. J. Shrewbury**, auditor.

Albert H. Fay has been engaged as an assistant editor of the *Mining Journal-Press*. He comes to New York from Washington, where for a number of years he was head of the natural resources division of the Internal Revenue Bureau, in charge of valuation of mining properties for income tax purposes. Mr. Fay brings to the *Mining Journal-Press* a wealth of experience in the mining industry. He was graduated with the degree of B.S. from the Missouri School of Mines in 1902, and received the degree of E.M. from the same institution in 1905. He then took post-graduate work at Columbia, and received his A.M. degree from the latter university in 1907. In 1902 and 1903 he was assistant to the late Dr. Rossiter W. Raymond, secretary of the A.I.M.E., and in 1903-05 was mining engineer with the Cananea Consolidated Mining Co., Cananea, Sonora, Mexico; was next mining engineer and superintendent Bartels Tin Mining Co., Cape Prince of Wales, Alaska, 1906-07, and mining engineer, John T. Williams & Son, Bristol, Tenn., 1907-08. Then

from 1908 to 1911 he was on the staff of *Engineering and Mining Journal*, as this publication was known at that time, and in 1911 was editor of "Mineral Industry," Vol. 19, published then as now by the McGraw-Hill Book Co. From 1911 until 1920 he was with the U. S. Bureau of Mines, in charge of mine accident statistics, resigning to engage in private practice as mining engineer and petroleum geologist, from which he was again drafted by the government to take charge of the mine valuation work. In connection with his work for the government he is the author of annual reports, beginning with the volumes for 1911, of "Metal Mine Accidents in the United States,"



Albert H. Fay

and "Quarry Accidents in the United States"; annual reports, beginning with the volumes for 1913, of "Coke-Oven Accidents in the United States," and "Accidents in Metallurgical Plants in the United States"; also annual reports, beginning with volume for 1912, on "Production and Distribution of Explosives in the United States." He is also the author of "Coal Mine Fatalities in the United States, 1870-1914," with statistics of coal production and mining methods, by states and calendar years, issued as a bulletin of 370 pages by the Bureau of Mines, and of "Monthly Statement of Coal Mine Fatalities," issued monthly over a period of seven years by the Bureau of Mines. During the World War he performed a signal piece of good work for the government. This was the compilation of a census of mining engineers and chemists in the United States and cataloging them according to their experience, so that it would be possible for the government to select quickly the proper man for special work. As the census contained 22,500 names and the indexing required 60,000 cards, the magnitude of this work can be imagined. He is also author of "A Glossary of the Mining and Mineral Industry," the most comprehensive and complete ever published, containing, as it does, more than 20,000 mining terms and more than 30,000 definitions. This was published by the U. S. Bureau of Mines as Bulletin 95. During the past two years he has been in private practice as consulting engineer.

Recent Technical Publications

Reviews, Abstracts, and References

Aluminum

The Metallurgy of Aluminum and Aluminium Alloys. By Robert J. Anderson. Henry Carey Baird & Co., New York. Price, \$10.

No authoritative English book on aluminum, with the scope of this, has been published for thirty years, in which time vast changes have occurred and the metal has graduated from the ranks of those that are comparatively rare to those of extensive commercial utility. With the continued expansion of the electrical and aircraft industries, aluminum promises to become increasingly important, and a book of close to a thousand pages on the subject, as this one is, seems well justified.

All phases of the industry are covered by Mr. Anderson, though most of the book is concerned with the utilization rather than the production of the metal. Economic aspects are considered in the first chapter of 29 pages, followed by a 40-page chapter on the occurrence and distribution of ores of aluminum, their mining and dressing. Then comes a 60-page chapter covering the various processes of producing aluminum. The remaining 750 pages have to do with the physical and chemical characteristics of aluminum and its alloys, and the methods of using the various forms of the metal in industry.

As is generally known, the Aluminum Company of America is the largest and practically the only producer in the United States and its control of the industry reaches into foreign countries. It has never felt kindly toward any publicity concerning its technical or marketing methods, so that aluminum is the only metal of commercial importance whose production is shrouded in mystery. Of course, the main features of the Hall and Heroult processes, by which practically all of the metal is made, are known, and these Mr. Anderson gives, but the reader will look in vain for any very extended treatment of this phase of the subject. When it comes to the metallography of aluminum, the author is more at home, and this part of the book, though not coming within the field of most *Mining Journal-Press* readers, should be of great value to metal workers.

The choice of the word metallurgy in the title, and in fact the general use of the word metallurgy to cover the working of metals as well as their extraction from ore, seems to this reviewer unfortunate. Why not reserve the word metallography for that branch of science which treats of finished metals and metal working, and employ the term metallurgy for the science of metal production?

Aluminum ranks third among the elements in abundance in the earth's crust, only oxygen and silicon being more generously distributed by the Creator. But it is only from comparatively pure bauxite that aluminum can be made by present commercial processes and, as Mr. Anderson says on

page 75, "a commercially feasible process for the production of aluminium from aluminium silicates and the common aluminium minerals is the *desideratum* at the present time." Such processes will no doubt be developed when it becomes impossible to get sufficient aluminum from pure bauxite, which will be some years yet. But it is comforting to know that when all the copper in the world has been used up, which some pessimistic experts calculate will be in the next generation, the earth's crust will still contain about 8 per cent of aluminum, so that there is small chance that the "age of metals" will stop all of a sudden.

Mr. Anderson evidently prefers the foreign term "aluminium" to the American "aluminum" despite the fact that the largest producer has incorporated the simpler term in its corporate title, and that most of the world's supply of this metal is produced and consumed in the four-syllable form. Etymologically, there seems little choice.

E. H. ROBBIE.

Locomotive Haulage— "Simplified Methods in Locomotive Haulage" are discussed in a 3-page article by H. C. Goodrich, chief engineer of the Utah Copper Co., in *The Mining Congress Journal* for June (Washington, D. C.; price 30c.) Steam, internal combustion, and electric locomotives are described briefly and their merits compared.

Science in Industry—The *Annals* of the American Academy of Political and Social Science, for May (Philadelphia; price, \$2), is devoted to a symposium on the application of science in modern industry. No mention is made of the numerous applications of science in the winning of metals from their ores, though several other branches of industry are considered.

Screen Sizing—Bulletin 234 of the U. S. Bureau of Mines, Washington, D. C. (140 pp.; price 40c. from the Superintendent of Documents, Washington, D. C.) is entitled "Screen Sizing of Coal, Ores, and Other Minerals." E. A. Holbrook and Thomas Fraser are the authors. This is perhaps the most comprehensive publication on screening that has so far appeared, and though largely devoted to coal, the metal and non-metallic mineral miner will find much of interest in it. The bulletin is well illustrated.

Missouri Clays—The School of Mines and Metallurgy, Rolla, Mo., has issued "A Treatise on Missouri Clays," by M. H. Thornberry. The production, occurrence, types, analyses, and softening points are given, and the clay-producing regions are indicated on a map that is included in the bulletin. Missouri has become one of the most important clay-producing states in the Union, the discovery and development of diaspore clay deposits having given the industry new life. Methods for the complete mechanical analysis of clays are given in an appendix. Copies are obtainable on request.

Mining Engineering—The sixth volume of *Cours d'Exploitation des Mines*, by M. L.-E. Gruner, has recently been issued. The first three volumes were reviewed in these columns on Dec. 9, 1922. The present section discusses accidents and hygiene, surface installations, statistics, and rules. Price 32 fr. from Librairie de L'enseignement Technique, 3, Rue Thénard, Paris (V), France.

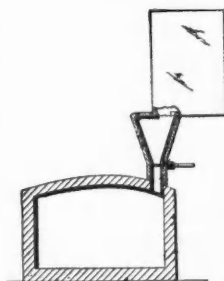
Patents

Electric Ore Reduction—No. 1,545,582. July 14, 1925. B. G. Cobb, Toronto, Ont., assignor to Cobb Electro Reduction Corporation of Canada, Ltd., Toronto, Ont. Metallic compounds are reduced by charging into a fused bath of a non-electrolytic flux, maintained in a fused condition by the passage therethrough of a direct current of electricity.

Ore Treatment—No. 1,545,619. July 14, 1925. W. E. Trent, Washington, D. C., assignor to Trent Process Corporation, Washington, D. C. A method of treating ores while held in suspension in a suitable receptacle, the dry or molten product being collected by baffles discharging into a receiver.

Metallurgy of Copper—No. 1,542,934. June 23, 1925. W. E. Greenawalt, Denver. Copper sulphide ore is concentrated and the concentrates roasted and leached to extract a part of the copper. The residue is smelted to a matte, which is crushed and added to the fresh sulphide charge to be leached. Sulphuric dioxide is used as a reducing agent in the process, flow sheet of which is given in the patent.

No. 1,542,966. June 23, 1925. J. M. Samuel, Douglass, Ariz., assignor of 55/100 to Phelps Dodge Corporation. A heat-insulated and airtight transfer conduit between a roasting furnace and a reverberatory as shown in the accompanying figure.



Mine Door—No. 1,543,005. June 23, 1925. F. A. Guth, Columbus, Ohio. Design for an automatic mine door.

Mineral Separator—No. 1,546,822. July 21, 1925. R. N. W. Bligh, Raneville, Queensland, Australia. A portable riffled table having a floor formed of fine-mesh fabric and wire screen, for separating minerals and precious stones from alluvial wash.

Oxidized Lead Ore—No. 1,546,854. July 21, 1925. Virgil Miller, Salt Lake City, Utah, and H. D. Ballow, Levan, Utah. Oxidized lead ores are heated to a temperature sufficient to convert the lead carbonate to lead oxide, which is then subjected to gravity separation.

Fume Precipitation—No. 1,545,975. July 14, 1925. R. B. Rathbun, Salt Lake City, Utah, assignor to American Smelting & Refining Co., New York. Arrangement of long and short electrodes in an electrical fume precipitator.

New Machinery and Inventions

New Portable Crane for Light Trucks

By virtue of its mobility, the motor truck crane will be found of service on those operations the nature of which does not warrant the installation of stationary hoisting devices. Of the several types of portable cranes on the market, the majority are built for use on trucks of 5 tons capacity or over. The International Motor Co., New York, has recently developed a crane, mounted on Mack trucks of 1½, 2 and 2½ tons capacity. This crane, primarily designed for the purpose of unloading 1,000-gal. fuel oil tanks from gondola cars, is adaptable to many other uses such as handling gasoline drums, barrels, stone slabs, etc., weighing up to 2,500 lb.

The equipment consists of a mast, braced and anchored to the chassis frame; a special drum-winch, and two booms, the longer of which is shown in the accompanying illustration. The long boom measures 13 ft. 3½ in. and has a 16-ft. clearance from the ground, while the short boom, measuring 8 ft. 11½ in., has a 10-ft. ground clearance. Both booms have an 8½-ft. lateral radius, and since the shorter one may be operated with the mast in a lowered position, it is used for general lifting; but where additional clearance is required, as in hoisting from freight cars, the long boom is necessary.

Power is applied to the winch from a power take-off through a one-speed forward and reverse gear and a chain drive to the winch-worm sprocket. The controls, consisting of motor-clutch and gear shift, are located directly behind the cab, on the left side of the mast; and attached to the back side of the cab is an auxiliary gas control that permits the operator to regulate the engine speed without leaving his position at the control levers.

To insure rigidity of the chassis while the crane is being operated, two jack screws support the mast from the ground. These screws are attached to the cross-members under the mast by means of a swivel arrangement, so

that when not in use the free ends may be fastened to brackets on the sides of the frame.

The entire assembly may be mounted on any standard Mack truck with but little alteration to the body and none to the cab.

A New Line of Iron Body Gate Valves

An entirely new line of iron body gate valves, containing structural features that are expected to appeal to valve users, has just been introduced by the Lunkenheimer Co., Cincinnati, Ohio.

The valves are made in two types, stationary stem, inside screw and rising stem, outside screw and yoke. Either type may be had in the standard pattern for 125 lb. working steam pressure or in the extra heavy pattern for 250 lb., total temperature being 450 deg. F. They are made in all standard sizes.

The bodies have been designed with ample thicknesses of metal properly distributed and having large fillets, so as to insure the strength and rigidity needed to withstand the strains incident to expansion and contraction.

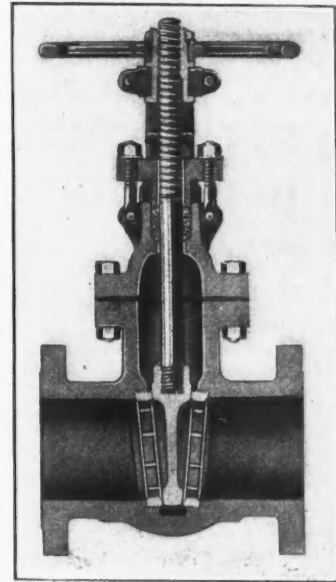
All parts are renewable, including the seat rings. The seat rings do not form a joint with the body by the usual means of a small flange on their seating surfaces, which is depended upon to prevent the seats from dislodging when the wedging action between them and the disk takes place, but instead are solidly backed by the walls of the body, thereby preventing any possibility of their becoming loose or being wedged out of place.

Care has been exercised in finishing these valves. The ribs which act as guides for the disk and which are cast integral with the body are actually machined, as are also the grooves in the disk which engage the ribs. Naturally, the "side-play" of the disk is controllable by this finishing process and consequently the disk does not drag upon the seat nor touch them until the valve is fully closed. Therefore the excessive wear and marring of the seat-

ing surfaces incident to the dragging of the disk upon the seats is eliminated and the life of these parts is prolonged.

The disk, of the inside screw, stationary stem pattern, is hollowed only to the extent sufficient to receive the stem. That of the outside screw and yoke, rising stem pattern is solid throughout. The advantage of a solid disk is that when expansion and contraction occur, both sides of the disk are simultaneously affected, thereby preventing distortion or fracture and insuring tight seating surfaces.

The exceptionally deep stuffing box provides a large packing surface. The stuffing box is repackable under pressure when the valves are wide open,



New type of iron body gate valves

a tight seat being formed between the top of the disk and the bottom of the stuffing box bushing.

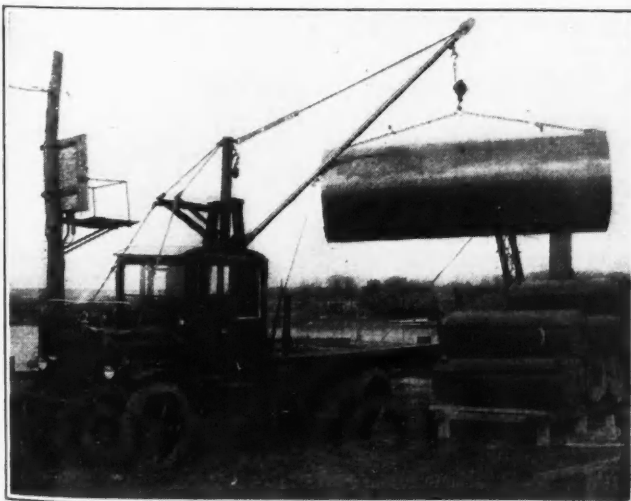
One of the features is that of the two lugs provided within the yoke arms directly above the stuffing box gland. When it is necessary to repack the valve, the gland is raised above the lugs, and, by slightly turning it, the flange on the gland will then rest upon these lugs, thereby dispensing with the usual method of tying up the gland while the stuffing box is being repacked.

Convenience of repacking is also afforded by the use of swing bolts which retain the stuffing box gland. To raise the gland requires only loosening of the nuts sufficiently to permit of swinging the bolts aside. Entire removal of the nuts is not necessary.

At no point does the stem come in contact with iron, as the yoke, gland and bottom of the stuffing box are all bronze bushed. Corrosion is thereby prevented and an easily operated valve assured.

The manufacturers claim that the materials employed are of a fabrication particularly adapted for valve service, not alone for high pressures and temperatures but also for the stresses incident to expansion and contraction and pipe strains.

Face to face dimensions of the flange ends valves are what is generally accepted by the trade as "standard."



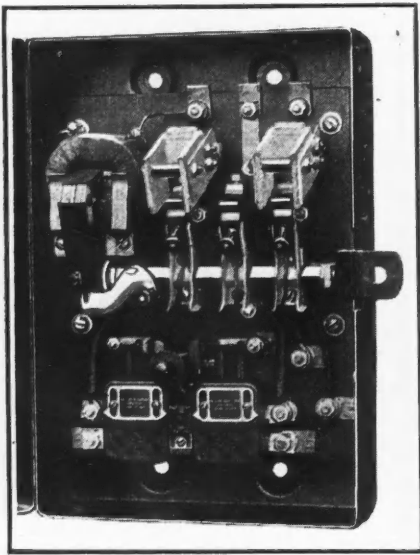
*Hoisting
a
1,000-gal.
fuel oil
tank
weighing
1,500 lb.
by
means of
new
truck
crane*

Therefore replacements can be made without alteration of pipe lines.

The valves are regularly furnished with the body, bonnet, yoke and gland of iron, and the stem, disk faces, seats, and yoke, gland and stuffing box bushings of bronze.

New Across-the-Line Starters for A.C. Motors

The first two of a new line of automatic starters for squirrel-cage and single-phase motors have been developed and placed on the market by the Cutler-Hammer Manufacturing Co., Milwaukee, Wis. Both of the new "X" starters have a three-pole switching mechanism with butt contacts of an improved design that insures long service and permits easy renewal of the



Interior view of new automatic across-the-line starter, showing switch mechanism and thermal overload relay

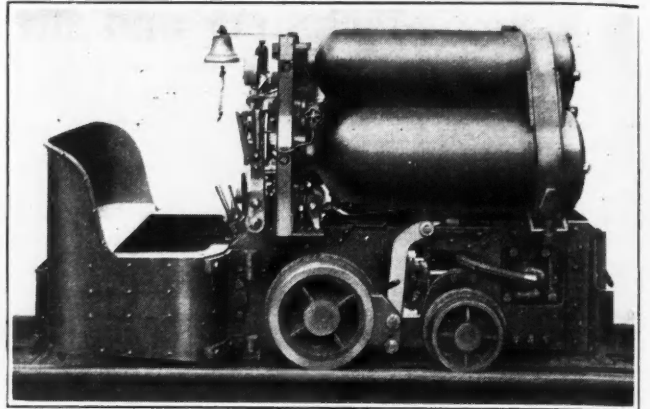
contacts. The switching mechanism, terminals and overload devices are mounted on a slate panel which is inclosed in a steel cabinet provided with knockouts for conduit wiring, and the entire construction is exceptionally compact, the cabinets being only 13½ in. high by 9 in. wide by 6 in. deep. The cabinets are arranged for convenient mounting on wall, post or machine.

Small Compressed Air Locomotive

A small mine locomotive, which is illustrated in the accompanying cut, has recently been developed by Messrs. Demag, of Duisburg, Germany, where it has been used in coal-mining operations, though not necessarily limited to this class of work.

In its design dimensions have been reduced to a minimum. It can be moved onto the cage without dismantling further than removing the driver's seat. This is a small sheet-metal casing, without fittings, which can be easily attached or removed. It can be readily moved from level to level or

Locomotive used in coal mines in Germany, which is so small it goes into the cage without dismantling



to the surface for repairs. Attention has also been paid to reducing the weight of the engine so that it may be used on the lightest rails in the furthest workings. The locomotive is able to haul 16 to 20 tons, depending on conditions.

Reservoirs of 7 to 9 cu.ft. capacity are sufficient for covering a distance of 4,000 ft. going and returning with the load mentioned and at a loading pressure of 2,200 to 2,500 lb. per square inch. A compound compressed air engine with intermediate heating of the working air is used for driving. Other data of the locomotive are as follows:

Weight, empty, tons.....	2
Speed, miles per hour.....	4 to 6
Traveling pressure in cylinders, lb. per sq.in.....	205 to 235
Useful performance, tons per mile per hour.....	7.2
Width of engine, in.....	31½
Number of axles.....	2
Output normal, hp.....	4
Output maximum, hp.....	6
Pull normal, lb.....	330
Pull maximum, lb.....	550
Length of engine, in.....	78½
Height of engine, in.....	49
Axle distance, in.....	20½

New Safety Brakes for Hoists

By George Iring

Section Chief, Vienna Institute for Scientific Auxiliary Work

The fact that accidents continue to occur from time to time on hoists and elevators shows that the safety devices in use at present are still imperfect. The device shown in the sketch is designed to overcome the faults of existing systems and is said to be foolproof, automatic, and unailing. The left side of the drawing shows the device when not in operation, the right side shows it operating as a brake.

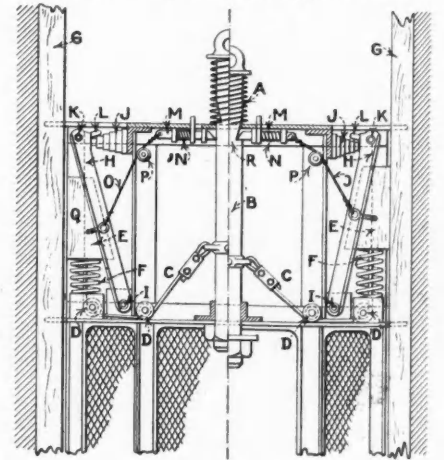
When the cable breaks, the pull on the supporting rod *B*, which carries the elevator, ceases, and it sinks as far as the supporting spring *A* will permit. This releases the cables or chains *C*, which are attached to *A* and lead over rollers or pulleys *D*, and permits the spring *F* to force the brake shoe *E*, which is wedge shaped, between the rails *G* and the diagonal brake bar *H*. A flange and groove or dovetail arrangement is provided between *E* and *H* so that the movement of the wedges *E* takes place parallel to the guide rails. These guides have springs that prevent the wedge from jamming and also lessen the shock. To obtain better friction, the surface of the wedges

may be covered with a roughened iron, to which rubber sections are added to reduce the shock.

The rails that form the brake bars *H* turn on a solid axle *I*. To avoid excessive strain on the axle which might lead to its breaking, the upper end of the rail *H* is held by pinions *K*, and can move only the extent of the slit *L*. Powerful springs *J*, against which the upper part of *H* is pressed by the wedge *E*, provide the necessary elasticity for the braking movement, and avoid shocks or swaying.

To prevent the possibility of the cable rebound tightening the chains *C* and loosening the wedges, so that the braking of the car would become questionable, the rod *B* is automatically locked in its lowest position. This is done by the bolts *M*, which are constantly under pressure of the springs *N* and are pressed toward the rod *B*, but without touching it. If the hoist cable breaks, the rod *B* is pushed downward by the springs *F*, the brake shoes *E* press the brake rod *H* toward the center and the tension is removed from the wire cable *O*, which passes over the pulley *P* to the bolt *M*. This allows the spring *N* to press the bolt *M* into a notch in the rod *B*, which is thus locked. To release the elevator from its locked position it is merely necessary to draw out the bolt *M*, and the hoist is again able to operate.

This device can be built on any car without much trouble, it is claimed, and its method of operation makes it practically perfect. It works equally well on wooden and on metal guide rails.



Design of new safety brake for hoists and elevators

The Market Report

Daily Prices of Metals

July	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
23	14.125	57.75	58.75	8.25	8.125	7.30@7.325
24	14.125	56.875	58.00	8.25	8.15	7.225@7.25
25	14.00	56.625	57.75	8.25	8.15	7.25
27	14.00	56.625	57.75	8.30	8.20	7.275
28	14.125	56.875	58.375	8.30	8.25	7.275@7.30
29	14.125	57.125	58.50	8.30	8.25	7.325
Av.	14.083	56.979	58.188	8.275	8.188	7.281

*The prices correspond to the following quotations for copper delivered: July 23d and 24th, 14.375c.; 25th and 27th, 14.25c.; 28th and 29th, 14.375c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of Mining Journal-Press and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

July	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3M	Spot	3M	Spot	3M
	Spot	3M							
23	62½	63½	67	263½	266	35½	34½	35½	35½
24	61½	62½	66½	258½	261½	34½	34½	35½	34½
27	61½	62½	66	257½	260	34½	34½	35½	34½
28	61½	62½	66½	258½	261½	35½	34½	35½	35
29	61½	62½	66½	261	263½	36	35½	35½	35½

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

July	Sterling Exchange "Checks"	Silver		Gold London	July	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
23	4.85½	69½	32½	84s10½d	27	4.85½	69½	32½	84s10½d
24	4.85½	69½	32	84s10½d	28	4.85½	69½	31½	84s10½d
25	4.85½	69½	31½	....	29	4.85½	69½	31½	84s10½d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-half cent premium.

Metal Prices Firm in Listless Market

New York, July 29, 1925—The non-ferrous metal markets have been exceedingly quiet in the week ending today, the demand for tin in the last two or three days being about the only sign of activity. The threatened coal strike in England has been responsible in part, though the recent heavy volume of sales would naturally have been followed by a period of midsummer dullness. In general, producers are well sold up with current production and are in no mood to sacrifice metal at bargain prices.

Copper Sales Light

The tonnage of copper sold in the week ending today has been the smallest in months, though prices are today unchanged from a week ago. A fair business was done on Thursday and Friday at 14½c. delivered, but on Saturday and Monday resale lots appeared, which were taken up at 14½c., so that the large producers were unable to do any business outside of an occasional carload. The decline in London on Monday increased the cheap offerings

by dealers, but the advance of 12½s. on standard yesterday scared all sellers of 14½c. copper to cover, and in the last two days producers have again been able to obtain 14½c. for an exceedingly modest tonnage. Some of the largest sellers are practically out of the market as a result of recent heavy sales, and are nominally quoting 14½c. delivered, without, of course, doing any business.

The export demand has also been light, with American agencies continuing to hold their prices at 14.60c., c.i.f. A small amount has been sold at that level on the Continent. The threatened coal strike in England has slowed up business in that country materially. It was offered as an excuse for a bear raid on Friday and Monday, which soon petered out, however.

Lead Continues Scarce

The contract price of the American Smelting & Refining Co. for New York continues at 8.20c. The so-called outside market is considerably above this level, however, and spot lead has been offered as high as 8½c., New York, with occasional sales of small tonnages at slightly under this figure. The business done on a contract basis at 8.20c. is, however, in much larger volume than that at premium prices. Some consumers in the East have also bought lead from Middle Western producers, paying in the neighborhood of 8½c. for it. In the Middle West much the same condition obtains as in the East, with producers reluctant sellers to regular customers at prices considerably lower than are available to others. They have come up to an 8½c. basis in the last day or two, though a few days back most sales were figured back to 8.10c. or 8½c., St. Louis basis. Some lead has also been sold to and by dealers at 8.40@8.60c. St. Louis, but the tonnage is relatively small. Dealers, and even consumers who are speculatively inclined, are having a hard time getting hold of any lead except at prohibitive prices. Supplies, however, seem adequate for taking care of the nearby requirements of consumers, and they have no cause to worry. Monday was a rather active day, but during most of the week, inquiries have not been particularly large, and many of these inquiries did not result in sales. Some September lead has been sold, but by far the largest proportion of the business has been for August.

Zinc Still Above 7.30c.

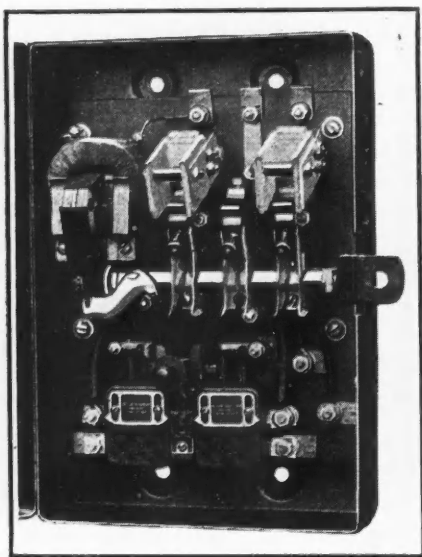
Zinc took a little dip during the week as a result of a little weakness in London and freer offerings by small producers, which were quickly absorbed by the large producers optimistic over the future for this metal. The price today is again at 7.32c., about the same as a week ago, though a few lots were absorbed at 10 points under this level on Friday last. One or two good-

Therefore replacements can be made without alteration of pipe lines.

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Interior view of new automatic across-the-line starter, showing switch mechanism and thermal overload relay

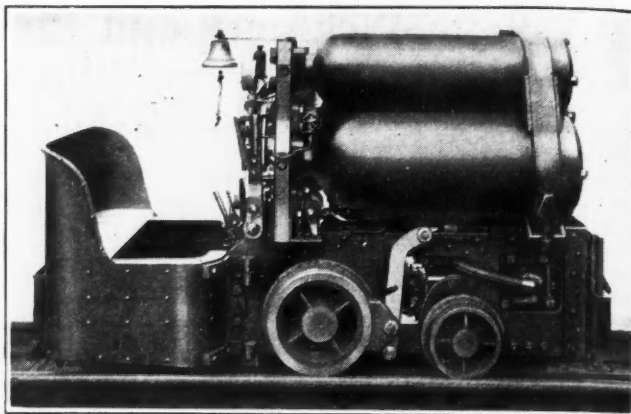
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By George Iring

Section Chief, Vienna Institute for Scientific Auxiliary Work

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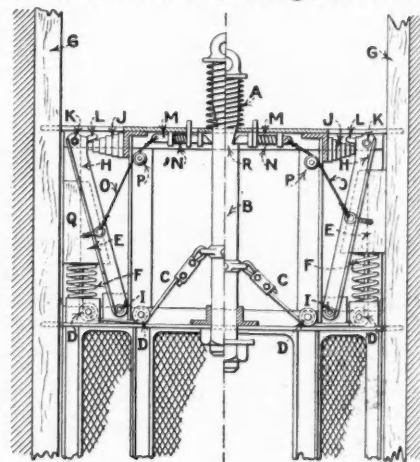
When the cable breaks, the pull on the supporting rod *B*, which carries the elevator, ceases, and it sinks as far as the supporting spring *A* will permit. This releases the cables or chains *C*, which are attached to *A* and lead over rollers or pulleys *D*, and permits the spring *F* to force the brake shoe *E*, which is wedge shaped, between the rails *G* and the diagonal brake bar *H*. A flange and groove or dovetail arrangement is provided between *E* and *H* so that the movement of the wedges *E* takes place parallel to the guide rails. These guides have springs that prevent the wedge from jamming and also lessen the shock. To obtain better friction, the surface of the wedges

may be covered with a roughened iron, to which rubber sections are added to reduce the shock.

The rails that form the brake bars *H* turn on a solid axle *I*. To avoid excessive strain on the axle which might lead to its breaking, the upper end of the rail *H* is held by pinions *K*, and can move only the extent of the slit *L*. Powerful springs *J*, against which the upper part of *H* is pressed by the wedge *E*, provide the necessary elasticity for the braking movement, and avoid shocks or swaying.

To prevent the possibility of the cable rebound tightening the chains *C* and loosening the wedges, so that the braking of the car would become questionable, the rod *B* is automatically locked in its lowest position. This is done by the bolts *M*, which are constantly under pressure of the springs *N* and are pressed toward the rod *B*, but without touching it. If the hoist cable breaks, the rod *B* is pushed downward by the springs *F*, the brake shoes *E* press the brake rod *H* toward the center and the tension is removed from the wire cable *O*, which passes over the pulley *P* to the bolt *M*. This allows the spring *N* to press the bolt *M* into a notch in the rod *B*, which is thus locked. To release the elevator from its locked position it is merely necessary to draw out the bolt *M*, and the hoist is again able to operate.

This device can be built on any car without much trouble, it is claimed, and its method of operation makes it practically perfect. It works equally well on wooden and on metal guide rails.



Design of new safety brake for hoists and elevators

The Market Report

Daily Prices of Metals

July	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
23	14.125	57.75	58.75	8.25	8.125	7.30@7.325
24	14.125	56.875	58.00	8.25	8.15	7.225@7.25
25	14.00	56.625	57.75	8.25	8.15	7.25
27	14.00	56.625	57.75	8.30	8.20	7.275
28	14.125	56.875	58.375	8.30	8.25	7.275@7.30
29	14.125	57.125	58.50	8.30	8.25	7.325
Av.	14.083	56.979	58.188	8.275	8.188	7.281

*The prices correspond to the following quotations for copper delivered: July 23d and 24th, 14.375c.; 25th and 27th, 14.25c.; 28th and 29th, 14.375c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of Mining Journal-Press and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

July	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic	Spot	3M	Spot	3M	Spot	3M
	Spot	3M							
23	62½	63½	67	263¾	266	35¾	34¾	35½	35½
24	61¾	62¾	66½	258¾	261¾	34¾	34¾	35½	34¾
27	61½	62½	66	257¾	260	34¾	34¾	35½	34¾
28	61½	62¾	66½	258¾	261¾	35½	34½	35½	35
29	61¾	62¾	66½	261	263¾	36	35¾	35¾	35½

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

July	Sterling Exchange "Checks"	Silver		Gold London	July	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
23	4.85½	69¾	32½	84s10½d	27	4.85½	69¾	32½	84s10½d
24	4.85½	69¾	32	84s10½d	28	4.85½	69¾	31¾	84s10½d
25	4.85½	69¾	31¾	...	29	4.85½	69¾	31¾	84s10½d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-half cent premium.

Metal Prices Firm in Listless Market

New York, July 29, 1925—The non-ferrous metal markets have been exceedingly quiet in the week ending today, the demand for tin in the last two or three days being about the only sign of activity. The threatened coal strike in England has been responsible in part, though the recent heavy volume of sales would naturally have been followed by a period of midsummer dullness. In general, producers are well sold up with current production and are in no mood to sacrifice metal at bargain prices.

Copper Sales Light

The tonnage of copper sold in the week ending today has been the smallest in months, though prices are today unchanged from a week ago. A fair business was done on Thursday and Friday at 14¾c. delivered, but on Saturday and Monday resale lots appeared, which were taken up at 14¾c., so that the large producers were unable to do any business outside of an occasional carload. The decline in London on Monday increased the cheap offerings

by dealers, but the advance of 12½s. on standard yesterday scared all sellers of 14¼c. copper to cover, and in the last two days producers have again been able to obtain 14¾c. for an exceedingly modest tonnage. Some of the largest sellers are practically out of the market as a result of recent heavy sales, and are nominally quoting 14¼c. delivered, without, of course, doing any business.

The export demand has also been light, with American agencies continuing to hold their prices at 14.60c., c.i.f. A small amount has been sold at that level on the Continent. The threatened coal strike in England has slowed up business in that country materially. It was offered as an excuse for a bear raid on Friday and Monday, which soon petered out, however.

Lead Continues Scarce

The contract price of the American Smelting & Refining Co. for New York continues at 8.20c. The so-called outside market is considerably above this level, however, and spot lead has been offered as high as 8¾c., New York, with occasional sales of small tonnages at slightly under this figure. The business done on a contract basis at 8.20c. is, however, in much larger volume than that at premium prices. Some consumers in the East have also bought lead from Middle Western producers, paying in the neighborhood of 8¼c. for it. In the Middle West much the same condition obtains as in the East, with producers reluctant sellers to regular customers at prices considerably lower than are available to others. They have come up to an 8¼c. basis in the last day or two, though a few days back most sales were figured back to 8.10c. or 8¼c., St. Louis basis. Some lead has also been sold to and by dealers at 8.40@8.60c. St. Louis, but the tonnage is relatively small. Dealers, and even consumers who are speculatively inclined, are having a hard time getting hold of any lead except at prohibitive prices. Supplies, however, seem adequate for taking care of the nearby requirements of consumers, and they have no cause to worry. Monday was a rather active day, but during most of the week, inquiries have not been particularly large, and many of these inquiries did not result in sales. Some September lead has been sold, but by far the largest proportion of the business has been for August.

Zinc Still Above 7.30c.

Zinc took a little dip during the week as a result of a little weakness in London and freer offerings by small producers, which were quickly absorbed by the large producers optimistic over the future for this metal. The price today is again at 7.32c., about the same as a week ago, though a few lots were absorbed at 10 points under this level on Friday last. One or two good-

sized lots were sold to galvanizers, the brass mills not showing much interest this week. The export market has been unsettled and prices have ruled under domestic parity. Foreign demand is likely soon to assert itself again, however. High-grade zinc has been in good demand at unchanged prices of 8½@8¾c., delivered.

Two Active Days in Tin

Consumers were quick to take advantage of the decline in London tin from £263 to less than £258, and bought heavily in the domestic market on Monday and Tuesday, absorbing practically all offerings. The tin-plate outlook for the fall months is good. Today, as a result of the buying here, London advanced, but consumers here seem to be satisfied for the time being, so the domestic price, at 58½c., is only slightly above that of yesterday. Forward tin has commanded about the same price as prompt and 99 per cent continues at from 1 to 1½c. below the price of Straits. Even high-grade English refined tin, of 99.8 per cent purity, is offered at a concession of about ¾c. under Straits.

Unchanged Conditions for Silver

Conditions in the silver market remain unchanged, China rates being the chief influence, although India is a potential buyer at slightly lower levels. With this situation, it is only natural than San Francisco delivery has ruled at a good premium over New York, and the latter market remains substantially above London. In fact, the drop in London of ¼d. on the 28th was reflected to the extent of only ¼c. in New York, and on the 28th New York regained this loss, although London remained unchanged. Silver closes steady.

Mexican Dollars: July 23rd, 53¾c.; 24th, 53½c.; 25th, 53¾c.; 27th, 53½c.; 28th, 53¾c.; 29th, 53½c.

Francs and Lire Quiet

Francs and lire are substantially unchanged from last week. Closing cable quotations on Tuesday, July 28, were as follows: francs, 4.7325c.; lire, 3.66c.; and marks, 23.805c. Canadian dollars, ½ per cent premium.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—99 per cent grade, 28c. per lb.; 98 per cent, 27c. London, £118 per long ton for 98 per cent.

Antimony—

Chinese brands, spot, 16¼@17¼c. per lb.; September, 16@16¾c.

Cookson's "C" grade, spot, 19½@20c. Arrivals of antimony quickly absorbed and prices largely nominal.

Needle and oxide nominally unchanged from quotations in July 4 issue.

Bismuth—\$2.65@\$2.70 per lb., in ton lots. London, 10s.

Cadmium—60c. per lb. London, 2s.3d.

Iridium—\$400 per oz. for 98@99 per cent. Nominal. London, £80.

Nickel—Ingot, 34c.; shot, 35c.; electrolytic, 38c.; London, £170@£175 per long ton.

Palladium—\$75@\$83 per oz. Crude, \$65. London, £16.

Platinum—\$120 per oz. refined officially quoted. Sales also at \$115@\$118. Crude, \$114. London, £25 per oz. for refined; crude £23.

Quicksilver—\$82.50@\$83 per 75-lb. flask. San Francisco wires \$82.33. London, £14.

The prices of **Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmiridium, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tantalum, Tellurium, Thallium, Tungsten and Zirconium** are unchanged from the July 4 issue.

Metallic Ores

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports:

Brazilian, 42@44c.

Indian, 44c.

Caucasian (unwashed), 42c.

Caucasian (washed), 44c.

Tungsten Ore—Per unit of WO₃, N. Y.: High-grade wolframite, \$12. Ordinary quality, \$11.50@\$11.75. Scarce.

High-grade Western scheelite, \$12.50.

Chrome, Galena and Pyrite Radio Crystals, Iron Ore, Molybdenum, Tantalum, and Vanadium Ores are unchanged from quotations in the July 4 issue.

Lead Higher—Zinc Unchanged

Joplin, Mo., July 25, 1925

Zinc Blende		Per Ton
High	.....	\$54.60
Premium, basis 60 per cent zinc	.....	52.00
Prime Western	.....	\$50.00
Fines and slimes	.....	\$49.00@
Average settling price, all..	.....	\$49.42

Lead Ore		Per Ton
High	.....	\$105.79
Basis 80 per cent lead	....	\$100.00
Average settling price, all..	.....	\$103.64

Shipments for the week: Blende, 16,193; lead, 1,738 tons. Value, all ores the week, \$982,290. Shipments for seven months: Blende, 453,902; calamine, 579; lead, 72,673 tons. Value, all ores seven months, \$31,572,230.

Prices quoted above are as confirmed, though it is rumored that \$51 basis Prime Western was offered for export ore. Buyers for domestic smelters refused to offer more than \$50 basis up to 5:30 o'clock this evening, and it looked as though no additional business would be later transacted; if there is it will be included with next week's transactions.

Lead offerings were advanced \$5 to \$105 basis. A total of 266 carloads of ore has been loaded for export.

Platteville, Wis., July 25, 1925

Zinc Blende		Per Ton
Blende, basis 60 per cent zinc	.....	\$51.50

Lead Ore		Per Ton
Lead, basis 80 per cent lead	.....	\$107.00

Shipments for the week: Blende, 832 tons; lead, 160 tons. Shipments for the year: Blende, 26,035; lead, 1,168 tons. Shipments for the week to separating plants: 1,980 tons blende.

Non-Metallic Minerals

Amblygonite, Andalusite, Asbestos, Barytes, Bauxite, Beryl, Borax, Celes-

tite, Chalk, China Clay, Corundum, Diatomaceous Earth, Emery, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Ilmenite, Iron Oxide, Lepidolite, Limestone, Magnesite, Manjak, Monazite, Ocher, Ozocerite, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystals, Rutile, Silica, Spodumene, Sulphur, Talc, Tripoli, and Zircon are unchanged from prices in the July 4 issue.

Feldspar—First quality, New Hampshire, \$8.50 per ton. See also July 4 issue.

Mica—In North Carolina, No. 2 quality, stained, per lb.:

2 x 2 in., 25c. 3 x 4 in., \$1.40

2 x 3 in., 55c. 3 x 5 in., \$1.75

3 x 3 in., 90c. 4 x 6 in., \$2.25

Punch, 5@7c.

Scrap, \$30 per ton.

Market improving. Other prices in July 4 issue.

Mineral Products

Arsenious Oxide (White arsenic)—4c. per lb. Several carloads sold at this price by one producer.

Copper Sulphate, Sodium Nitrate, Sodium Sulphate, and Zinc Oxide are unchanged from prices in the July 4 issue.

Ferro-Alloys

Ferrotungsten—\$1.10 per lb., contained W.

Ferrocium, Ferrochrome, Ferromanganese, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferro-uranium and Ferrovanadium are unchanged from the prices in the July 4 issue.

Metal Products

Rolled Copper—Sheets, 22½c.; wire, 16c. per lb.

Nickel Silver—28¾c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal—Sheets, 19½c. per lb.; rods, 16¾c.

Lead Sheets and Zinc Sheets unchanged from July 4 issue.

Refractories

Bauxite Brick, Chrome Brick, Firebrick, Magnesite Brick, Silica Brick, and Zirkite are unchanged from prices in the July 4 issue.

Steel Prices Remain Steady

Pittsburgh, July 28, 1925

Apart from declines reported a week ago, \$1 a ton in plates and \$2 a ton in shapes, there have been no declines in finished steel products for more than thirty days, while the sheet market has stiffened slightly. Sheet prices actually done represent a much narrower range, so that the market is steadier besides averaging a trifle higher.

Pig Iron—Transactions are very light. Prices are if anything firmer than a month ago, at \$19 for bessemer, \$18 for basic and \$18.50 for foundry, f.o.b. Valley furnaces.

Connellsville Coke—Accumulations of furnace coke on track having lately been cleaned up, the spot market has stiffened, sales being at \$2.90, against \$2.75@\$2.85 formerly done. Spot foundry coke remains at \$3.75@\$4.25, with very little being done above \$4.

Company Reports

Silversmith Mines, Ltd.

Silver, Lead, Zinc; British Columbia

Report of Silversmith Mines, Ltd., for the fiscal year ended May 31, 1925, shows a total production of 35,533 tons of ore, of which all but 92 was mill grade. The average assay of the mill feed was: Silver, 19.35 oz.; lead, 6.19 per cent, and zinc, 7.70 per cent.

During the year, 92 tons of crude lead, 3,072 tons of silver-lead concentrates and 3,760 tons of silver-zinc concentrates were produced.

The metal contents of the ore shipped from the mine was as follows: 453,122.42 oz. silver, 2,426,790 lb. lead, and 3,012,524 lb. zinc.

Balance Sheet, May 31, 1925

Assets		
Property:		
Cost of mining property.....	\$331,266. 10	
Less depletion of mine through operation.....	316,266. 10	\$15,000. 00
Machinery and equipment.....	\$183,304. 78	
Buildings.....	87,042. 42	
Total.....	\$270,347. 20	
Less reserve for depreciation.....	99,955. 85	\$170,391. 35
Total property.....		\$185,391. 35
Current assets.....		\$199,007. 24
Prepaid insurance.....	1,800. 00	
Total assets.....		\$386,198. 59
Liabilities		
Capital stock:		
Preferred:		
Authorized.....	\$250,000. 00	
In treasury, unissued.....	250,000. 00	
Common:		
Authorized.....	\$500,000. 00	
Assessments not called.....	125,000. 00	
Outstanding—Paid up to 15c.....		\$375,000. 00
Current liabilities:		
Accounts payable.....	\$3,064. 22	
Wages payable.....	7,103. 04	
Accrued royalties.....	540. 26	
Total current liabilities.....		\$10,707. 52
Surplus account (free).....		\$491. 07
Total liabilities.....		\$386,198. 59

Profit and Loss Account—Year Ended May 31, 1925

Debit			
Mining in ore.....	\$96,362. 42		
Mining expense.....	35,996. 52		
Development.....	8,859. 25		
Milling expense.....	62,929. 85		
Power plant operation.....	13,057. 36		
Boarding house loss.....	547. 33		
Insurance.....	3,600. 10		
Royalties.....	5,765. 97		
Taxes.....	21,729. 91		
General expenses.....	33,925. 05		
Depreciation.....	22,682. 60		
Total expenses.....		\$305,456. 36	
Depletion of mine.....	\$7,670. 55		
Gain for the year.....	137,183. 84	144,854. 39	
Total.....		\$450,310. 75	
Credit			
Received from sales of 2,644 tons of silver-lead ore and concentrates.....	\$244,162. 96		
Received from sales of 3,324 tons of zinc concentrates.....	132,093. 00		
Actual value of 256 tons of silver-lead ore and concentrates in transit.....	23,188. 63		
Actual value of 136 tons of zinc concentrates in transit.....	6,021. 65		
Estimated value of 264 tons of silver-lead ore and concentrates on hand.....	29,000. 00		
Estimated value of 340 tons of zinc concentrates on hand.....	13,500. 00		
Received interest from government bonds.....	2,344. 51		
Total.....		\$450,310. 75	

Surplus Account—May 31, 1925

Debit			
Balance June 1, 1924.....		\$13,307. 23	
Gain for year.....	\$144,854. 39		
Less depletion.....	7,670. 55	137,183. 84	
Total.....		\$150,491. 07	
Credit			
Dividends paid.....	\$150,000. 00		
Balance May 31, 1925.....	491. 07		
Total.....		\$150,491. 07	

Union Minière du Haut Katanga

Copper; Africa

Pending the receipt of the full report of the Union Minière du Haut Katanga, the following comparative data on 1924 and 1923 operations are reported:

	1924	1923
Output, metric tons.....	85,570	57,886
Profit, Belgian francs.....	111,715,402	78,872,755
Ore reserves.....	74,686,600	72,666,000
Average grade of reserves, per cent.....	6.69	6.41
Tons ore mined.....	1,564,958	1,307,027
Yield, pounds per ton.....	150½	97½
Cost per pound copper, cents.....	10.412	11.321

Taking the Belgian franc at 4.50c., profit for the year was \$5,027,193. Copper production for the first six months of this year was 43,695 metric tons, against 36,831 in corresponding period a year ago.

Canario Copper Co.

Copper; Mexico

The Canario Copper Co. publishes the following balance sheet as of July 15, 1925.

Assets		
Cash in bank.....		\$1,200,500. 00
Accounts receivable.....		659,571. 92
Capital stock tax in suspense.....		2,000. 00
El Canario Consolidated Copper Co. capital stock.....		20,000,000. 00
Development.....		621,048. 23
Total assets.....		\$22,483,120. 15
Liabilities		
Capital stock outstanding.....		\$19,836,150. 00
Reserve for stock of predecessor company still outstanding.....		163,850. 00
Surplus.....		2,483,120. 15
Total liabilities.....		\$22,483,120. 15

Little Change in World's Rate of Copper Production

The American Bureau of Metal Statistics gives in short tons, copper production by the principal countries of the world, which furnished about 97 per cent of the world's total in 1923 and 1924. The figures follow:

	Feb., 1925	March, 1925	April, 1925	May, 1925	June, 1925	Jan.-June, 1925
United States.....	78,237	87,109	79,149	77,041	76,633	480,845
Mexico.....	2,756	3,138	2,468	2,323	2,720	16,057
Canada.....	1,914	1,955	1,590	2,527	2,418	12,109
Chile and Peru.....	18,481	19,216	17,405	18,504	18,348	111,598
Japan.....	5,508	5,786	5,928	(a) 6,000	(a) 6,000	35,312
Australia.....	953	1,075	890	1,473	(a) 1,000	6,082
Europe (b).....	8,500	8,900	9,300	8,700	7,700	51,800
Belgian Congo.....	6,418	7,960	7,562	8,856	9,418	48,156
Rhodesia.....	208	220	218	250	250	1,356
Total.....	122,975	135,359	124,510	125,674	124,487	763,315
Estimate for non-reporting countries.....	3,800	4,200	3,800	3,900	3,800	23,600
World's total.....	126,700	139,600	128,400	129,600	128,300	786,900

(a) Estimated. (b) Incomplete; partly estimated.

Lead Production Lower in June

Figures of the American Bureau of Metal Statistics show a decrease in lead production by countries that in 1923 furnished about 78 per cent of the world's total and in 1924 about 79 per cent.

	March	April	May	June	Jan.-June
United States (a).....	49,635	46,209	47,316	50,095	282,583
Mexico.....	17,860	18,425	17,468	15,148	100,158
Canada.....	11,875	10,138	9,211	(b) 8,754	62,079
Total North America (d).....	79,370	74,772	73,995	73,997	444,820
Spain and Tunis (c).....	11,825	11,243	12,363	10,807	66,203
Italy.....	570	304	603	(b) 500	3,103
Australia.....	12,291	11,894	12,683	12,576	73,591
Burma.....	4,090	4,090	4,089	4,092	25,944
Rhodesia.....	279			339	1,133
Transvaal.....	15	198	284	(b) 250	778
Total.....	108,440	102,501	104,017	102,561	615,572

(a) Crude lead; includes only production reported by smelters who are members of this bureau. (b) Estimated or partly estimated. (c) Partial. (d) The total for North America is a correct statement of the aggregate production of crude lead by the smelters of the several countries, but the distribution according to countries is not precise, particularly as between the United States and Canada, an accurate allocation by months being at present impossible.

Mining Stocks—Week Ended July 25, 1925

Stock	Exch.	High	Low	Last	Last Div.
COPPER					
Anaconda.....	New York	43 1/2	41 1/2	42 1/2	Jy. 18, Au. 24, Q 0.75
Arcadian Consol.....	Boston	1 1/2	1 1/2	1 1/2	
Ariz. Con'l.....	Boston	12	11 1/2	11 1/2	Jy. 21, Jy. 31 SA 0.50
Calaveras.....	N. Y. Curb	2	2	2	
Calumet & Arizona.....	New York	51 1/2	49 1/2	49 1/2	Jn. 15, Jn. 22 Q 0.50
Calumet & Hecla.....	Boston	15 1/2	15 1/2	15 1/2	Ja. 30, Mh. 4 0.50
Cerro de Pasco.....	N. Y. Curb	7 1/2	7 1/2	7 1/2	
Chile Copper.....	New York	54 1/2	51 1/2	51 1/2	Au. 21, Se. 1, Q 1.75
Chino.....	New York	34 1/2	34	34	Jn. 3, Jn. 29, Q 0.37 1/2
Con. Coppermines.....	N. Y. Curb	2 1/2	2 1/2	2 1/2	
Copper Range.....	Boston	21 1/2	21 1/2	21 1/2	Ap. 9, My. 4 1.00
Crystal Copper.....	Boston Curb	*50	*50	*50	
East Butte.....	Boston	4	4 1/2	3 1/2	Dec., 1919 0.50
First National.....	Boston Curb	*20	*20	*20	Feb., 1919 0.15
Franklin.....	Boston	*70	*70	*70	
Granby Consol.....	New York	16 1/2	16	16	May, 1919 1.25
Greene-Canaan.....	New York	14 1/2	13 1/2	13 1/2	Nov., 1920 0.50
Hancock.....	Boston			*76	
Howe Sound New r. t. c.	N. Y. Curb			16 1/2	April, 1924 0.05
Inspiration Consol.....	New York	29	27 1/2	28 1/2	Jn. 18, Jv. 6, Q 0.50
Iron Cap.....	Boston Curb	1 1/2	1 1/2	1 1/2	May, 1923 0.15
Ile Royale.....	Boston	14	13 1/2	13 1/2	Sept., 1923 0.50
Jerome Verde Dev.....	N. Y. Curb			1	
Kennecott.....	New York	54	53	53 1/2	Jn. 5, Jy. 1, Q 0.75
Lake Copper.....	Boston	1 1/2	1 1/2	1 1/2	Jn. 1, Jn. 15 Q 0.50
Magma Copper.....	New York	42 1/2	41	42	Jn. 15, Jy. 15, 0.75
Mason Valley.....	N. Y. Curb	2	2	2	
Mass Consolidated.....	Boston	*80	*70	*70	Nov., 1917 1.00
Miami Copper.....	New York	10 1/2	10	10 1/2	Au. 1, Au. 15 Q 0.25
Mohawk.....	Boston	34	32 1/2	32 1/2	Aug. 1, Sept. 2 1.00
Mother Lode Coa.....	New York	8	7 1/2	8	Jn. 12, Jn. 30 0.37 1/2
Nevada Consol.....	New York	13 1/2	13	13 1/2	Sept., 1920 0.25
New Cornelia.....	Boston	20 1/2	19 1/2	19 1/2	Aug. 7, Aug. 24 0.25
North Butte.....	Boston	1 1/2	1 1/2	1 1/2	Oct., 1918 0.25
Ohio Copper.....	N. Y. Curb	*85	*82	*82	Nov. 14, Dec. 2 0.05
Old Dominion.....	Boston	20 1/2	20	20 1/2	Dec., 1918 1.00
Phelps Dodge.....	Open Mar.	113 1/2	108	108	Jn. 20, Jy. 2 Q 1.00
Quincy.....	Boston	26 1/2	25 1/2	25 1/2	Mar., 1920 1.00
Ray Consolidated.....	New York	16	14 1/2	15 1/2	Dec., 1920 0.25
Ray Hercules.....	N. Y. Curb			14	
St. Mary's Min. Ld.....	Boston	37 1/2	35	36	Ap. 20, Mv. 20, 3.00
Shannon.....	Boston	*75	*65	*65	Nov., 1917 0.25
Shattuck Arizona.....	New York			7	Jan., 1920 0.25
Superior & Boston.....	Boston	1 1/2	1 1/2	1 1/2	
Tenn. C. & C.....	New York	12	11 1/2	12 1/2	Dec. 31, Ja. 15, Q 0.25
United Verde Ex.....	N. Y. Curb	24 1/2	23 1/2	24	Jy. 6, Aug. 1 0.50
Utah Copper.....	N. Y. Curb	97	94 1/2	95 1/2	Mh. 20, Mh. 31, Q 1.00
Utah Metal & T.....	Boston	*55	*50	*50	Dec., 1917 0.30
Victoria.....	Boston	*37	*20	*32	
Walker Mining.....	Salt Lake	2.55	2.52 1/2	2.52 1/2	
NICKEL-COPPER					
Internat. Nickel.....	New York	30 1/2	29 1/2	29 1/2	March, 1919 0.50
Internat. Nickel pfd.....	New York			98 1/2	Jy. 16, Au. 1, Q 1.50
LEAD					
Carnegie Lead & Zinc	Pittsburgh	7 1/2	7	7 1/2	
Glad-tone M. Co.	Spokane	*23 1/2	*22	*23 1/2	Jy. 1, Jy. 10 0.0 1/2
National Lead.....	New York	153 1/2	149	152	Sept. 11, Sep. 30 2.00
National Lead pfd.....	New York	118	118	118	Aug. 21, Sep. 15 1.75
St. Joseph Lead.....	New York	42	40 1/2	41 1/2	Jn. 9, Jn. 22, 0.50
ZINC					
Am. Z. L. & S.....	New York	8 1/2	7 1/2	7 1/2	May, 1920 1.00
Am. Z. L. & S. pfd.....	New York	31	28 1/2	29 1/2	Nov., 1920 1.50
Butte C. & Z.....	New York	6 1/2	5 1/2	5 1/2	De. 10, De. 24 0.50
Butte & Superior.....	New York	12 1/2	11	11 1/2	Mh. 19, Mh. 31 0.50
Callahan Zn-Ld.....	New York	2 1/2	2 1/2	2 1/2	Dec., 1920 0.50
New Jersey Zn.....	N. Y. Curb	192	190	192	Jn. 20, Jy. 10 Ex. 2.00
United Zinc.....	N. Y. Curb			*35	
Yellow Pine.....	Los Angeles	*71	*68 1/2	*71	De. 10, De. 15 Q 0.04
GOLD					
Alaska Juneau.....	New York	1 1/2	1 1/2	1 1/2	
Argonaut.....	Toronto	*26	*25	*25 1/2	
Barry-Hollinger.....	Toronto	*45	*35 1/2	*43	
Carson Hill.....	Boston			*25	
Consol. W. Dome L.	Toronto	*14 1/2	*13 1/2	*14 1/2	
Cresson Consol. G.....	N. Y. Curb	3 1/2	3	3 1/2	Mh. 31, Ap. 10 Q 0.10
Crown Reserve.....	Toronto	*24	*19 1/2	*23 1/2	Jan. 1917 0.05
Dome Mines.....	New York	15 1/2	15	15	Mh. 31, Ap. 20, Q 0.50
Golden Cycle.....	Colo. Springs	1.49	1.48	1.48	Dec. 11, 1924 0.03
Hollinger Consol.....	Toronto	14.85	14.80	14.80	Jy. 27, Au. 12 0.08
Homestake Mining.....	New York	44	44	44	Jy. 20, Jy. 25 M 0.50
Kirkland Lake.....	Toronto	*41 1/2	*41	*41 1/2	
Lake Shore.....	Toronto	6.18	6.05	6.10	Mh. 2, Mh. 16, 0.05
McIntyre-Porcupine.....	New York	19	18 1/2	18 1/2	Aug. 1, Sept. 1 0.25
Newray.....	Toronto	*21 1/2	*19	*21	
Night Hawk Pen.....	Toronto	*23	*23	*23	
Portland.....	Colo. Springs	*45	*45	*35	Oct., 1920 0.01
Rand Mines.....	New York			37	Fe. 17, Fe. 25 1.79
Teck-Hughes.....	Toronto	1.72	1.61	1.71	
Tom Reed.....	Los Angeles	*58 1/2	*54 1/2	*54 1/2	Dec., 1919 0.02
Tough-Oaks.....	Toronto	*38 1/2	*35	*37 1/2	
United Eastern.....	N. Y. Curb	*47	*47	*47	July, 1924 0.05
Vipond Cons.....	Toronto	1.16	1.09	1.12	
Wright-Hargreaves.....	Toronto	5.06	5.00	5.05	Jn. 15, Jy. 1 5.00
GOLD AND SILVER					
Black Onk.....	N. Y. Curb			*81	
Con. Cortez.....	N. Y. Curb	*8	*7	*8	
Con. Virginia.....	San Francisco	4 1/2	4 1/2	4 1/2	
Continental Mines.....	N. Y. Curb			1 1/2	
Dolores Esperanza.....	N. Y. Curb	*55	*50	*55	July, 1923 0.05
Premier Gold.....	N. Y. Curb	2 1/2	2 1/2	2 1/2	Jn. 18, Jy. 1, 0.08
Tonopah Belmont.....	N. Y. Curb	*55	*55	*55	Mh. 15, Ap. 1 0.05
Tonopah Divide.....	N. Y. Curb			*23	Oct., 1923 0.10
Tonopah Extension.....	N. Y. Curb	1 1/2	1 1/2	1 1/2	Mh. 11, Ap. 1, Q 0.05
Tonopah Mining.....	N. Y. Curb	3 1/2	3 1/2	3 1/2	Mh. 31, Ap. 21, 0.07 1/2
Unity Gold.....	N. Y. Curb	*85	*85	*85	
West End Consol.....	N. Y. Curb			*50	Mar., 1923 0.05
Yukon Gold.....	N. Y. Curb			*35	June, 1918 0.02

Stock	Exch.	High	Low	Last	Last Div.
SILVER					
Alvarado.....	Boston Curb			*50	Oct. 1920 0.50
Beaver Consol.....	Toronto	*32	*30	*31 1/2	May, 1920 0.05
Castle-Trethewey.....	Toronto	*94	*92 1/2	*92 1/2	
Coniagas.....	Toronto	*6 1/2	*6	*5 1/2	May, 1924 0.12 1/2
Keeley.....	Toronto	1.77	1.75	1.76	Mh. 1, Mh. 15 SA 0.12
Kerr Lake.....	N. Y. Curb			1 1/2	Ap. 1, Ap. 15, Q 0.12
L. Rose.....	Toronto	*48 1/2	*47	*48	Apr., 1922 0.10 1/2
Lorrain Trout Lake.....	Toronto	1.01	*95	1	Jy. 2, Jy. 15 0.05
McKinney-Dar-Sav.....	Toronto	*29	*28 1/2	*28 1/2	Oct., 1920 0.03
Miner Con. Can.....	Toronto	2.56	2.50	2.55	Jy. 1, Jy. 15 0.12
Nipissing.....	N. Y. Curb	4 1/2	4 1/2	4 1/2	Jn. 30, Jy. 20, Q 0.15
Ontario Silver.....	New York	7	7	7	Jan., 1919 0.50
Temiskaming.....	Toronto	*16 1/2	*16	*16	Jan., 1920 0.40
SILVER-LEAD					
Ahumada.....	New York	11	10 1/2	10 1/2	Jn. 15, Jy. 2, Ex 0.25
Bingham Mines.....	Boston	29	27	29	Jn. 20, Jn. 30 Q 0.50
Cardiff M. & M.....	Salt Lake			1.37 1/2	De. 16, No. 18 0.10
Chief Consol.....	Salt Lake	3.30	3.15	3.15	Ap. 10, My. 1 0.10
Columbus Rexall.....	Salt Lake	*8 1/2	*7 1/2	*7 1/2	Aug., 1923 0.05
Erupicon.....	Boston Curb	3 1/2	3	3 1/2	Jn. 15, Jy. 2, Ex 0.25
Federal M. & S.....	New York			17 1/2	Fe. 26, Mh. 15 Q 1.75
Federal M. & S. pfd.....	New York	58 1/2	56 1/2	57	My. 25, Jn. 15, Q 1.75
Hecla Mining.....	N. Y. Curb	14 1/2	14 1/2	14 1/2	My. 15, Je. 15 Q 0.50
Iron Blossom Con.....	Salt Lake			*37	Oct. 25, 1924 0.01 1/2
Iron King Mining.....	Salt Lake	*51	*50	*50	
Keystone Mining.....	Salt Lake	*79	*75	*75	Au. 12, Au. 26 0.07 1/2
Mammoth Mining.....	Salt Lake	2.65	2.52 1/2	2.55	My. 15, Mv. 25 0.10
Marsh Mines.....	N. Y. Curb			*4	June, 1921 0.02 1/2
Park City.....	Salt Lake	5.90	5.90	5.90	Jn. 15, Jy. 1 Q 0.15
Park Utah.....	Salt Lake	6.00	5.90	5.90	April, 1924 0.15
Prince Consol.....	Salt Lake	*46 1/2	*45	*46	
Silver King Coal.....	Salt Lake	8.15	8.00	8.00	Jn. 20, Jy. 1, Q 0.25
Tamersmith.....	Spokane	*19	*17 1/2	*19	Jy. 1, Jy. 10 0.01
Tamarack-Custer.....	Spokane	*75	*73	*73	Sept., 1924 0.25
Tintie Standard.....	Salt Lake	11.37 1/2	11.37 1/2	11.37 1/2	Jn. 24, Jn. 29 Q 0.40
Utah-Apex.....	Boston	5 1/2	5 1/2	5 1/2	Jy. 3, Jy. 15, Q 0.35
Western Utah Copper.....	N. Y. Curb			*11	
IRON					
Bethlehem Steel.....	New York	43 1/2	42 1/2	43	July, 1924 1.25
Char. Iron.....	Detroit			*20	
Char. Iron pfd.....	Detroit			*85	
Colorado Fuel & Iron	New York	42	40	41	May, 1921 0.75
Gt. North'n Iron Ore	New York	29 1/2	28 1/2	28 1/2	Ap. 11, Ap. 30 1.00
Inland Steel.....	New York	42 1/2	41 1/2	41 1/2	Ny. 15, Jn. 1 0.62 1/2
Mesabi Iron.....	N. Y. Curb	2 1/2	2 1/2	2 1/2	
Replogle Steel.....	New York	15 1/2	14 1/2	14 1/2	
Republic I. & S.....	New York	49 1/2	48	48	May, 1921 1.50
Republic I. & S. pfd.....	New York	89	88	89	Jn. 17, Jy. 1, Q 1.75
Sloss-Sheffield S. & I.	New York	1.07 1/2	98 1/2	102	Jn. 10, Ap. 20 Q 1.50
Sloss-Shef. S. & I. pfd.....	New York	97 1/2	96	97 1/2	Jn. 20, Jy. 1, Q 1.75
U. S. Steel.....	New York	119 1/2	116 1/2	117 1/2	Jn. 1, Jn. 29, OX 1.75
U. S. Steel pfd.....	New York	125	124 1/2	124 1/2	My. 5, Mv. 29, Q 1.75
Virginia I. C. & C.....	New York			31	Jan., 1924 1.50
Virginia I. C. & C. pfd.....	New York			73	Jn. 20, Jy. 2, 2.50
VANADIUM					
Vanadium Corp.....	New York	31 1/2	*30	30 1/2	Aug. 1, Au. 15 0.50
ASBESTOS					
Asbestos Corp.....	Montreal	83 1/2	66	75	My. 1, My. 15 Q 1.00
Asbestos Corp., pfd.....	Montreal	115 1/2	97	107 1/2	Ap. 1, Ap. 15, Q 1.50
SULPHUR					
Freeport Texas.....	New York	16	15 1/2	15 1/2	Nov., 1919 1.00
Texas Gulf.....	New York	111	109 1/2	110	Jn. 1, Jn. 15, Q 1.75
DIAMONDS					
De Beers Consol.....	New York	22 1/2	20 1/2	20 1/2	Jy. 27, Au. 30 0.97
PLATINUM					
So. Am. Gold & P.....	N. Y. Curb	2 1/2	2 1/2	2 1	