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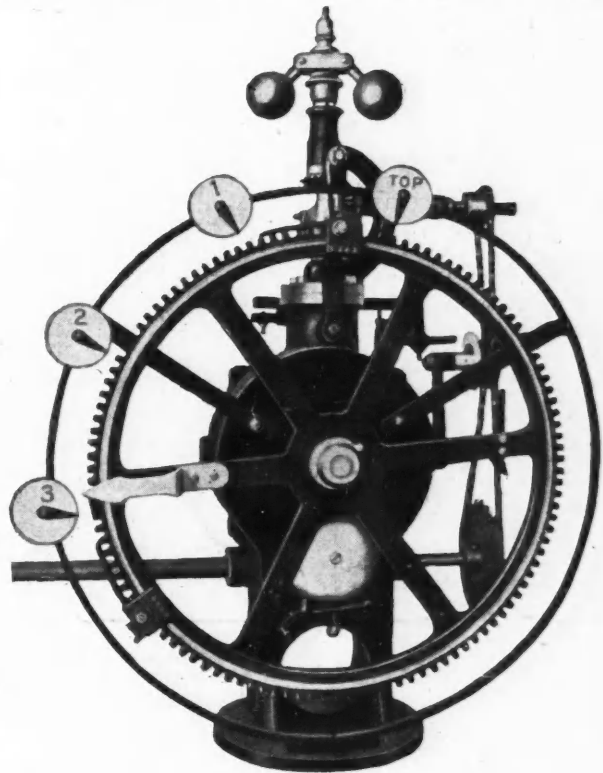
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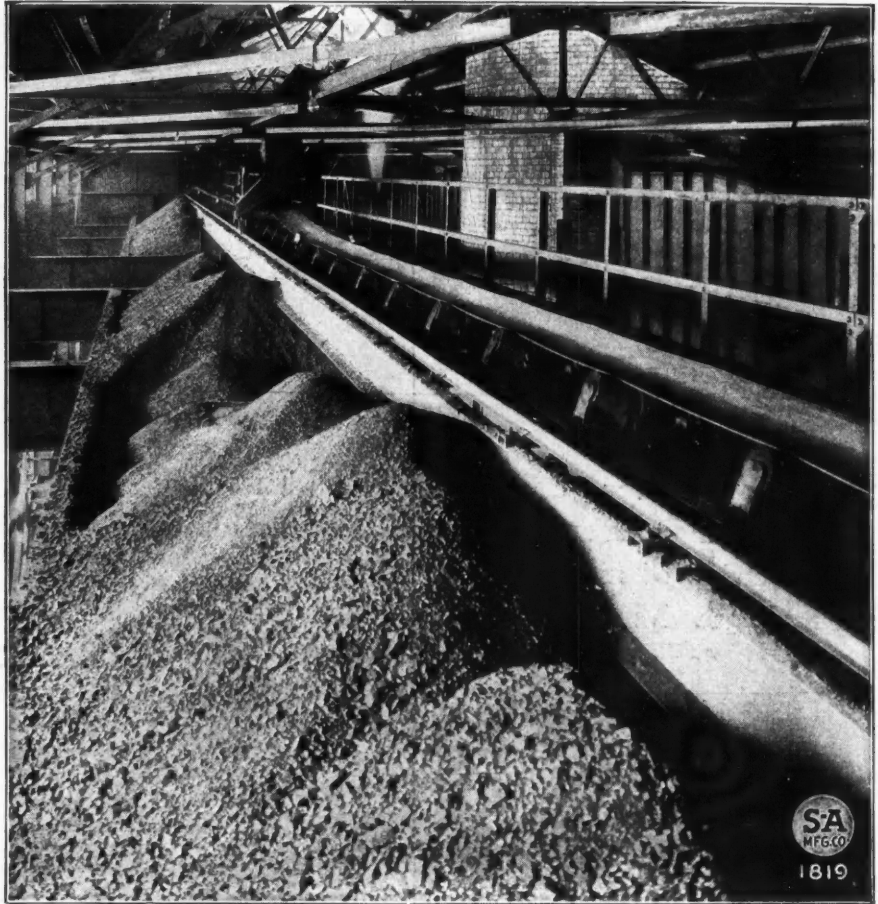
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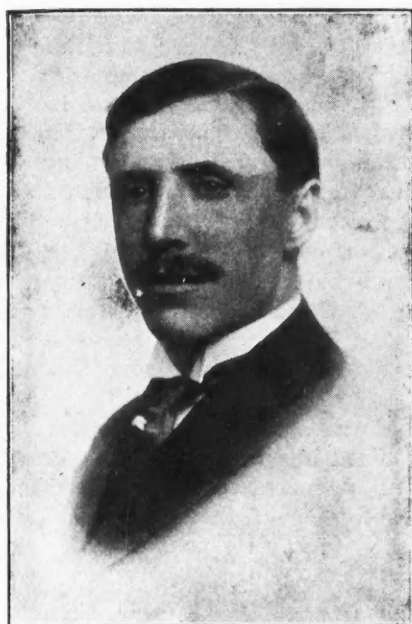
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LEADING OFFICERS OF THE NATIONAL SAFETY COUNCIL

## The National Safety Council

*The work of an organization such as the National Safety Council is unique in that its principal objectives are humanitarian. By bringing employers into close coöperation, individual efforts are concentrated and duplication is eliminated. For a moderate fee, a service is rendered that would be impracticable of attain-*

*ment by the individual employer of labor. The National Safety Council bulletins are familiar to many engineers, and their influence in reducing accidents is appreciated. These bulletins are read by more than six million workmen weekly in the United States, Canada and some foreign countries. Work of the safety engineer.*

**O**N SEPT. 20, 1912, the Association of Iron and Steel Electrical Engineers met in the city of Milwaukee, and, following the report of the Committee on Accident Prevention, resolved to launch a national coöperative movement for the dissemination of policies and methods worked out in the steel industry and found effective in reducing the number and severity of industrial accidents.

Forty delegates attended the First Safety Congress, meeting jointly with the Iron and Steel Electrical Engineers. An outline of procedure was adopted, together with a constitution and by-laws, and the work of scientific accident prevention became an integral part of American industrial life. Federal and state officials were in attendance and took active interest in the work. After several days of discussion and careful

planning, a central body was established known as the National Council for Industrial Safety. For convenience of classification, departments were established to popularize and further the movement, and the close of the congress found the organization ready to take up safety work in the mining industry, on the railroads, in manufacturing and among iron and steel companies. Thus was a new coördinating factor placed behind the safety movement.

The new organization grew and prospered. A weekly safety bulletin service was established and has continued without a break for more than four years, growing to a distribution of 75,000 copies per week. Statistical researches were made and tabulated, and practical value was given to shop activities. The innovation of using available data in the simple and effective

form of one-page illustrated bulletins, rather than in the compilation of massive treatises, proved the value of the council's services in presenting the lessons in readable form, fresh from the press. The council doubled its membership and greatly increased its usefulness in the second year.

The Third Safety Congress was held at the Hotel La Salle, Chicago. This series of meetings was epoch making, both in attendance and interest. It was at this congress that the industrial medical practitioner first made his voice heard. Plant managers learned that the installation of adequate mechanical safeguards did not comprise their entire duty. Sanitation, ventilation, control and eradication of industrial disease, elimination of infections—all these and other questions were placed on the program and thoroughly discussed. Tuberculosis, blood poison, hernia, eye strain and excessive fatigue were handled in a way to awaken the interest and cooperation of the large audiences.

#### NAME CHANGED TO "NATIONAL SAFETY COUNCIL" MEMBERSHIP DOUBLED

A year of intense activity followed. With a broadened scope of activities the association changed its name to the "National Safety Council." The program of the Third Safety Congress furnished the text for the activities of the officers and members, and the work was carried on with renewed enthusiasm. The membership doubled, and with every mail came scores of experience statements from plant officials. These were compiled, digested and reissued for the information of the whole membership. It is significant of the interest taken in the work that the master minds of industry have cheerfully and unostentatiously given so liberally of their time and experience for the causes of safety and humanity.

The Fourth Safety Congress was held at the Bellevue-Stratford Hotel, Philadelphia. To meet the demands of the congress it was necessary again to divide the council into new sections, each group meeting being larger in attendance and more ambitious in program than the first congress at Milwaukee. The Governor of Pennsylvania, the Mayor of Philadelphia, the press and the public united to further the propaganda of the congress.

#### "ROUND-TABLE" GATHERING

After the preliminary "round-table" gatherings, devoted to general discussion, ten sectional meetings considered the particular safety problems of their industries. The Cement Section took a leading part in the congress, as did the Mining, Steam Railroad, Laundry, Paper and Pulp Manufacturers, Public Utilities, Textile, Industrial Hygiene, Safeguarding of Machinery, Foundry and Woodworking sections.

It was at this gathering that the greatest truth in the safety crusade was forcibly driven home to plant managers, safety engineers and the public: That all the safeguards, all the rule books, all the discipline, and all other efforts must fail without the earnest and willing cooperation of the workmen themselves. Millions of dollars had been expended by members of the National Safety Council in perfecting mechanical safeguards in their plants; other millions went for sanitation, for ventilation, and for preventive measures; yet

the men vitally affected too often showed only a perfunctory interest in their own welfare.

An important lesson was gleaned from the wealth of digested experience and statistical data furnished through the medium of the parent body—the National Safety Council. Where one case of industrial disease was prevented in the shop or factory, two were susceptible of prevention and cure in the home life of employees.

From the time of the Fourth Safety Congress the importance of education, rather than compulsion, in safety matters, was given prominent place in the activities of the movement. The elasticity of safety work was never better exemplified than during the succeeding year. Employers who had held aloof, waiting for the movement to prove itself, came forward in whole-hearted recognition of the justness of the plea for a larger humanity. From an organization struggling to meet the patent demands made upon it in the simple necessities of every-day life, organized accident prevention, almost in a day, was placed beyond the need of financial worries.

From the Fourth to the Fifth Safety Congress the membership again doubled in number; the work of the sections was improved, an increased staff at headquarters facilitated the activities of the officers, and the newer phases of safety work were pushed with unremitting vigor.

#### THE FIFTH AND SIXTH SAFETY CONGRESSES

The Fifth Safety Congress was held at the Hotel Statler, Detroit, and the Sixth Congress at the Hotel Astor, New York City, Sept. 12 and 13, 1917. Perhaps the most important contribution to the cause of safety during this period was the organization of an information bureau and library containing every scrap of printed material available, touching on the work of accident prevention. This information bureau, at present in charge of three trained librarians, classifies and files all information, sending it to hundreds of inquirers every month. Among the duties of a staff of safety engineers is the classification and preparation of the material for suitable bulletins and publications for employers and safety engineers properly to start them in new activities. For the year ended Apr. 1, 1918, five million bulletins were distributed to fifteen thousand representatives.

#### VALUE TO INDUSTRY OF THE PAMPHLET "SAFE PRACTICES"

During the year 1917 a monthly pamphlet, "Safe Practices," was born. This is an encyclopedic work, destined to take its place in literature with the foremost handbooks of accident prevention. A modest number on "Ladders" was followed by others on "Stairs and Stairways"; "Boiler Rooms"; "Crane Construction and Safe Practices"; "Knots, Slings, Bonds and Hitches"; "Belt Shifters," and like subjects. In time, it is intended to present every phase of industrial education, and by rule, illustration and practice complete a digest of safe practices for the prevention of accidents in every branch of industry. This is an ambitious program, but the National Safety Council can probably better than any other organization put it through to a successful conclusion.

## Progress in Accident Prevention

**T**HE development of the science of accident prevention in America within the last five years has been summarized in a single phrase, "Nothing is so valuable economically as the man." Outlined briefly, the following have been found to be the essential features of accident-prevention work:

1. To ascertain the actual conditions of risk under which employees perform each task and to determine the most practicable methods of eliminating or reducing this risk.
2. The provision of proper working conditions and of efficient safeguards for dangerous machinery and appliances.
3. Careful selection, instruction and supervision of workmen, and their assignment to work for which they are best suited.
4. The promulgation and rigid enforcement of necessary rules for safeguarding.
5. The inculcation of habits of caution in the minds of all concerned.

Actual conditions of risk, five years ago, were usually summarized as follows: Industrial accidents, fatal, one every four minutes; non-fatal, one every four seconds. Only male workmen were taken into account, and no reference was made to the many women and minors engaged—probably because no statistics were available. Elimination of risk has not been achieved or even approached, but a start has been made, approximating reductions of 15% in fatal and 40% in non-fatal industrial mishaps. Members of the National Safety Council who have carefully compiled statistics covering the five-year period report even more satisfactory totals, a few declaring reductions for both fatal and non-fatal classifications of 65 to 85 per cent.

### MODERN INDUSTRIAL METHODS AND STANDARDIZATION OF SAFEGUARDS

The attempted achievement of proper working conditions and the standardizing of safeguards on dangerous machinery and appliances have revolutionized modern industrial methods, particularly when applied to plants engaged in "quantity production." Starting with the fundamental principle of installing only safe machinery and equipment, plant managers demand of machine builders that every guard of known merit shall be incorporated in the design of the machine. In the present-day workshop the executive strives to embody in every operation, beginning in the drafting and planning departments, provisions for safeguarding his workmen. The purchaser of a crane, for example, can now secure a completely appointed device—fully as efficient as any previous model, plus a full complement of guards.

Manufacturers of woodworking devices have gone further, probably, than any other group of machinery designers, and shapers, jointers, saws and planers are usually fully protected. The same may be said, varying only in degree, for the manufacturers of lathes, cutting, stamping and boring machines commonly found in workshops of every character. In the operation of such machinery, however, plant executives, even through

the most careful supervision, have not succeeded in achieving entire elimination of work accidents.

In older installations the safety engineer and department foremen are relied on to design and fabricate most of the guards. Certain large industries have systematized the designing, building and installation of guarding devices by turning the work over to a special department, and men engaged in this work are not called upon to take part in production. Remarkable results have been achieved, but as yet, although records in accident prevention show reductions of 85%, no safeguard, however elaborate in design and efficient in operation, is claimed to be "fool proof." Accidents still occur, though happily in decreasing number.

### INITIAL TRAINING SHOULD BE IN HOME AND SCHOOL

Careful selection, instruction and supervision of workmen and the assignment to them of work for which they are best suited may be said to start in the home rather than in the factory, workshop or mill. Education in safety begins with the parents, continues in the schoolroom, and finally reaches the employment manager or foreman.

A score of American cities have attempted civic safety work, notably Rochester, N. Y., where a campaign of education embracing every phase of home, street, public and industrial accident prevention is being carried on. Thousands of educational bulletins, changed weekly, have been printed and displayed, and the lessons have proved of intense interest. Scenes familiar to every citizen of Rochester have been utilized to drive the lesson home, and it is a safe prediction that the campaign will prove of lasting benefit.

Special series of safety bulletins are available for use in public schools, and in many communities these are proving valuable aids to teachers in safeguarding pupils to and from their homes. Primary lessons in crossing streets, avoidance of traffic accidents, safety at play and in the home are taught in the lower grades, and in the advanced grades more comprehensive lessons are offered.

### SCIENTIFIC COURSE FOR STUDENTS

Carrying the idea to a logical conclusion, a national committee is now at work formulating a scientific course for students of technical schools and universities. The need for such a course is emphasized by the establishment in western Pennsylvania of a private course in safety engineering, under the auspices of a local branch of the National Safety Council, the industries being unable to secure a sufficient number of technically educated men to fill the positions awaiting such engineers.

Supervision, whether in production or in accident prevention, is one of the most important of industrial problems. In safety work it has often been said that "without the whole-hearted coöperation of the foreman, all efforts in accident prevention must fail."

Adopting the experience of safety engineers, it has been found advisable, if not imperative, to enlist the services of the general manager not only in enforcement but in every stage of preliminary planning. This se-

cured, the executive staff accepts as the policy of the establishment the slogan, "Stop the Accidents," or, as more popularly phrased, "Safety First."

The management, the planning staff and the foremen working in unison, the employment manager is next in line for conversion to the movement. This is well emphasized by the present plan in certain large industrial plants of charting every position in the works and the acceptances by the employment managers of partly incapacitated men or women for lighter service. The plan, too, has worked well in returning injured men to work. Men incapacitated because of injury to a lower extremity are found suitable places.

The promulgation and rigid enforcement of necessary rules for safeguarding have worked out in actual practice to an advanced stage of mutual cooperation. Success in drafting shop rules for accident prevention has been attained when shop safety committeemen serve on boards organized for the formulation of accident prevention standards. In fact, next to the general manager and his superintendents, the members of the shop safety committee are the most valuable safety boosters in the plant.

#### SAFETY RULES AUGMENTED BY BONUSES

Safety rules are often augmented by bonuses, prizes and rewards of various kinds, and these serve to inculcate the habit of caution in the minds of all concerned. That "the best safety device known is a careful man" is an aphorism of proved merit. Discipline has its value, but watchful care must be exercised to prevent foremen from confusing discipline with peevishness or "nagging" of workmen. Proneness to follow precedent in operation, though excellent in maintaining discipline of a sort, is destructive to best results in safety work. Change of process, equipment and operation calls for complete revision of method, and gradually habits of personal caution and conscientious observance of safety standards are revising experience tables of lost-time mishaps.

### Safety Provisions in Plant Design And Construction\*

Perhaps the most interesting inquiry regarding industrial accidents concerns the extent to which they may be prevented. Is it reasonable to look forward to a time when accidents will be so few as to be negligible, or is it necessary to contemplate always having a huge yearly toll of deaths and injuries in industry?

The prevailing belief is that it is hopeless to attempt the entire elimination of accidents, at least within a measurable time. But the results of a recent study of accident causes in the iron and steel industry suggest that the current belief may be erroneous—that, though it may not be possible to do away with accidents, it is entirely practicable to make industry so safe that fatal and serious accidents will be of exceptional occurrence. This conclusion is the result of a careful analysis, and, in a broad way, it would seem applicable to all industries. The premises upon which the conclusion is based are summarized under three heads.

\*Abstracts from an article by Lucian W. Chaney and Hugh S. Hanna in the Monthly Review of the U. S. Bureau of Labor Statistics.

1. Until recently, emphasis has been placed upon the frequency of accidents rather than upon their severity. The vast majority of accidents occurring in the iron and steel industry are of a minor character. Thus, even when injuries causing loss of time of less than one day are excluded, more than 50% of all the injuries reported caused disabilities terminating in less than one week.

2. The safety movement has dwelt unduly upon the carelessness of the worker and has stressed too little the importance of safe tools, safe machines, safe practices, and safe construction. Carelessness and ignorance on the part of the worker are undoubtedly responsible for many accidents, but chiefly for minor ones.

3. Fatal accidents and serious accidents, as appears from the present study, are primarily due to fundamental engineering or structural defects, over which the workman has no control. The reduction in the rates of death and severe injury has been due primarily to engineering revision of structure and practice, and it is in that direction that real progress lies.

A careful examination of accident rates in connection with certain blast furnaces from 1905 to 1914 indicates that the major part of the reduction in severity rates which took place was due to structural and mechanical improvements in the department. The disappearance of hot-metal "break-outs" was owing to completion of modifications in design which increased the resistance of the furnaces. Experience strongly suggests the overwhelming importance of improvements in physical conditions.

In the openhearth department, injuries caused by cranes and hoists show high severity rates in the earlier years, particularly in 1907. This was due almost entirely to the structural defects then prevalent, such as absence of footwalks, poor access to the crane cage, overhung gears, and similar causes. By 1911 these defects had been largely corrected, and from that time severity rates dropped markedly and continuously. In injuries caused by hot substances, explosions other than ingot are the main cause of the early high severity rates. It is obvious that the carefulness of the individual workman can do little to prevent such happenings. When they occur, some workmen are killed or injured. There is rarely any warning to enable those exposed to escape. The lessened severity rate of recent years is to be credited mainly to revisions in structure and in method which were primarily introduced to favor production.

This review sustains the contention that the effect of personal care appears mainly in reduced frequency rates, and that engineering revision is reflected more largely in the decline of the severity rate. There must be no misunderstanding. This contention does not diminish the importance of organization. In an important respect it increases it materially. Organization and the interest it evokes lead to the discovery and remedy of structural defects. Without organization the revision so far accomplished could not have occurred. The facts here pointed out emphasize the importance of directing organization more vigorously to the discovery of faulty structure. Open and obvious faults have been noted, and it is becoming a matter of intensive engineering study to discover and remedy the less obvious ones. This goes beyond the province of many safety men and requires the assistance of able engineers.

# Effects of Mine-Dust Inhalation\*

BY J. S. HALDANE

*An interesting study of the effects of various kinds of dust when breathed by mine or mill workers. The comparative immunity of coal miners from any ill effects led to investigations from which several interesting conclusions were reached, subsequently confirmed by experimentation with animals. The influence of adsorption is mentioned, and a suggestion made that ill effects from inhalation of quartz dust can be minimized by admixture of this with coal and shale dust.*

**T**HE disastrous effects produced by inhaling certain kinds of dust are now well known. It is equally well known that no evident ill effects result from inhaling certain other kinds. There is no evidence that dust inhalation has hitherto caused appreciable danger to life in British coal mining. The widespread introduction of stone-dusting as a thoroughly practical and effective means of preventing coal-dust explosions has, however, directed new attention to the possibility of injurious effects of dust inhalation in coal mines.

## INJURY TO LUNGS CAUSED BY DUST

The ill-effects from dust inhalation in mining have been observed only where hard rock is mined, and, practically speaking, only where the rock is in quartz, or stone such as granite, containing quartz. Observation not merely on miners, but also on other persons exposed to dust from various forms of quartz or crystalline silica, all tell the same story of dangerous injury to the lungs and death from phthisis after prolonged inhalation of quartz dust. The natural inference from these observations would seem to be that dust inhalation is dangerous in proportion to the amount of quartz or silica inhaled, and this was my own belief a few years ago. My opinions on the subject were, however, much shaken by observations made in the course of the work of the late Royal Commission on Metalliferous Mines and Quarries. We visited many quarries where hard stone containing about 70% of silica was being worked and dusty crushers were in use, so that men were considerably exposed to siliceous dust. I thought this dust must certainly be dangerous; but careful inquiry among workers, ordinary doctors, and medical officers of health failed to furnish evidence of injury.

## DUST NOT INVARIABLY DANGEROUS

In 1911, while on a scientific expedition in the Rocky Mountains, I visited the gold mines of the Cripple Creek district. The stone worked is hard and contains about 70 to 80% of silica. Rock drills were working everywhere without water jets to stop the dust; and the men were evidently inhaling much dust. On careful inquiry, however, I found that miners' phthisis or other lung injury from dust was unknown in the district, although

it does occur at some other groups of mines in the Rocky Mountains.

In gold mining in quartz reefs there seem to be striking differences at various places as regards the danger of the work. At the Mysore mines, for instance, where the gold is in quartz, I am informed that there is little trouble from lung affections attributable to dust; and in Western Australia there appears, also, to be only a moderate amount. In the Transvaal, on the other hand, the pulmonary diseases caused by dust have been of a most formidable character, necessitating extremely drastic preventive measures.

## EFFECT OF QUARTZ DUST

The ill-effects of quartz dust have been attributed to the sharpness of the particles, and their consequent irritant action on the lungs. But if so, one would expect the quartz dust to prove irritant in proportion to the amount inhaled. One would also expect to find the sharp spicules in the lungs, whereas what is actually found consists of extremely fine particles, which do not look specially sharp or different in appearance from other fine particles.

The whole matter was so mysterious that it seemed desirable to try to clear it up by experiments on animals; and the Medical Research Committee asked me to arrange for the investigation, and provided the necessary funds. The experiments were made on guinea pigs. From previous investigations it appears that any kind of dust particles (except, perhaps, when they are soluble and chemically harmless) will cause inflammatory changes in the lungs if enough of the particles are inhaled. The nose and air passages are, of course, a great defence against dust, and in some animals the convoluted surfaces inside the nose constitute a particularly efficient defence. The particles which fall against the surfaces of the nose and air passages are swept out by the action of the cilia lining these passages, or by coughing. Nevertheless a considerable portion of the finest dust reaches the lungs, and will cause harm if it is in sufficient amount. This harm, if caused immediately, seems to be much the same with all sorts of dust. But if the harm is not caused immediately, there is a great difference in the effects. Certain dusts, and notably any unmixed form of crystalline silica, cause lasting and cumulative injury; whereas others, and notably coal dust or shale dust, cause no cumulative injury, and no injury at all unless they are present in enormous amounts.

## RESULTS OF EXPERIMENTS

Now, what happens to the dust within the lungs in these two cases? On this point the experiments gave a perfectly clear answer. When the animals were exposed to as nearly as possible equal quantities of the fine dusts, and for equal times, the dusts were, at the end of the period of exposure, found to be abundantly present in the lungs. With coal dust there was special abundance, which is what we should expect, considering its lightness and fineness. The lungs became quite black.

\*Excerpt from a paper to be submitted to the Chemical, Metallurgical and Mining Society of South Africa, and the Institution of Mining Engineers of London.

But if the examination was made some weeks later, it was found that the coal dust and shale dust lungs were clearing up, whereas there was no evident diminution in the dust in the lungs of animals which had been exposed to powdered flint or quartzite dust from a Transvaal gold mine. After several months the coal dust and shale dust had entirely disappeared from the lungs, whereas the flint and quartzite were nearly as abundant as immediately after the exposure to the dust.

#### NATURE'S EFFORT TO COMBAT EFFECTS OF DUST INHALATION

The examination showed that all the dust particles are taken up into the protoplasm of certain of the epithelial cells lining the air cavities of the lungs. In the case of the coal dust or shale dust these cells detach themselves and wander away with their load of dust particles. Some pass directly into the ends of the bronchial tubes, and are thence swept upward by the cilia and swallowed. They thus pass out of the body by the alimentary canal. Other dust-laden cells wander into the lymphatic vessels and are carried to the lymphatic glandular tissue surrounding the bronchi. From this position they wander through the walls of the bronchi, and are then swept out like the cells already referred to. Still other dust-laden cells are carried into the lymphatic glands at the roots of the lungs, and where they wander afterward is still uncertain.

In the case of the flint or quartzite dust, nearly all the dust remains *in situ*. It is only to a comparatively small extent that the cells wander out with it, though some wandering does occur, and some of the dust gradually reaches the lymphatic glands, where it can readily be recognized, as it becomes coated with a dark pigment.

#### EFFECT OF COAL DUST

It can now be realized readily what is happening in the lungs of a coal miner breathing large quantities of coal and shale dust, as compared with what is happening in the lungs of a gold miner breathing quartzite dust. As fast as the dust goes in, day by day, to the coal miner's lungs, it is carried out again by the dust cells. His lungs, it is true, are probably always more or less black; but, on the other hand, what he coughs up is black and full of the dust on its way out again. His black spit is in truth his salvation. On exposing the animals to relatively small daily doses of coal or shale dust, and continuing this over a long period, it was found that after a few days the dust in the lungs ceased to increase. The intake of dust was thus balanced by the output. From all we know about similar physiological processes we may be fairly sure that the capacity for eliminating dust particles grows with use. If this is so, the practice of constantly getting rid of coal and shale dust may help the lungs in eliminating other kinds of harmful particles, such as tubercle bacilli, and may thus account for the remarkable fact that coal miners are, and always have been since statistics were first available 60 years ago, extremely free from phthisis.

In the case of the miner breathing quartzite dust, the dust remains for the most part *in situ* in the lungs, and there tends to accumulate from month to month and year to year. Some of it is certainly got rid of; but to reach a balance between intake and output, without there

being a dangerous permanent loading of the lungs with dust, the amount of dust inhaled must be reduced to a minimum. The fate of men who have constantly, and often against constant warning and against the law, exposed themselves to heavy concentrations of quartzite or granite dust in working rock drills and in blasting, is tragic. For many years I have abstracted for the home office the information obtained by local registrars in Cornwall as to the mining history of miners who have died there. Since the war no statistics have been published, but for 10 years previous to the war the average duration of employment on machine drills of the men who died in the Redruth area, and had worked machine drills in the Transvaal only, was 4.7 years, and in Cornwall only was 7.8 years. Practically every one of these men died of phthisis, and usually at an age below 40.

On the ultimate effects of chronic overloading of the lungs with dust, I do not purpose to dwell at present. It may suffice to mention that an overdevelopment of connective tissue gradually occurs, constituting the condition of "fibrosis," and that at the same time the lungs become extremely susceptible to attacks by the tubercle bacillus, so that death from phthisis is the usual result.

Why is coal or shale dust easily removed from the lungs, but not siliceous dust? And why, above all, is pure quartz so difficult to remove, whereas the large proportion of quartz in shale dust is removed easily? Let consideration be given the first question first. The evidence points to the fact that not only is quartz dangerous, but also other kinds of very insoluble crystalline dust. Thus Professor Beattie found that emery, a crystalline alumina, and carborundum, a carbon silicide, are extremely dangerous. Now, if it were the case that the danger is due to mere hardness or sharpness, one would expect to find that crystalline dust, even when mixed with other dust, is dangerous. But the quartz in shale and other hard stone is actually harmless in practice. The mere chemical composition of the stone does not seem to matter. There is, however, a quality in the dust that does seem as if it mattered, and this is its power of adsorbing other substances.

#### INFLUENCE OF ADSORPTION

Absorption or solid solution is a process distinct from chemical combination and similar to solution in a liquid. It depends upon attraction between the molecules of the adsorbed substance and those of any free surface on or in the adsorbing solid; just as solution depends on attraction between the molecules of the solvent and of the dissolved substance. The importance of adsorption in all kinds of processes used in industry is, of course, great; and the recent remarkable experiments by Ivon Graham on the solution or adsorption of gases by coal point out one direction in which adsorption is of great interest in coal mining. Particles of coal dust and other insoluble carbonaceous matter possess in a high degree the property of adsorbing other substances. The same property is possessed in a less degree by such substances as shale; whereas crystalline substances such as quartz seem to have little adsorptive power.

It is highly probable that insoluble dust particles are attractive and stimulating to dust-collecting cells in proportion to the soluble substances adsorbed in the

\*Trans. Inst. of Mining Engineers, LIII, p. 336, 1917.



dust particles; and that the particles containing little of these substances will be correspondingly unstimulating. This, at least, seems to me the most probable explanation of why some kinds of insoluble dust stimulate the cells and others do not; and the facts so far known seem to be consonant with this explanation, though far more work on the whole subject is required.

To the second of the two questions the answer seems simpler. The particles of quartz are taken up by dust-collecting cells, as already mentioned, though the cells do not readily wander out with them. But if enough of the juicy adsorbent particles are also present, they will stimulate the cells sufficiently, and consequently the whole of the dust, including the quartz, will be removed. In this way it can be seen how a mixture of quartz with silicates, as in shale dust and the dust from many hard stones, causes no harm; also why the dust in the Transvaal gold mines is so much more harmful than in some other districts where the metal mined is also in quartz. In the Transvaal both the gold-bearing reef and the surrounding country rock is quartzite. The quartz dust is thus pure. At Mysore, on the contrary, the country rock is not quartzite; and the dust is, therefore, a mixture containing, probably, enough of the stimulating variety of dust to stir the dust-collecting cells to activity.

#### POSSIBLE SOLUTION OF THE PROBLEM

It is evident that the facts ascertained point to the possibility of attacking the problem of dangerous stone dust in mines and elsewhere from a new side. If the inhalation of dangerous stone dust cannot be altogether prevented, it is possible, apparently, to neutralize its effects by causing another kind of dust to be inhaled with it. Dust from pulverized clay or shale, or a mixture of coal dust with shale dust, would seem to be suitable. A black mixture of, say, 60% of shale with coal dust might be specially suitable, as it would be easily visible, and could not explode. The most suitable method of applying it, so as to insure that the men should breathe enough of the dust, would have to be carefully thought out; but I do not see why practical success should not be reached, particularly if the existing precautions against inhaling quartz dust were vigorously maintained. When little quartz dust is inhaled, less of the neutralizing dust will be required, just as, in the case of coal mines, the less coal and coal dust are deposited along the roads, the less stone dust will be required.

The need for further experiments on the effects of inhaling different kinds of dust, and on the conditions needed for neutralizing the ill effects on the lungs, is evident, but as the practical conclusions which can be drawn from what has already been discovered are both evident and important, it seemed worth while to give the present summary. Observations of mining engineers on the effects of dust inhalation and the conditions in different mining districts throughout the world would, of course, be a most valuable help in guiding future experiments and devising effective methods of preventing the terrible suffering and loss due to miners' phthisis and fibrosis.

As far as coal mining is concerned, the results of the investigation are fortunately reassuring. So long as the dust in a coal mine is not explosive, and is not breathed in excessive quantities, it seems to do no harm, and possibly even does some good.

## Injuries From Rolling Objects

BY CHESLA C. SHERLOCK\*

Legal decisions record a large number of cases in which the courts have been called upon to consider the question of injuries caused by falling objects. A significant fact is to be noted in these cases where injury was caused by objects rolling down hillsides: in every instance the employer has been held liable in damages for the injury done.

In a Utah case, it was shown that the plaintiff and a number of other householders lived in a deep ravine, so that it was necessary, in delivering supplies, to unload them on top of a hill about 200 ft. above the level of the houses, from which point each person removed his own supplies to his home. The plaintiff was working in his yard when a large piece of coal came rolling down without warning from the top, where the defendant's employee was unloading coal, and struck him, breaking his arm and rendering him unconscious.

It was shown that the edge of the pile was only two feet from the edge of the incline, and that there was no barrier or railing there to prevent pieces of coal rolling down, and upon this showing a verdict was given to the plaintiff and affirmed by the Supreme Court.

In a Washington case, the plaintiff was engaged with another workman in operating a rock drill a hundred feet or so below the main body of workmen. The nature of his work required him to pay close attention to the drill. A rock loosened by the men above, though they had placed brush below them to hold back material, rolled down on the plaintiff and injured him. The court held that because of the employer's measures in piling up brush to protect the plaintiff, the plaintiff had a right to assume that all due measures for his safety had been taken, and that he should recover damages.

Workmen are frequently injured while working under overhanging rocks or under the overhanging side of a hill. In a New York case, the plaintiff was working under an overhanging ledge, which had begun to crack badly. The evidence showed that the situation had been examined by the foreman and that he had made extensive tests to determine whether the crack was widening, and that he had found that it was, but had done nothing. The plaintiff did not know of the dangerous character of his place of work and had had no opportunity of finding it out. The court awarded him damages.

### Bureau of Oil Conservation Needs Inspectors and Engineers

The Bureau of Oil and Natural Gas Conservation, Washington, D. C., wishes to secure the services of six field inspectors, whose work will consist of visiting the larger oil- and gas-producing localities and ascertaining the condition as to wastage of oil and gas. It also desires the services of eight fuel-oil combustion engineers. As far as possible, it is hoped to obtain inspectors who will volunteer their services to the Government during the period of the war, but if this is not possible, a fair remuneration, together with the necessary expenses, will be paid. Only men having had experience in these respective lines need make application.

\*Box 604, Des Moines, Iowa.

# Method of Mining Pillars at the Fortuna Mine Of the Braden Copper Co., Chile

By CHARLES HOLLISTER\*

The orebody was first stoped by shrinkage, leaving pillars. The pillars were undermined and caving was attempted, but pillar caving ceased when the back apexed with the hanging wall. Stopes were then drawn empty and filled with waste, and drifts and raises were driven in the foot wall. That part above the section stoped was developed by transverse parallel drifts, connected by inclined raises at close intervals, that were drilled and blasted, retreating from hanging to foot walls. In mining the pillars below this section central drifts were driven through each and at close intervals short incline raises put up on each side and connected over the drift. The intervening ground between raises was drilled and blasted, retreating as described in the first operation.

THE method of mining at the Fortuna mine of the Braden Copper Co., Chile, is adapted from that used at the mines of the Ray Consolidated Copper Co., Ray, Ariz., namely, shrinkage stopes separated by pillars at regular intervals transverse to the orebody.

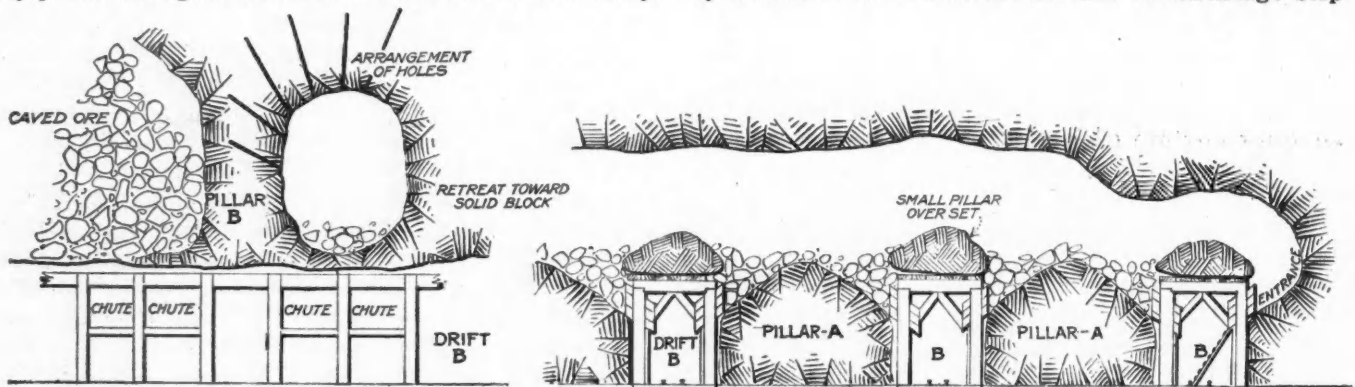


FIG. 1. LONGITUDINAL AND END SECTIONS SHOWING METHOD OF OPENING UP AND STOPING UPPER SUB-LEVEL AT FORTUNA MINE

At the Fortuna, the orebody presents an elliptical horizontal area 3000 ft. on the long axis and 260 ft. across at the widest part. The dip of the orebody is steep, and it has been developed by tunnels at four levels from the surface to a depth of 1425 feet. Shrinkage stopes extended across the orebody from wall to wall and ranged from 15 to 25 ft. in width; pillars left between stopes were usually from 15 to 24 ft. wide. The flexibility of this system permitted a widening or narrowing of the stopes or pillars, according to changes in the character of ground—wide stopes and narrow pillars for hard ground and *vice versa* for soft ground. At Ray, the earlier 25-ft. wide pillars, alternately separated by 25-ft. wide shrinkage stopes, were mined first by taking a 10-ft. wide shrinkage stope up through the center of each pillar, thus stoping out the core, and then undercutting the pillar base and caving the whole over large areas

by simultaneously drawing the ore from several stopes and pillars. Several methods of pillar attack were originally tried at Braden. One method was to excavate under the pillars by a series of drifts and crosscuts, undermined by drilling and blasting out the solid sub-pillars so left between. Though this plan seemed feasible at the time, and probably would have been successful under different conditions, results at the Fortuna were not satisfactory.

In drawing the broken and caved stope and pillar ore after undermining the pillars, the action was a gradual sloughing of the ore from the back of the pillars until the back apexed at the inclined hanging wall, forming an arch that prevented further caving, and leaving a large block of ore on the foot wall.

Horace Graham, who became superintendent about the time that the operations detailed were in progress, made some decidedly advantageous and well-devised changes in the mining method, eliminating entirely the wide pillar and stope system in favor of narrow stope and pillar units. This change retained the advantages of flexibility possessed by the old method, and though increasing the proportion of initial breaking necessary by reason of the additional amount of shrinkage stop-

ing required, the saving in chute blasting and the extraction of cleaner ore compensated for the additional work. Accordingly, the stopes were all completely drawn and waste filled in, under and alongside the partly caved pillars and close to the stope backs.

To mine the uncaved block and recover the arched pillars, it was decided to raise in the foot wall at a distance sufficient for a good margin of safety and to develop a sublevel system for stoping and caving. The block was divided into two parts, an upper and a lower. The upper section was that portion of the ore above the ground that had been stoped and the lower section included the pillars of the stoped-out and filled portions below. The upper section was developed, first, by a drift in the foot wall from raise to raise; then drifts 24 ft. center to center from the foot-wall drift to the hanging wall of the orebody, driven parallel to the original line of pillars. Incidentally, in driving the

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Eventually, the following method was adopted: Chutes, of which only a few had been previously constructed, were placed staggered for two sets, then a set missed, etc., to the end of these transverse drifts. As shown in Fig. 2, short inclined raises were driven at about 35° to the horizontal, connecting with similar raises through the pillars between adjacent drifts. This left a pillar 6 ft. thick over each chuteless set between raises. The connecting raises were then stoped up from 7 to 8 ft. high, and the muck was drawn down, leaving only working head room. The intervening 6-ft. pillars were then drilled and blasted successively. The men were always safe, as the retreat was away from the undercut and caving area, as shown in Fig. 2. The result of this procedure was completely to undermine the entire block, and though it was thought at first ad-

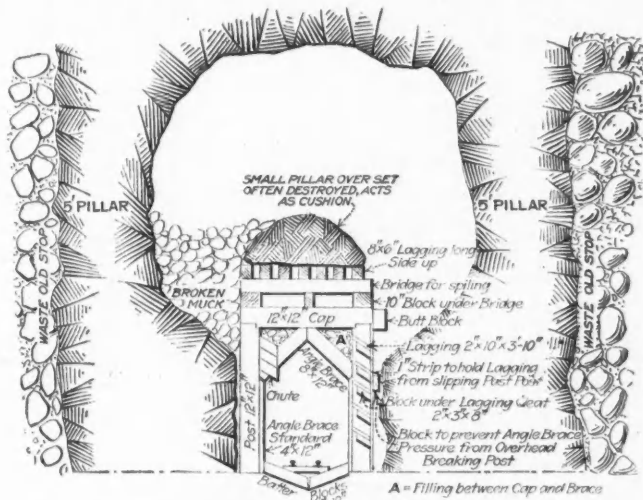


FIG. 2. DETAILS OF TIMBER SET AND SECTION OF STOPE OPENED UP IN LOWER PILLAR LEVELS

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The second or lower section above the Fortuna No. 3 sublevel, with the exception of a part of the foot-wall drift, was developed during the drawing stage of the upper section. The development plant was practically identical, central pillar drifts being 24 ft. center to center, and timbering and chute building following at a working distance behind each heading. Owing to the heavy character of ground expected in this section, 12 x 12-in. timber sets were used, supplemented with bridges for spiling purposes.

The conditions that existed here were entirely different from those of the first section. The ore in the shrinkage stopes on either side of the pillars had been completely withdrawn, and the stopes were filled with waste. The problem that presented itself was to prevent pillar stopes from breaking into the old filled stopes

and allowing the waste to mix and dilute the pillar ore. Chutes as shown in Fig. 2 were placed in each timber drift set and raises driven up 6 ft. at an angle of 45° into the pillar, along each side of the drifts. The raises were then continued by inclining backward to connect over the top of the drift. After this was done for the total length of a drift, the small pillars between openings were drilled and shot. The result was the removal of a core which, with occasional holes to widen the excavated area, caused the pillars to cave freely, and the caved ore was drawn from the chutes. The extraction up to Mar. 1, 1917, from pillars No. 1, 2, 3, 4, 5, and 6 was, respectively, 100, 77.3, 64.2, 78.6, 37.7, 80.7, 80.4, and 58 per cent. Upon my return to the United States at this time, the chutes, with the exception of those in Pillar No. 1, were all still producing ore.

#### CONCLUSIONS

It is of interest to note that at Ray the top weight on timber sets manifested itself first, resulting in a firm setting of the timber sets before side pillar pressure took effect. This, however, was not the condition at Braden. The primary pressure was exerted by side squeezing, causing the posts to yield by bending inward. To relieve this strain, the angle braces, as shown in Fig. 2, were changed from 50° to 40° from the horizontal, and 8 x 12-in. batter blocks were used in place of sills. A crew was kept picking away the ground back of posts to relieve the pressure. Conclusions were:

1. In heavy sections of wide area it is imperative to start caving operations as soon as possible after drift development and timbering have fair lead. This to permit chute construction and raising without interfering with the other work.
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Eighty-seven Mining Titles for properties located in various states of the republic were issued during the month of June, 1918, by the Mexican Department of Commerce and Industry, according to a consular report, and of this number 49 belong to the State of Sonora alone, where the mining industry has assumed a considerable impetus during recent months. Of these mines, 16 are for gold and silver; 8 for copper; 7 for gold, silver and lead; 7 for gold, silver and copper; 7 for silver and copper; 7 for silver and lead; 4 for molybdenum; 2 for manganese; 3 for antimony; 3 for fluorspar; and the remainder are for silver, gold, or copper combined with various other metals.

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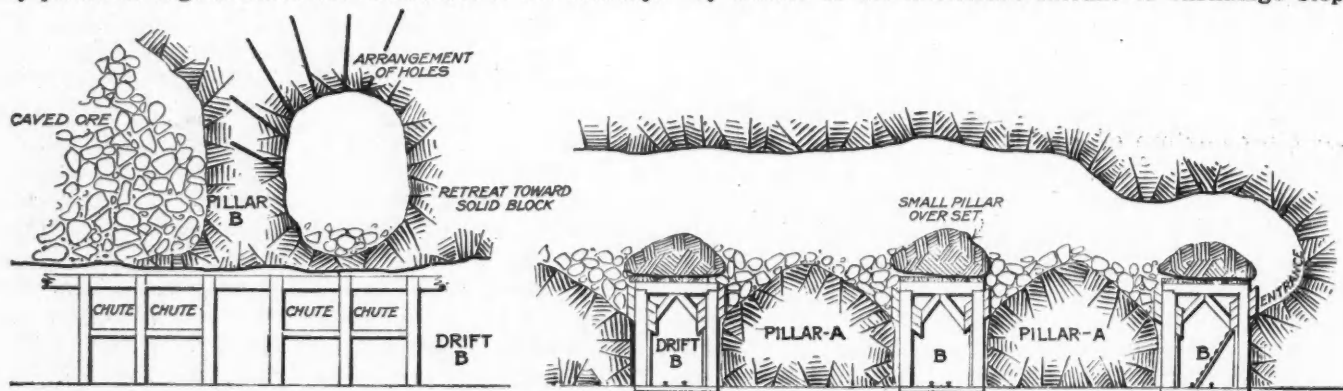


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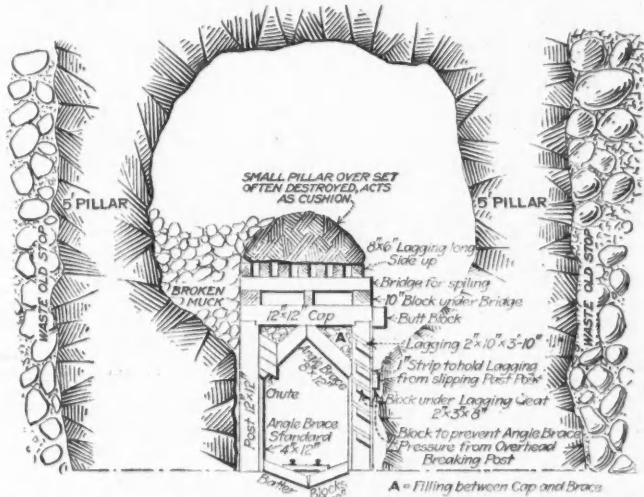


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# Safety and Health in Hydrometallurgical Plants

By A. W. ALLEN

*Measures which increase efficiency in metallurgical plants nearly always result in greater safety, general improvement, and better health. Such installations are scattered throughout the world, and this paper therefore is addressed to a wide audience. A plea is made for full consideration, at the time the plant is designed, for the operator of the mill and his helpers. The fact that inefficiency and poor results are often caused by the continual need for unproductive and wasteful effort, in an attempt to counteract the ill effects of unsatisfactory plant design, should be kept in mind by the engineers from the outset.*

**A**CCIDENTS to machinery or workmen in hydro-metallurgical plants are usually to be attributed to a multiplicity of causes. Faulty design of plant arrangement and faulty estimation of power requirements for certain machines are often responsible. Other than in exceptional cases, no margin is allowed—no safety provision. Pulley and belting widths are often kept at a minimum consistent with theoretical requirements. When the mill starts, a cloud of dust coming from the rock-breakers, or raised by the injudicious or overzealous use of the broom, finds its way between belt and pulley. Slippage follows, and is usually the forerunner of serious trouble, often culminating in personal injuries.

## REASONABLE CAPACITY MARGIN DESIRABLE

Underestimation of capacity needed is another potent cause for a condition of affairs that leads to trouble of many kinds. A machine that will carry the load only when favored with unremitting attention is the cause of general inefficiency, owing partly to neglect of other units of the mill—a condition which often leads to minor accidents.

Cheap, second-hand, and often defective machines sometimes cost much more in the long run than a new and guaranteed item of equipment. Workmen are unacquainted with whatever hidden deficiencies and weaknesses are present, and accidents frequently result. The question of actual rather than of apparent economy should be considered in the first instance. If this is done, a liberal and expert estimate of probable cost for repairs and renewals will often sway the decision in favor of the unused and guaranteed machine.

## AMPLE SPACE AND ELBOW ROOM ESSENTIAL

Space is usually the cheapest of commodities in a mining locality, and yet treatment plants apparently are often designed with an idea that the ground on which they are to be erected is almost priceless. Ample elbow room between dangerous belts and moving mechanisms is an imperative necessity if safety and comfort are to be considered and promoted. Compactness in design need not and should not involve a sacrifice of all elements of safety—or of any of them.

Congestion and crowding of equipment have been especially noticeable in the past in connection with cyanide plants designed by certain "experts," whose metallurgical concoctions were monuments to their ignorance of practical working conditions. In such plants the operator's patience was reduced to almost complete disappearance by the frequent necessity of having to crawl through indescribably dirty holes and narrow passageways to tinker with valves, or to assist in the flow of slime pulp which the designer of the plant had assumed would move under the influence of some law of accelerated gravity as yet undiscovered. In practically all such instances the designer could have prevented perpetual discouragement and annoyance, occasional injury, and ill health, by the use of a modicum of common sense, and the provision of adequate space and ample head room. This would have gone far to insure efficient control, and would have provided room for those minor modifications in arrangement usually needed in all chemico-metallurgical installations after the first run.

## OPERATORS' POINT OF VIEW TO BE CONSIDERED

One of the most important considerations to be kept in mind throughout the preliminary stages of the development of plans and specifications should be the provision of every possible incentive to productive effort on the part of those who will operate the plant, and the elimination of arrangements that may lead to discouragement of any kind, and which may result in the avoidance of, or in attempts to avoid, routine duties. The operator of the plant must be considered, and considered to the fullest possible extent—from the outset. His attitude toward every phase of the work must be anticipated. His duties must be freed of tasks that are not required in a sensibly designed installation; and then, provided he has cooperated to the best of his ability, he will be able to hand over the plant, or section, at the end of his shift with the realization that the work has been well done, and that nothing has happened to diminish his enthusiasm. This should be the aim of the designer of the plant, who, if he knows what he is doing, has the power to influence the careers of the men who will work in his mill to a far greater extent than is usually realized.

## UNPRODUCTIVE EFFORT LEADS TO INEFFICIENCY

Nothing is more detrimental to the general efficiency of operations than the presence of a perpetual irritant in the form of some disagreeable duty—disagreeable only because of the shortsightedness of the man who designed the plant. Nothing will occasion so much loss as when employees have a justifiable "grouch." This may arise from causes which those in authority cannot appreciate, such as many minor personal discomforts which often lead to illness or injury. What is needed is emphasis on the fact that plants are operated by human beings who are possessed of more or less keen susceptibilities. Keeping of this fact constantly in mind while designs are being considered is a prime necessity.

If this was done in all cases, a great amount of discouragement would be avoided, less initiative would be stifled, and much unproductive effort would be saved for efficient purposes. A discouraged man is often an angry man, and an angry man is less likely to consider his own or another's safety—less likely to be able to make a wise decision in an emergency—than one who is contented with his surroundings.

#### FAULTY COST ESTIMATION OFTEN LEADS TO UNSOUND ECONOMIES

The cost of plants is usually underestimated, and for a number of reasons that it is unnecessary to dwell upon. Toward the completion of erection work the most rigid economies are sometimes introduced; and everything that can be considered, by any possible stretch of the imagination, as not absolutely necessary, is eliminated. Satisfactory arrangements for dry walkways, substantial ladders, and broad stairways, insuring both safety and comfort, are thrown out as unessential, in conformity with an eleventh-hour policy of cheeseparing. Temporary substitutes are put in, and the promise of standard equipment at a later date is seldom fulfilled. Concrete flooring is often omitted, for the same reason; and the operator is sometimes expected to watch a daily waste of gold or silver in solution or other valuable product and at the same time maintain his enthusiasm for effecting economies in other directions. Such a policy is the worst kind of mistake. A good floor that can be kept clean and keeps itself drained should be the first consideration in a wet-crushing mill. It is no economy to neglect a provision that will add to health and comfort, to say nothing of the saving of the valuable metal effected. It is absurd to expect men to be enthusiastically responsive to appeals to "keep the place clean" when the most elementary precautions to encourage or insure this have been ignored in the original design of the plant.

In many cases the smallness of the installation is pleaded as a reason for the avoidance of what a large corporation would consider essential health and safety provisions. This excuse is not always legitimate, and is often made through adopting a mistaken policy of erecting a mill before the mine had been developed to a scale sufficient to justify the expenditure for an adequate treatment plant.

#### MANUAL LABOR ECONOMIZING HAS AIDED SAFETY MOVEMENT

Dusting in a hydrometallurgical plant is usually confined to primary crushing, and the ill-effect on the health of the workers is small, due possibly to the fact that the dust usually contains a percentage of non-abrasive particles. The introduction of tubular mills of various designs has unconsciously aided the safety movement, inasmuch as their adoption has led to a greater simplification of operation, making personal attention less necessary, and so reducing the liability to accident. The economy in manual labor resulting from the use of mechanical devices such as crushed ore distributors and excavators has also resulted in a diminution in injuries, and an improvement in general health, by freeing a number of workers from monotonous and often unhealthful tasks.

Apart from those arising from the lack of safety

provisions, the majority of accidents occurring in a modern plant result from unexpected causes. The relation of knowledge of danger to resultant accident is marked. The deadly nature of cyanide is well known, and poisoning from this cause, in spite of continual contact, is happily rare in most countries, and deaths from cyanide poisoning are so uncommon as to be almost negligible in number. Precautionary measures are now standard, and though in isolated districts, where it is impossible to convince natives of the danger, it is not uncommon to have a number of poisonings with "green" gangs, all the cases respond to the antidote, which is kept handy.

High-tension current is well known as dangerous—the effects of a slight shock are not easily forgotten—but the number of accidents from this cause is comparatively small. Other dangers are more insidious and less obvious. Salivation, or mercury vapor poisoning, is not uncommon among amalgamation-plant workers—a condition that has often been improved by an educational campaign in the mill.

#### SAFETY PRINCIPLES IN ACCORD WITH EFFICIENCY PROGRAM

On reviewing the situation it is impossible to avoid the conclusion that, in general mill work, the insuring of greater safety and better health has often resulted without a recognition of safety-first principles, *per se*. This proves the eminently sensible nature of the safety campaign, because the changes that have tended to reduce or eliminate danger and discomfort and increase security and satisfaction were concordant to a plan insuring greater efficiency in general results, made in the first instance to increase returns and decrease costs, or both. The resulting economy in labor diminished the likelihood of accident and freed workers for other less dangerous but more responsible tasks, and so aided the movement that has done so much to stabilize industry in general.

### Development of Mining in Papua

A project involving the construction of a light railway, 18 miles in length, to connect Port Moresby (Papua) with the Laloki River, to serve a copper-mining enterprise, is being considered. The government had decided to spend £35,000 on the construction of this line, but the project was temporarily abandoned on account of the war. The harnessing of Rona Falls, on the Laloki River, for the purpose of generating electric current for mining purposes, has been authorized.

Papua, which is one of the largest islands in the world, lies to the northeast of Australia, and is practically unexplored. One quarter of the island was taken from the Germans by Australian forces during the early days of the war, and one half of Papua is now under Commonwealth administration. The remainder of the island belongs to the Dutch.

Gold has been found extensively in river estuaries on the mainland, and also in the smaller volcanic islands. Development of the colony is likely to be slow, on account of climatic conditions, coupled with isolation from trade routes and centers of civilization, but it is expected that extensive mineral deposits will eventually be opened up.

# Differential Flotation at Wallace, Idaho

By C. T. RICE

*The efficient treatment of zinc-lead ore by flotation involves the adoption of a system of selective concentration. This article describes in detail a typical installation of this kind in the form of an addition to a jig and table concentration plant. The capacity is about 300 tons per day, and a plan is shown giving the general arrangement of equipment. In the older section of the mill the crushed ore is cleaned by jigs and tables, and, after regrinding in a conical mill, is treated in the differential-flotation annex as here described. The installation is of particular interest to millmen in that it exemplifies the solution of a problem that many mining companies have under consideration—how to increase recovery without greatly changing existing methods of ore treatment or of increasing the capital input for plant and appliances. A flotation unit can be added to an existing mill with as much ease as and not much greater expense than an old-time canvas plant.*

**T**HE recent installation of differential flotation at Morning No. 2 plant of the Federal Mining and Smelting Co., to adapt it for the treatment of zinc-lead ore from the Morning mine, involved a consideration of several important details. The annex was added to the old mill buildings, and apart from the fact that the hillside facilities permitted the placing of the Pachuca emulsifiers at the head of the flotation machines, instead of between the two roughers, the arrangement may be followed elsewhere. The design is well worthy of study and is to the credit of T. M. Owen, the Federal company's flotation expert—one of the few men who have had experience with differential flotation both in this country and Australia.

The installation has an underload capacity of 300 tons of 60-mesh flotation feed per 24 hours. In the older section of the mill the ore is crushed and treated on jigs and tables, not so much to get out the lead and zinc as to reduce the amount of crushing to be done subsequently by making tailings rejections as early as possible throughout the treatment. The final product is then crushed to 80 mesh in an 8-ft. x 36-in. Hardinge mill before going to the flotation plant. The drawings illustrate the treatment which begins at this stage.

## DRAG-CLASSIFIERS AND AIR LIFTS USED

The Hardinge mill operates in close circuit with two drag classifiers, and the overflow from these is delivered, by a 6-in. centrifugal pump, to the 40 x 12-ft. Dorr thickener. The pulp is thickened to a consistence of 4 to 1 and then pumped to the Pachuca emulsifiers feeding the lead roughers. The emulsification is accomplished in two Pachus, and as there is a considerable amount of granular material in the feed, a second and smaller air-lift pipe has been added to the Pachus. These auxiliary air lifts do not operate in close circuit with the tank, but discharge either into the second Pachuca or into the feed box of the first series of rough-

ers. The same system of two air lifts (one to elevate the granular material that would not overflow from the tank, and which otherwise would build up in the Pachus) is also used in the zinc-emulsifying Pachus.

As will be seen from the drawings, there are two lines of lead pneumatic machines and four lines of zinc machines, each line being composed of two roughers and a cleaner, the second rougher taking the bottom flow from the first rougher, and the float from both roughers going to the cleaner. The bottom flow of the cleaner returns to the lead Pachus for re-treatment, tailings only being made by the second rougher of the series. In the lead series, the tailings from the second roughers go to an 8 x 8-ft. tank, where any irregularity in the discharge of the lead machines is equalized, and the feed held and mixed slightly so as to even it in grade, as well as in quantity, before being pumped to the zinc emulsifiers. The tailings from the second roughers in the zinc section go to the creek.

## EMULSIFICATION FOR ZINC SEPARATION IN JANNEY EMULSIFIER AND PACHUCAS

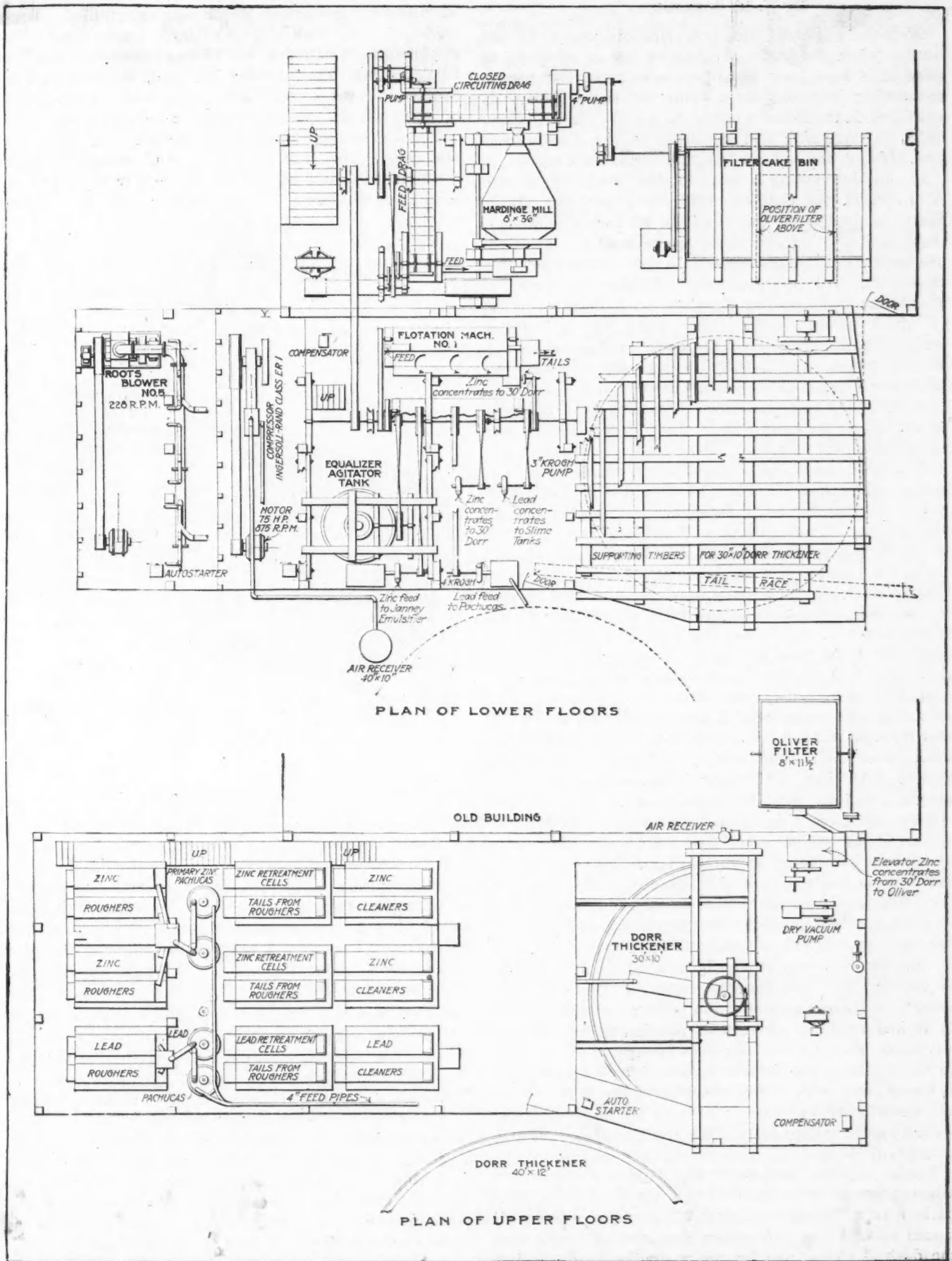
The emulsification for the zinc machines commences in a Janney emulsifier and is completed in two Pachus. The single Janney does not give the pulp sufficient emulsification, but from the trials made during the six weeks that the plant operated, it was thought that the two Janney emulsifiers running in series would produce a better emulsification than could be obtained with the two Pachus. The Janney emulsifier was, however, installed only as an experiment, and the plant did not run long enough to permit a decision as to which device gave the better emulsification.

The air for the Pachus and for other purposes is supplied by a small compressor at 15 lb. per sq.in. The air for the Callow cells is delivered by a No. 5 Root blower at 3½ lb. per sq.in. pressure. The flotation machines are 2 x 10 ft. in size and equipped with cast-iron filter-pan individual bottoms for each cell. This now represents the standard practice of the district. The froth concentrate from the lead cleaners is added to the lead concentrate from the tables, and the mixture settled in tanks. The amount of lead froth obtained is too small to warrant the installation of a filter. The zinc froth is settled in a 30 x 10-ft. Dorr thickener to a consistence of about 1 to 1 and then raised by a small bucket elevator to the feed box of an 8 x 11½ ft. Oliver filter. The oil used to float the lead is No. 2 Cleveland-Cliffs, and No. 8 G. N. S., or No. 350 Pensacola for the zinc. Sulphuric acid is added previously, to promote the flotation of the zinc and to keep down the siderite. The arrangement of the machines on the different floors is shown in the drawings, together with other operating details.

After six weeks of operation, the plant was closed by court order, arising out of litigation concerning the title to part of the Morning orebodies. The suit has been settled in the lower court in favor of the Federal company.

Remember the Comfort Fund of the 27th Engineers.





GENERAL PLAN OF MORNING NO. 2 MILL, WALLACE, IDAHO

## Automatic Elevator-Bucket Discharge

BY H. M. SCHLEICHER\*

Methods employed for procuring discharge of the bucket when the material elevated has a tendency to pack in it have been described recently in two papers concerning belt elevators. One of these papers is published in the Bulletin of the A. I. M. E. for February, 1918, on page 273, and the other in the *Engineering and Mining Journal* of Dec. 29, 1917, on page 1113.

In an interesting paper in the Bulletin of the A. I. M. E. for October, 1917, on page 1475, A. P. Watt, in describing the handling of flotation concentrate, writes: "If conditions are such as to permit its use, an elevator is preferable to a centrifugal pump for elevating flotation concentrate." If the concentrate is at all like the material produced in a flotation plant of which I had charge a few years ago, a marked tendency to pack tightly in the bucket and remain there will be noted, and it will be necessary to resort to extraneous means for insuring discharge.

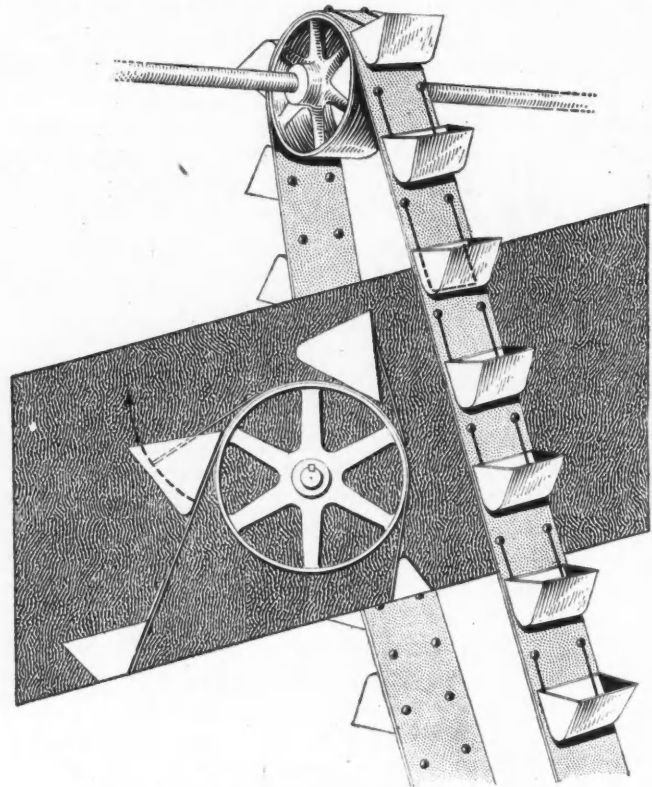
Many of the methods outlined in the papers referred to for aiding the discharge of the buckets depend upon a bumping or vibrating device which, theoretically, would seem hard on the elevator mechanism. A method developed in the flotation plant mentioned would seem to be worth bringing to the attention of millmen, as it was effective, quiet, and not harmful to the elevator. The principle involved is simple, and the device is cheap and readily installed. The method is illustrated in the accompanying sketch. A given point on the belt starts around the head pulley before any point below it. The ends of a wire U-shaped loop are fastened to the belt just above a bucket and project down into the bucket. As the ends of the loop start around the head pulley, the bottom of the loop describes an arc across the bottom of the bucket. Furthermore, and more important, as the ends of the loop leave the head pulley on the down side, the action is reversed, and at this time the bucket is inverted and in the proper place and position to discharge.

The wire loop is provided with eyes at the ends of its arms, by which it is fastened to the belt with small belt bolts over large washers. The bottom of the loop is made to conform closely to the form of the bucket. The loop should be of such length that it does not touch the bucket anywhere, either when the belt is straight or going around a pulley; that is, the arc described by the bottom of the loop should be shorter than the distance across the bucket. The bucket, in traveling around the pulley, remains tangent to it and does not change in relation to the belt at any time, although the loop does change in its relation to the bucket when it starts around and again when it leaves the pulley. The first sweep of the loop through the bottom of the bucket loosens its load and the second sweep, taking place while the bucket is inverted, insures discharge.

Trials of this method were made with ordinary telegraph wire bent into shape by hand around four nails driven into a mill post. The nails were positioned so that the wire, when bent around them, took the desired shape, and by removing the heads of two

of the nails the eyes on the loops could be made at the same time. These loops were tried at varying lengths until the proper length was ascertained. Those made of soft wire did not show much wear after two months' operation, but were rather soft for the best work. They tended to bend, which would be avoided if spring-steel wire were used. Loops made of steel should give long and satisfactory service.

The device will work satisfactorily on fine, wet materials. The wire should be stiff enough to penetrate the load, and should be fastened to the belt over large flat washers. As the material in the buckets



DEVICE FOR INSURING BUCKET DISCHARGE

has little opportunity to pack, the wire need not be as thick as would at first thought seem necessary.

It is desirable to find the correct length of the loops so as to avoid contact of the wire and the bucket. In order to have a starting point for ascertaining the proper length, the following formula, which gives the approximate length, is offered: Let  $D$  be the diameter of the head pulley in inches. Measure the distance from the tip to the back of the bucket, divide by two and call this  $W$ . Then  $L = \sqrt{Dw - W^2}$  = length of the loop. This can be only approximate, as the shape of the buckets varies and in deriving the formula the loop is assumed to be in a position which may hold good only for a particular case. It will be necessary to adjust one loop properly and then make the remainder the same, both as to length and the distance the loop projects into the bucket. The device has proved effective, and it is hoped that others encountering the difficulty of material packing in elevator buckets will make up and experiment with at least one loop to learn what it will do in their particular cases.

\*In charge of the Central Research Laboratory, U. S. Smelting, Refining and Mining Co., Cambridge, Mass.

Today is an opportune time to send a check for the Comfort Fund of the 27th Engineers.

## Development of Brazilian Iron-Ore Deposits

That the iron-mining industry in Brazil is to be developed soon after the close of the present war seems evident, states a consular report. The prospect of early development is due to the fact that many important iron-ore deposits have been acquired by foreign and Brazilian syndicates.

Below are given the names of the companies that are at present said to be the more important owners:

The Itabira Iron Ore Co., an English concern, with its head offices in London, incorporated by the Rothschilds, Baring Bros., and E. Sassel, and which purchased the Conceicao and Esmeril deposits for 2,400,000 milreis (about \$600,000 in American currency). This group has control of the Victoria Minas Ry. The deposits, situated at Itabira de Matto Dentro, are estimated at 99,000,000 cu.m. and capable of producing 296,000,000 tons. The purchase price paid by the prior holders was 400,000 milreis (\$100,000).

The Brazilian Iron Steel Co., an American corporation, represented by M. Harder, has acquired, also in Itabira de Matto Dentro, the deposits known as Caná and Sant' Anna, containing 33,000,000 cu.m. or over, or 132,000,000 tons. The purchase price is stated as 300,000 milreis (about \$75,000). This organization has also purchased the Algeria and Cota deposits, situated in the municipality of Santa Rita Durão (Marianna), for the sum of 150,000 milreis (about \$37,500). These deposits are reported to be capable of producing 10,000,000 tons. The same organization also has a concession to construct a railroad operating between the mines of Santa Rita Durão (Marianna) and S. José da Lagoa.

The Minas Geraes Iron Syndicate, an American company, organized by Phel. Hartemback, Ernest Moser and John Hammond, has purchased the deposits of Paracatú and Bananal, situated in Cattas Atlas and in Santa Barbara.

The Société Franco-Brésillienne and Bernard Goudchaux & Co. (presumably French), represented in Brazil by an engineer named Corvée, has acquired the deposits of Candonga, in S. Miguel de Guanhões, estimated as containing 10,000,000 tons of ore, for the sum of 200,000 milreis (about \$50,000).

The Société Civile de Mines de Fer de Jangada, a French company, also represented by an engineer named Corvée, has purchased the Jangada mines, in the municipality of Villa Nova de Lima (Paraopeba), with a capacity of 15,000,000 tons, for the sum of 100,000 milreis (about \$25,000). This mine is being prospected by Professor Metayer.

The Deutsch Luxemburgischs Bergwerks und Hutton Aktiengesellschaft, a German company, purchased the Corrego do Feijão deposit, situated in Piedade do Paraopeba (Villa Nova de Lima), for the sum of 100,000 milreis (\$25,000). The deposit is at present being prospected by an engineer named Westerma.

A. Thum purchased the Casa de Pedra mine, situated in Congonhas (Ouro Preto), with 500,000 cu.m., and capable of producing 2,000,000 tons. The sum paid was 60,000 milreis (about \$15,000).

The Bracuhy Falls Co. has purchased the Serra do Mascate and Mendonca mines, situated in Congonhas (Ouro Preto), with deposits estimated at 8,000,000 cu.m. and capable of producing 29,000,000 tons. The sum paid was 70,000 milreis (about \$17,000). The same company has also acquired the Inhotim deposit, situated in Paraopeba (Bomfim), for the sum of 100,000 milreis (about \$25,000). All of the prospecting of these mines for the company is being done by an engineer named Joaquim de Almeida Lustoza.

Carlos Wigg, of Rio de Janeiro, has purchased the Fazenda da Vargem, Marinho and Rocinha deposits, situated in Serra da Moeda (Ouro Preto), capable of producing 10,000,000 tons. The purchase price was 50,000 milreis (about \$12,500).

Trajano de Medeiros, a Brazilian engineer of high stand-

ing, has purchased the Morro do Veado, Retiro das Almas and Barra deposits, situated in Serra da Moeda (Ouro Preto), capable of producing 12,000,000 tons. The sum paid was 50,000 milreis (about \$12,500).

The Corrego do Meio deposits, situated in Sabará, were acquired by a German syndicate for the sum of 450,000 milreis (about \$112,500) through an intermediary named Phel. Hartemback.

The Companhia Metallurgica Brasileira, with head offices in Rio de Janeiro, which is also connected with the mangane-se mining interests, Companhia Morro da Mina, purchased for a reasonable price eight mines, all in the State of Minas Geraes, the group representing a total reserve of some 100,000,000 tons.

The Companhia de Mineração and Metallurgia do Brazil, organized on Sept. 8, 1917, in Rio de Janeiro, has acquired the iron mines belonging to Antonio da Costa Lage, who is one of the incorporators and the largest shareholder in this company.

The Canadian Metallurgic Co., which is said to be making plans for an electric smelting furnace on Governor's Island in the Bay of Rio de Janeiro, capable of producing 500 tons of steel daily, has acquired a manganese mine at S. João d'El Rey, and also certain iron deposits.

The Companhia Siderurgica Mineira, with its head offices in Bello Horizonte, State of Minas Geraes, and founded in 1917, for the purpose of exploiting the iron industry, has also acquired important deposits of iron, which are now being operated. The company was incorporated with a capital of 350,000 milreis (about \$87,500), the principal shareholders being João Gomes do Val and Amara Lanazi, of São Paulo.

The firm of Quieroz Junior & Co., owners of the Usina Esperanca (Esperanca Mill) and concessionaires of the Usina Wigg, also possess an extensive deposit of iron ore situated at Itabira de Campos, the ore being of excellent quality for the manufacture of pig iron.

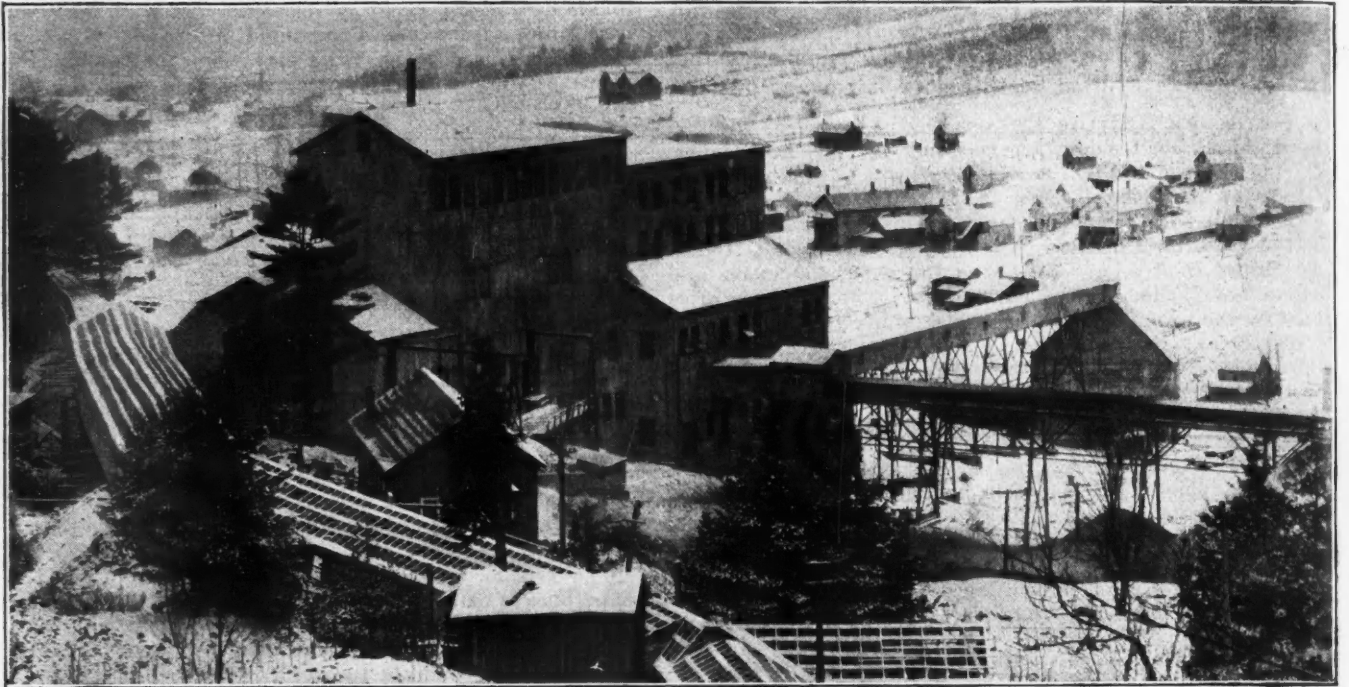
The Companhia Siderurgica Brasileira, founded by Carlos Wigg and Trajano de Medeiros, owns seven deposits of iron ore in the State of Minas Geraes, with a total area of 7120 hectares, which also contain considerable manganese ore.

Besides the deposits referred to, it is said that negotiations are being carried on to obtain the deposits known as Fabrica, situated in Congonhas de Campo (Ouro Preto), belonging to Colonel Machado; also deposits known as Tres Irmãos, in the municipality of Bomfim, and a deposit known as Serra do Pires, in the municipality of Ouro Preto.

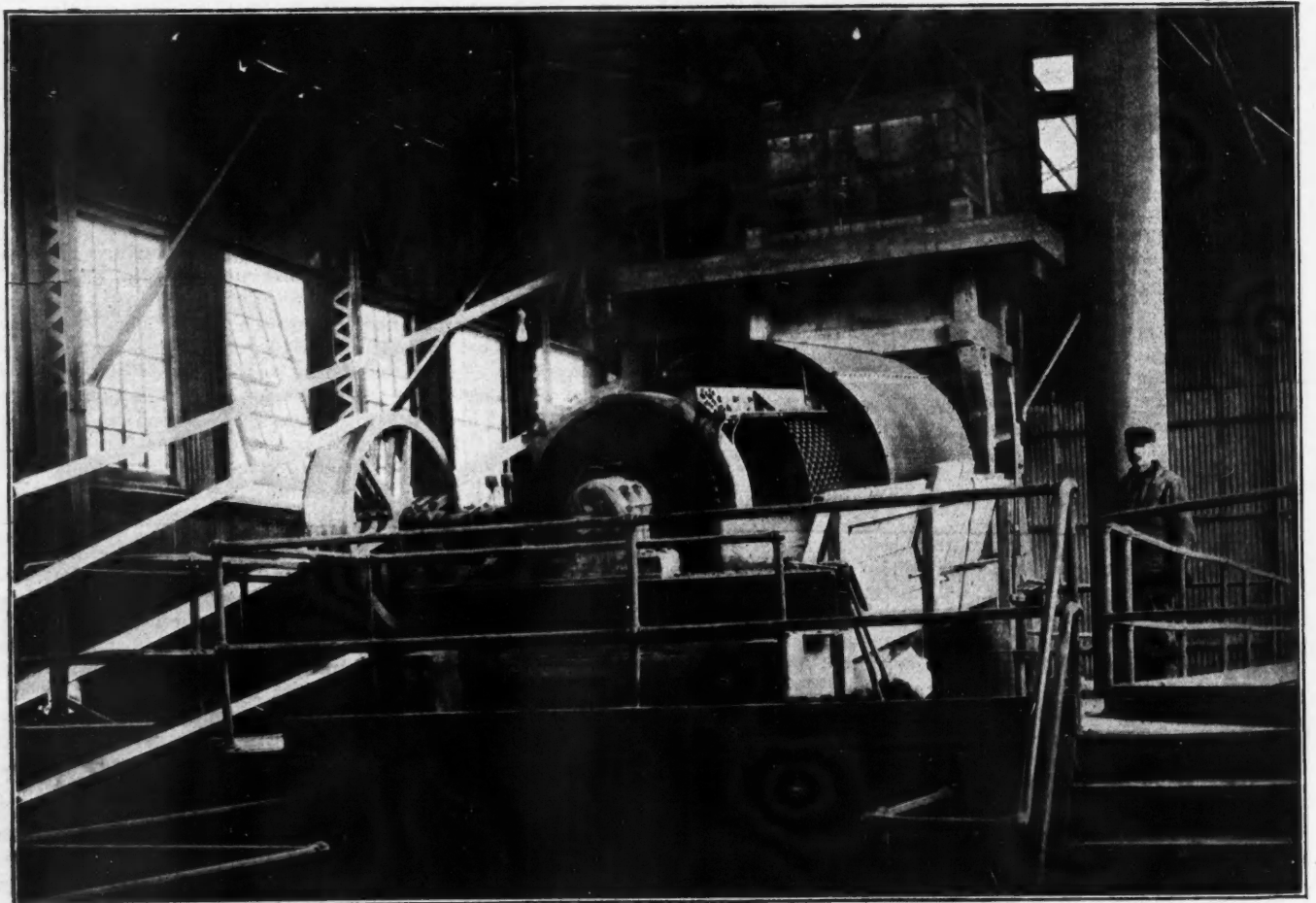
It is reported that the Itabira Iron Ore Co., which owns immense deposits in Itabira and Matto Dentro, with more than 100,000,000 tons of iron ore running from 68 to 70%, will, soon after the war, exploit these deposits. The plan is to construct a branch line of the Victoria & Mines Ry., which is under that company's control, to transport the ore to tidewater. The plans of this company are: (1) To install modern machinery in the mines for the extraction of large quantities of ore; (2) to extend the railroad to the mines at Itabira de Matto Dentro; and (3) to construct a fleet of vessels specially built to discharge the mineral automatically at the destination in Europe and to be suitable for transporting coal from Europe to Brazil.

Crystalline Graphite for Making Crucibles should contain as high as 85% of graphitic carbon, and should be free from mica, pyrite, and iron oxide, which are particularly harmful impurities, states the *Mining Journal*. It should also preferably contain a large proportion of flakes 1 millimeter or more in diameter, so that its fragments may interlock and thus be more easily bound together by the clay with which it is to be mixed. In the United States most makers of crucibles prefer to use a mixture of Ceylon graphite with American flake graphite, for Ceylon graphite is more nearly free from impurities, and its more nearly cubical fragments have a much smaller surface area in proportion to their volume than the thin flakes of the domestic graphite, so that it requires the use of less clay as a binder. Domestic flake graphite may be used alone for making crucibles.

## Photographs From the Field



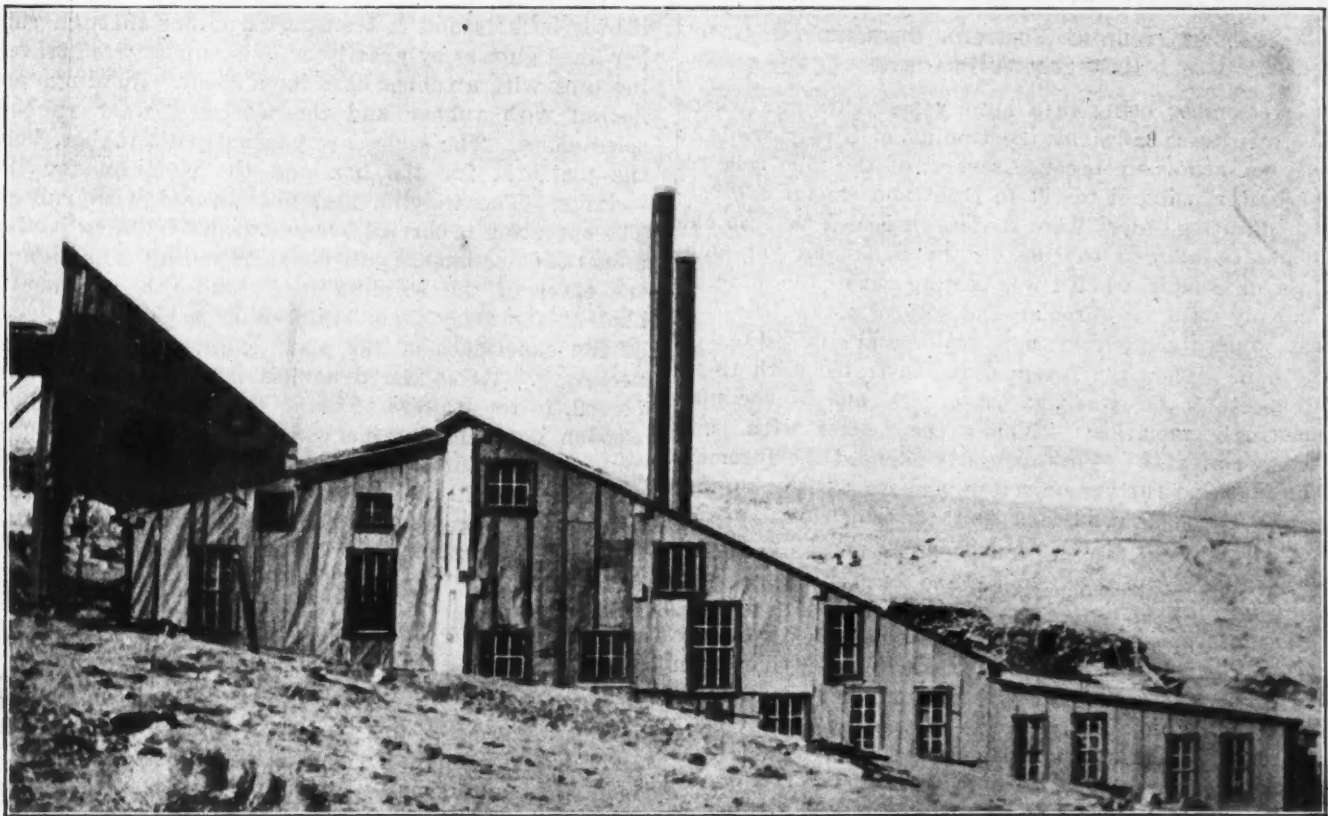
NO. 4 MILL OF WITHERBEE, SHERMAN & CO., MINEVILLE, NEW YORK



COARSE-CRUSHING ROOM OF MAGNETIC CONCENTRATOR TREATING IRON ORES AT MINEVILLE, NEW YORK



COSTA RICAN MANGANESE DEPOSITS WORKED BY AMERICAN MANGANESE MANUFACTURING COMPANY



TEST MILL OF THE BUFFALO HUNTER MINING, MILLING AND DEVELOPMENT CO., SILVER CLIFF, COLO., SHOWING ORE DEPOSIT IN THE BACKGROUND. TREATMENT OF THIS ORE INVOLVES THE SO-CALLED MANGANESE-SILVER PROBLEM

# Handling and Storing of Explosives\*

BY ARTHUR LA MOTTE†

*The development of measures and appliances for avoiding accidents incurred in the use of explosives and for minimizing their results has been the subject of careful study and experimentation. Though there exists among mining men a general familiarity with specified precautions, a closer analysis of the recommendations made by manufacturers is often desirable. The list of "don'ts" seems formidable, but it should prove interesting to mine executives, foremen and workmen.*

IT HAS been maintained that it takes three generations to make a gentleman; the same may be said of a man who can be depended upon to engage in hazardous work with a maximum of safety. One must begin with his grandfather. The primary characteristics of the safe man are unselfishness and consideration for others. Personal bravery and nerve, or cowardice, has nothing to do with it. Thorough knowledge of the subject has a great deal to do with it. The most unsafe man on dangerous work, or, rather, in handling dangerous goods, is the man who is afraid to be afraid. He may know that the thing he is doing is dangerous—he may know that it is dangerous to remain where he is under certain conditions—but he is often afraid to take cover himself or to warn others, or to take ordinary intelligent precautions, for fear of being thought afraid.

## TIMID ATTITUDE OF FOREMEN DETRIMENTAL TO BEST SAFETY PRACTICE

I remember being in a mine some years ago where five men were killed by the tipping of a skip while it was being hoisted, because several of the men rode on the bail, causing it to tilt in front and engage a cross-tie. Positive orders were thereupon issued that no one should be allowed to ride on the bail; and yet, only three days later, when I was coming out of the mine, in company with the foreman and several others, the skip was stopped and several men got on and climbed out on the bail. When the foreman remonstrated with them, saying that this was against orders, one of the men sneeringly remarked: "What's the matter with you? Are you afraid?" This instantly silenced the foreman, who made no further objection, and we went out under exactly the same conditions as those which were known to have caused a fatal accident.

## ENFORCED DISCIPLINE FREQUENTLY ESSENTIAL

The prevention of this type of accident, it seems to me, can be accomplished only by discipline, laying down hard and fast rules and enforcing them ruthlessly. Education, which is effective in preventing a large class of accidents, seems to be helpless here. If possible, rules should be made so inelastic as to prevent even the officers

of the company from violating them. In the army, for general safety, even the commanding general may not do certain things, and I feel it would have a beneficial effect on industrial workers if they knew that their chiefs were not allowed to do various dangerous things which are forbidden the workers.

## PROCESS OF MANUFACTURE ONE OF SAFE HANDLING

To return to the subject, it is necessary, to an extent, to begin with the grandfather of the dynamite; that is, the raw materials. These are purchased on specifications, submitted to a rigorous analysis, and are carefully inspected, sorted and strained. The inert or non-explosive ingredients which enter into the manufacture of explosives are just as carefully treated as are the more essential ingredients; and this inspection is brought right up to the last process in the course of manufacture. For instance, the wood meal and nitrates are given the final sieving in the mixing house just before they are put into the tub and incorporated with the nitroglycerin. This latter ingredient is put through a series of processes which would delight the heart of any safety man. From first to last it is "handled with gloves," generally rubber gloves. After separation from the acid it comes in contact only with wood or rubber. It is washed and stored in wooden tubs under water. It is drawn off through rubber pipes, the flow through which is stopped by elevating the end of the pipe. It is weighed in rubber buckets and is transported either through rubber-lined gutters by gravity or by a rubber-tired traveling tank with a rubber hose for a spout. Buildings are floored with rubber and the workmen wear rubber-soled shoes. The scales are covered with rubber, both the platform for the box and the platform for the weights. The weights also are covered with rubber. The operation is carried out in a frame building having an earth embankment entirely surrounding it as high as the eaves of the building itself, and this building is kept as far away from every other explosive building as the experience of the plant engineers shows to be necessary. After the dynamite is made, it is transported, in the process of being punched and packed, in wooden boxes having no exposed metal parts, and is punched with soft rubber-tipped wooden sticks. Special shoes are worn throughout the danger area, and the floors of the buildings have coverings of soft rubber-like material which can be taken up from time to time and burned.

## PRECAUTIONS DEVELOPED FROM CLASSIFICATION OF ACCIDENTS

For a number of years a list of accidents in the use and handling of explosives was kept, compiled from the British and Canadian government reports and supplemented by an elaborate system of American newspaper clippings. The object was to classify the accidents which happen in the use of explosives in such a way that a brief list of precautions could be made up which would

\*Paper to be read at the Seventh Annual Congress of the National Safety Council, September, 1918.

†Manager, technical division, E. I. du Pont de Nemours & Co., Wilmington, Delaware.

cover practically every condition likely to arise in the use of explosives in mines, quarries or on construction work. The list is added to from time to time, whenever a new cause of accident is reported. It is not always possible to be specific, but that the list covers the ground fairly well is shown by the fact that in the last few years no accident has been brought to the attention of the du Pont de Nemours management which is not covered by the rules and which would not have been prevented had all of the precautions been observed. This list of precautions is printed in the company's catalogs, and I will take each rule in turn and try to explain the reason and necessity of the precaution.

All rules begin with the injunction "Don't." I remember reading this list at a convention of coal miners a few years ago, and one of the miners told me at the end that if he obeyed all the rules he would not be able to use explosives at all, but when I asked him to describe in detail each of the different operations through which he went in his blasting, I showed him that at no time did he do anything in violation of these rules, which was probably the reason why he had never had an accident with explosives.

#### HANDLING OF EXPLOSIVES DEMANDS CARE

"Don't forget the nature of explosives, but remember that with proper care they can be handled with comparative safety." The function of explosives is to explode, and a perfectly safe explosive would be useless. The company has always tried to avoid describing any explosive as safe, but explosives can be used in such a way that accidents are avoided, and for the man who handles explosives a good thought to carry is: "Don't take a chance, and don't try conclusions with dynamite." It is dangerous, of course; but so is a mine mule, and both the mule and the dynamite will perform their allotted work and render good service if treated with the proper amount of respect.

#### DANGER OF SMOKING AND USE OF OPEN LIGHTS

"Don't smoke while you are handling explosives, and don't handle explosives near an open light." Not all explosives ignite from a spark with the same facility. Blasting powder and nitro-starch powders are most easily ignited. The paper shells covering dynamite give it a certain amount of protection, but there is considerable difference, even among the various kinds of dynamite, in the ease with which they are ignited. Straight dynamite ignites more easily than ammonia dynamites and gelatins. The permissibles of the ammonia-base type are least easily ignited. A pipeful of ignited tobacco spilled in an open box of dynamite would probably ignite it; it would certainly ignite blasting powder. Open lamps on the hats of men who carry the dynamite around in the mine are distinctly dangerous, as sparks are continually falling from wick lamps, and, although acetylene hat lamps are safer, I have seen a lighted lamp drop into a box of dynamite. The best practice is for powder men to be equipped with permissible electric hat lamps, which are the safest lights known. It is thought that the Park Avenue explosion in the New York subway construction was brought about by a man bringing an open light into the powder house, where a number of detonators had been inserted into the dynamite. I remember seeing a

drill runner drop an open bug-light into a lot of paper shells which had been removed from several boxes of gelatin dynamite and which entirely covered a box of primers. This was in one of the New York subway tunnels and probably closely paralleled, except for the result, the Park Avenue explosion.

#### PRACTICE OF CARRYING LOOSE MATCHES CONDEMNED

"Don't carry loose matches in your pockets while loading explosives—use safety matches." A number of accidents have occurred from the dropping of matches from hat bands into bore holes which were being loaded with dynamite. Quarrymen frequently appoint a number of laborers to fire the block-hole and mud-cap shots, for the lighting of which they fill their pockets with matches and stick half a dozen into their hat bands, so that in case one match goes out at a critical time they can quickly lay hand on another. These men are called upon, in the loading of a large blast, such as well drill holes, to assist the blasting foreman, and it seldom occurs to him to take matches away from the men, especially out of their hat bands. In leaning over the holes, matches stuck into the hat band are likely to fall into the bore hole and fire the dynamite. Though dynamite will usually burn peacefully in the open, it cannot be depended upon to do so in a bore hole, and will certainly explode if the detonator has been inserted.

#### NO SHOOTING OR HUNTING NEAR MAGAZINES

I almost hesitate to read the next rule on the list, as it would seem that no one out of an insane asylum would require it, yet the failure to observe so obvious a precaution has been the cause of many serious explosions. "Don't shoot into explosives with a rifle or pistol, either in or out of a magazine." To an intelligent man it would appear to be a plain case of suicide, and yet not many years ago a customer tried to convince one of the company's salesmen that the dynamite would not explode if fired into with a small-caliber rifle bullet. The customer tried the experiment in his cellar, shooting into several cases of dynamite which he had stored there. However, he failed to prove his point, as the dynamite did explode, killing the experimenter and his entire household. "Don't allow shooting or hunting near magazines." Though magazines should be bullet proof, it is seldom that they are, and, even if they were, the doors are likely to be open when explosives are being carried in or out. The risk of a disaster is too great for any sensible person to take any chances.

#### CARELESS DEPOSITION OR STORAGE OF EXPLOSIVES

"Don't leave explosives in a field or in any place where cattle can get at them." Black powder probably would do them no harm, but nitroglycerin is a powerful poison. Although cattle like the taste of the soda and nitrates in dynamite, the other ingredients would probably poison them. "Don't handle or store explosives in or near a residence." In some parts of the country it is the custom for miners to buy their own explosives and take home what they do not use in the day's work. This introduces a great hazard into the home, both on account of the possibility of children getting hold of the explosives and because of the danger in case the building should take fire. The new Federal regulations governing the handling of explosives will probably result in fewer accidents from this cause.

"Don't leave explosives in a wet or damp place. They should be kept in a suitable dry place, under lock and key, and where children or irresponsible persons cannot get at them." There is an increased effort in the matter of conservation to use nitrate of ammonia explosives, which require less nitroglycerin. Nitrate of ammonia explosives are more hygroscopic than other types, although any explosive will deteriorate when stored in a humid atmosphere. Probably the chief cause of explosives taking on moisture is storage in magazines built into the side of a hill in so-called dugouts. The actual loss in dollars and cents from this kind of treatment of explosives is considerable, but there are two reasons from a safety standpoint why explosives should be kept dry. In the first place, wet dynamite and wet blasting caps produce only a partial detonation, which is likely to cause a blown-out shot, and is highly dangerous in coal mines containing inflammable gases or dust. Secondly, the fumes from a partial detonation are more poisonous than those from explosives which are in good condition and explode perfectly. Dampness in blasting caps is a prolific cause for dynamite igniting instead of detonating, and a charge of burning dynamite in a bore hole fills the working place with extremely poisonous fumes. At present more care is taken to keep explosives under lock and key than was the case a few years ago. Blasting caps are particularly attractive to children, and from 30 to 50 accidents are caused every year through their playing with them, resulting in the loss of fingers, hands or eyes, and occasionally in loss of life. When one considers that a modern blasting cap will blow a hole through a  $\frac{1}{16}$ -in. steel plate, and that the pieces of flying copper will imbed themselves in iron two or three feet away, it is not difficult to realize what a power for mischief these necessary articles may become.

#### EVILS OF IMPROPER CHAMBERING OF BORE HOLES

"Don't explode a charge to chamber a bore hole and then immediately reload it, as the bore hole will be hot and the second charge may explode prematurely." This operation, variously known as "springing," "chambering," "pot-holing," "squibbling," and so on, is done by exploding a succession of charges in increasing amounts in the bottom of the bore hole, with little or no tamping, in such a way as to expand the bottom of the hole, so that a larger charge may be accommodated. In some rocks the enlargement is produced by shearing and scaling off rock from the sides of the bore hole, and in others by compressing the rock itself. This latter, of course, is possible only in soft rock. Considerable heat is generated, not only by the explosive itself, but in the compression that occurs, and unless ample time is allowed between "springing" shots, accidents are likely to occur from an explosion of the charges which may be placed in the hot pocket, or become ignited from fragments of fuse or wire insulation. Of course, when the pocket is full of water and fills up immediately after each "springing" operation, there is no danger from the hole being too hot, but another hazard presents itself in the loading of "sprung" holes. That is the danger of the dynamite, especially when a straight dynamite is used and the cartridges are slit, getting between the cracks and crevices of the rock in such a way that when the hole is being tamped it may be pinched under considerable pressure and cause an explosion. For this

reason, dynamite of the gelatin type is much safer to use where this operation is regularly performed, but where gelatin cannot be used the next best thing is not to slit the cartridges.

#### WOODEN TAMPERS SHOULD ALWAYS BE USED

"Don't do tamping with iron or steel bars or tools. Use only a wooden tamping stick with no metal parts." There is great danger in punching dynamite with an iron tamping rod, especially in holes bored in hard rock, but I venture to say that nearly half the miners who use dynamite use their drill steels for loading the charges, and, considering the frequency of this practice, it is a wonder that more accidents do not occur. It would seem a simple thing to provide miners with wooden tamping sticks and compel their use, but a number of them look upon it as a needless refinement, and always having their drill steels with them, they prefer to use them. When powder men remonstrate with them, they say that if the drill does strike a spark it will not ignite the dynamite; that they use it carefully and ram the dynamite in gently. However, it is only the survivors who say this. The men who are killed do not give their versions of these affairs. One of the curiosities of legislation was a bill introduced in one of the state legislatures requiring the use of several inches of copper on the end of the tamping sticks. When black blasting powder was used to a greater extent than it is now, copper was looked upon as a safe material to use with it, because it would not strike a spark, and that same feeling has descended to dynamite, but it is just as easy to detonate a drop of nitroglycerin or a pinch of dynamite with a copper hammer as it is with a steel one.

#### FORCING CARTRIDGES IS FREQUENT CAUSE OF ACCIDENTS

"Don't force a cartridge of explosives into a bore hole." This is one of the prolific sources of accidents in the use of explosives and one of the most difficult to control. If a miner or blaster has a cartridge of dynamite sticking half way down in a bore hole, it is a great temptation to drive it further by main strength rather than let it go and waste the bore hole and all the labor that it represents. Fortunately, modern explosives, which are much less likely to explode from rough handling than the straight dynamites of 10 or 20 years ago, have reduced the number of accidents from this cause to a considerable extent. The remedy, of course, is to have the drill bits always made to gage, allowing for a sufficient clearance over the diameter of the dynamite that is being used.

#### SAFE AND PROPER CIRCUITS SHOULD BE PROVIDED FOR ELECTRIC BLASTING

"Don't have a wire carrying electric current near detonators or charged bore holes at any time except for the purpose of firing the blasts." One of the dangers of having electric mining or quarrying machinery around explosive operations is the chance of one of the terminals coming in contact with the electric blasting-cap wires. Considering the care necessary to make connections properly for firing the blast purposely, it would seem that this danger is remote, but a number of accidents have occurred through careless placing of light wires. When the blasts are fired by the lighting or power current, it is doubly necessary to observe this caution,



because, even with special safety switches, there is always a chance of the workmen becoming confused and connecting the wrong wire. Though the power and lighting current is generally advised for quarry and construction work in the open, the regular blasting machine is much safer in underground work, as by its use the danger of connecting the blast to a live wire can be avoided, and though in open work the number of shots that it is desired to fire at any one time may be in excess of what the blasting machine can do, it is rare indeed that such necessity arises in mining or tunneling operations. By keeping an entirely different circuit for the firing of the blast, much greater safety in operation is secured, but under no conditions should electric drills, electric punchers or undercutters be operated or other wires allowed around a room where men are charging bore holes for electric firing.

#### MEN SHOULD BE PROTECTED FROM BLASTS

"Don't explode a charge before every one is well beyond the danger zone and protected from flying debris. Protect your supply of explosives, also, from danger from this source." "Don't cut the fuse short to save time. It is dangerous and wasteful of explosive, as it is impossible to tamp such charges properly." There are not many accidents from flying rock where electric firing is practiced, as compared with cap and fuse, because the blaster will not operate the blasting machine if he knows he is in range of the blast, and, even if his leading wire is being continually shortened by the rock falling upon it, he will take care to lengthen it by splicing on other wire until he can get into a safe place; but in quarry work this does not always hold. The blaster is likely to continue to use his leading wire without taking this precaution and get too close to the danger zone. I have seen blasters fire their shots from the cover of an up-turned dump cart while there was an unused half-box of dynamite, with three or four electric blasting caps in it, out in the open a few feet away from them. It would seem an unnecessary hardship to expect the blaster to take all unused explosives and accessories back to the magazine before the blast is fired, as he may have to use some of them in case it became necessary to reprime a bore hole, but it should be impressed upon him that these left-overs should be put in a safe place before the blast is put off.

#### HANG-FIRES AND SAFETY FUSES

"Don't hurry in seeking an explanation for the failure of a charge to explode." This is to warn blasters against returning to the face in the event of a hang-fire, until sufficient time has elapsed to render it safe. High-grade safety fuse is a wonderfully reliable device. It is strong, resists abrasion well and stands immersion in water, often for several hours; and it is uniform in its burning speed. Cheap fuse is not regular in its burning rate, is not waterproof and will not stand abrasion against rock in the bore hole nearly as well as the better grades. However, any kind of safety fuse is likely, occasionally, to hang fire. This happens at times from the blaster failing to ignite the powder core, and the jute or cotton wrappings of the fuse may smolder for several minutes and then ignite the core, or, if the fuse is cut in the hole, the powder core may go out but ignite the jute beyond the break, which may cause a hang-fire.

It is difficult in experimenting with fuse to simulate the conditions which cause hang-fires, but hang-fires do occur in actual work and are a prolific source of accident.

Accidents happen more frequently, perhaps, from a miscount in the number of explosions. Where eight or ten fuses are lighted simultaneously, two will frequently go off at exactly the same time, making one report. Consequently, blasters are inclined to venture back to the face, even if the reports heard do not tally with the number of fuses lighted, assuming that two or more have gone off together. In the event of a misfire, half an hour is the least time that should be allowed before investigating. Two or three hours is much better, and waiting until the next day is practically safe. Hang-fires can be eliminated by the use of electric blasting caps and electric squibs, and the increased sales of these devices are gradually cutting down the number of accidents from this cause.

#### CARE TO BE OBSERVED IN MISFIRES

"Don't drill, bore or pick out a charge which has failed to explode." A careful miner can sometimes be depended upon to remove the tamping and insert another primer. It is, however, at times safer to drill another hole near the missed one, but this is not practicable in many instances, especially in hard rock and in "sprung" holes. As a precautionary measure against striking the charge in the case of a misfire, it is suggested that a piece of newspaper or a handful of some other easily recognized foreign substance be placed on top of the last cartridge before the tamping or stemming is done. This acts as an indicator, so that the tamping may be removed with comparative safety without any chance of digging into the explosive.

#### VARYING ACTION OBTAINED IN DIFFERENT EXPLOSIVES

"Don't use two kinds of explosives in the same bore hole except where one is used as a primer to detonate the other." It is a common practice in some sections to place a dynamite cartridge in the bottom of a bore hole and the main charge of black powder on top of that, firing the black powder with fuse or squib. The dynamite explodes from the shock of the black powder, but it does not explode as completely as when detonated by a blasting cap, and it is doubtful if any real benefit is obtained. Different explosives have such different rates of detonation that it is not only wasteful but frequently dangerous to use this method of blasting.

#### BEWARE OF FROZEN OR CHILLED EXPLOSIVES

"Don't use frozen or chilled explosives." Although frozen dynamite is more difficult to detonate with a blasting cap than when it is properly thawed, it is more sensitive to other kinds of shock. Before low-freezing explosives became as generally used as they are today, a number of accidents occurred when men broke the frozen cartridges in two or rolled them to break up the frozen crystals. In loading well drill-holes with large-sized cartridges, a number of thawed cartridges could be dropped into the holes, sometimes 100 ft. or more in depth, with safety. Punching a hole into a frozen cartridge is by no means a safe operation, and the fumes from frozen dynamite are more poisonous than from the same dynamite when properly thawed. In fact, frozen dynamite frequently takes fire from the blasting cap and

burns up, giving off large quantities of exceedingly noxious gases, which may render the workings uncomfortable if not dangerous to the men.

"Don't use any arrangements for thawing dynamite other than those recommended by the manufacturer." Thawing dynamite is one of the frequent sources of accidents, or, rather, it has been, as the use of low-freezing explosives has cut down the number of accidents from this cause enormously. Manufacturers of explosives have investigated every kind of thawing device and recommend only those which they know are safe. Thawing must be done slowly, at a relatively low temperature, and no part of the explosive should be exposed to any temperature higher than that which can be comfortably borne by the hand. It should not be heated on stoves or on hot rocks or metal, or placed on top of a steam boiler, or over any steam or hot-water pipe, or over heated metal surface. The warmer dynamite becomes, the more likely it is to exude, and a drop of nitroglycerin falling a few inches on a heated metal surface may explode. For this reason the radiators or coils in a thawing house should always be over or to one side of the dynamite, and never directly under it. It is often a great temptation to thaw dynamite by putting it directly on top of the radiator, but this is an exceedingly dangerous operation, and radiators should be fenced off so that it is impossible to do this in the thawing house. Explosives should never be taken into or near a blacksmith shop or forge, as the flying sparks incidental to the work there performed are likely to ignite or to detonate them.

#### PROMPT USE OF THAWED DYNAMITE RECOMMENDED

"Don't allow thawed dynamite to remain exposed to low temperatures; use it as soon as possible." Blasters often attempt to use explosives which have become chilled or partly frozen, and when remonstrated with say that the powder has been thawed. For this reason, they are urged to use the dynamite as soon after it has been thawed as possible and to take precautions against it freezing again after it leaves the thawing house.

"Don't paint magazine roofs black." On a bright summer day the temperature directly under the roof of the magazine, especially if the ventilation is poor, may rise to as high as 130 deg. This may cause the dynamite to leak, and the waterproofing on fuse and electric blasting caps to run, so that they will not only not be waterproof, but they will not carry the spark or explode. For the same reason, high explosives, fuse or detonators should not be exposed to the direct rays of the sun longer than is necessary. Sunlight tends to decompose nitroglycerin, as well as to cause it to leak if it becomes too hot.

#### PRECAUTION TO BE OBSERVED IN THE USE OF BLASTING CAPS

"Don't allow priming (the placing of a blasting cap or electric blasting cap in dynamite) to be done in a thawing house." A separate place should be provided for the operation of priming, so there will be no temptation to use the magazine or thawing house for this purpose. The Park Avenue explosion in the first New York subway excavation was probably due to failure to observe this precaution. "Don't prime or connect charges for electric firing during a thunder storm." A number of

accidents have occurred from lightning exploding charges connected for electric firing, not only in the open but in tunnels where leading wires have crossed the rails and the rails have been struck by lightning. "Don't carry blasting caps or electric blasting caps in your pockets." In the first place, the blasting caps are likely to accumulate moisture, in which case they may set fire to the charge instead of detonating it, or become filled with foreign matter, in which case they will not explode from the fuse, and, finally, they are too dangerous and sensitive to make this a safe practice; besides which, they are likely to fall out, become lost and turn up again at an inopportune moment. "Don't attempt to take blasting caps from the box by inserting a wire, nail or other sharp instrument into the caps," and "Don't try to withdraw the wires from an electric blasting cap." The explosive charge in blasting caps is extremely sensitive, as mentioned before, and a box of blasting caps has enough potential explosive force to blow a man in two. The proper way to remove one cap from a box is to tilt it over slightly until a few caps slide part way out, and then withdraw one of the caps with the fingers. "Don't fasten a blasting cap to the fuse with the teeth or by flattening with a knife—use a cap crimper." Crimping caps with the teeth is a common operation, but aside from the danger of biting the shell down on the fuse, it does not make an efficient crimp, and the fuse may come out or moisture get in. The cap crimper is a tool made specifically for this purpose, and it should always be used. "Don't keep electric blasting caps, blasting machines or blasting supplies in a damp place." All of these accessories are either spoiled or their life and usefulness are materially abbreviated by damp storage. A blasting machine which is kept in a dry place will be twice as effective as one not kept dry, and the same is true of blasting caps.

#### MANNER OF WIRING

"Don't leave the leading wire connected to the blasting machine." To make assurance doubly certain, it is not a bad idea to carry the blasting machine with one if it is necessary to return to the charge; then it is possible to be sure that nobody has tampered with it or will attempt to fire the charge while one is in the danger zone. "Don't loop or tie wire connections. Scrape the ends of the wires clean and bright and twist them tightly together." In mines where there is much acid water or corrosive gases, it is worth while to have all the blasting-wire connections soldered, as a number of misfires have been observed from connections, which were originally well made, becoming so corroded as to fail of their purpose.

#### CARE TO BE USED IN PLACING OF BLASTING CAPS

"Don't insert blasting cap or electric blasting cap in explosive cartridges carelessly. Have closed end of detonator point toward the bulk of the charge, and have it tied to the cartridge securely." A large proportion of blasters using electric blasting caps punch a hole diagonally through the side of the cartridge, insert the detonator and take a half hitch around the cartridge with the wires. If the hole is punched through the cartridge at too great an angle, it is likely to go through the cartridge and possibly jam in the bore hole. This would probably lead to a fatal accident. The detonator

should lie as nearly as possible in the central axis of the dynamite cartridge, although a slight angle does no harm, provided the end of the detonator is well inside the cartridge. The object in having the detonator point toward the bulk of the charge is that the greatest effect of the detonator is from its loaded end. If the detonator points away from the bulk of the charge, unexploded powder may be deposited in the bottom of the hole and afterward cause trouble. The detonator should always be tied or fastened securely to the cartridge, so that there is no danger of its pulling out when the charge is loaded and tamped. Otherwise unexploded powder or misfired holes may result.

#### NECESSITY FOR SEPARATE STORAGE

"Don't store or transport blasting caps or electric blasting caps with high explosives." High explosives by themselves are fairly insensitive to shock and will withstand an extraordinary amount of rough treatment at times without exploding; whereas detonators are extremely sensitive both to shock and to sparks, and though they are violent in their explosion, effects are local. When they are carried in the same receptacle or transported together there is established a condition combining the sensitiveness of the caps with the far-reaching force and violence of the high explosive. The rule against storing or transporting blasting caps with high explosives is a particularly necessary injunction, and, unfortunately, it is often largely disregarded in mines and quarries where the powder man carries a box containing 20 or 30 lb. of dynamite with a box of caps or a bunch of primers on top of the dynamite.

#### PRECAUTIONS AGAINST ELECTRIC BLASTING

"Don't attempt to use electric blasting caps with the regular insulation in very wet work. For this purpose secure 'waterproof' or 'submarine' electric blasting caps." This does not necessarily apply where only one shot is fired at a time, but where several shots are fired there is a possibility of electric leakage and short circuits through the ground to the electric blasting cap wires. This results in the under holes and those adjoining going off and the holes in the middle of the line missing fire. "Don't use old or broken leading wire or connecting wire." Broken wires are prolific sources of misfires and failure to get the shot off at the time desired. Breaks inside of the insulation are not easy to detect, and the use of wire that may contain broken sections or strands often costs much more than would new material.

#### EFFECT OF TEMPERATURE ON FUSE

"Don't handle fuse carelessly in cold weather, for when cold it is stiff and breaks easily. It should be warmed slightly before using." "Don't store fuse in a hot place, as this may dry it out so that uncoiling will break it." The waterproofing material on fuse is a compound of various asphalt tars with guttapercha and similar substances which become brittle in cold weather and which also are likely to run if subjected to too high a temperature. It is well worth while to store the fuse, at least immediately before its use, at a temperature between 60 and 80 deg. F. If the fuse is too cold it may crack when uncoiled and cause a misfire or a

hang-fire, with its resulting danger, or, if stored in too hot a place, it is likely to go out and cause a misfire.

"Don't lace fuse through dynamite cartridges, and don't place several slit or broken cartridges on top of primer with cap and fuse. This practice is frequently responsible for the burning of the charge." The paper shell of the dynamite cartridge is sufficient protection against the side spit of the fuse from igniting the dynamite inside the shell. Without this protection the side spit is almost sure to ignite the dynamite, which will burn much more rapidly in a bore hole when strongly confined than it will in the open, sometimes causing the loss of a considerable proportion of the charge, besides giving off poisonous fumes and possibly blowing out the tamping and so making the explosion ineffective.

#### STRONG DETONATORS INSURE EFFECTIVE RESULTS IN BLASTING

"Don't expect explosives to do good work if you try to explode them with a detonator weaker than a No. 6." The use of modern low-freezing ammonia dynamites has resulted in an immense reduction in the number of accidents, as those explosives are less sensitive to shock and friction than those in general use 20 years ago. At the same time, these explosives require a much stronger detonator to develop their full power than did the older type of explosives. Although it is possible under favorable conditions to detonate even these modern explosives with weaker detonators than a No. 6, there is a considerable factor of safety gained by using the stronger caps. They not only insure complete detonation, but increase the effective power of the explosive and reduce the amount of noxious fumes to a minimum. Explosives which have been stored for some time under adverse conditions become more insensitive, and a larger detonator tends to offset this condition to a considerable extent. Strong detonators will fire larger charges than weak ones, and they not only reduce chances of misfires, but almost entirely eliminate the chance of a properly primed charge burning instead of exploding. No. 6 or stronger detonators are required for all "permissible" explosives which are not "permissible" unless the strong detonators are used.

### De Beers Consolidated Mines

The report of the De Beers Consolidated Mines, Ltd., for the year ended June 30, 1917, shows that the revenue from sale of diamonds was \$22,530,781, and that from other sources \$1,196,639. Mining expenditures were \$5,630,279, and miscellaneous expenses increased total disbursements to \$9,266,196. Dividends aggregating \$10,560,305 were paid, and \$1,111,022 was set aside against income taxes. The undistributed balance carried forward was \$9,007,215. The British monetary units of the report have been changed in the foregoing to those of the United States at the standard ratio of \$4.8665 to the pound.

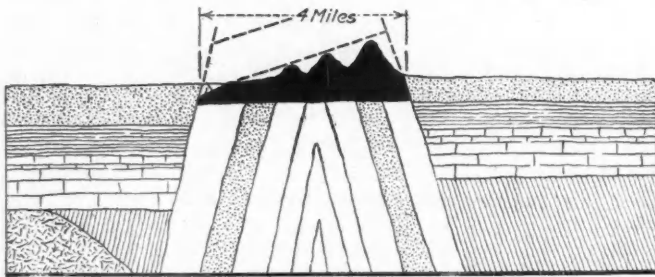
Bonuses paid to its employees engaged in military service by the De Beers company aggregated \$369,226 on June 30, 1917. The number of its employees in active service as of that date was 354.

# Geologic Structure of Sierra del Oro, In New Mexico

BY CHARLES R. KEYES

*Sierra del Oro, in northern New Mexico, has been shown to be a horst of great size—four miles in width—a huge block of flat-lying rocks resting on top of a truncated pre-Cambrian arch and evidently a type of laccolithic intrusion.*

**S**IERRA DEL ORO, or Gold Mountains, is a name that was applied by the first Spanish settlers of the Southwest to a lofty group of peaks in northern New Mexico. It is one of the oldest and most famous of American mining districts. The name is derived from the rich and extensive placer deposits which surround the bases of the mountains. They have, however, an even stronger claim to the title because of the fact that the eruptive rock of which they are composed carries a notable gold content. Numerous assays average more than a dollar a ton. The San



CROSS-SECTION OF SIERRA DEL ORO HORST,  
IN NEW MEXICO

Pedro copper mine occupies the flank of one mountain. Silver, lead and zinc in numberless veins occur on other hills and mountains. Two exceptionally mineralized belts, the halcyon days of which are probably yet to come, traverse the entire length of the district.

The facts that these mountains rise abruptly out of a vast plain affording little display of geological structure and that the formations are mainly eruptive seem to have been the chief cause of much of the misinterpretation of the tectonics of the region. The circumstances that four mountain groups lie in a straight line, that the mountains are laccolithic in character, and that the ore deposits are manifestly sharply confined to a narrow belt appear to have been generally overlooked. Genetic significance of such related groups of facts is missed entirely.

## MINERAL BELT IN TRACT OF 80 SQUARE MILES

When the district was examined recently for purposes of railroad location, with the main object of possibly adjusting the right of way to the service of the greatest number of potential industries that would yield the largest immediate tonnage, the probabilities of future development had to be worked out largely along geological lines. As the mineral belt was soon found to be sharply outlined over a tract about 4 miles wide and 20 miles long, within which stood the four

groups of eruptive mountains, it was assumed that this, perhaps, represented one of those great tilted fault blocks which characterize so many of the Great Basin ranges.

Satisfactory evidences revealing geological structure wholly fail near the mountains themselves. Ten miles beyond them, along the line of their trend, the fault block, if it exists, should appear in cross-section where its axis intersects that of the highly tilted Sandia-Manzano ranges. Inspection of this district in and between the Tijeras and Hell canyons discloses the entire substructure of the postulated block. Instead, however, of being a simple tilted prism of strata, it is found to be a huge block of flat-lying rocks perched upon the summit of an ancient arch of extremely resistant beds. On each side of the prism is a profound fault of more than 1000-ft. throw. The entire structure is that of an ordinary horst of gigantic size. The salient features are represented in the accompanying illustration.

## HORST RESTS ON TRUNCATED PRE-CAMBRIAN ARCH

The support of this remarkable, four-mile-wide horst appears to be a truncated pre-Cambrian arch the rigidity of which is maintained mainly by a thick siliceous stratum locally known as the Tijeras quartzite. Standing almost vertically, the two huge white quartzite plates are often mistaken for gold reefs, or true mother lodes.

Aside from its mining interest, the principal economic significance of the great horst lies in the circumstance that its bounding fault planes are fundamental elements in the formation of those anomalous intrusive masses known as laccoliths. With these fault planes doubtless coincide the supply pipes of the igneous bodies. Their faces are the chief belts of metamorphism, mineralization and ore localization. For the first time the associated intrusions reveal the mechanical contrivance by which laccoliths are formed. Instead of being mere erratic blisters in the earth's crust, as so long commonly assumed, they are found to be really wedge-shaped bodies of intrusive magma definitely determined and placed by special geologic structures. Thus initiation of ore deposition follows a regular plan.

## LACCOLITHIC INTRUSIONS FAVOR ORE DEPOSITION

Dependence of extensive ore deposits upon the laccolithic type of magmatic intrusion is unquestionably much more important than has been commonly believed. Perhaps when final comparisons shall have been made, ore deposits associated with laccoliths will prove to be the most important of all. Laccolithic bodies are found to occur more frequently than was, until recently, thought to be the fact.

Laccolithic intrusions provide many exceptional conditions favoring copious ore deposition. The strata above are literally floated. This cover is seldom more than a mile in thickness. Thus it retains, on the one hand, the ordinary volcanic vapors, and on the other

does not occlude them within their mass, as do plutonic rocks. The cover is commonly creviced and parted around the margins of the wedge. The metallic gases and watery vapors expelled from the cooling magma pass at once into chambers and porous tracts, where they are confined for a greater or less period, or enter into the groundwater circulation. All in all, laccoliths offer ideal conditions for the accumulation of large ore-bodies. Perhaps it is only under such conditions that ores derived directly from cooling magmas segregate. At any rate, the definite determination of the laccolithic character of igneous masses may prove to be of great practical service in prospecting in new or slightly explored mining districts the foundations of which are igneous rocks.

### Efficient Guard Rails

BY GEORGE M. DOUGLASS\*

In most industrial plants the provisions adopted for guarding against accidents are fairly efficient as far as the equipment is concerned, but the same cannot be said of structural work.

It is probably fully 10 years since the example was set by the larger industries of including in their general specifications for machinery and structures those safety features necessary to prevent accidents to workmen, yet it is common to see drawings of modern installations in which such important items as guard rails for walkways, runways, and stairways are omitted or given without dimensions. The result often is that guard railings, for instance, will measure 36 in. in height, whereas the standard height of such a railing should not be less than 3 ft. 6 in. Details are too often left to others than those who should be responsible for them, and the man in charge of the work who gets the blueprint and instructions usually makes a railing that is anything but standard. If he happens to be familiar with safety requirements he may possibly call the attention of those in authority to the design of the railing; but, as a general rule, the man doing the work of actual construction will abide absolutely by the drawing without making any comment.

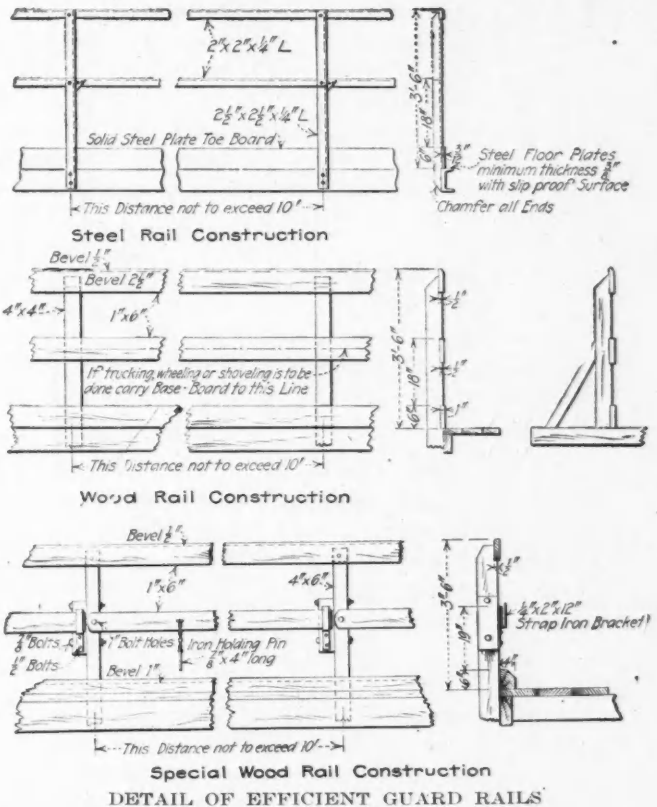
In my opinion it is time that firms which make a specialty of structural work should be aware of the fact that there is such a thing as a safety standard for guard railings; and that, whether their customer's plan calls for this type or not, they should make it a practice to build it exclusively. Only those who are close to the work can appreciate the importance of good guard railings. It is not always from the height of 20 to 30 ft. that a workman falls, to be killed or maimed. I have in mind three fatal cases, which occurred within a short time, in which the height from which the men fell was no more than 10 feet.

Make the railing 42 in. high, with good posts, spaced fairly closely. Put a base rail or toe board close to the floor, and let it be at least a 12 x 2-in. board if any work is done on that trestle. A 4 or 6 x 1-in. middle rail, with a top rail of 4 or 6 x 2 in. let into posts in the manner shown, will result in what may be termed a standard guard railing. The same principle may be

applied generally to similar structural steel work.

Do not lay a plank flat on top of the posts, with a side piece to strengthen, as it will rot. Moreover, such a rail makes a convenient seat, and it is against safety rules to sit on railings. The top rail on edge is not designed for comfort, but it lasts, and it takes less lumber to make it. With wooden rails, use bolts instead of nails wherever possible. The railing is then easily taken apart whenever necessary, and can be moved and used elsewhere as occasion requires.

The special design of railing shown was made to use on certain old-style ore bins, where the bosses claimed that if a standard safety rail was placed they could not do the dumping. It will be noted that, first of all, a dumping timber was arranged. This timber took the place of the usual standard toe board; and, being offset somewhat, permitted dumping without



trouble. The middle rail was swung on a bolt through the post and could be held vertically with a pin attached to a chain. This gave all the opening necessary for the dumping. After filling the bin at that point the middle rail was dropped into position, and the standard railing was intact. Previous to the installation of the new type of rail, it was usual for a couple of men to fall into the bins in one day. Since then, a period of two years, not one workman has been injured in this manner.

Proportion of Development Work to ore production in stoping as typified at the Dome mine, in the Porcupine district of Ontario, is discussed in its report for 1917. It has been found imperative to maintain a certain minimum ratio, else production suffers. At least 1500 to 1800 sq. ft. of stoping area per machine drill is necessary to secure the desired stoping efficiency. The average duty for all breast and back stoping can be maintained at 50 tons per machine shift on that basis, and for a given daily output from the mine a definite area of stopes must be working.

\*General safety inspector, American Smelting and Refining Co., 120 Broadway, New York.

# Standard Safety Ladder For Tall Chimneys

BY GEORGE M. DOUGLASS\*

The increasing height of chimneys of metallurgical plants, for the more efficient control and dispersal of fume or smoke, is admittedly a most important development and will doubtless repay the immense expenditures involved in the erection of massive and notable structures of this kind.

whenever necessary. Some one must climb such structures at regular intervals, and it is essential that means be provided that may be considered efficient and safe for ascending and descending. To ask a man to climb a tall chimney with nothing to cling to but a row of hand holds—a grip for the fingers and a rest for the toes being all there is between him and eternity if a slip is made or he becomes exhausted—would be positively inhuman.

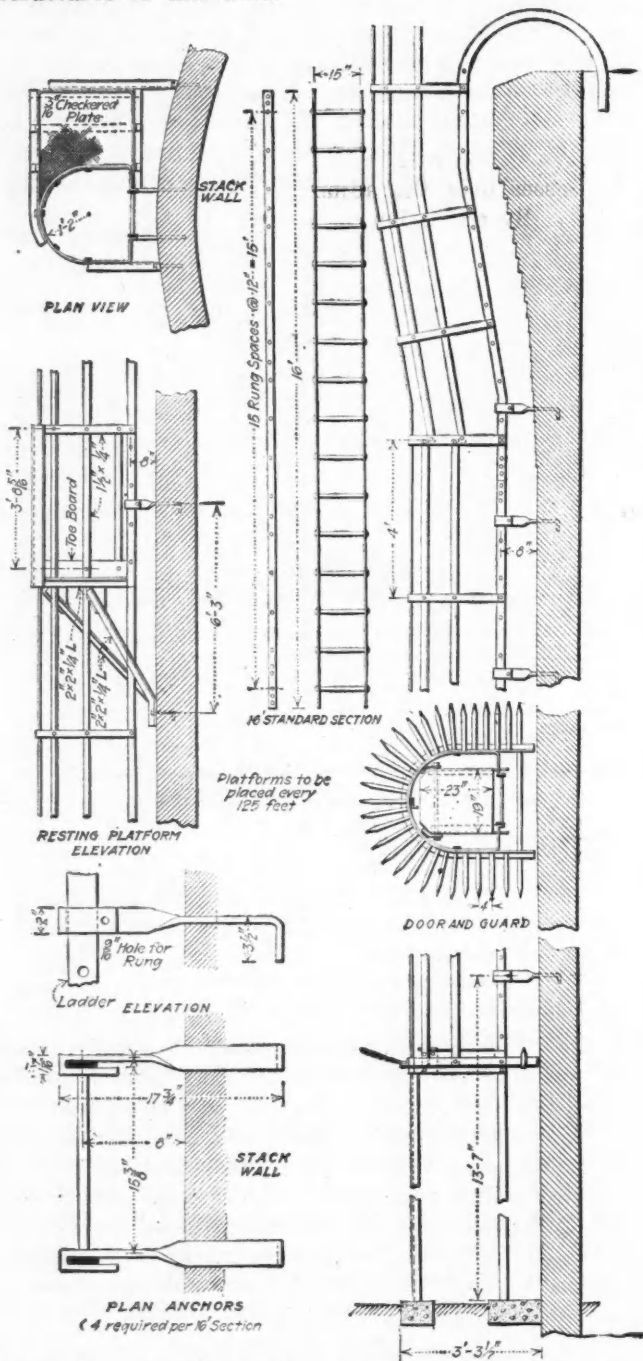
A type of standard chimney ladder is shown herewith, in which a number of safety principles have been incorporated. A resting platform is placed every 125 ft., and an improved type of door and guard forms a feature of the design.

## The Safety Congress From The Mining Viewpoint

The seventh annual congress of the National Safety Council, which will be held at St. Louis from Sept. 16 to Sept. 20 (inclusive), will consider many problems of especial interest to miners and metallurgists. On Sept. 17 the division of metals and metallography will discuss eye protection and the use of leggings and shoes of special design, as applied to furnace and foundry work. On Sept. 18 addresses will be given by D. K. Glover on "Hazards and Safeguards in Coal Breakers and Washeries"; Robert Johnson on "What Relation Has Labor Turnover to Mining Accidents?"; Edwin Higgins on "Safety Work in Metal Mining From the Employees' Standpoint"; M. W. Reed in "Hoisting Ropes"; and a paper will be read on the subject "Is the Experienced Miner Most Liable to Accident?" In the afternoon Prof. R. M. Raymond will discuss "Standardization of Mine Cars in Metal Mines"; H. M. Chance, "Acetylene and Electric Cap Lamps From a Safety Standpoint"; A. H. Fay, "Suggested Methods of Keeping Mine Accident Records, and Results Obtained"; J. S. McKaig, "Hazards in Ore Dressing Plants"; Arthur La Motte, "Handling and Storage of Explosives." On Sept. 19 papers will be presented by C. A. Mitke on "Practice of Mine Ventilation"; F. L. Hoffman, "The Dust Hazard to Health in the Stone Industry"; Dr. F. M. Barnes, Jr., "The Effects of the Use of Pneumatic Tools on the Nervous System"; W. A. Borchardt, "Abatement of Dust From Drilling Operations by the Use of Water Drills"; and Lieut.-Col. C. H. Connor will present a report on "Standardization of First-Aid Methods."

In addition to the subjects of direct application to mining practice, a number of phases of accident prevention and safety endeavor work will be considered, many of which will apply to mining as to other industries. Organization methods, health problems, relation of employer to employee, benefits, insurance, and many other questions of vital importance to all industries will be discussed.

Automatic Sprinklers for Fire Protection in metallurgical mills are likely to be considered an unnecessary refinement, because the usual 24-hr. operation necessitates enough watchmen on the job to obviate the automatic feature. Several mills among the Calumet & Hecla subsidiaries were, however, equipped with this system in 1917, according to annual reports, including the Ahmeek, the Isle Royale, Lake No. 2 and the Osceola.



CONSTRUCTIONAL DETAILS, STANDARD SAFETY LADDER

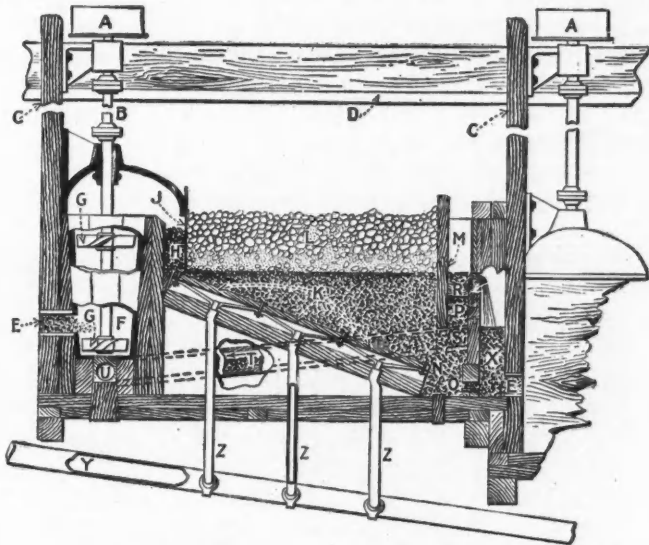
The building of such high chimneys, however, emphasizes the need of a safe means of making regular inspections and observations in connection with metallurgical operations, as well as of facilitating repairs

\*General safety inspector, American Smelting and Refining Co., 120 Broadway, New York.

# Mining and Metallurgical Machinery

## The "Little" Janney Flotation Machine

The Stimson Equipment Co., of Salt Lake City, has placed on the market a new model of the standard Janney flotation machine, which is especially adapted for use in small plants treating from 20 to 75 tons per day. It is also suitable for larger mills where only



"LITTLE" JANNEY FLOTATION MACHINE

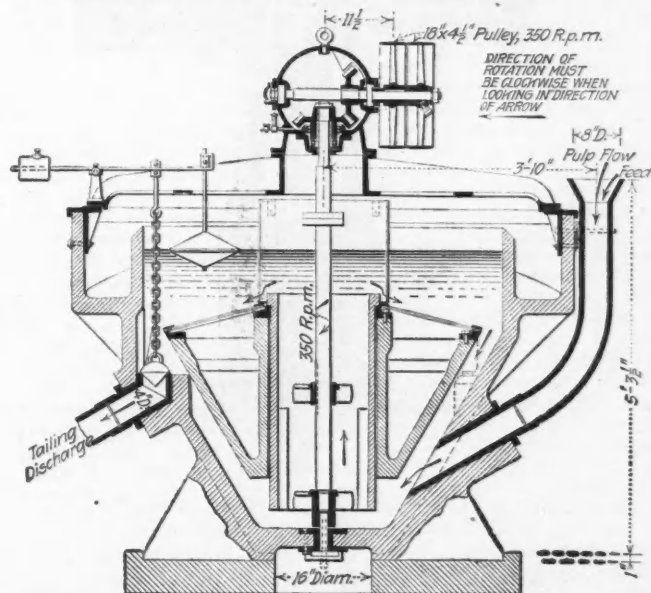
a proportion of the ore, such as the slime, is to be treated by flotation.

The new machine is belt-driven from a line shaft. The drive pulleys *A* are arranged so that they are all of the same elevation and are driven by a 4-in. belt from the line shaft. The length of shaft *B* between the couplings varies to compensate for the drop of 10 in. between the machines in the series. The support *C* also varies in the same manner. A runway *D* extends along the supports to facilitate ease of operation. The flow of pulp through the machine is as follows: Pulp enters the machine through the pipe *E* into the agitating or mixing chamber *F*. This is an octagon-shaped cast-iron liner, made in three parts. The pulp is agitated and discharged from the mixing chamber by the two impellers *GG*, and discharged into a launder which extends all around the mixing chamber and directs the pulp out into the spitzkasten at *H* behind the baffle *J*. This baffle is adjustable. The pulp now passes over the air pan *KKK*, which is covered with a four-ply, cross-stitched Palma twill air mat. This air pan has a slope of  $4\frac{1}{2}$  in. to the foot. The resulting froth *L* discharges over both sides of the spitzkasten into two concentrate launders, which have a slope of  $1\frac{1}{2}$  in. to the foot. The pulp now passes down under the baffle *M* at *N*. A small portion of the coarsest material passes on through the spigot opening *O*. The remainder rises up through the passage *P*. On each side of this passage is an adjustable weir *R*. These two weirs regulate the amount of material to be circu-

lated back into the agitating chamber. The pulp passes over the weirs *R* (only one shown) down through a box (not shown) and out the opening *S* into the pipes *T* (only one shown). These pipes are on the outside of the spitzkasten and lead back through the opening *U* into the agitating chamber at opening *V*, which opening is directly under the lower impeller. This circulation of pulp may be built up to as much as ten times the amount of feed entering at *E*. The tailing from the machine passes over the adjustable weir *W* into the chamber *X*. By regulation of the weir *W*, any desired pulp level may be maintained in the spitzkasten. The weirs in the machine are simply narrow blocks of wood placed one upon the other. The tailing passing over the weir *W* and the coarser material passing out through the spigot opening *O* combine and pass on to the next flotation cell through the pipe *E*, or are discharged from the last cell in the series as a waste product. The high pressure air (3 to 5 lb.) is forced through the header *Y* from the blower and is drawn off through the pipes or hose *Z* to the three sections in the air pan *KKK*. An air valve is placed on each pipe *Z* in order to obtain any desired regulation of air passing through the air mats and into the spitzkasten.

## Jones-Belmont Flotation Machine

An illustration showing the fundamental features of the new Jones-Belmont flotation machine, designed by A. H. Jones, superintendent of the mills of the Tonopah Belmont Development Co., of Nevada, appears herewith.



CROSS-SECTIONAL VIEW, JONES-BELMONT FLOTATION MACHINE

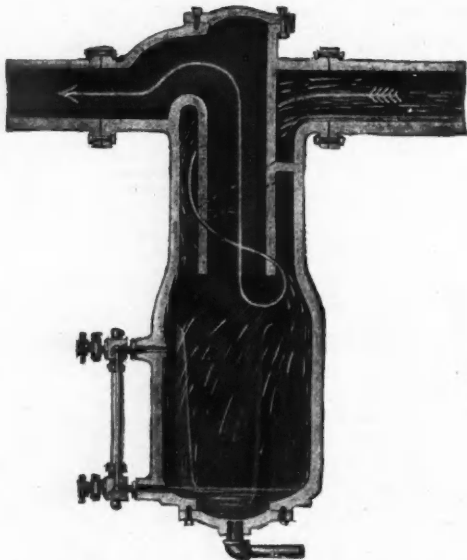
The pulp is introduced between two 60° cones, delivering to the bottom of a central barrel 18 in. in diameter, having both impellers and baffle plates. In addition to the emulsification effected, the arrangement acts

as a pump, discharging the pulp from the top of the barrel with a decided swirling motion over a fabric blanket or apron 5 ft. in diameter and circular in form. At the outer edge of the blanket the pulp is either returned between the two 60° cones, over about nine-tenths of their periphery, to the bottom of the impeller barrel, or discharged to the next cell, or into the tailings, by a mechanically actuated valve. The operation insures a number of complete circuits of the pulp through the impeller barrel and over the blanket in each cell before it is discharged, and in this way permits satisfactory emulsification and frothing. By these means a surer and more complete circulation is obtained than is possible in many other appliances.

The pulp zone over the blanket has a depth of only about 12 in., allowing a lower air pressure to insure satisfactory results and less upper travel for sulphides to reach the froth zone. The delivery of the pulp over the top of the central barrel, close to the blanket and with a decided velocity, tends to turn over the gangue and sulphides many times during each passage, thus allowing every opportunity for the sulphide particles to separate from the gangue and join the froth; and the swiveling motion also tends to deliver the froth at the periphery to the circular launder without mechanical assistance and in a free and continuous flow.

### Stratton Air Separator

The presence of water in compressed air is a source of great inconvenience in the operation of pneumatic tools. Air after it has been compressed and has passed through coolers contains a considerable amount of water. The after-cooler reduces the temperature of the air and condenses the water vapor. In these days



STRATTON SEPARATOR FOR REMOVING WATER FROM COMPRESSED AIR

of extensive use of compressed air in mining operations it is interesting to note a new specialty designed for the removal of water from compressed air. The Stratton air separator, as shown in accompanying cut, is manufactured by the Griscom-Russell Co., 90 West St., New York, for this service.

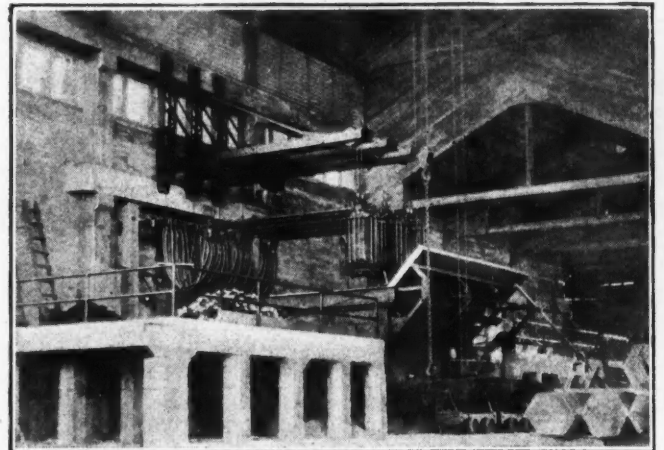
The separator utilizes centrifugal force. The air and

water entering the separator take a helical direction, resulting in a swirling motion. As water is several hundred times heavier than air, it does not make the turns as easily, and centrifugal force throws it out of the curving air current against the wall of the separator, which it meets at an angle, and adheres until the motion dies out in the receiver space at the bottom. The air makes the turn easily and passes out of the separator free from water. The separator is constructed of close-grained cast iron suitable for a working air pressure up to 160 lb. per square inch, and is made in various types of inlet and outlet to suit different piping arrangements.

### Electric Smelting in California

Electric smelting is receiving considerable impetus in California in those sections of the state where the mineralized regions provide a variety of ores suitable for treatment and where water-power, both developed and undeveloped, is available.

A plant of recent construction is that of the Pacific Electro Metals Co., which is now operating a 40-ton



SILICO-MANGANESE FURNACE OF PACIFIC ELECTRO METALS CO. AT BAY POINT, CALIFORNIA

silico-manganese 3000-kw. furnace at Bay Point, 30 miles east of San Francisco and accessible to both rail and water transportation. This company will soon be operating another furnace of the same capacity for making ferromanganese, and is installing three 300-kw. furnaces for the manufacture of ferronickel, ferromolybdenum, ferrochrome and ferrotungsten.

The main furnace building is a concrete structure, 120 ft. x 50 ft., and is adjacent to the transformer building, also of reinforced concrete. The necessary cooling and packing rooms for the alloys, as well as machine shop, storeroom, washhouse, office, laboratory and gatehouse, are all situated near the furnace building.

A three-phase furnace, provided with an open top, is used in the manufacture of silico-manganese, and the operation is a continuous one, the raw materials being fed by shovel around the 24-in. electrode as the metal is drawn off at the bottom by means of a tap hole. The transformer equipment for one furnace is composed of four single-phase, 1000-kw. transformers, one of which is a spare. An electrode plant has been built, and local raw materials have been utilized in the manufacture of electrodes. The Beckman & Linden Engineering Corporation, of San Francisco, designed the plant.



## Events and Economics of the War

Following closely on the heels of the retreating Germans, the Allies have reached approximately the line that they held last March, though they have advanced beyond it at Quéant; in the south the enemy still holds the Chemin des Dames ridge, but has given up the Vesle. In Petrograd, the British Embassy was raided by the Bolsheviki, Captain Cromie, of the British Legation, being killed; in retaliation, Great Britain has placed the Bolshevik ambassador under arrest and demanded reparation. The Czecho-Slovaks in Siberia have gained control of the Siberian railway from a point 400 miles east of Lake Baikal to Penza, 600 miles southeast of Petrograd, the distance between the two points being 2000 miles; the Czecho-Slovaks have been recognized as a nation by Washington.

In the United States, the men of the nation between 18 and 45 years old were registered on Sept. 12 for the selective draft, unless they were already enrolled. A new list of preferred industries was issued on Sept. 9 by Bernard M. Baruch, chairman of the War Industries Board. The Food Administration ordered on Sept. 3 that breweries throughout the country must close on Dec. 1 next, and the Senate passed the Emergency Agricultural Appropriation Bill with the "dry" rider calling for nation-wide prohibition beginning July 1, 1919. The Water-Power Leasing Bill was passed by the House on Sept. 5. Secretary Baker, accompanied by John D. Ryan, is reported to have arrived in France. The U. S. transport "Mount Vernon," formerly the "Kronprinzessin Cecilie," was struck by a torpedo off the French coast and 35 of the crew were killed.

### House Gets New Revenue Bill

The new revenue bill, by which it is purposed to raise about \$8,000,000,000 by taxation, was reported to the House, on Sept. 3, by Representative Claude Kitchin, chairman of the Ways and Means Committee. The amount of revenue to be raised is the largest on record for any one bill and constitutes one-third of the estimated expenditures of the nation for the year ending June 30, 1919, the balance to come from bond sales.

Taxation sources of the last two revenue laws are closely adhered to in the proposed measure, though, in general, rates are greatly increased. The list of luxuries has been lengthened to afford a new source of revenue. The proposed war- and excess-profits taxes will directly affect only corporations. Individuals of all classes, however, will feel the effect of the new bill, if it becomes law. Consumption taxes were avoided, though the tax on beverages has been made so heavy that it is estimated that \$1,137,000,000 will be raised through this source alone within the first year.

Other estimated yields are as follows: War profits, \$3,200,000,000; individual incomes, \$1,481,186,000; corporation incomes, \$984,000,000. Thus over 80% of the total amount to be raised will come, it is proposed, from four taxation sources.

### New Industrial Preference List Out

Preference List No. 2 of industries and plants, compiled by the Priorities Division of the War Industries Board and superseding List No. 1, issued on Apr. 6, was finally released on Sept. 9 (though dated Sept. 3) after prolonged speculation on the part of the public as to the classification made. The new list is the basis for industrial exemption from the draft, and may be regarded, it is said, as the governing factor in the distribution of labor, capital, material, transportation and fuel.

The major industries have been grouped according to their relative importance into four classes, given in the statement issued as follows:

Class 1, Class 2, Class 3, and Class 4. Requirements of industries and plants grouped under Class 1, Class 3, and Class 4 shall have precedence over those not appearing on the preference list. As between these three classes, however, there shall be no complete or absolute preference. The division into classes is for the purpose of presenting a composite picture of the relative importance of the industries and plants embraced within each group. It is not intended that the requirements of Class 2 shall be fully satisfied before supplying any of the requirements of Class 3, or that those of Class 3 shall be fully satisfied before supplying any of those of Class 4.

Industries concerned with mining and metallurgy that are included in the list are given as follows, with their class numbers:

Blast furnaces producing pig iron, 1. Brass and copper—Plants engaged principally in rolling and drawing copper, brass and other copper alloys in the form of sheets, rods, wire and tubes, 2. Chemicals—Plants engaged principally in manufacturing chemicals for the production of military and naval explosives, ammunition, and aircraft, and use in chemical warfare, 1; plants not otherwise classified and listed, engaged principally in manufacturing chemicals, 4. Coke—Plants engaged principally in producing metallurgical coke and byproducts, including toluol, 1; plants not otherwise classified and listed, producing same, 2. Explosives—Plants engaged principally in manufacturing same for military and naval purposes for the Government and the Allies, 1; plants not otherwise classified or listed, engaged principally in manufacturing same, 3. Ferroalloys—Plants engaged principally in producing ferrochrome, ferromanganese, ferromolybdenum, ferrosilicon, ferrotungsten, ferro-uranium, ferrovanadium, and ferrozirconium, 2. Mines—Coal, 1; producing metals and ferroalloy minerals, 2. Plants engaged principally in manufacturing mining tools or equipment, 3. Newspapers and periodicals—Plants engaged principally in printing newspapers and periodicals which are entered as second-class mail matter, 4. Oil and gas—Plants engaged principally in producing oil or natural gas for fuel, or for mechanical purposes, including refining or manufacturing oil for fuel, or for mechanical purposes, 1. Pipe lines and pumping stations engaged in transporting oil or natural gas, 1. Plants engaged principally in manufacturing equipment or supplies for producing or transporting oil or natural gas or for refining and manufacturing oil for fuel or for mechanical purposes, 3. Steel-making furnaces—Plants engaged solely in manufacturing ingots and steel castings by the openhearth, bessemer, crucible or electric furnace process, including blooming mills, billet mills and slabbing mills for same, 1. Steel-plate mills, 1. Steel-rail mills rolling rails 50 or more pounds per yard, 2. All steel plants operating steel rolling and drawing mills exclusive of those taking higher classification, 3. Tin plates—Plants engaged principally in manufacturing same, 3. Wire rope and rope wire—Plants engaged principally in manufacturing same, 2.

The term "principally" as used in listing industries is to be construed to mean plants whose output is not less than 75% of the products mentioned. No distinction has been made between any of the industries or plants within any one class.

## To Protect Industry From Draft

The War Labor Policies Board of the Department of Labor, in coöperation with General Crowder, has organized the Committee on the Relationship of Industrial and Military Man-power, whose function is to prevent the new draft law from crippling industries. Charles Neave is chairman. The committee's representatives will advise the 168 district boards throughout the country in the matter of industrial exemptions. Two such representatives, one of whom will be a specialist on agricultural labor and the other an expert on manufacturing conditions, together with a third member to be selected by the board itself, will sit as an advisory committee in each district. In every case, the War Department will have the right to make the final decision.

Recommendations for exemptions of these special committees will be based upon the list of 64 essential industries recently issued by the War Industries Board. The committees will also have the power to initiate claims for such exemption.

## Mineral Bill Reported to Senate

WASHINGTON CORRESPONDENCE

Early action in the Senate on the War-Minerals Bill, which has been practically rewritten, will be asked by Senator Henderson, of Nevada, the chairman of the Committee on Mines and Mining. As the request will have behind it the pressure of the influence of the President, the Secretary of the Interior and the Chairman of the War Industries Board, it is probable that the bill will be brought before the Senate in the near future. No opposition to the measure has shown itself in the Senate, and it is Senator Henderson's opinion that no fight will be made on the bill. The latter's report on the bill was submitted to the Senate on Sept. 5. Extracts from the report follow:

The minimum-price principle had the approval of the House, but the attention of your committee was called to the possibility of the Government's thereby incurring onerous obligations which might be avoided by an elaboration of the contract principle approved by the House, thus lessening the Government's liability. By the contract system, the Government would know definitely just what the obligation would be; whereas the minimum-price feature might so stimulate production as to place the Government in a most embarrassing position.

The adoption of a contract system places the Government in the position of buyer and seller, necessitating an increase in the appropriation from \$10,000,000 to \$50,000,000. This, however, is a revolving fund and should be returned to the Treasury through the various transactions when the purpose of the bill shall have been fulfilled.

In the course of the hearings, considerable opposition was expressed to the licensing feature, and it does not appear that this is essential to the successful operation of the legislation, and its withdrawal will render the measure more acceptable to the mining industry.

Many penalty provisions were contained in the House bill, but it is felt that this is sufficiently taken care of in Section 4 of the amended bill, under the President's power to establish rules and regulations and providing a penalty for failure to comply therewith.

The list of minerals coming within the purview of the bill was unchanged by the Senate committee with the exception of substituting "sodium" for "sea salt" and by the addition of phosphorus. The reason for adding phosphorus is that it has become a war mineral in every sense of the word, owing to its extensive use in smoke screens. The "mineral substances and ores, minerals, intermediate metallurgical products, metals,

alloys and chemical compounds thereof," which are mentioned in the Senate bill, are as follows: Antimony, arsenic, ball clay, bismuth, bromine, cerium, chalk, chromium, cobalt, corundum, emery, fluorspar, ferrosilicium, fullers' earth, graphite, grinding pebbles, iridium, kaolin, magnesite, manganese, mercury, mica, molybdenum, osmium, sodium, platinum, palladium, paper clay, phosphorus, potassium, pyrite, radium, sulphur, thorium, tin, titanium, tungsten, uranium, vanadium, and zirconium.

In addition to the materials mentioned above, the Senate bill also includes "such other rare or unusual elements as the President from time to time may determine to be necessary and as to which there is a present or prospective inadequacy of supply." It is understood, however, that an amendment is to be offered which will alter the reading of the foregoing sentence.

## The Coal Situation

Bituminous coal production showed a slight recovery during the week ended Aug. 24, according to the reports of the U. S. Geological Survey. It is still, however, far below the amount required to meet the deficit. The total for the week was 12,603,000 net tons, including lignite and coal made into coke, an excess of 669,000 net tons over the previous week's output.

The Geological Survey reports that the shortage for the week of Aug. 17 was due largely to lack of cars. The bituminous mines during that week produced 77.7% of their normal output. Of this deficit, car shortage contributed 12.4%; labor shortage and strikes, 4.1%; mine disability, 4.2%; no market, 0.5%; all other causes, 1.1 per cent.

Anthracite production for the week of Aug. 31, on the other hand, was the largest of the year, the total output being 1,806,121 tons, an increase over the preceding week of 100,000 tons. It was the first week of the year when the daily average exceeded 300,000 tons.

In the five months just ended, the anthracite industry has produced and distributed to the ultimate consumers about 34,000,000 tons of anthracite, which is a larger amount than has ever been produced before in the same period, this in spite of the serious labor shortage with which it has had to contend.

The industry enters upon the remainder of the year with no storage coal, and orders in excess of current producing capacity. The output can be increased if more labor can be obtained, it is maintained. The record production achieved has been due to greater efficiency in operating methods.

## Gasoline Consumption Reduced

Consumption of gasoline in the states east of the Mississippi was reduced from 63 to 95% on the first trial on Sept. 1 of the effectiveness of the Fuel Administration's recent appeal to motorists to avoid using their cars on Sundays. Between 100,000 and 150,000 bbl. was saved on that day, according to A. C. Bedford, chairman of the National Petroleum War Service Committee. Illinois stood first, with a 95% reduction in gasoline consumed. In general, the states in the western part of the territory concerned decreased their consumption more than those on the eastern seaboard.

## Colorado Meeting of Institute a Success

“ENGLAND today is the world's most efficient country, not even excepting Germany,” said J. Parke Channing recently discussing the program of the war-work meeting in Colorado of the American Institute of Mining Engineers, which has just been concluded. According to Mr. Channing, the people of the United States have developed high efficiency as far as machines and methods are concerned, but have failed properly to utilize the country's man-power. Our foreign labor must be Americanized and given a national point of view, just as British labor at heart is British, if the war is to be successfully concluded and if increased efficiency is to be had after the war. Never was there a time, in Mr. Channing's belief, when it was so necessary to impress upon business managers the importance of the human side of engineering, for they are now in a position to solve the labor problem. He pointed out that the engineer's duty today is to convince the employer that, in the long run, the latter will be better off if he improves the condition of the laborer and educates him to produce his maximum output.

To increase the mineral output of the country and to conserve mineral resources at the mines was the object of the Colorado meeting. On the opening day, Sept. 2, in Denver, many hundreds of the 7000 members of the Institute registered, coming from all parts of the country and from many foreign mining fields. This was the first time in 22 years that the mining engineers have met in Colorado, and the tremendous effort which the Institute is making in war work greatly increased the importance of the gathering.

Since the beginning of the war Western mining centers have undergone great development. Witnessing this is the fact that, compared with one electric-furnace smeltery west of the Mississippi before the war, there are now eight in operation and three more under construction. Owing to this and other expansion, the smelting of ores has increased enormously throughout the West.

On the first day of the meeting, the members of the Institute visited the ferroalloy plant and other points of interest in Denver, and, later in the day, took a trip by automobile to the top of Lookout Mountain. A dinner was held at the Denver Country Club, followed by addresses made by officials of the Institute, including a number of representatives of the war-work committees at Washington. Early on the following morning the engineers entrained for Colorado Springs, which was the convention headquarters throughout the week, and from which side trips were made to other points.

At the technical session on Sept. 3, those present were told that 70% more coke than ever before will be available this year to help solve the fuel shortage. This supply will be further increased by the development of tar, coke-oven gas and other byproducts newly dignified in war time as available fuels. Pulverizing coal for attaining the greatest efficiency was another subject discussed. Some of the advantages of pulverized coal were stated to be the utilizing of every heat unit in the coal, the reduction of labor for handling coal, and the maintenance of a constant temperature in the furnace.

At noon on the second day, the Institute paused from

its business sessions to hold a memorial service for Dr. James Douglas, the noted mining engineer and former president of the Institute, whose death was a severe loss to the mining industry.

A luncheon was held at the Broadmoor Hotel, Colorado Springs, which was attended by a large number, and a reception and dance were given the members and their families. An elaborate program had been prepared for the entertainment of the ladies accompanying the members.

The death knell of the world's supply of radium, now in constant use on the battle front, and a proved cure for forms of cancer, was sounded before the members on the third day, and a warning was given to the country's physicians and surgeons to accumulate all of this precious metal not needed for war purposes. The warning has an official tone, coming, as it does, from Dr. Richard B. Moore, of the U. S. Bureau of Mines. Dr. Moore stated that there are only about three ounces of radium element in existence at the present time.

Because the physicians and surgeons of the country are not purchasing enough radium to make the industry a financial success, said Dr. Moore, the material is being used on the faces of watches and clocks, electric light push buttons, and chains attached to electric globes. This is obviously dissipating a substance which has a distinct medical and military value. It was stated that there are nine different instruments used on aeroplanes having dials that are made luminous with radium paint, which is used, also, on compasses and gun sights. The efficiency of night firing on the Allied front with both machine guns and artillery has been greatly increased, says Dr. Moore, by the use of these luminous sights.

The engineers spent an entire day in Cripple Creek. They had an opportunity to observe the development through many stages since the first crude methods were installed. An entire evening was given over to a technical session on geology and mining, at which nine of the forty subjects that were on the schedule were discussed.

### August Pig-Iron Production

Pig-iron production in August was 3,389,585 gross tons, as compared with 3,420,988 tons in July, according to *Iron Age*. The daily rate for August was 109,341 tons for a 31-day month, as against 110,354 tons in July, also a 31-day month. This is an average loss of 1013 tons a day, notwithstanding a net increase of nine furnaces during the month. In the same period of 1917, however, production fell off 3048 tons and was at the rate of only 104,772 tons a day in August, 1917, although six furnaces were added in that month, giving 357 active on Sept. 1, 1917. Active furnaces on Sept. 1, 1918, total 372, blast having been started in 17 stacks in August and eight having been blown out. The output of 54,009 gross tons of ferroalloys ranks next to the record production of 54,663 tons last May and is 2247 tons greater than that of July, formerly the next highest. Only 28,038 tons of ferromanganese was made, as compared with 29,996 tons in July.

## Hands Across the Sea

Forget that course in memory training and send the money into the Comfort Fund instead. Forget the 27th! It can't be done. We are sure of this from evidence that comes daily to hand. Today from Colorado, yesterday from South America, and again it was from Australia, that the friends of the 27th reached out to brighten things up for the regiment.

Last week in Colorado, while the members of the American Institute of Mining Engineers were grouped around the reception rooms of the Broadmoor Hotel at Colorado Springs, H. L. Brown proposed to collect subscriptions in behalf of the Comfort Fund for the 27th Engineers, if Mr. Ingalls would loan his hat for the purpose. The hat being loaned, the persuasions of Mr. Brown and his friends resulted in the collection of \$215, which is entered in the list as from "Members of the A. I. M. E. meeting in Colorado Springs, Sept. 4, 1918."

The friendly interest in the regiment extends to our folks who are living in remote parts of the world. We get letters expressing interest and enclosing substantial evidence thereof from many quarters. Mrs. Harold Kingsmill wrote from Morococha, Peru, that she was sending 25 pairs of socks for the boys. She apologized for some of the odds and ends in the way of wool that she had to use in the knitting; but they are good socks nevertheless, and the boys will not mind the looks when they think that these were knitted in distant Peru, where wool supplies are not easy to get.

Capt. H. L. Jacques, commanding Company F of the mining regiment, writes as follows:

On behalf of all members of Company F, 27th Engineers, I wish to express my sincere thanks for the many favors you have shown us, and to assure you that the many gifts and expressions of good will are highly appreciated by every man in this company. It is indeed gratifying to us to know that the mining industry is backing up the men who have heeded the call to the colors, and we in the service, as members of the mining industry, will surely do our very best in the present world crisis to merit these many favors shown us.

The subscription recorded below from the employees of the Utah Leasing Co. in Newhouse, Utah, was participated in by all of the 34 men on the company's payroll, whose names are given as follows:

H. H. Adams, William Strange, John Doe, H. C. Hammer, K. K. Clark, J. E. Bonzo, Arch Bacon, L. Watts, F. Rogers, T. Flood, E. E. Meyer, W. H. Thompson, C. A. Bell, E. W. Muir, R. Anderson, A. Riela, O. Sigismund, James Bardino, Martin Bardino, Leland Rowley, James Davidson, Tom Wilson, W. J. Richards, Fred Morzenti, Joe Cavijoli, C. G. Woodbury, Bill Morris, M. Griffiths, Moses Helsten, Alfred Hall, Skelly Johansen, Tom McLaughlin, O. P. Johansen, Mike Antone, E. A. Goodwin, John Davidson, Fred McGary, Carl Goodwin, Frank Shay, D. P. Van Fleet, and E. L. Buterbaugh.

### HOW THE COMFORT FUND STANDS

Previously acknowledged	\$14,436.50
H. Foster Bain	10.00
Marc Bailey	10.00
Charles Le Vasseur (second contribution)	10.00
William Wraith	25.00
H. A. Wheeler	10.00
Nevada Mine Operators' Association	100.00
Louis R. Wallace	50.00
H. P. Bowen	5.00
H. L. Brown and M. W. Hayward	15.00
Iron Cap Copper Co.	50.00
W. N. Smith	10.00
E. S. Geary	5.00
H. J. Wolf	10.00
F. H. Stebold	10.00
H. A. Kee	10.00
W. S. Grether	5.00
Marlon J. Thomas	10.00
E. F. Eurich	10.00
Liberty Bell Gold Mining Co.	200.00
H. De Witt Smith	15.00
Associated Miners of the University of Idaho	10.00
New Idria Quicksilver Mining Co.	100.00
F. P. Burrall	25.00
Livingston Wernecke	5.00
E. P. Mathewson	50.00
Interest to June 26	82.61

H. W. Hixon	10.00
R. C. Canby	10.00
S. R. Guggenheim	100.00
Richard Tavis	5.00
Simon Guggenheim	100.00
J. V. Kelley	10.00
Algernon Del Mar	4.00
Sumner S. Smith	5.00
Will H. Coghill	10.00
Lincoln Crocker	10.00
C. E. Dewey	10.00
Plymouth Consolidated Gold Mines, Ltd.	100.00
United Eastern Mining Co.	50.00
W. A. Wilson	20.00
Oscar Lachmund (fifth contribution)	10.00
W. Rowland Cox	10.00
L. D. Huntoon	5.00
Alaska Mining and Engineering Society	50.00
W. R. Benedict	3.00
Etheredge Walker	25.00
Fritz Mella	10.00
Richard McCarthy	10.00
J. N. Houser	10.00
Weedon Mining Co.	50.00
William H. Kinnon	30.00
A. P. O'Brien	10.00
Lester W. Strauss	10.00
Montana Society of Engineers	50.00
W. R. Atkeson	2.50
Charles Le Vasseur (third contribution)	5.00
Frank Carroll	10.00
V. P. Hastings, Jr.	5.00
D. E. Woodbridge	5.00
Harvey B. Small	10.00
J. C. Porter	10.00
A. F. Taggart	10.00
G. E. Parish	25.00
H. K. Sherry	10.00
T. M. Hamilton	50.00
George O. Argall	10.00
C. T. R.	15.00
Oscar Lachmund (sixth contribution)	10.00
P. M. Arnold	10.00
W. A. Wolf	5.00
Employees of Utah Leasing Co., Newhouse, Utah	20.50
Employees of Braden Copper Co.	112.50
Charles A. Mitke (second contribution)	10.00
G. M. Colvocoresses	25.00
Charles Le Vasseur (monthly)	5.00
A. H. Wethey	25.00
S. Ford Eaton	25.00
H. H. Hunner	5.00
N. G. Thomson	25.00
Members of the A.I.M.E. meeting in Colorado Springs, Sept. 4, 1918	215.00
Total	\$16,667.61

Make your checks payable to W. R. Ingalls, treasurer of the Association of the 27th Engineers.

## Cross Purposes\*

It is wearisome and discouraging to see various branches of the Government, whose war duties overlap each other in greater or less degree, still pulling and hauling at cross purposes instead of getting together, agreeing upon a program and putting it through without friction or lost motion. When a fresh case of conflict of views and activities arises, the public is likely to think again and again with wonder if not anger at the obstinate opposition that has been shown to the creation of a War Cabinet which would have organized harmony and team work among the multiform Federal agencies.

These reflections are forced upon every one today by the pronouncement of Provost Marshal Crowder published this morning, knocking the elaborate draft plans of the War Industries Board, published only yesterday, into the proverbial cocked hat. Public opinion, only 24 hours ago, was discussing the War Industries Board's program of exemption as a well-conceived scheme based on exact information, at last a scientific effort to solve a difficult problem. But General Crowder now curtly declares, to quote the Washington despatches, that "the district (draft) boards would not have their hands tied by such rulings, which would be used simply in supplementing other information collected by the

\*Editorial in the *Evening Sun*, Sept. 10, 1918.

boards in determining whether industries were essential and whether the employees who claimed deferred classification or for whom deferred classification was asked were vital to such industries."

The situation, as it stands, is simply bewildering. The War Industries Board has at its head a highly competent business man, Mr. Baruch, whose advent to the position was generally hailed with approval. He has an elaborate and expensive organization working under him. A large proportion of the energies of this highly efficient machine has been given for weeks to collecting data, formulating conditions and deducing a systematic scheme of war needs in industry. The work has cost perhaps half a million dollars or more. It has taken the time of scores of intelligent men and women when men and women of any sort are scarce and their services are at a premium. It is as nearly an expert product as it is humanly feasible to produce.

Well, General Crowder treats it as all but negligible. It can only be useful as supplementary to the crude, local inquiries of the many hundreds of men who make up the draft boards. We should have looked for rigid local inquiry as supplemental to the great, scientific, country-wide theory. But not at all! The local board is the thing, and the big, reasoned effort of a great Federal commission, run under mere civilian auspices, is virtually scrapped, and a new and in some respects conflicting system substituted.

The saddest thing about it all is that Mr. Baruch and his board and General Crowder and the War Department are conscientiously trying to accomplish the same result. Both desire to bring about a draft which will produce the maximum of fighting men with the minimum of retardation of war industries and of injury to the life and prosperity of the country. But with the same patriotic aim and purpose the two cannot cooperate. It may be doubted whether Crowder even knew that Baruch was busy on a classification of industries. There was apparently no concert between them. One or other was wasting effort—perhaps both were, and effort means man-power and money. There was no one to bring them together.

There is no War Cabinet. The overburdened President cannot attend to details of administration. Apparently the Cabinet lacks the will or the power to coordinate activities. Indeed, there are so many agencies at work not truly subordinate to any Cabinet officer, that team work by Cabinet guidance is difficult. The mass of activities carried on by at least a score of minor organizations lacks organization in the large sense that Britain and France have secured through placing all the interests of the war under the control of small bodies, war cabinets of three or five members.

### Chronology of Mining, August, 1918

Aug. 1—U. S. Steel Corporation makes 10% wage increase effective—Committee acting under the War Industries Board assumes control of sulphur-bearing materials.

Aug. 6—Meeting of "high-cost" copper producers with War Industries Board at Washington—Plant of Union Sulphur Co. at Sulphur, La., damaged by hurricane.

Aug. 8—Meeting of the Colorado chapter of American Mining Congress and Colorado Metal Mining Association at Denver to discuss the gold-mining situation.

Aug. 9—President approves the continuance of the 26c. price of copper.

Aug. 10—Missouri-Kansas-Oklahoma Zinc Institute formed at Joplin, Missouri.

Aug. 11—First unit of 1500-ton Ray-Hercules mill at Ray, Ariz., placed in operation.

Aug. 12—Meeting of American Mining Congress at Reno, Nev., to discuss gold production—Mexican oil decree modified so that government is now to receive one-sixteenth of the product of every foreign-controlled well.

Aug. 15—Price of silver fixed at \$1.01½ per fine ounce by the Government.

Aug. 20—Lead Producers' Committee issued notice to manufacturers and dealers requesting that efforts be made to eliminate non-essential uses of lead.

Aug. 21—Agreement between sheet-zinc producers and War Industries Board to maintain existing prices.

Aug. 23—Fuel Administrator Garfield refuses to approve of increase in wages of coal miners.

Aug. 27—Henderson bill proposing Government production of metals and minerals needed for the war introduced.

Aug. 28—Meeting of iron and steel manufacturers in New York to discuss measures in connection with the new draft.

Aug. 30—I. W. W. leaders sentenced by Judge Landis at Chicago—Suit of minority stockholders of Hull Copper Co. against Charles W. Clark settled out of court.

Aug. 31—Draft Bill, requiring registration of all men between the ages of 18 and 45, signed.

### Sound Taxation Work for the Senate\*

Senators with principles and brains are not wasting their time, as some newspapers are, in discussing Chairman Kitchin's theories of taxation. As we must judge him by his words and acts, Mr. Kitchin hasn't any theories of taxation. He has a hatred of that part of his country north of Mason and Dixon's line. He has a passion for destruction. Wherefore Mr. Kitchin's taxation practices consist of inordinately penalizing, financially raiding and economically looting revenue sources that are distasteful to him.

It is idle to discuss the economics of the fellow in the fable who killed the golden goose. There is no need to explain in detail that as Kitchin makes it impossible for industry and business to be prosperous, or even to survive, he makes it impossible for the Treasury to continue to draw greater and greater revenue from those depleted sources. So what the responsible Senate leaders of both parties want to do without useless words about the Kitchin bill, what the Treasury Department wants them to do, and what the country must have them do unless it is to suffer permanent disaster from the Kitchin performances, is to put some sound taxation into the House measure, which Senator Smoot describes as a bungling absurdity.

We have not discovered any respectable sentiment against heavy income taxes. Everybody expects them; everybody whose war spirit is right is willing to pay his full share, big or little, so long as it is a fair share. The income of corporations merits no exception. Nobody suggests it. But a tax that penalizes a business

\*Editorial in the *Evening Sun*, Sept. 6, 1918

for not scattering all its earnings in dividends instead of holding a reasonable share of them back to provide for the expansion of that business and to guard against usual hazard to that business is simply a fool tax. The Senate may not lighten the burden on individual incomes. But if the Senate does not eliminate the discrimination whereby a corporation is taxed only 12% on its distributed earnings, but 18% on its undistributed earnings, it will help to lock the wheels of every great industry in this country.

If the Senate does not provide for greater revenues out of profits that come purely from war business, it will permit a wrong to every normal business. It is true that a tax on war profits, pure and simple, is merely a cutting of price to the Government on war materials supplied to the Government. No war could possibly be largely financed by taxes on war profits, because the most that such taxes could do would be to get the price of the war material down to cost. The material still would have to be paid for by other taxation. But there is no sound reason why a business whose profits come solely from the war should be permitted to make out of the Government anything like what normal business should be permitted to make out of its customary peace operations.

If the Senate writes into the revenue measure consumption taxes, ignored by Kitchin, we shall have not only fair taxation, which will hurt and can hurt nobody, but taxation which, paid by all, in cents by the small consumer, in dollars by the big consumer, will turn into the Treasury hundreds of millions, perhaps billions of dollars.

The Senate can do any of these things and improve the Kitchin measure vastly. Nothing that the Senate could do could make the Kitchin measure worse than it now is.

### Yukon Gold Co. Suspends Dividends

The payment of further dividends by the Yukon Gold Co. has been suspended until such time as gold-mining conditions improve. Operations are to be continued, as a matter of patriotism, so long as the company can cover operating expenses.

William Loeb, Jr., president of the company, has sent a letter to stockholders, notifying them that dividends have been suspended, a portion of which follows:

"This action is absolutely necessary in order to conserve our cash resources. The estimated income for the year is a disappointment, as it has been to all gold companies, due to the abnormally high and constantly rising cost of labor, material, supplies and freight. Owing to the high wages paid to the miners of base metals, efficient miners are attracted away from the gold mines, and the labor left in the gold mines is only 60% efficient, and not obtainable in sufficient numbers.

"Notwithstanding these increasing burdens on this industry, the value of our product is stationary. If these were not war times and we were free to exercise our business judgment and leave patriotism out of account, the proper course to pursue would be to leave the gold in the ground, to be mined when times were more normal. As long as we can show a profit or break even, we consider it our patriotic duty to keep up the production of gold, one of the most essential of war metals, trusting that the Government will see the necessity of coming to the relief of this industry.

"The gold companies of the different gold-producing countries are petitioning their respective governments for relief, and it is hoped that the showing that will be made of the danger of a complete shut-down of gold mining will induce the governments to take some kind of action to relieve the situation. Many formerly profitable gold properties in this country are already now closed down, and others are only taking out their high grade ore; consequently the production of gold is rapidly diminishing.

"In California, where this company operates several dredges, the Public Utilities Commission has curtailed all electric power one-third, due to the shortage of water, and this will correspondingly reduce our output.

"In view of the above, it seemed to the board that ordinary prudence called for the action which it has taken."

### The Fluid Ton

The ton, as a unit of measurement for solutions, was adopted early in the history of the cyanide process, on account of the obvious advantage of being able to report the value extracted in units corresponding to those used in the case of the tailing or ore treated. It was apparently first used about 1890 by the pioneer metallurgists of the Rand, as the term "tons of solution" appears in some of the earliest publications of the Chemical and Metallurgical Society of South Africa. The word "fluid" was not prefixed, just as it is commonly omitted when ounces of liquid are mentioned, but it is evident that a volume measure was intended, solutions for assay being accordingly measured by volume. The following quotations show that it has been definitely recognized as a unit of volume for hydrometallurgical purposes, agreeing with the general adoption of the "short ton" of 2000 lb. as a unit of weight:

W. A. Caldecott (*Journ. Chem., Met. & Min. Soc. of S. Africa*, Oct., 1908, IX, 124), "Reminiscences of the Early Rand": "The records of those times when assays were made on ounces of material and weighed in thousandths of a grain and reported in troy ounces, pennyweights and grains per 2240-lb. ton, when cyanide strength determinations were of solutions applied to charges measured in gallons, would indeed appear distant were it not that some of the former practices still linger in England, and our friends, the engineers, still prefer to speak of millions of gallons of water instead of employing the common cyaniding unit of a fluid ton of 32 cubic feet."

W. J. Sharwood (*Mining Magazine*, Nov., 1909, Vol. I, p. 226), "Measurement of Pulp and Tailing": "Next to accepting the metric system in its entirety, it is most convenient for practical purposes to adopt, as units, the ton of 2000 lb., the cubic foot, and the fluid ton of 32 cu.ft.—the last being the volume occupied by 2000 lb. of water, on the assumption that a cubic foot of water weighs 62.5 lb. The fluid ton is a unit that has been tacitly assumed and used for years in connection with cyanide work, but I believe that it has not been thus specifically defined." (A footnote adds: "Since this paragraph was written, W. A. Caldecott has indirectly defined the fluid ton in the same way.")

The Institution of Mining and Metallurgy, by an order of the Council dated Dec. 21, 1910, adopted the following (see *Trans. I.M.M.*, XII, 740, and *Bull. Min. & Met. Soc. of America*, VIII, 196): "In reporting assay values of parts by weight in a stated volume of the solution. In the case of cyanide solutions the use of the 'fluid ton of 32 cu.ft.' is recommended. It closely approximates 2000 lb., and is in common use."

## Editorials

### The National Safety Council

THE development of the National Safety Council has been so rapid that it is evident that its growth is due not only to its energetic personnel but also to the fulfillment of a real need. The growth of the safety-first movement received impetus from the formation and the achievements of the U. S. Bureau of Mines. This Bureau is performing a valuable service in accident research, gathering and publishing statistical information, the testing of mining appliances, the publication of safety rules, and in maintaining contact with mining companies and mining work. Individual mining companies have developed safety organizations. Of these we may mention the New Jersey Zinc Co., the Anaconda Copper Mining Co., the Butte & Superior Mining Co., and the Bunker Hill & Sullivan Mining Co. Other companies have excellent organizations, which are doing good work in the reduction of accidents and the maintenance of safe operating conditions.

As the safety movement developed, its sponsors soon discovered that personal contact with the miners was alone not sufficient and that additional means were necessary. Out of this need grew safety publications, such as the *Anode*, the *Spelter Journal*, the *Safety Review*, *Safe Practice*, and various state safety bulletins. These publications may be looked upon as supplements to the mine bulletin board. A great number of mines, large and small, could not undertake to organize publications of the kind mentioned. Other industries found the same difficulty. The National Safety Council meets this requirement with its *Safety Bulletins*. Its organization serves a number of industries, and its bulletins deal specifically with the requirements of each. By well-thought-out wording and pertinent illustrations a single accident and its results are brought home to the worker. Even if he is unable to read, the pictures carry the message. Placed next to the mine bulletin board and at gateways, change houses, shafts and stations, they keep the safety message ever present. The blunt picture of a one-legged miner standing before the grave of his leg is more than a sermon on safety, for it is something that cannot be readily forgotten.

In another place in this issue we publish a brief history of the National Safety Council, which is to hold its seventh convention at St. Louis this month. A part of the work of the convention deals with mining, and there will be a number of interesting mining papers read there. One of these, on the subject of handling and storing of explosives, by Arthur La Motte, is presented in the current number. It is an excellent review of the subject, and should be of considerable value to all quarry and underground workers, the aim of the author being the education of the miner by means of pertinent instructions.

We heartily commend the work of this organization, and take pleasure in bringing it before our readers.

### "What You Can Do Now To Help The Next Liberty Loan"

UNDER the above caption we printed in our advertising columns in last week's issue two pages of suggestions for starting the work of the next Liberty Loan. We believe the plan for Liberty Loan meetings is a good one. We advise our readers who are in managerial positions, or who may assume the responsibility for organizing a meeting, to write for the pamphlet of "Suggested Programs." The time is short, and the best word that we can send to our boys on the other side is the news of the success of the loan.

Do not delay. Form your committee and get together at once. Decide upon your plans and then put them through. Get your business men together; bring your church members along, and don't fail to have one or two hammer-and-anvil orators.

### Mining Low-Grade Copper Orebodies

IN THIS issue we present a paper dealing with a phase of mining operations that in many mines is the problem of greatest importance. The development of the large low-grade coppers of Utah, Arizona, Nevada and New Mexico has opened up a new field of mining in North and South America. These deposits have offered varying mining problems, each of which has been successfully solved according to its nature and conditions. In all cases the orebodies have been thoroughly prospected by drilling prior to underground development, and large capital expenditures have been made in order that low operating cost might be secured. Loss of ore in pillars and loss of grade by dilution have respectively been balanced against the cost of high recovery of ore and a mill feed free from waste. During the development stages, the ore extracted from drifts, crosscuts and raises yields a considerable tonnage, and this ore at the newer properties was treated in a pilot mill, which performed the double function of sampling the mine and solving the metallurgical problem.

At Inspiration, a series of tests was conducted by the engineering department on a laboratory scale intended to show the effects of different methods upon the grade of ore and recovery which results from drawing large tonnages of broken ore from under a caving caprock. The results of this experimentation as verified by subsequent operations have, so far as data can be obtained, justified the expectations.

At both Ray and Braden, where shrinkage-stope and pillar-caving methods are used, the pillar problem offered the greatest field for new ideas. In his paper, Mr. Hollister describes the solution of the problem at Braden, and his conclusions are the more valuable in that they emanate from one who has had long, first-hand experience with mining at both properties.

Complete data regarding the degree of final recovery obtained by the method discussed are as yet unavailable, as the orebodies are still far from exhaustion. We shall, however, watch with interest the reports from Braden, which, to judge from the data given by Mr. Hollister, promise to be all that could be expected.

### Mr. Kitchin's Tax Bill

THE greatest tax bill in history has been introduced in the House of Representatives. Mr. Kitchin exultingly proclaimed this and made several remarks that betray his state of mind. He said that there are some persons who are enjoying incomes a thousand-fold larger than before the war; that it is all right to tax the \$3 shirt, for he had never worn one costing more than \$1.50, and such had been good enough for him; and, finally, that the Government can take \$8,000,000,000 out of some of the people without hurting business. The last assertion savored, however, of whistling to keep up courage. There is a little too much protestation about it.

Mr. Kitchin's attitude is well understood. He and his committee colleagues have blandly disregarded the advice and wishes of the Treasury Department, and hence of the Administration. They are going to tax not war profits but rather are going to mulct the rich so as to punish them for being rich. The desideratum is the reduction of everybody to the basis of the \$1.50 shirt. Those who are already living on the scale of the \$1.50 shirt, or lower, need not pay much of anything.

Of course, the talk about incomes swollen a thousand-fold is the kind of buncombe, at which Mr. McAdoo himself has connived, that is intended to gain the applause and support of the masses. It is conceivable that a man possessing a thousand-dollar income in 1914 may by the lucky strike of a bonanza in a mine be enjoying a million-dollar income in 1918, but such cases are among the rarities, as Mr. McAdoo's own report to the Senate shows. However, the great question is the effect upon business, upon the beehives of the nation, of a tax law framed upon these theories.

There are some things that are sufficiently clear. The total business turnover in 1917 has been estimated at something like 50 billion dollars. If it be any greater than that in 1918, owing to inflation, the increase will be mainly in the wages paid to labor, for commodity prices have been so restrained by the price-fixing policy that there can have been little if any expansion in that way. On the contrary, the evidence is pretty strong that the aggregate of man-hours of work and the quantity of materials produced will be less in 1918 than in 1917. But let us disregard considerations of that sort and assume that the aggregate of business in 1918 will be as large as it was in the previous year, and that fully half of the total has now become war-work, Governmental expenditures now averaging about two billion dollars per month. Manifestly such a consummation has been possible only by curtailing ordinary industrial activities; but there is a limit to that. The majority of the people are not engaged in war-work at all, yet they must work, and have material with which to work, in order to live—not to speak of paying taxes. Without any doubt these people have already been reduced to a difficult situation. It is a certainty that the moderately

well-to-do classes are no longer going to be able to subscribe to national loans in the way they have done heretofore after Mr. Kitchin has taken out of them in taxes what he is going to do. Their incomes will not yield enough, not even after the most drastic economizing in living.

The corporations and the wealthy and well-to-do people cannot pay the cost of the war. There are not enough of them, and their net income is not enough. Their gross income may be large, but the major part of it is paid out for labor and the things that represent labor. In fact, the produce of the nation is mainly absorbed by the 40 million workers. It is to them that the proceeds of industry accrue, especially at this time, when the fixing of savings by the thrifty in railways, houses, factories, etc., is checked by high prices and high taxation. If the wage-earners, especially those who are engaged in war-work, do not save, if they squander their earnings, and, worse than that, waste their time, the country is losing, and the financing of the war is going to become increasingly difficult. Moreover, the state of our industry is going to be jeopardized.

The theory of taxing the war-profiteer is a sound one, but the practice of taxing only the capitalistic profiteer and letting the laboring profiteer go scot-free is dangerous. Mr. Kitchin did not appeal either to common sense or the finer feelings of patriotism when he bragged that he had framed a bill to draw eight billion dollars in taxes without touching the breakfast table. He ought to have touched the breakfast table and done other things to discourage the laboring men—the real moneyed class of today—from indulging in luxuries and idling their time. As it is, we must look more and more to that class to supply the money for bonds. If they will only do that, and themselves rise in the scale while the present well-to-do class is descending, the nation will experience a leveling process but no economic loss; but such a happy outcome is not to be expected until the wage-earners have been taught, or compelled, to cease wasting and to work with maximum efficiency.

### Safety Precautions in Mining

IN A RECENT issue of the *Journal* we printed an interesting description of a safety crosshead which was designed to prevent the recurrence of an accident that was, happily, unattended with serious consequences. An ordinary type of crosshead was being used in shaft-sinking work; and, owing to freezing of water, it stuck between the guides and allowed the bucket to proceed alone. The crosshead remained near the surface and the bucket reached a depth of 600 ft. before it lodged in the shaft timbers. The engineer, ignorant of what had happened, continued to pay out the rope until about 400 ft. was piled on the crosshead, which then collapsed. The force of the impact between crosshead and bucket was so great that the latter was completely cut in two by the steel guide plates. The tangled wreckage of rope, crosshead and bucket continued downward with gathering momentum to meet another bucket, which it also completely demolished.

Nine men were working in the bottom of the shaft at the time of the accident, but the crash heard when the crosshead struck the bucket warned them of immi-



ment danger, and gave them time to seek what safety was offered in the corners of the shaft before the wreckage reached the bottom. Luckily no one was injured, and it was then realized that similar accidents could be prevented by the provision of the safety measures to which we have drawn attention.

### Spreading of the Blight

THE War Industries Board appears to have set itself firmly against increased prices for anything, and the formal meetings between the producers and price-fixing committees have lost most of the interest they used to have. There is nothing much to be gained by the producers going to Washington to play checkers with Mr. Brookings. Some people still talk about speeding up production, but in many of the major minerals and metals we see waning outputs, in others statistics that are just about holding their own, and in but few any material increase except in those cases where the markets have been let alone. A depression is gradually spreading over the great mining industry, where there ought to be enthusiasm. This is in no way the fault of the producers. They are doing everything that they can. They have simply been led into an economic blind alley in which they are helpless.

The price-fixing committee is quite unperturbed about this. It says that it has enough of iron, copper, lead, etc., so wherefore should it raise prices in order to encourage production by those producers whose margin has disappeared? The latter are told that they will best shut down, so as to release their men to more essential occupations. At the same time, however, everybody is trying to curtail consumption for what are deemed to be not immediately necessary purposes. There can be such a thing, however, as making it so impossible for people to do business that they can neither subscribe enough to liberty bonds or have earnings on which to pay taxes. If the country is put wholly on a war basis, with the result of a relatively few contractors making great profits, of millions of mechanics and laborers receiving great wages and squandering a large part of them, the rest of the people may be so squeezed that they can yield no more.

The War Industries Board is not, of course, responsible for all of this. It is simply playing its part in a generally uneconomic policy. At the beginning of the war we thought that a sound precept was "Increase production and curtail consumption." The War Industries Board has changed this to "Decrease production and curtail consumption more and more."

### BY THE WAY

Practical jokes were not unknown in the early days of Nevada mining. Dan De Quille tells the following story in "The Great Bonanza":

Old Daniels would sometimes get so drunk that he didn't know whether he was dead or alive. Very late one night some wags found him so much intoxicated that they at first thought he was dead. They got a hand-barrow and carried him out to the graveyard, where they found a Chinaman's grave that had been

opened so that the bones of the defunct Oriental might be sent back to China. The old shattered coffin still lay beside the open grave, and alongside the coffin they laid old Daniels.

The wags then secreted themselves near the spot, in order to see how the old fellow would act when he came to his senses. When the air began to grow cold, Daniels began to toss and tumble uneasily, and presently was fully awake. He then arose to a sitting posture and began a deliberate survey of his surroundings—the empty coffin by his side, the open grave, the tombstones all around.

"The day of resurrection!" said he solemnly; then took another survey of the graveyard. "Yes," he repeated, "the day of resurrection—and I'm the first son of a gun out of the ground!"

### The German Explanations

BY R. W. RAYMOND

To engineers especially, the explanations offered by the German staff and the German press, to account for the successive defeats of the German army, are peculiarly amusing. The other day, we were told that Ludendorff had shown masterly ability in throwing enormous reserves into the Marne salient, so as to facilitate the retreat of the force already there—which reminds me of the story of the Irishman who was seen punching a greenback down between the boards of the Atlantic City boardwalk. His explanation was that he was not wasting the greenback at all—he had lost a nickel in that crack, and he was simply putting enough after it to make it worth his while to take up the planks.

But the latest of these amusing *camouflages* is the pean of triumph over "our victorious retreat," of which the following verses may perhaps be regarded as a sufficiently accurate echo:

#### AN INTERVIEW

"Wilhelm, what blacked your eagle eye?"

"O curious journalist!

It was this eye, now swollen high,  
That smote old Foch's fist!"

"And, Wilhelm, 'seems to me you limp  
And stumble as you go."

"'Tis true, I gave my leg a crimp  
In stamping on the foe."

"O Wilhelm! whence, for goodness' sake,  
That footprint on your seat?"

"That's where he failed to overtake  
My masterly retreat!"

"For I, when he came on apace,  
With frenzy born of fear,  
Strategically saved my face  
Behind my conquering rear."

"Yes, even in battle's dread array  
The leader still I'll be;  
To hostile hosts I'll show the way,  
And they shall follow me!"

"Now let those brazen bands of mine  
Strike up the usual tunes,  
Beginning with *Die Wacht am Rhein*,  
And ending, *Gott mit Uns!*"

## Personals

### Have You Contributed to the Association of the 27th Engineers?

**Albert H. Fay**, of the U. S. Bureau of Mines, spent Sept. 7 and 8 in Lead, South Dakota.

**J. D. Cain**, of Middlesboro, Ky., has been reappointed assistant state mine inspector of Kentucky.

**P. C. Stoess**, of Seattle, Wash., has returned from Alaska, arriving in Seattle about the middle of August.

**Max Atwater** has been appointed manager of the Butte & Plutus mining company in the Philipsburg district of Montana.

**John C. Anderson**, of Tucson, Ariz., has been examining mining property in the region of Oatman, Mohave County, Arizona.

**B. Britton Gottsberger**, general manager of the Miami Copper Co., is back at Miami after a six weeks' vacation in southern California.

**L. S. Rogers**, of Rogers, Norton & Co., New York, has been in Arizona, visiting the Silver King mine at Superior, and the Gibson, at Miami.

**Dwight E. Woodbridge**, of Duluth, Minn., is in Batesville, Ark., studying the manganese situation there. He expects to be there about a month.

**Joseph Walker**, of Joplin, Mo., representing the Edgar Zinc Co., recently spent several days in the North Arkansas zinc and lead field purchasing ore.

**William Koerner**, formerly with the Gray Eagle Copper Co., Siskiyou County, Calif., is now in charge of operations at Majuba Hill, Humboldt County, Nevada.

**C. E. Addams**, who recently resigned as general manager for the Arizona Hercules Copper Co., has leased the Ray silver-lead property three miles from Ray, Arizona.

**Robert George Hall**, formerly general manager of the River Smelting and Refining Co., St. Louis, Mo., is now resident manager of the Burma Mines, Ltd., of Nantun, Burma.

**C. S. Parsons** has been appointed superintendent of the Joseph Dixon Crucible Co.'s graphite mill and mine at Graphite, N. Y. He formerly was with the Mines Branch, Ottawa, Canada.

**W. W. Williams** is at present in Arizona as consulting engineer directing resumption of work on the famous Peck silver bonanza, which El Paso, Texas, men have begun to operate.

**George H. Beaumont**, vice president of Pickands, Mather & Co., will act temporarily as president of the Cromwell Steel Co., of Cleveland, Ohio, in the place of **Max McMurray**, resigned.

**Edwin Young** has been appointed welfare engineer at the Great Falls Reduction Works of the Anaconda Copper Mining Co., a newly created position. Mr. Young has been in the company's employ for 28 years.

**Percy A. Rockefeller** has been elected president of the United Metals Selling Co. to succeed **John D. Ryan**, who resigned in order to devote his time to the service of the Government as Director of Air Service.

**D. L. H. Forbes** is general superintendent for the Teck-Hughes Gold Mines Co., Ltd., of Kirkland Lake, Ont., Canada, the announcement in the Aug. 24 issue of the appointment of **Robert Dye** to the management of this property being in error.

**N. H. Snow**, for many years district purchasing agent for the Illinois Zinc Co., has given up active field work on account of ill health and has been succeeded by his son, **C. W. Snow**, of Platteville, heretofore employed as chemist and assayer by the company.

**R. W. Mackey**, assistant foreman, and **L. M. McBride**, engineer of the Homestake Mining Co. of Lead, S. D., have returned from Denver, where they took the examinations for engineer officers. Both men have been recommended for commissions, and will report soon for training.

**E. E. Dieffenbach**, general superintendent of the Balbach Smelting and Refining Co., Newark, N. J., completed 35 years of service on Sept. 3. His staff and old employees presented him with a handsome gold watch suitably engraved, accompanied by an address of loyalty and appreciation.

**Arthur H. Young**, director of the American Museum of Safety, New York, since Jan. 1, 1917, has resigned to take charge of the employee relations department of the International Harvester Co. **R. M. Little**, formerly a trustee of the museum, has succeeded Mr. Young as director.

**Carl Hayden**, formerly chief engineer and geologist for the Wisconsin Zinc Co. at Platteville, Wis., has gone to Canada in the interests of the Grasselli Chemical Co. **H. S. George**, formerly connected with the Wisconsin Zinc Co. and at one time director of the Wisconsin Mining School at Platteville, has succeeded Mr. Hayden.

**W. H. Locker**, of Duluth, Minn., vice president of the American Manganese Manufacturing Co., Dunbar, Penn., is at Batesville, Ark., buying manganese ore to be shipped to his company's furnace for ferro making. The company is operating mines in the Cuyuna district, but these do not produce an ore entirely suitable for ferro.

**Prof. Volney Lewis**, of Rutgers College, New Jersey, has been studying the chromite deposits and plant of the Carolina Chrome Co., of Waynesville, N. C., on behalf of the U. S. Geological Survey. **S. H. Hamilton**, mining geologist, accompanied Professor Lewis. Mr. Hamilton is at present engaged in field work in North Carolina and Tennessee for the Cranberry Furnace Co., of North Carolina.

**William M. Corse**, general manager of the Titanium Bronze Co., Niagara Falls, N. Y., has resigned to become associated with the Ohio Brass Co., at Mansfield, Ohio. Mr. Corse is a brass foundryman and metallurgist of wide experience. He was elected secretary-treasurer of the American Institute of Metals in 1908 and president in 1917. This organization now constitutes the Metals Division of the American Institute of Mining Engineers.

## Obituary

**J. M. Chambers**, who introduced in New Zealand the Askham-Molloy and Parkes process of extracting gold from refractory ore, died in Wellington on Mar. 6, aged 55. Mr. Chambers erected plants using the process mentioned at Thames, Karangahake and Collingwood. Prior to his illness he was attorney in New Zealand for the Waihi Grand Junction Gold Co., Limited.

## Societies

**American Association of Engineers.** A committee has been appointed to study after-the-war conditions. It comprises **Isham Randolph**, chairman; **Edmund T. Perkins**, **Gardner S. Williams**, and **Samuel Moreell**, secretary. The committee will be enlarged as its work increases and will join its forces with other agencies in the country that are studying the problem. The Chicago chapter tendered its incoming secretary, **C. E. Drayer**, a dinner on Sept. 4 at the City Club, **Isham Randolph** acting as toastmaster. Mr. Drayer outlined some of the problems now before the profession.

**National Safety Council.** The following have been nominated for members of the board of directors of the council to be elected on Sept. 16 at St. Louis: **George T. Fonda**, superintendent, bureau of labor and safety, Bethlehem Steel Co., Bethlehem, Penn.; **Van H. Manning**, U. S. Bureau of Mines; **A. H. Young**, manager industrial relations, International Harvester Co., Chicago; **Robert J. Young**, manager, department of safety and relief, Illinois Steel Co., Chicago; **John J. Eagan**, president American Cast Iron Pipe Co., Atlanta, Ga.; **J. W. Ensign**, general manager, American Car and Foundry Co., Huntington, W. Va.; **E. H. Flesinger**, safety engineer, Semet-Solvay Co., Syracuse, N. Y.; **Dr. L. A. Shoudy**, chief surgeon, Bethlehem Steel Co., Bethlehem; **C. B. Auel**, director of standards, processes and materials, Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pennsylvania.

**Institute of Metals** division of the American Institute of Mining Engineers and the iron and steel section of the same society, together with the American Foundrymen's Association and the American Malleable Castings Association, will meet simultaneously in Milwaukee, Wis., during the week of Oct. 7. The program of the non-ferrous meetings will include a discussion of the conservation of tin. The following papers will be presented: Oct. 8—"The Metallurgy of Tungsten," by **Zay Jeffries**; "The Constitution of the Tin Bronzes," by **S. L. Hoyt**; "Notes on Babbitt and Babbitted Bearings," by **Jesse L. Jones**; "Oxygen and Sulphur in the Melting of Copper Cathodes," by **S. Skowrowski**; and "The Relation of Sulphur to the Overpolling of Copper," by **S. Skowrowski**, with discussion by **Philip L. Gill**. On the morning of Oct. 9 there will be a symposium on "The Conservation of Tin." This topic will be discussed by the following: **G. W. Thompson**, National Lead

Co.; **G. H. Clamer**, Ajax Metal Co., Philadelphia; **C. M. Waring**, Pennsylvania R.R. Co.; **M. L. Lissberger**, Mark Lissberger & Son, Inc., Long Island City, N. Y.; **D. M. Buck**, American Sheet and Tin Plate Co., Pittsburgh; **W. M. Corse**, Buffalo; **G. K. Burgess** and **Mr. Woodward**, Bureau of Standards, Washington, D. C.; **M. L. Dizer**, War Industries Board, Washington, D. C.; a representative of the Niles, Bement, Pond Co., New York; a representative of the bureau of steam engineering, U. S. Navy, Washington, D. C. In the afternoon further papers will be read as follows: "The Volatility of the Constituents of Brass," by **John Johnston**; "Notes on the Metallography of Aluminum," by **P. D. Merica** and **J. R. Freeman, Jr.**; "The Effect of Impurities on the Hardness of Cast Zinc or Spelter," by **G. C. Stone**; "Dental Alloys," by **Dr. Arthur W. Gray**; "Electrolytic Zinc," by **C. A. Hansen**; and "The Condensation of Zinc From Its Vapor," by **C. H. Fulton**, Oct. 10—"Notes on Non-Metallic Inclusions in Bronze and Brasses," by **G. F. Comstock**; "Nichrome Castings," by **Arlington Bengal**; "Fusible Plug Manufacture," by **G. K. Burgess** and **L. J. Gurevich**; "Application of the Spectroscope to the Chemical Determination of Lead in Copper," by **Messrs. Hill and Lucke**; and "Radium," by **Richard B. Moore**. The program of the iron and steel section of the American Institute of Mining Engineers has been tentatively outlined as follows: Oct. 8—"The Limonite Deposits of Mayaguez Mesa, Porto Rico," by **C. R. Pettke** and **Bela Hubbard**; "The Manufacture of Ferroalloys in the Electric Furnace," by **R. M. Keeney**; "The Manufacture of Silica Brick," by **H. Le Chatelier** and **B. Bogitch**; "Notes on Some Iron Ore Resources of the World," "Recent Geologic Developments on the Mesabi Iron Range," discussion by **Anson A. Betts** and **J. F. Wolff**; "A Volute Aging Break," by **Henry M. Howe**; and moving pictures of the triplex steel process, Oct. 9—"The Byproduct Coke Oven and Its Products," by **W. H. Blauvelt**; "The Use of Coal in Pulverized Form," by **H. R. Collins**; "Carbocoal," by **C. T. Malcolmson**; "Low-Temperature Distillation of Illinois and Indiana Coals," by **G. W. Traer**; and "Price-Fixing of Bituminous Coal by the U. S. Fuel Administration," by **R. V. Norris** and others.

## New Patents

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

**Electrolytic Iron**, Process for Making. Axel Theodor Constantin Estelle, Hagen, Germany, assignor to Martin Filip Wijkstrom, Stockholm, Sweden. (U. S. No. 1,275,161; Aug. 6, 1918.)

**Flotation**—Separation of Mixed Metallic Sulphides. Leslie Bradford, Broken Hill, New South Wales, Australia. (U. S. No. 1,274,505; Aug. 6, 1918.)

**Furnace, Electric**. Mark Shoeld, Chicago, Ill., assignor to Armour Fertilizer Works, Chicago, Ill. (U. S. No. 1,274,794-5-6-8; Aug. 6, 1918.)

**Mine Car Brake** for Haulage on Inclines. William J. Mow, Grass Valley, Calif. (U. S. No. 1,274,071; July 30, 1918.)

**Mine Railway Signal**. Joseph A. Muir, Smithboro, Ill. (U. S. No. 1,274,072; July 30, 1918.)

**Nickel Alloy** with Cr, Si and Al; also in which Fe replaces part of Cr. Paul Richard Kuehnrich, Sheffield, England. (U. S. No. 1,273,877; July 30, 1918.)

**Nickel Titanium Alloys** for Resistance Elements. Wilbur B. Driver, East Orange, N. J. (U. S. No. 1,274,250; July 30, 1918.)

**Pig Iron**, Method of Producing. Frank H. Crockard, Birmingham, Ala. (U. S. No. 1,274,245; July 30, 1918.)

**Potash**—Process for Increasing Solubility of the Potassium Content of Cement-Kill Dust. Raymond J. Nestell, Los Angeles, Calif., assignor to International Precipitation Co., Los Angeles, Calif. (U. S. No. 1,274,310; July 30, 1918.)

**Potash**—Process for Recovering the Constituents of Alunite in Technically Useful Forms. Henry J. Detwiler, Allentown, Penn. (U. S. No. 1,274,145; July 30, 1918.)

**Roasting Ore**, Process for. Charles H. Fulton, Cleveland, Ohio, assignor, by mesne assignment, to Metallurgical Laboratories, Inc., Chicago, Ill. (U. S. No. 1,273,844; July 30, 1918.)

**Zinc**, Process of Treating. Charles A. H. de Saulles, New York, N. Y. (U. S. No. 1,274,249; July 30, 1918.)

**Zinc**—Retort-Charging Machine. George W. Whipple and Cloise H. Baldwin, Cherryvale, Kan., assignors to Edgar Zinc Co. (U. S. No. 1,274,120; July 30, 1918.)

## Editorial Correspondence

### SAN FRANCISCO—Sept. 3

**Fatal Injuries from Electricity** in California during the 24 months of 1915 and 1916 numbered 50. In the same period there were 13 permanent and 676 temporary injuries. The cost of compensation and medical fees totaled \$153,566. Tentative electrical station safety orders will be given two public hearings, one on Sept. 12 at Los Angeles and one on Sept. 25 at San Francisco, under the direction of the State Industrial Accident Commission.

**Fatal Injuries in Rock Quarries** in California during the 24 months of 1915 and 1916 numbered 32. There were 60 permanent and 2314 temporary injuries in that period. The total cost in compensation and medical fees was \$176,034. Tentative quarry safety rules were given a public hearing at San Francisco on Aug. 28, and another such hearing will occur at Los Angeles on Sept. 11. These hearings are in charge of the State Industrial Accident Commission.

**The Comstock Northend Mines** in the four weeks ended Aug. 24 milled 2244 tons of ore, having a total value of \$34,099. This represents an average value of \$15.195 per ton and an average weekly production of 561 tons. The Mexican mill was operated about 79% of the total time. The largest total weekly milling production was 704 tons and the smallest, 442 tons. The highest per-ton value of ore milled was \$37.03 and the lowest, \$6.08. In the four weeks the Union Consolidated and Consolidated Virginia ran full milling time, whereas Ophir, Sierra Nevada and Mexican operated only two weeks each. Union Consolidated milled a total of 747 tons, of an average value ranging from \$10.76 to \$22.21; Consolidated Virginia a total of 1121 tons, of an average value from \$11.62 to \$14.75; Mexican, 171 tons, averaging from \$22.14 to \$37.03; Ophir, 65 tons, averaging from \$7.20 to \$8.56, and Sierra Nevada, 140 tons, averaging from \$6.08 to \$12.35. Development has been carried on at various levels from the 1600 at the Union Consolidated to the 2600 level at the Union and Sierra Nevada. From this development ore was saved running from as high as \$74.64 per ton in the Mexican to \$5.67 in Consolidated Virginia.

**Daily Production of Petroleum** in California increased 14,129 bbl. from June 1, 1917, to June 1, 1918, according to reports filed with R. P. McLaughlin, state gas and oil supervisor. This increase is due to developments in the last year in the Montebello and Casmalia fields. The wells in these fields average a daily production per well of 862 bbl. in Montebello and 166 bbl. in Casmalia. But for the results of this development the state would be now facing a serious decrease. The average total daily production in these fields in June, 1918, was 16,322 bbl. in Montebello and 4708 bbl. in Casmalia, making a total daily increase from the two fields of 21,030 bbl. In the week ended Aug. 17, six new wells were made ready to drill, and in the week ended Aug. 24, the number of new wells ready to drill increased to 21, making a total since Jan. 1 of 497 wells. In the same period of 7½ months 814 wells were reported for test of water shut-off. This test is often the most critical operation in the drilling of an oil well. Besides determining whether formations are protected, it is during this test that the operator often obtains the first definite knowledge as to whether he has a productive well, so that operators are especially desirous of the presence of the state supervisor or a deputy. About 50% of the shut-off jobs are reported satisfactory upon the first test. About 40% require further testing. The remaining 10% are rejected as positive failures at the first test. The encouraging outlook for favorable Congressional legislation is having a good effect in many fields of the state, particularly in western Kern County and in the Montebello, Coalinga and Midway. The new work long planned by large companies will be promptly started as soon as the leasing bill is enacted into law. Congressional delay has been largely if not wholly responsible for the unfavorable condition of the oil industry in the state during the last two or three years. There is at present a sprit of optimism abroad

**California Gold Production** in 1917 amounted to \$20,087,504, according to Charles G. Yale, of the U. S. Geological Survey. This is a decrease of \$1,323,237 from the total production in 1916, which amounted to \$21,410,741. In the first half of 1918 the gold production in the state was less than in the first half of 1917 by \$1,174,500, making a total decrease in the 12 months of 1917 and six months of 1918 amounting to \$2,497,737. In the "Journal" of Aug. 17, it was estimated that the decline in gold production in the first half of 1918 was approximately \$2,500,000. The Survey figures are, of course, dependable, as they represent official returns, and the "Journal" figures were based on the writer's individual estimate. The deep mines, which formerly produced 62 to 64% of the total gold, are now producing about 55%, and by the end of 1918 will be producing less. The gold dredges now produce 90% of the placer gold, which was increased about 6% in 1917. Copper, lead-silver and zinc mining have prospered and have drawn many men from the gold-mining camps. Mr. Yale shows that in one gold-mining county having a population of 8000, about 1000 miners left for other fields in the first half of 1918. Nevada County, where the cost increased \$1.15 per ton, produces the highest average per ton value of ores; but in 1917 the average value from 14 mines was only \$7.84, compared to \$9.10 in 1916. And that is approximately the rate of increase in other counties. Although copper mining is prosperous, there was a decrease in production in 1917 of 14% from the production in 1916. There was a decrease of 2.9% in zinc production, but an increase of 7.6% in the production of lead. The copper mines have particularly suffered from labor shortage, in spite of procuring men from the gold-mining counties, although some of the copper mines have increased production. Two mines have been closed down temporarily on account of the high cost of transportation or lack of transportation. Flotation of copper ores has advanced at the Mountain Copper Co., the Engels, the Bully Hill and the Walker plants. Silver production in the first half of 1918 was 32,000 oz. less than in the first half of 1917, so it is apparent that practically all mining in California has been affected by the shortage of labor and lack of transportation, though gold mining has carried the additional burden of a decrease in the purchasing power of gold. There has been notable advancement in chrome and manganese mining, as well as in tungsten; but even these minerals have been hit rather hard by lack of transportation and shortage of labor.

### SALT LAKE CITY—Sept. 5

**The Possible Effect of the New Draft** upon the mining industry in this state in calling to the colors a still larger proportion of available labor, at the present time not too plentiful, is being considered by the Utah chapter of the American Mining Congress, which at a meeting on Aug. 31 appointed a committee consisting of J. C. Lynch, J. M. Bidwell and G. W. Lambourne to look after the interests of labor coming within the limits of the new law. It is felt that in view of the fact that mining is recognized as a war industry, mining companies will be able to obtain permission to retain such men as are actually needed for ore production. At the meeting it was therefore recommended that members be prepared to submit to the district exemption board the names of employees essential to ore production.

**August Shipments from Tintic** of 739 cars exceeded the July output by 119 cars—the tonnage coming from 30 shippers. A car of bullion by the Tintic Milling Co. is of interest as coming from a camp which up to the time of the starting of the milling enterprises in question has been a shipper of entirely first-class ores through a period of many years, and is keeping up its output of ores of this class. A car of manganese ore was shipped by lessees from Chief Consolidated ground. The largest single shipper is the Dragon Consolidated, with 199 cars, which is finding a ready market for its fluxing iron ores. This company will stop mining other ores, which will be exploited under lease by the Tintic Milling Co., which will treat the lower grades at its mill and ship the better ore. The Chief

Consolidated, with 162 cars, is the next heaviest shipper, and shipments are of ores more typical to the district. This company, as is true in general throughout the district, except in the case of several Knight properties shipping to the Tintic Milling, is able to market, with present high costs and labor scarcity, only its higher-grade ores. The complete list of shippers is: Dragon Consolidated, 199 cars; Chief Consolidated, 162; Eagle & Blue Bell, 84; Iron Blossom, 80; Tintic Standard, 69; Centennial-Eureka, 59; Grand Central, 37; Colorado Consolidated, 36; Mammoth, 26; Gemini, 23; Gold Chain, 19; Ridge & Valley, 15; Showers, 6; Swansea, 6; Eureka Hill, 5; Bullion Beck, 4; Yankee, 4; Godiva, 4; Victoria, 4; Scranton, 4; Alaska Lease, 3; Sunbeam, 2; Uncle Sam, 2; May Day, 2; Scotia, 1; Golden Key, 1; Old Susan, 1; Primrose, 1; Huish & Bean (manganese lease) 1; Tintic Milling (bullion), 1.

### TONOPAH, NEV.—Sept. 2

**Activity in Divide District**, six miles south of Tonopah, is greater than in any other camp in southern Nevada, owing to the striking of a large shoot of high-grade ore in the Tonopah Divide mine. In addition to that mine, other properties being worked are: Brouher Divide, Tonopah Dividend, Divide Extension, Gold Zone, Gold Reef, East Divide and Hasbrouck. Chief development work to date has consisted of sinking. In the Tonopah Divide mine, ore has been opened on the 160, 265 and 370 levels. Electric-power lines are being extended to the district. When completed, a compressor and machine drills are to be installed in this property, and shipments made to Goldfield Consolidated mill. At the Brouher Divide mine the shaft is down 177 ft., and drifting is under way. At the Gold Zone mine, the shaft has been sunk 300 ft. and a crosscut driven to the vein, where good assays were obtained. Cross-cutting on the 300 level of the Tonopah Dividend mine is under way. Contract will be let by the Divide Extension Co. to deepen the shaft, now 100 ft. deep. The Hasbrouck mine, in the southwestern part of the district, has been the largest shipper. Sinking of Gold Reef shaft, now down 65 ft., will be resumed. At the East Divide mine a hoisting equipment has been installed, and the power line is to be extended.

### JEROME, ARIZ.—Sept. 3

**The Hull Copper Co. Litigation** has been settled by compromise, which also brings a settlement of all differences between the United Verde and United Verde Extension companies. The published story is that both the Clark and Douglas interests were desirous of securing the Hull property, and that in the summer of 1916 Charles W. Clark, general manager of the United Verde, paid George W. Hull \$1,000,000 cash for his stock in the Hull, Columbia, Consolidated King, and Cleopatra copper mining companies, and for certain surface rights in and about Jerome. This deal included the transfer to Clark of 77% of the stock of the Hull company. The remaining 23% was held by about 4500 scattered stockholders. Soon after the transaction was completed, John H. Page, of Phoenix, and others formed a "Stockholders' Protective Association." Then William H. Kemp, of Boston, brought suit in the superior court of Yavapai County, Arizona, on his own account and that of other minority stockholders, seeking an accounting by Hull of the company business transacted by Hull while he was connected with it. The complaint alleged that after Hull had organized a company capitalized at \$10,000,000, with shares of \$1 each, he traded property owned by him for the outstanding stock, a large amount of which he sold, representing it as treasury stock, and the proceeds of which were not used for development purposes, as the buyers of that stock believed they were to be. Finally Hull, so it was further alleged, attempted to "freeze out" others associated with him, then got title to the property, and later sold it to the Clark interests. Hull died after the suit had been filed. After some delay, a receiver was appointed on the application of the plaintiffs. Rather than give up possession of the property, the Clark interests filed a supersedeas bond of \$1,000,000, as a

guarantee that the minority interests would not suffer. The hearing of the case was set to begin at Prescott, Ariz., on Aug. 26, but was postponed a few days. Meanwhile conferences were held in Los Angeles, Calif., between the Clark interests, represented by Charles W. Clark, general manager, and Robert E. Talley, assistant general manager of the United Verde company, with their attorneys, and representatives of the minority stockholders—William H. Kemp, of Boston; Elmer Sykes, F. W. Lowry, and Hugh McKay, of Denver; John H. Page, of Phoenix, and a number of attorneys representing Douglas and the minority stockholders. When the conferees reached Prescott, the court was informed that a compromise had been arranged and an agreement executed, and this the presiding judge approved and handed down his decree in accordance with the terms thereof. These terms are: That Charles W. Clark is to return 2,500,000 shares of stock to the treasury of the Hull company for cancellation; his title to 5,181,173 shares is confirmed, thus giving him a majority of the stock and control; both sides to the Hull litigation are to pay their own costs; the receiver, who did not undertake any duties, is dismissed, and the Clark supersedeas bond of \$1,000,000 is dissolved. A new board of directors, giving representation to the United Verde Extension and the minority stockholders, as well as the United Verde, takes charge of the Hull affairs at once. The board consists of Robert E. Talley, president; George Kingdon, general manager of the United Verde Extension Co., vice president; Leroy Anderson, of Prescott, attorney for the United Verde Co., secretary; and these, together with Thomas Taylor, superintendent of the United Verde Co. smelter at Clarkdale, and John H. Page, of Phoenix, constitute the directorate.

#### CALUMET, MICH.—Sept. 5

**Copper Mining Companies** of the Lake Superior district have less than three months in which to ship their refined product East by the lake route, for the inland channels and canals cutting through the Keweenaw peninsula will be locked by ice by Nov. 20, or a week later at best. Shipments of copper have been almost entirely by the lake route this year, which has given the producing companies a considerable saving as compared with the all-rail routes. Some small shipments have been made via the Welland Canal and directly to ocean points, these consignments being destined for overseas ports eventually. There has been some increase in lake freights this season, but the increase in rail freight rates, especially since the new schedule of the Government became effective, has been greater, up to 30% in fact, due to the rule making operative the rating of the nearest multiple of 10 after 25% increase is figured. This has not only hit many of the copper-producing companies as regards rates on rock shipments to the mills, but will affect them when it becomes necessary to ship by rail, instead of boat, in forwarding their product to Eastern points. Because of increased rail rates, it is probable that most of the producers will store more copper on their docks this winter, to await the re-opening of lake navigation next spring, than in several years past. In order to do this they must rush every possible pound of the metal East this summer and autumn to meet their over-winter contracts, and will therefore handle by rail only such amounts of the metal as may be absolutely necessary during the winter months. Several cargoes of from one million to three million pounds

of refined copper have been sent down the lakes by boat this summer, and many more are to be shipped. Most of the silver product of the local mines goes East by express.

#### CLEVELAND, OHIO—Sept. 3

**Iron Ore Shipments** from upper lake ports during August totaled 9,725,331 tons, according to "Iron Trade Review." This is a decrease of 933,872 tons from July shipments, which amounted to 10,659,872 tons. Heavier coal and grain shipments and a dock strike at Superior held down the August total. The total amount of ore shipped this year to Sept. 1, is 39,334,264 tons. In 1917 shipments for the same period amounted to 39,221,149 tons.

#### SPOKANE, WASH.—Sept. 5

**"The Gold Situation and Its Remedies"** was the subject of an address by Frank A. Ross before the Gold Conference held here today. He emphasized the fact that there is a vast difference between granting a bounty for the production of gold and decreasing an increase in the standard value of an ounce of gold. The following conditions, he stated, should govern the bounty to be granted on all new gold that this country may produce: "1. That the bounty shall be paid only upon identification of the possessor of bullion and after satisfactory explanation of its origin, payment to be made at such places as shall be designated by proper authorities, notably at the mint or its branches. 2. That, in lieu of bullion, the applicant for bounty shall present certificates from the mint that bought his bullion, or from the public mill or smelter that bought his ores. 3. That all such certificates from public mills or smelters shall be officially endorsed by a Government inspector of ore shipments."

#### TORONTO—Sept. 5

**A Notable Increase in Crude-Oil Production** in Ontario is shown for the first six months of 1918, as compared with those for the corresponding period of 1917. The output of the principal Ontario fields for the first half of the present year was 132,248 bbl. as against 94,492 bbl. during the first six months of last year. The increase is due largely to the development of the Mosa field, the production from which has increased from 2712 bbl. in January to 12,395 bbl. in June. The Plympton-Lambton field, however, shows a great falling off, the production for the first six months of 1918 being only 191 bbl. as compared with 65,379 bbl. during the first half of 1917.

**Gold Mine Operators** are considering the advisability of making an appeal to the Canadian government for an investigation in regard to the high cost of blasting powder, which is a prominent factor in increasing the cost of production. As shown by a statement prepared by one of the gold-mining companies, the price has doubled during the last five years. The ruling quotation on 40% powder, the kind chiefly used, was on Feb. 12, 1913, \$13.10 per 100 lb. in car lots f.o.b. the mine. Since that time it has risen steadily, until on July 10 last it was advanced to \$26.70. The question is regarded as of hardly less vital importance to the gold-mining industry than that of labor shortage.

**Hon. Edward Brown**, provincial treasurer of Manitoba, has announced that a line of railway is to be built soon north from The Pas, to open up the rich copper country, giving access to the Flin Flon and Mandy mines. At the Flin Flon, the copper deposit indicated by diamond drilling comprises approximately 25,000,000 tons, of an

estimated value of \$250,000,000. No work is now being done, the construction of a railway being regarded as an essential preliminary. Smelters must be built at the mine, as the ore is of lower grade than at the Mandy, and this will involve an expenditure of upward of \$4,000,000. Mr. Brown states that the railroad, which will be about 70 miles long, will cost approximately \$2,000,000, and will connect with the Hudson Bay Railway.

**The Canadian Government** has issued an order-in-council prohibiting the export of Canadian silver coin, silver bullion and fine silver bars, excepting under license issued by the Minister of Finance. The reason assigned is the urgent need of silver for coinage by the Allied governments. The regulations governing the issue of licenses provide that they shall be given only in cases where the silver is to be used for civil or military purposes of importance in connection with the war, and where the exporter certifies that it has been purchased at a price which does not directly or indirectly exceed \$1.01½ per oz. 1000 fine at the point where the silver is refined, or at the point of importation in the case of imported silver. As certain silver mines have been able to sell their output for prices above the figure specified, the order has caused some dissatisfaction in mining circles.

#### VICTORIA, B. C.—Sept. 4

**Prospecting and Development** of those minerals in British Columbia which are needed by the Munition Resources Commission of Canada is well under way, according to G. C. Mackenzie, of the geological survey branch of the Canadian Department of Mines. In the Tulameen River district no drilling has been done, but some gravel has been washed, and it has been established that platinum can be obtained. Several claims that are being worked are producing gold and platinum and all making wages. Clean-ups from these claims are to be taken either to the Bank of Montreal or the Bank of Commerce, at Princeton, B. C., whence the mineral will be forwarded to the Dominion Assay Office, Vancouver, B. C., for treatment. Mr. Mackenzie says, in this connection, that the refinery for the handling of platinum and gold, which is being installed at the Vancouver Assay Office, is almost complete and that it will be prepared to take all platinum, with or without gold, that may be offered, paying the market price for the latter and \$105 an ounce for the former. The prices offered for palladium, iridium and osmiridium have not yet been decided, but quotations have been cabled for and will be known soon. With regard to recent manganese discoveries in the Cowichan district, Vancouver Island, Mr. Mackenzie, who just returned from an inspection of one of these properties, situated on the summit of the divide between the Chemalnus and Cowichan rivers and within easy reach by aerial tramway of the Esquimalt & Nanaimo Ry., speaks enthusiastically of its possibilities. Although no development work has been done, samples from the surface ran high in recoveries. As it had been proposed to import ferromanganese from India for use in the manufacture of munitions in Canada, Mr. Mackenzie thought that the situation of these properties on Vancouver Island was of first importance. He thought it likely that the War Trade Board of Canada, in cooperation with the locaters and owners, would arrange for their early development, in which event, owing to their accessibility, it would not be long before ore was being shipped.

## The Mining News

### ARIZONA

#### Cochise County

**HUACHUCA TUNGSTEN** (Huachuca)—Testing processes in new 20-stamp mill.

**ARIZONA UNITED** (Johnson)—Shipping 100 tons daily to El Paso, mainly from lower levels of 1100-ft. incline.

**CENTRAL BUTTE** (Pearce)—Cut commercial ore in deep cross-cut and will start ore shipments, soon.

#### Gila County

**AMERICAN SMELTING & REFINING** (Hayden)—Stack complete and coal-crush-

ing plant adjusted for full operation.

**INSPIRATION CONSOLIDATED** (Miami)—August production was 9,000,000 lb. of copper.

#### Greenlee County

**ARIZONIA COPPER** (Clifton)—Copper produced in August was 4,300,000 lb. July production was 4,000,000 pounds.

#### Mohave County

**CHLORIDE QUEEN** (Chloride)—Operating new hoist and four-drill compressor equipment. Drifting on 220 level, and will

enlarge stoping area. To ship within 60 days.

**SCHUYLKILL** (Chloride)—Retimbered old Tennessee shaft and extended tracks on 900 level. Plans have been made for large mill.

**GOLD TRAILS** (Little Meadows)—Sinking shaft 300 ft. to drift under known orebody. D. A. McMillen in charge.

**CYCLOPIC** (White Hills)—McDonald, Ramsey and Wright are operating 75-ton mill. Dry crushing and cyaniding securing a recovery of 90 per cent.

**Santa Cruz County**

**EXPOSED REEF** (Patagonia)—Leased by Sullivan, Dawson & Harrington, who are installing new surface equipment.

**WORLD'S FAIR** (Patagonia)—Installing 100-ton tube mill transferred from the abandoned Montana camp in Ore Blanco district.

**COMET** (Washington)—Shipped first carload of high-grade manganese.

**CONSOLIDATED ARIZONA COPPER** (Washington)—Received hoist and other surface equipment. Shaft down 100 feet.

**MORNING GLORY** (Washington)—Experimenting with new process for treatment of complex low-grade ores.

**MOWRY** (Washington)—Developing large bodies of low-grade manganese. Concentrating machinery has been ordered.

**Yavapai County**

**CALUMET & JEROME** (Jerome)—Number five drill-hole down over 250 ft. in schist containing copper ore; also quartz and hematite.

**ARKANSAS****Boone County**

**COON HOLLOW** (Zinc)—Active operations started after some months' shutdown.

**GLORIA** (Zinc)—Milling tailings pile.

**Independence County**

**EUREKA** (Batesville)—To build 50-ton log washer and will purchase pumps and piping.

**POLK-SOUTHARD** (Batesville)—To build 50-ton log washer and will purchase washers, belts, pumps, engine and piping.

**Marion County**

**O'MEARA** (Buffalo)—Started active mining and milling operations after several months' shutdown. Produces high-grade carbonate of zinc.

**PARADISE** (Dodd City)—Purchased by Salina Mining Company.

**MORNING STAR** (Rush)—Prospecting manganese outcrop recently found overlying zinc strata.

**LONE STAR** (Yellville)—Two of three drill holes have cut rich bodies of carbonate and jack at shallow depths. To thoroughly drill ground and develop.

**CALIFORNIA****Butte County**

**SURCEASE** (Oroville)—Cave-in of shaft disclosed rich vein or ore, indicating a second gold-bearing ledge. Under development by Goldfield Consolidated, of Nevada.

**Del Norte County**

**CHROME DEPOSIT** discovered near Owl Chrome mine in French Hill district by Silas White.

**CHROME ORE** mined at French Hill to be hauled to Crescent City in motor trucks by M. M. Boutz.

**NEW CHROME DEPOSITS**, including five claims on Patrick's Creek, to be developed by Fred Beam, of Smith River.

**RED MOUNTAIN** (Requa)—To ship chrome ore by burro pack train. New discoveries of chrome reported.

**Eldorado County**

**RISING HOPE** (Placerville)—Ventilation by use of water from tunnel for driving compressed air a distance of 3100 ft. up a 7% grade, installed by George W. Englehart, superintendent, is proving successful.

**Humboldt County**

**CHROME ORE SHIPMENTS** from Eureka average three cars a week, from Low Divide district, in Del Norte County, and Pecwan Creek district, in Humboldt County.

**Plumas County**

**TRASK & COFFER** (San Francisco)—To install mill and drive 500-ft. tunnel on vein showing copper and silver. Situated in Moonlight mining district.

**San Luis Obispo County**

**MANGANESE DEPOSIT** near Berros, in Los Berros mining district, discovered by W. D. Murray, of San Luis Obispo, and E. E. Murray, of Jolon. Wear brothers have also discovered manganese in the same district while operating a chrome mine.

**LOS ANGELES MANGANESE** (Los Angeles)—To mine and reduce manganese ores from deposits operated under lease.

**Sierra County**

**HILO** (Downieville)—Extensive gravel cut by 100-ft. drift. Sluicing to begin with first rains. Produced profits for some years.

**Siskiyou County**

**EASTERN MINING** (Gottville)—Chrome deposits discovered at Donnemore, in Siskiyou Mountains, near Oregon line. Four-mile motor road built from mine through Klamath forest. Soft formation will reduce cost of mining.

**Trinity County**

**CHROME DEPOSITS** discovered near South Fork Mountain and Elpaton Creek by W. Pelletreau and associates. U. S. Forestry Service contemplates road into district provided 2000 tons of ore can be promised for hauling. Manganese and lime rock also reported.

**Yuba County**

**CENTRAL SOUTH YUBA** (Grass Valley)—To develop property near Jones Bar and install mill. Ore carries copper, high sulphur content and some gold and silver. J. A. Coley and J. E. Craig are owners.

**COLORADO****Clear Creek County**

**GEORGETOWN TUNNEL** (Georgetown)—New four-drill compressor and electric equipment have been installed, but company is experiencing difficulty in securing air pipe, on account of slow delivery.

**SCEPTRE** (Georgetown)—Temporarily closed down on account of negotiations between lessor and lessee. Development during the last year was: Sceptre tunnel cleaned out and retimbered; 300 ft. of drifting done in east stopes; main raise of 370 ft. to Grant tunnel completed and 60 ft. of drifting was done on 275 level. Small vein of good silver-lead ore has been opened. Property recently equipped with bunk houses to accommodate 60 men, and the new 7000-ft. Broderick & Bascom wire-rope tramway has been completed. New railroad spur from the Colorado & Southern track has been completed to the lower tramway terminal.

**CROWN POINT AND VIRGINIA** (Idaho Springs)—Old workings have been cleaned out and retimbered and 70 ft. of drifting has been done on oreshoot 400 ft. east of shaft. New orebody contains pockets of high-grade ore. Ninety feet of stoping ground remains over the new drift.

**San Juan County**

**BULLION KING** (Silverton)—Has been leased to local operators, who have reopened mine and plan active development. Surface plant to be overhauled and remodeled. The tunnel will be cleaned out and retimbered.

**San Miguel County**

**RADIUM ORE SAMPLING** (Montrose)—Has completed a rare-ore custom sampler at a cost of 12,000, and is prepared to receive and sample all kinds of rare metal-bearing ores and concentrates. Company does not assay ores nor buy them, but samples the ores for the owners, charging for this service a suitable fee for handling. In connection with the sampler the company has provided a storage warehouse in which lots of ore can be held for a short period, either for the purpose of taking advantage of variations in market quotations or in order to await favorable shipping facilities. This company is probably the pioneer in rare-metal custom sampling. O. Barlow Willmarth is manager.

**BELMONT-WAGNER** (Ophir)—Recently transported the ten-ton bed plate of a compressor in sections and will rejoin them by the use of oxy-acetylene welding apparatus.

**Summit County**

**TONOPAH PLACERS** (Breckenridge)—No. 1 dredge now working through old ground to new Magnum Bonum placer, which, it is expected, will take several years to dredge. No. 2 dredge is working ground leased from Farncombe Hill Gold Dredging Co. Lewisohn interests had a contract to work this ground on royalty basis, and lease was acquired by Tonopah company from them. No. 3 dredge working adjoining ground that belongs to company. Large areas of dredging ground not contiguous are owned, as well as rights of way between them now acquired.

**Teller County**

**BIG TOAD** (Cripple Creek)—Mill has been remodeled and has resumed operations.

**IDAHO****Bonner County**

**FALLS CREEK** (Sandpoint)—To build concentrator to cost \$40,000.

**Shoshone County**

**NABOB CONSOLIDATED** (Kellogg)—Hauling ore to railroad. Orebody cut in

Nabob raise followed 30 ft. to lower tunnel of the Denver.

**JACK WAITE** (Union)—To resume shipments. Idle for some time awaiting completion of road. To use motor truck.

**KANSAS****Joplin District**

**MISSISSIPPI QUEEN** (Baxter Springs)—To build 250-ton mill and expect to purchase tables, belts, ore cars, crushers, conveyors and compressor. W. H. Beny is manager.

**INSPIRATION** (Joplin)—Drilling before proceeding with operation of mill.

**MICHIGAN****Copper District**

**SENECA** (Calumet)—Shaft sunk to 1080 ft. and progressing rapidly.

**FRANKLIN** (Demmon)—Averaging 1000 tons per day. Extended work planned at No. 2 if men can be secured.

**MOHAWK** (Gay)—Turbine installed at mill site. Shaft down 30 ft. and expected to reach limit of 125 ft. in September. When complete, drift will be extended 2000 ft. into lake to provide water for mills.

**QUINCY** (Hancock)—Rich pocket of mass and stamp copper extends from 65 to 67 level.

**ISLE ROYALE** (Houghton)—Electric haulage is keeping up daily tonnage.

**NEW BALTIC** (Houghton)—Shaft sunk 60 ft. below second level.

**NORTH LAKE** (Houghton)—Operations confined to two exploration openings.

**AHMEEK** (Kearsarge)—Shipping 90 cars daily and has full quota of men.

**WHITE PINE EXTENSION** (Kearsarge)—Has pulled pumps which were worked two months after mine closed down.

**MICHIGAN** (Rockland)—Shipments stopped temporarily owing to water trouble at Winona mill.

**MINNESOTA****Cuyuna Range**

**SULTANA** (Ironton)—Washing plant in operation and treating 1900 tons per 24 hours.

**Mesabi Range**

**STATE MINE SHIPMENTS** for the week ended Aug. 17 were: Hanna "A" mine; 3010 tons; Helmer, 9917; Leonidas, 18,675; Pool, 1300; Smith, 5850; Deacon, 820; Wacootah, 11,592; Shiras, 1610; Wanless, 2760; Woodbridge, 4730; Frantz, 9360; Thompson, 11,376; Philbin, 9954; Grant, 17,708; Missabe Mountain, 51,024; Hill Annex, 8610, and Majorca, 9880 tons. Total 178,176 tons.

**REPUBLIC IRON AND STEEL** (Gilbert)—Company planning agricultural exhibit for its Mesabi range employees.

**OLIVER** (Hibbing)—Contract let to move 60 houses from old town site to new Oliver addition at Alice.

**MISSOURI****Joplin District**

**SHARP & CO.** (Aurora)—To build 150-ton mill on Bonanza lease, and will purchase tables, crushers, compressors, drills and conveyors.

**STANLEY & CO.** (Aurora)—To build 150-ton mill and will purchase tables, boilers and crushers.

**UNION** (Aurora)—Mill sold and being moved to Hockerville, Oklahoma.

**BANKERS** (Bell Center)—Contract let to James A. Jeffcott, Joplin, to build 250-ton mill. Need, but have not purchased, boilers, tables, compressors, conveyors and ore cars.

**LUCKY GIRL** (Carthage)—To build 300-ton mill near Baxter Springs, Kan., and will purchase tables, ore cars, compressors, engine, boilers and conveyors.

**SILVER PLUME** (Duenweg)—To remodel 200-ton mill, and expect to purchase tables, compressors, ore cars and track. W. H. Logan is superintendent.

**JULIAN** (Joplin)—To build 150-ton mill and will purchase tables, compressors, drills, ore cars and conveyors.

**MANSFIELD** (Mansfield)—To build 250-ton mill, and expect to purchase tables, crushers, ore cars, conveyors and compressors. J. R. Sandage is superintendent.

**BUTLER BROS.** (Waco)—To build 250-ton mill at an estimated cost of \$65,000. Will purchase crushers, boilers, ore cars, track, tables, compressors, pipe and conveyors.

**FRANK DANGLADE (Waco)**—To build 250-ton mill, and will purchase tables, crushers, conveyors, compressors, engine boilers and drills.

### MONTANA

#### Beaverhead County

**BOSTON AND MONTANA DEVELOPMENT (Elkhorn)**—To begin shipments upon completion of spur from Divide to the mine. A 500-ton mill is to be built at the mine when material can be shipped in.

#### Jefferson County

**ALTA (Corbin)**—New electric plant installed. Pumping water from old workings.  
**MT. WASHINGTON (Wickes)**—Shipping 30 ton of galena ore per day to railway at Wickes.

#### Lewis and Clark County

**HELENA (Helena)**—Recently purchased by Cruse Consolidated Mining Co. Cross-cutting and drifting on 400 level.

**SCRATCH GRAVEL GOLD (Helena)**—New vein cut by lessees. Company expects to resume operations.

**BALD BUTTE (Marysville)**—Shaft on new vein in good-grade gold ore.

#### Silver Bow County

**DAVIS DALY (Butte)**—Has cut new vein in Hibernia mine 200 ft. north fissure on 150 level, which shows good ore. To crosscut for new vein on 400 level.

**TUOLUMNE COPPER (Butte)**—Enlarging of ore bins at Butte Main Range delayed by slow delivery of material.

### NEVADA

#### Churchill County

**NEVADA HILLS (Fairview)**—Entire equipment to be sold. Material includes 20-stamp mill cyanide plant, hoist and headframe, compressor plant, blacksmith and machine shop, assay office, office and equipment, boarding house and 14 cottages.

**NEVADA WONDER (Wonder)**—Mill treating 150 tons daily. Some ore being mined on 2000 level. Best ore stoped between 500 and 700 levels.

#### Esmeralda County

**GAILLAC-KUSICK GROUP (Goldfield)**—Manganese claims to be developed under lease by Carl Fuetch, of Goldfield.

**LONE STAR CONSOLIDATED (Goldfield)**—Company refinanced and development to be resumed soon on larger scale. G. B. Hartman is manager.

**RED HILL FLORENCE (Goldfield)**—Ore from development on 400 and 500 levels awaiting shipment. Crosscut on 400 level has opened new vein.

#### Lyon County

**MINING REVIVAL IN COMO**, an old gold-silver camp near Dayton, is under way. Some properties being worked again, and examinations recently made in district.

**COMO CONSOLIDATED (Como)**—Ten-stamp mill operating steadily on good-grade gold ore.

**NEVADA-DOUGLAS (Ludwig)**—Shipments from mines to be increased to 300 tons daily at the Ludwig mine. Shaft to be sunk to 900 level.

**MASON VALLEY MINES (Thompson)**—Ore receipts at Thompson smelting plant for week ended Aug. 21 were: Mason Valley Mines, 1673 tons; Bluestone, 1573; Nevada-Douglas, 958; miscellaneous, 398 tons. Receipts lower than average.

#### Mineral County

**AURORA CONSOLIDATED (Aurora)**—In spite of low-grade rock, scarcity of labor and shortness of supplies, mill is handling 400 to 500 tons per day, contrary to report that property had closed down.

#### Nye County

**NORTH STAR (Tonopah)**—Ore opened recently on 900 level.

**TONOPAH EXTENSION (Tonopah)**—Concrete work for new pump installation on 1680 level nearly complete. After pump is installed, new headframe will be built, and shaft sinking resumed. Station now being cut on 1750 level.

### NEW MEXICO

#### Grant County

**LUCKEY AND McKEEGHAN (Lordsburg)**—Opening fluorspar property in Mayflower district of Arizona and making shipments from Duncan, Arizona.

**MAPLE AND LISSO SYNDICATE (Lordsburg)**—Consolidation of interests operating the following properties: Bounds and Rice, O. T. Phillips, and T. Edwards fluorspar properties, and the Willow Spring, Cap Rock and McKeeghan manganese properties, consisting of 27 claims. J. P. Porteus, is consulting engineer.

### OKLAHOMA

#### Johni District

**UNION (Hockerville)**—To remodel 200-ton mill, and expect to purchase tables, compressors and crushers.

**AMALGAMATED (Miami)**—To build 250-ton mill near Picher and will purchase tables, motors, crushers, conveyors and ore cars. H. T. Huddleston, Webb City, is superintendent.

**ATOKO (Miami)**—Building 300-ton mill near Bob White lease. Need, but have not purchased, tables, crushers, compressors, drills, ore cars and conveyors. E. W. Aplegate is superintendent.

**BUCK SHOT (Miami)**—To remodel 250-ton mill and expect to purchase tables, belts, conveyors and ore cars.

**MOGUL (Miami)**—To build 250-ton mill near Picher, and will purchase tables, crushers, compressors, conveyors and ore cars. A. E. Dunlap is superintendent.

**ZUNI (Miami)**—Sinking shaft east of Leadville in Lincolnville district.

**GOLDEN ROD (Picher)**—To build two concentration plants, capacity 250-tons. Will purchase crushers, tables, compressors and drills. George Smoyer is superintendent.

**CANTON (Quapaw)**—Started new mill at old Mission mine after several months' idleness. Otis White is superintendent.

**DULUTH-MIAMI (Quapaw)**—Shaft in ore. Drifting preparatory to building mill.

**SPELTER (Quapaw)**—To build 250-ton mill at an estimated cost of \$65,000. In the market for crushers, compressors, tables, drills and belts. Whit. M. Grant, Oklahoma City, is manager.

**SUMMIT (Quapaw)**—Has installed 75 hp. oil engine in shaft to operate pump.

### SOUTH DAKOTA

#### Lawrence County

**DEADWOOD LEAD AND ZINC (Deadwood)**—Concentrator to be placed in commission this month. Orebodies of sufficient size to assure a steady production.

**TITANIC (Deadwood)**—Contract let to drive 1200 ft. of tunnel, and work has started. New work will explore virgin ground and act as drainage for old workings. Property at one time a large silver producer.

### TENNESSEE

#### Hamilton County

**CHATTANOOGA ELECTRO-METALS (Chattanooga)**—To manufacture ferrosilicon. Had planned to manufacture ferrochrome, but changed at request of War Industries Board. Company subsidiary of Southern Ferro-Alloys Company.

### TEXAS

#### Brewster County

**QUICKSILVER PRODUCERS** situated in the Terlingua district are: Chisos, Marfa and Mariposa and Big Bend mines at Terlingua and the W. K. Ellis mine near McKinney Springs.

### UTAH

#### Juab County

**EAGLE & BLUE BELL (Eureka)**—Work resumed on 200 level to follow continuation of orebodies at higher levels.

**TINTIC STANDARD (Eureka)**—Main working shaft to be extended below 1300 level, which it has now reached.

**COLORADO CONSOLIDATED (Silver City)**—Development work being done. Foundations laid for new Ingersoll-Rand 1700 cu. ft. compressor.

#### Salt Lake County

**ALTA TUNNEL & TRANSPORTATION (Alta)**—Tunnel in 3500 ft. Increased mineralization and larger flow of water showing.

**LITTLE COTTONWOOD TRANSPORTATION (Alta)**—Line running between Wasatch and Alta carrying about 175 tons daily.

**HOWELLS (Salt Lake)**—Boarding house completed and arrangements for winter work being made.

### Summit County

**PARK CITY SHIPMENTS** for the week ended Aug. 31 amounted to 3,301,050 pounds.

**PARK CITY KING (Park City)**—Main working tunnel in 500 ft., and mineralization increasing. Thought to be approaching expected orebody.

### VERMONT

#### Lamoille County

**AMERICAN MINERAL (Johnson)**—Completed installation at hydro-electric mill. Power supplied by Village of Morrisville, over an eight-mile transmission line. Power to be supplied to company's talc mines.

### VIRGINIA

#### Giles County

**STANGE (Narrows)**—Building mill to handle manganese ore; also camps and railroad tracks. Will purchase 300-ton jaw crusher and 15 four-yard narrow-gauge, side-dump cars. O. Stange is superintendent.

### WASHINGTON

#### Okanogan County

**JENKINS-HAMMOND (Nespelem)**—Completing construction of 100-ton concentrator and flotation plant to treat ores of Great Metals Mining and Milling Co. and the Double Header mines, of Nespelem, Wash. Will also conduct a general milling business for other ores produced in the Moses mining district.

#### Stevens County

**UNITED COPPER (Chewelah)**—Has signed three-year contract with Tacoma smelter. Heavy exchange rate on money one of reasons for ceasing shipments to Trall smelter.

**SPOKANE CONSOLIDATED TUNGSTEN (Loon Lake)**—Organized to take over 320 acres belonging to Tungsten King, Blue Grouse and Spokane Tungsten companies. F. E. Parks, Deer Park, Wash., is president. To start 50-ton mill before Sept. 15. Shaft unwatered and down 115 ft. in ore.

**ELECTRIC POINT (Northport)**—Development of ore on 800 level proceeding. To complete aerial tramway soon.

### WISCONSIN

#### Zinc-Lead District

**HERCULES (Cuba City)**—Valuable discovery of zinc ore made on the Henry Kettler farm, one mile east of Elmo. Erecting small milling plant. Otto Seemiller and others, of Dubuque, are interested. R. A. Fox is general manager.

**LITTLE PLATTE (Platteville)**—Completed 50-ton mill on the James Tracey land, six miles west of Platteville. Raymond Piquett is general manager.

**VINEGAR HILL ZINC (Platteville)**—New Jefferson mill at Hazel Green placed in operation producing zinc concentrates. To sink new shaft on Copeland land at Shullsburg, where ore range has been proved by drilling.

### CANADA

#### Ontario

**WHITE RESERVE (Elk Lake)**—Has again suspended operations.

**MINING CORPORATION (Cobalt)**—Has taken over development of Ophir Cobalt Co. under option.

**GIROUX CLAIMS (Lorrain)**—Have been leased by J. J. Anderson, Gordon Cameron and George Watts, who will mine high-grade ore and ship to Cobalt.

**ONTARIO-KIRKLAND (Kirkland Lake)**—Plant to be installed and ready for operation by November 1.

### MEXICO

#### Hidalgo

**SANTA GERTRUDIS (Pachua)**—A 29-year lease has been acquired on three groups of mines by Beneficiadora Mexican Milling Co., a subsidiary. Properties are El Bordo, Malinche and Christo.

### PERU

#### Junin

**CERRO DE PASCO (Cerro de Pasco)**—August production was 2893 tons of blister copper.

### SOUTH AFRICA

#### Witwatersrand

**MEYER & CHARLTON (Doornfontein)**—Shaft accident caused death of 27 miners on July 13.

# The Market Report

## SILVER AND STERLING EXCHANGE

Sept.	Sterling Ex-change	Silver		Sept.	Sterling Ex-change	Silver	
		New York, Cents	Lon-don, Pence			New York, Cents	Lon-don, Pence
5	4.7550	101½	49	9	4.7550	101½	49½
6	4.7550	101½	49	10	4.7550	101½	49½
7	4.7550	101½	49	11	4.7550	101½	49½

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

## DAILY PRICES OF METALS IN NEW YORK

Sept.	Copper		Tin		Lead		Zinc
	Electro-lytic	Spot.	N. Y.	St. L.	N. Y.	St. L.	
5	*26	↑	8.05	7.75			8½
6	*26	↑	8.05	7.75			@9.05
7	*26	↑	8.05	7.75			@9.15
9	*26	↑	8.05	7.75			@9.15
10	*26	↑	8.05	7.75			@9½
11	*26	↑	8.05	7.75			@9½

\*Price fixed by agreement between American copper producers and the U. S. Government, according to official statement for publication on Friday, September 21, 1917, and July 2, 1918.

†No market.

The above quotations (except as to copper, the price for which has been fixed by agreement between American copper producers and the U. S. Government, wherein there is no free market) 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 the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

The quotations for electrolytic copper are for cakes, ingots and wirebars.

We quote electrolytic cathodes at 0.05 to 0.10c. below the price of wirebars, cakes and ingots.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

## LONDON

Sept.	Copper			Tin		Lead		Zinc
	Standard	Electro-lytic	Spot	Spot	3 M.	Spot	3 M.	
5	122	122	137	349½	349½	29½	28	54
6	122	122	137	347½	347½	29½	28	54
7	122	122	137	343½	343½	29½	28	54
9	122	122	137	343½	343½	29½	28	54
10	122	122	137	343½	343½	29½	28	54
11	122	122	137	343½	343½	29½	28	54

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given, reckoning exchange at \$4.7515: £294 = 6.2576c.; £54 = 11.4545c.; £110 = 23.3333c.; £125 = 26.5151c.; £260 = 55.1515c.; £280 = 59.3937c.; £300 = 63.6362c. Variations, £1 = 0.2121205c.

## Metal Markets

### NEW YORK—Sept. 11, 1918

The metal markets have arrived at the stage where there is nothing in the way of price movements to be reported, zinc being the only one of the major metals in which there is now a free and fluctuating market.

**Copper**—The refinery production in July showed a large increase, which created the

feeling that the situation was becoming easier, but it appears that the statistical increase in that month was due to the arrival of an accumulation of Chile copper and certain other abnormal conditions, the total therefore reflecting no real step ahead in the refining situation. According to preliminary estimates, the August production was materially less than the July figures. Of course, the hot weather of August was a retarding factor. The statistics of mine production show a decreasing tendency.

Miners, smelters and refiners are all alarmed over the prospects of further diminution of their working forces by military draft, and will do everything possible to cause their employees to be placed in deferred classes.

**Copper Sheets**—The base price of copper sheets has been advanced 1c. and is 35½c. per lb. Copper wire is quoted at 29 and 30c. per lb. f.o.b. mill, carload lots, subject to any change in the price of copper.

**Lead**—The tightness continues. At the request of the War Industries Board the Lead Producers' Committee has now undertaken the full management of the lead business on the same lines as the Copper Producers' Committee, but in addition thereto is attending to all sales, the several producers having put their supplies in the hands of the committee.

The August production was a trifle larger than that of July. There is understood to be considerable supply of lead in ore and base bullion at the smelters and refineries, at which congestion, due especially to shortage of labor, is preventing its conversion into refined lead.

The Lead Producers' Committee for War Service issued the following notice under date of Sept. 7, 1918: "Until further notice, retail dealers must limit their prices for virgin, re-melted and scrap lead, to the following amounts in excess of the ruling wholesale price for virgin pig lead, delivered at the same destination: One ton or over, \$0.50 per 100 lb. (ex warehouse); less than one ton, \$0.75 per 100 lb. (ex warehouse). Dealers are to make no new sales, nor shipments under existing contracts, of virgin pig lead in carload lots. Unless cleared by this committee, no sales for export of retail lots must be made. Retail dealers may be supplied by the producers solely on condition that they govern themselves accordingly, and also that they will endeavor to prevent the use of lead for non-essential work."

**Tin**—There was very little business, owing to the report that tin buying and distribution are to be handled by the Allied governments through a committee sitting in London. This committee is to comprise two members from the United States, two from Great Britain, and one each from Holland, China and Japan. It is understood that the American members will be Messrs. Hughes and Armsby.

As an index to the market, Chinese and Banka tin were mentioned at somewhere around 77@78c. Singapore quoted £349½, c.i.f., London, on the 5th; £347½ on the 6th; £343½ on the 9th; £341½ on the 10th; £339½ on the 11th.

**Zinc**—After the decline last week, resulting from free offerings from Western smelters, the market stiffened up very suddenly and very sharply, apparently in anticipation of a large Government order to be placed. Inquiries from France indicated also that that country is desirous of buying American spelter.

**Zinc Sheets**—Unchanged at \$15 per 100 lb. less usual trade discounts and extras as per list of Feb. 4.

## Other Metals

**Aluminum**—Unchanged at 33c. per lb.

**Antimony**—The situation is very strong, and it is nothing but the existence of unsold stocks that prevents the price from rising in this market. We quote spot at 14@14½c. The Chinese producers complain of their inability to ship antimony here, owing to silver exchange being very high. Unless we can export silver to the East we may not be able to import antimony.

**Bismuth**—Metal of the highest purity for pharmaceutical use is quoted at \$3.50 per lb. for wholesale lots—500 lb. and over.

**Cadmium**—This metal is quoted at \$1.50, \$1.75 per pound.

**Nickel**—Market quotations: Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

**Quicksilver**—We quote \$125@130, with a stronger tone than last week. San Francisco reports, by telegraph, \$118, steady.

## Gold, Silver and Platinum

**Gold**—Notice of new regulations governing the withdrawals of gold bars has been issued by Verne M. Bovie, superintendent of the New York Assay Office. The notice follows new regulations drafted by the Director of the Mint, and provides:

1. Gold bars for use within jurisdiction of the United States may be withdrawn only upon presentation of an industry priority certificate issued by the War Industries Board.

2. Bars intended for exportation may be withdrawn only upon presentation of an exportation license issued by the Federal Reserve Board.

3. In all other cases a special order of the Secretary of the Treasury is necessary.

4. The withdrawal of gold bars against the deposit of gold bullion may continue unrestricted, not being affected by the order.

**Silver**—Market unchanged, with continued inquiry from abroad for supplies for London and India. Domestic demands have fallen off owing to disposition of silversmiths to purchase more moderately than is usual at this season of the year. Shipments to London for the week ended Sept. 7 were 1,288,000 ounces.

Mexican dollars at New York: Sept. 5, 78; Sept. 6, 78; Sept. 7, 78; Sept. 9, 78; Sept. 10, 78; Sept. 11, 78.

**Platinum**—According to Washington dispatches, Ray Baker, Director of the Mint, will act as Platinum Administrator. His duty will be to collect all platinum, refine it and deliver it to the War and Navy departments as they require it.

**Platinum, Palladium and Iridium**—Prices fixed at \$105, \$135 and \$175, respectively.

## Zinc and Lead Ore Markets

**Joplin, Mo., Sept. 7.**—Blende, per ton, high, \$77.50; basis 60% zinc, premium, \$75; Class B, \$65@60; Prime Western, \$50; calamine, basis 40% zinc, \$38@33; Average selling prices: blende, \$52.61; calamine, \$36; all zinc ores, \$51.69.

Lead, high, \$105.50; basis 80% lead, \$100@102; average selling price, all grades of lead, \$100.84 per ton.

Shipments the week: Blende, 12,719; calamine, 670; lead, 1218 tons. Value, all ores the week, \$815,980.

Light orders were in the hands of a majority of buyers this week, affording an opportunity to those buying to further reduce the basis price \$2.50 per ton, with spelter stronger. Sellers were slow to accept the reduced price, but some had to meet first-of-month accounts and sold. The large shipment is the result of heavy buying two weeks ago, the car situation just bringing relief to shippers.

**Platteville, Wis., Sept. 7.**—Blende, basis 60% zinc, highest settlement price reported \$71.25. Base price for premium grade, \$75; base price for high-lead blende, \$50 to \$52.50 per ton. Lead ore, basis 80% lead, \$95 per ton. Shipments reported for the week were 2339 tons blende, 84 tons galena, and 703 tons sulphur ore. For the year to date the totals are 89,511 tons blende 5028 tons galena and 33,846 tons sulphur ore. During the week 2511 tons blende were shipped to separating plants.

## Other Ores

**Chrome Ore**—Easier. Ore of 40% grade is quoted nominally at \$1.40 per unit, but business was reported at concessions from that price.

**Manganese Ore**—Unchanged.

**Molybdenum**—There seems to be a little more inquiry.





# Current Prices—Materials and Supplies

## IRON AND STEEL

**SHEETS**—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots	St. Louis	Chicago	San Francisco	New York	
	Pittsburgh				Current	One Yr. Ago
No. 10	4.25	5.52	5.52	6.50	5.495	9.50
No. 12	4.30	5.57	5.57	6.55	5.545	9.55
No. 14	4.35	5.62	5.62	6.60	5.595	9.60
<b>Black</b>						
Nos. 18 and 20	4.80	6.32	6.32	7.40	6.295	9.80
Nos. 22 and 24	4.85	6.37	6.37	7.45	6.345	9.85
No. 26	4.90	6.42	6.43	7.50	6.395	9.90
No. 28	5.00	6.52	6.52	7.60	6.595	10.00
<b>Galvanized:</b>						
No. 10	5.25	6.97	6.97		6.845	
No. 12	5.35	6.97	6.97	7.95	6.795	
No. 14	5.35	6.97	6.97	8.10	6.945	
Nos. 18 and 20	5.65	7.17	7.17	8.25	7.245	11.40
Nos. 22 and 24	5.80	7.32	7.32	8.40	7.295	11.55
No. 26	5.95	7.47	7.47	8.55	7.445	11.70
No. 28	6.25	7.77	7.77	8.85	7.745	12.00

**STEEL RAILS**—The following quotations are per gross ton f. o. b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh		Chicago	
	Current	One Year Ago	Current	One Year Ago
Standard bessemer rails	\$55.00	\$38.00	\$65.00	\$38.00
Standard openhearth rails	57.00	40.00	67.00	40.00
Light rails, 8 to 10 lb.	3.13*	83.00	3.13*	68.00
Light rails, 12 to 14 lb.	3.09*	82.00	3.09*	67.00
Light rails, 25 to 45 lb.	3.00*	75.00	3.00*	65.00

\* Government price per 100 lb.

**TRACK SUPPLIES**—The following prices are base per 100 lb. f. o. b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh		Chicago	St. Louis	San Francisco
	Current	One Year Ago			
Standard railroad spikes, 1/4-in. and larger	\$3.90	\$5.00	\$4.50	\$5.30	\$6.70
Track bolts	4.90	6.25	5.50	Premium	8.00
Standard section angle bars		3.65	4.45	Premium	5.15

**STRUCTURAL MATERIAL**—The following are the base prices f. o. b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill, Pittsburgh	New York		St. Louis	Chicago	San Francisco	Dallas
		Current	One Year Ago				
Beams, 3 to 15 in.	\$3.00	\$4.245	\$5.25	\$4.27	\$4.27	\$5.25	\$5.50
Channels, 3 to 15 in.	3.00	4.245	5.25	4.27	4.27	5.25	5.50
Angles, 3 to 6 in. 1/4 in. thick	3.00	4.245	5.25	4.27	4.27	5.25	5.50
Tees, 3 in. and larger	3.00	4.245	5.30	4.27	4.27	5.55	5.50
Plates	3.25	4.495	9.00	4.52	4.52	5.50	6.50

**STEEL SHEET PILING**—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
\$4-5	\$4-5	\$4.50

**RIVETS**—The following quotations are per 100 lb.:

	Warehouse		San Francisco	Dallas
	Mill, Pittsburgh	New York		
1-in. and larger	\$4.65	\$5.65	\$7.00	\$8.00
3/4 in. and larger	4.75	5.75	7.10	8.15
1/2 in. and 3/4	4.90	5.90	7.25	8.15
1/4 in. and 1/2	5.25	6.25	7.60	8.50

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

**WIRE ROPE**—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	List + 20%
Galvanized cast steel rigging	Net List
Bright plow steel	30%
Bright cast steel	17 1/2%
Bright iron and iron tiller	5%

**HORSE AND MULE SHOES**—Warehouse prices per 100 lb. in cities named:

	Mill, Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	\$5.25	\$7.50	\$6.50	\$6.25	\$8.00	\$7.50
Assorted	5.40	7.50	6.50-7	6.40	8.25	7.75

**BAR IRON AND STEEL**—Per pound to large buyers at mill, Pittsburgh

Iron bars	3.5c.	Steel bars	2.90c.
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**COAL BIT STEEL**—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
\$0.12	\$0.16	\$0.18	\$0.18	\$0.17	\$0.16

**DRILL STEEL**—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	16c.	14c.	15c.	16c.
Hollow	24c.	25c.	...	28c.

**PIPE**—The following discounts are for carload lots f. o. b. Pittsburgh, basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

Inches	Steel		Inches	Black	Iron Galvanized
	Black	Galvanized			
1, 1 1/2 and 2	44%	17%	1 1/2 to 2	33%	17%
2 1/2 to 3	48%	33 1/2%			
	51%	37 1/2%			

**Lap Weld**

	Black	Galvanized		Black	Galvanized
2	44%	31 1/2%	2	26%	12%
2 1/2 to 6	47%	34 1/2%	2 1/2 to 4	28%	15%
			4 1/2 to 6	28%	15%

**Butt Weld. Extra Strong Plain Ends**

	Black	Galvanized		Black	Galvanized
1, 1 1/2 and 2	40%	22 1/2%	1 1/2 to 2	33%	18%
2 1/2 to 3	45%	32 1/2%			
3 to 4	49%	36 1/2%			

**Lap Weld. Extra Strong Plain Heads**

	Black	Galvanized		Black	Galvanized
2	42%	30 1/2%	2	27%	14%
2 1/2 to 4	45%	33 1/2%	2 1/2 to 4	29%	17%
4 1/2 to 6	44%	32 1/2%	4 1/2 to 6	28%	16%

Note—National Tube Co. quotes on basing card dated Apr. 1. From warehouses at the places named the following discounts hold for steel pipe:

	Black		Chicago
	New York	Cleveland	
1 1/2 to 3 in. butt welded	33%	43%	41.9%
3 1/2 to 6 in. lap welded	15%	39%	37.9%
<b>Galvanized</b>			
	New York	Cleveland	Chicago
1 1/2 to 3 in. butt welded	16%	28%	26.9%
3 1/2 to 6 in. lap welded	3%	25%	23.9%

Malleable fittings, Class B and C, from New York stock sell at list price. Cast iron, standard sizes, 5 and 5 1/2.

**NUTS**—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	\$2.50*	List	\$1.20	\$1.65	\$1.05	\$3.00
Hot pressed hexagon	2.50*	List	1.00	1.50	.85	3.00
Cold punched square	2.50*	List	.75	1.25	1.00	2.00
Cold punched hexagon	2.50*	List	.75	1.25	1.00	1.60

\* List plus.

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	40%	50%
Chicago	50%	50%
Cleveland	60%	50%

**MACHINE BOLTS**—Warehouse discounts in the following cities:

	Warehouse		
	New York	Cleveland	Chicago
1/4 by 4 in. and smaller	30%	45%	37%
Larger and longer up to 1 in. by 30 in.	15%	37%	25-5%

**WASHERS**—From warehouses at the places named the following amount is deducted from list price:

	New York	Cleveland	Chicago
For wrought-iron washers:			
New York	\$2.50	\$3.00	\$2.50
For cast-iron washers the base price per 100 lb. is as follows:			
New York	\$5.00	\$4.00	\$3.50

## CONSTRUCTION MATERIALS

**ROOFING MATERIALS**—Prices per ton f. o. b. New York or Chicago:

	Carload Lots		Less Than Carload Lots
	New York	Chicago	
Tarfelt (14 lb. per square of 100 sq. ft.)	\$64	\$65	
Tar pitch (in 400-lb. bbl.)	21	22	
Asphalt pitch (in barrels)	40	45.50	
Asphalt felt	72.50	77.20	

**PREPARED ROOFINGS**—Standard grade rubbered surface complete with nails and cement costs per square as follows in New York and Chicago:

	1-Ply		2-Ply		3-Ply	
	e.l.	l.e.l.	e.l.	l.e.l.	e.l.	l.e.l.
No. 1 grade	\$1.35	\$1.60	\$1.70	\$1.95	\$2.05	\$2.30
No. 2 grade	1.20	1.45	1.50	1.75	1.80	2.05

Asbestos asphalt-saturated felt (14 lb. per square) costs \$5.35 per 100 lb. Slate-surfaced roofing (red and green) in rolls of 108 sq. ft. costs \$2.20 per roll in carload lots and \$2.45 for smaller quantities. Shingles, red and green slate finish, cost \$5.50 per square in carloads, \$5.75 in smaller quantities, in Philadelphia.

HOLLOW TILE—

Table with columns for city (Boston, St. Paul, Cincinnati, Chicago, Kansas City, Denver, Seattle, Los Angeles, New Orleans) and tile sizes (4x12x12, 8x12x12, 12x12x12) with corresponding prices.

LUMBER—Price per M in carload lots:

Table showing lumber prices for various cities (Cincinnati, Kansas City, Seattle, New Orleans, St. Paul, Denver, Los Angeles) and grades (8x8-In. x 20 Ft. and Under, 12x12-In. 20 Ft. and Under).

1-In. Rough, 10 In. x 16 Ft. and Under

Table showing lumber prices for various cities and grades (1-In. Rough, 10 In. x 16 Ft. and Under, 2-In. T. and G. 10 In. x 16 Ft.).

NAILS—The following quotations are per keg from warehouse:

Table showing nail prices for various cities (Pittsburgh, St. Louis, Dallas, Chicago, San Francisco) and wire/cut types.

PORTLAND CEMENT—These prices are for barrels in carload lots, including bags:

Table showing cement prices for various cities (New York, Jersey City, Boston, Chicago, Pittsburgh, Cleveland, Denver) and time periods (Current, One Month Ago, One Year Ago).

LIME—Warehouse prices:

Table showing lime prices for various cities (New York, Kansas City, Chicago, St. Louis, Boston, Dallas, San Francisco, Los Angeles, St. Paul, New Orleans, Cincinnati, Denver) and grades (Hydrated per Ton, Lump per 300-Lb. Barrel).

LINSEED OIL—These prices are per gallon:

Table showing linseed oil prices for various cities (New York, Cleveland, Chicago) and time periods (Current, One Year Ago).

WHITE AND RED LEADS IN 500-LB. LOTS sell as follows in cents per pound:

Table showing lead prices for various cities (New York, Cleveland, Chicago) and grades (Red, White) and time periods (Current, 1 Year Ago).

MINING AND MILLING SUPPLIES

HOSE—

Table showing hose prices for various types (Underwriters, Common) and lengths (50-Ft. Lengths, 75c. per ft., 40 1/2 c).

Steam—Discounts from List

Table showing steam discounts for various grades (First grade, Second grade, Third grade) and percentages (25%, 30%, 40%).

LEATHER BELTING—Present discounts from list in the following cities are as follows:

Table showing leather belting prices for various cities (New York, St. Louis, Chicago, Birmingham, Denver, Cincinnati) and grades (Medium Grade, Heavy Grade).

RAWHIDE LACING—40-5% off list.

MANILA ROPE—For rope smaller than 1/2-in. the price is 1/2 to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c.

Table showing Manila rope prices for various cities (Boston, New York, Cincinnati, Chicago, St. Paul) and grades (Medium Grade, Heavy Grade).

PACKING—Prices per pound:

Table showing packing prices for various materials (Rubber and duck for low-pressure steam, Asbestos for high-pressure steam, Duck and rubber for piston packing, Flax, regular, Flax, waterproofed, Compressed asbestos sheet, Wire insertion asbestos sheet, Rubber sheet, Rubber sheet, wire insertion, Rubber sheet, duck insertion, Rubber sheet, cloth insertion, Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes, Asbestos wick, 1/2- and 1-lb. balls).

REFRACTORIES—Following prices are f.o.b. works, Pittsburgh:

Table showing refractory prices for various materials (Chrome brick, Chrome cement, Clay brick, 1st quality fireclay, Clay brick, 2nd quality, Magnesite, raw, Magnesite, calcined, Magnesite, dead burned, Magnesite brick, 9 x 4 1/2 x 2 1/2 in, Silica brick).

Standard size fire brick, 9 x 4 1/2 x 2 1/2 in. The second quality is \$4 to \$5 cheaper per 1000.

St. Louis—High grade, \$55; St. Louis grade, \$40.

Birmingham—Fire clay, \$55-60; silica, \$55-60.

Chicago—Second quality, \$25 per ton.

Denver—Silica, \$35 per 1000.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

Table showing railway tie prices for various cities (St. Louis, Chicago, San Francisco) and materials (No. 3 White Oak, plain, Douglas Fir—Green, Douglas Fir—Creosoted).

GREASES—Prices are as follows in the following cities in cents per pound for barrel lots:

Table showing grease prices for various cities (Cincinnati, Chicago, St. Louis, Birmingham, Denver) and types (Cup, Fiber or sponge, Transmission, Axle, Gear, Car journal).

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels:

Table showing flotation oil prices for various cities (New York, Chicago, Denver) and types (Pure steam-distilled pine oil, Pure destructively distilled pine oil, Pine tar oil, Crude turpentine, Hardwood creosote).

\* F.o.b. Cadillac, Mich.

COTTON WASTE—The following prices are in cents per pound:

Table showing cotton waste prices for various cities (New York, Cleveland, Chicago) and types (White, Colored mixed).

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

Table showing wiping cloth prices for various cities (Cleveland, Chicago) and quantities (13 1/2 x 13 1/2, 13 1/2 x 20 1/2).

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

Table showing explosive prices for various cities (New York, Boston, Cincinnati, Kansas City, Seattle, Chicago, St. Paul, St. Louis, Denver, Dallas, Los Angeles, San Francisco) and types (Low Freezing, Gelatin, Black Powder).

\* Price for 100 tons or over.

CHEMICALS

SODIUM CYANIDE—New York price is 50c. per lb.; Denver, 44c.; Chicago, 31 1/2c.; St. Louis, 40c.

SODIUM SULPHIDE—In New York the price per pound is 8 1/2c. for concentrated, 4 1/2c. for crystals. The Denver price for 60% is 6 to 10c.; the St. Louis price, 5c. for concentrated; the Chicago price is 7 1/2c. for concentrated, 3 1/2c. for crystals. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 16c. per lb.; Chicago, 16c.; Denver, 13c. f.o.b. Pueblo; St. Louis, 14 1/2c.

ALUMINUM DUST—Chicago price is \$1.65 per lb.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points.

Table showing miners' lamp carbide prices for various regions (East of the Mississippi, North of Chattanooga, Southeastern portion U. S. A., Texas (except El Paso), El Paso, Texas, Denver, Colo., West Coast).