The Engineering and Mining Journal

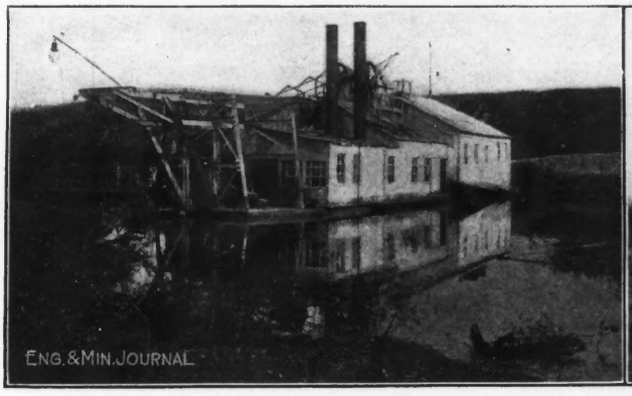
VOLUME 98 NOVEMBER 14, 1914 NUMBER 20

Dredging in the Russian Empire

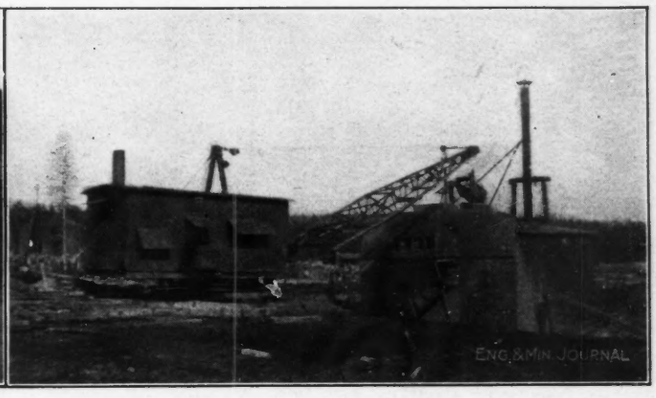
By John Power Hutchins*

SYNOPSIS—Dredging in the Russian Empire is handicapped by poor design of the individual dredges and lack of team work between those controlled by the same company. Moreover, centuries of cheap labor have exhausted all the easily worked ground.

The first dredges in the Russian Empire were installed in Central Siberia in 1901 by the Dredging Co., a Russian company, which is still operating, and a year later the Neviansk Co. commenced installing dredges in the Ural Mountains. The first dredge in East Siberia was installed by the New Oodeel Co., in 1907, and in 1911, the first American dredge was installed in the Russian Empire. There are now about 70 dredges at work and eight new ones were installed in 1913. Three of these are being completed on the watershed of the Lena River, and one is being installed on the head waters of the Yenesei, where dredging has not yet been done. It is apparent, therefore, that the dredging horizon is being slowly extended.



Amgoon Dredge



Drag-Line Excavator and Floating Washing Plant

Economic Aspects

In general, gold dredging in Russia has not been successful. However, there are notable exceptions in dredging for platinum, some of these operations having been wonderfully successful. In Central Siberia, where the first dredges were installed, there have been no successes and the companies now operating there are either in the hands of receivers, or are having a most precarious existence. The causes are not hard to find. In the Ural Mountains, where deposits of rich gold-bearing gravel formerly existed, and where labor is only 25c. to 35c. per day, nearly all the gold-bearing placers have been exhausted, although there are still some platiniferous areas that will be profitable for dredging, with the enhanced value of this metal.

No foreign company has ever been successful in dredging for gold in Russia and this should serve as a warning when plausible promoters talk about having thousands of acres of rich ground. There is not one gold-dredging company, Russian or foreign, now paying well in Russia.

The first and most important point is a low-tenor gravel, which can only be worked profitably when handled cheaply on a large scale. Most of what would have been rich ground for dredging had been worked by hand with opencuts. In Russia and Siberia it is only necessary to wash the gravel on and near bedrock to recover more than 90 per cent. of the gold. Since hand stripping and shoveling into horse carts can be done in many regions for about 6c. per cu.yd., it is not costly to strip overburden. Only the gravel left after stripping needed to be mined, transported, washed and wasted. Thus, with labor at 35c. to 50c. per day, it has been possible to mine large volumes of gravel averaging less than 20c. per cu.yd. from grass roots to bedrock, when only the lowermost gravel had to be washed. Chinese and Koreans working in Siberia will opencut ground even poorer than this, so it is not probable that great volumes of richer ground will be found where mining has been carried on for any length of time.

Until 1911 there had never been a good dredge in the Russian Empire. The installation of small dredges of

*Mining engineer, 441 Salisbury House, London, E. C.

poor design and weak construction has resulted in lost time, heavy repair expense and failure, where success would probably have been attained with large, powerful, well designed machines. One of the most potent factors in a generally poor design has been the ignoring of the necessity for securing as long a working season as possible. All the Russian dredging fields are situated where the winters are long and cold. Until the first American dredge was installed in Siberia, in 1911, with a design evolved from the practice in the Klondike, there were no Russian dredges possessing special modifications to permit working in cold weather. As a result, about 25% of the possible dredging time has been wasted each year. This has had an important influence, for successful dredging, like other large operations on low-grade material, must be carried on nearly continuously.

A third season for failure has been the lack of predetermining dredging conditions and content of bedrock gravel. Many dredges have been installed without one drill hole or pit having been put down to bedrock. Sufficient allowance for surface concentration has not been made, and the mistake of assuming rich bedrock content because rich material was found on the surface of stream gravels is still being made.

Payment of Excessive Royalties

Another reason has been the application to dredging of a leasing arrangement suitable only for one-man undertakings. Several dredges are now working on leased ground and pay a royalty based on the gross weight of the gold saved. This is called poodage and is expressed in roubles per pood, or, in other words, in money per unit of weight. It leads to complications.

It is a hardship for a company working low-grade material, where the difference between product and expenses is small, to pay royalty based on gross output; it is also difficult when this royalty is based on money per unit of weight, for the fineness of gold varies greatly. A pood (36.11 lb.) of pure gold is worth about $10,886.58, or Rs. 21,160.20. A poodage of Rs. 1000 means, therefore, at least 5% of the content, for dredging gold in Russia is never worth Rs. 20,000 per pood, but more frequently about Rs. 15,000 per pood. Some dredges are paying a poodage of Rs. 1500, or about 10% of the worth of the gross output. The object of the dredgemen working on poodage, of course, is to save the gold in as pure condition as possible. This is one reason for not using mercury and necessarily results in the loss of fine gold from the tables.

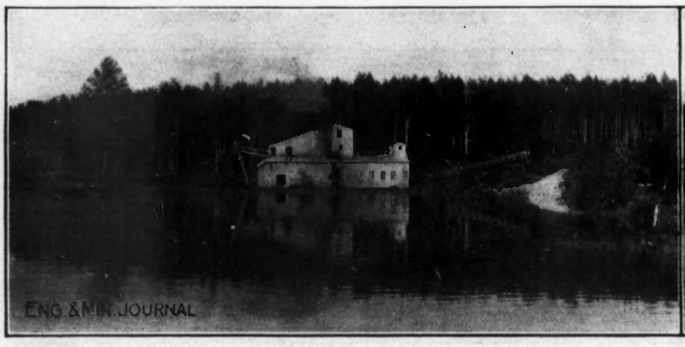
Yenesei River Region

The Yenesei River, rising in Central Asia and flowing north into the Arctic Ocean, is one of the several largest Siberian rivers. Its tributaries, from its source almost to its mouth, are auriferous. Only one dredge is working on the upper or southern watershed of the Yenesei. This has 5-cu.ft., close-connected buckets of Russian build and American type. The ground is shallow, contains about 25c. per cu.yd., and the working cost is about 10c. per cu. yd. Only a small area has been prospected ahead of this dredge and its success is therefore problematic.

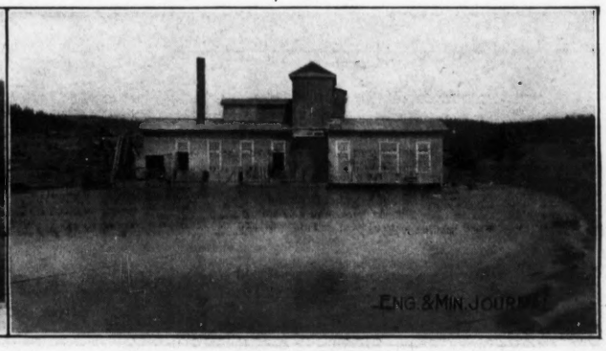
On the lower Yenesei, north of the Trans-Siberian R.R., about 35 dredges are operating with poor results. Most of these dredges have small buckets, are of faulty design and weak construction. The ground contains about 10 to 15c. per cu.yd. and with working costs of 8 to 14c. per cu.yd., there is little or no profit. Dredging conditions, except for the short working season, are generally favorable. The gravel is of medium depth, rests on generally soft bedrock, has a few large boulders, little clay and no cemented material. It is possible that success may yet be attained in the Yenesei, but it can only result from reorganizing the tottering companies, scrapping all the old dredges and beginning on a new and large scale with powerful dredges, central-power stations, control and repair shops.

One of the greatest drawbacks to progress in Russia is the inability of the people to do "team work" on a large scale. For instance, when a dredging company desires to operate on a large plan, it secures many small dredges of different size, each having an independent organization and management. Each has its steam-power plant, with all the consequent expense and lost time. Centralized electric-power generation has not been attempted. Dredges of the same size and with interchangeable parts reduce greatly the capital tied up in spare parts especially where the dredging fields are so remote from sources of supplies.

In the Lena River region dredging is just beginning and three dredges are being installed on the watershed. These are poorly designed and built, and are doomed to failure. As an example of poor design, 8 cu.-ft. buckets have 2½-in. pins and they must dig in rocky gravel that will be frozen in the early spring and late fall, conditions demanding the strongest construction. One of the handicaps of this region is its inacessibility and it has cost nearly $100 per ton to transport the dredges from England to the dredging ground. Two of the dredges are being installed on ground unprospected except for a few



Platinum Dredge on Iss River, Ural Mountains

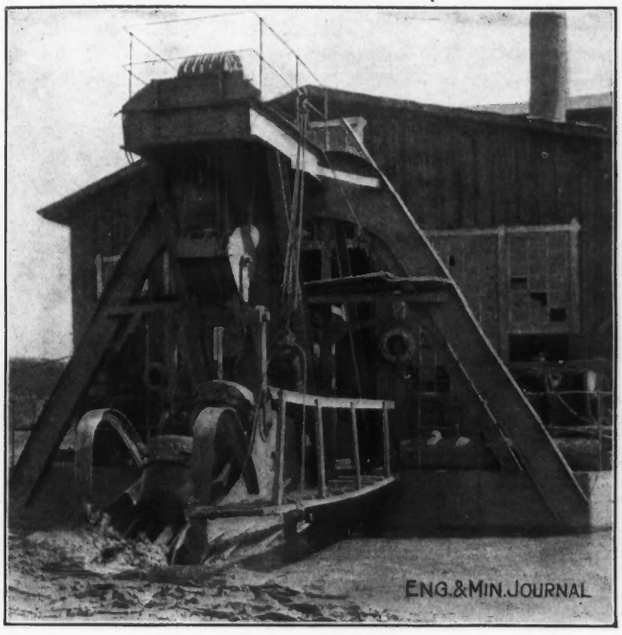


Demidoff Dredge
Note short stacker.

superficial pannings. From these so called tests rich gravel on hundreds of miles of rivers has been assumed to exist and to contain about 60c. per cu.yd. It is owing to this kind of work that so many dredges have failed in Siberia.

Amur River Region

The upper Amur waters have produced much placer gold but there have been no successful dredges. One machine working in the bed of a tributary of the Zea River is having a difficult career. Almost all the gravel, except that in the beds of the rivers, is frozen perpetually and is too low-grade to permit steam thawing. The Nerchinsk cabinet lands of the Emperor of Russia, situated on the upper Amur, have produced over $100,000,000 worth of gold, but all from material that could not be dredged, and no dredging ground is left there. The lower Amur has three dredges at work. One, the Oodeel dredge, built in Finland from home-made plans, is a failure.



Bow Gantry, Demidoff Dredge

It is working in ground that is rich but difficult because of clay. The rich area is small and a short existence is certain.

Two inferior dredges are operating on the watershed of the Amgoon River, a tributary to the Amur. These dredges are working the bed and banks of the Gongren River, on a pay channel about 240 ft. wide in loose, clean gravel about 20 ft. deep, which resting on a soft slate bedrock and contains about 50c. per cu.yd. The larger dredge has 7½-cu.ft. buckets, weighing about 800 lb. each, and having 2¼-in. bucket pins. The rest of the dredge is on a par. As a result, it works only 1200 to 1400 cu.yd. per 24 hr. The channel being worked has probably been enriched locally and the dredges will probably soon get into unprofitable ground.

Kolchan Dredges

These are, perhaps, the most interesting of the dredges recently installed in Russia. One was the first American gold dredge built with a steel hull and also the first American-built dredge erected in Siberia. It has 7½-cu. ft., close-connected buckets, that dig about 25 ft. below water level. It was installed on an old mine that had been worked partially by opencutting, with a cost of about 50c. per cu.yd., by hand. The gravel, because of clay content, had not been washed thoroughly and some gold had been left in the tailings, although the washing plants had trommels to disintegrate the clayey materials. About 40,000 cu.yd. of oversize from a trommel were worked with a drag-line excavator, dumping into a plain sluice set on a 5% grade, and using longitudinal poles and steel rails for riffles. About 50c. per cu.yd. were recovered. This shows the poor work done by the trommels.

Most of the ground worked so far had already been mined by opencutting and conditions for dredging were difficult. The dredge was operated among irregular piles of tailings and old workings, containing heavy timbers, old railroad iron, machine parts and other scrap. A working cost of less than 10c. per cu.yd. has been obtained, using electric power generated at a steam plant about 10 miles from the dredge. The total cost, including administration, winter expenses, London office expenses, etc., was about 28c. per cu.yd. These figures show well the difficulty of operating one dredge in a foreign country with imported labor and a short working season. It demonstrates emphatically that a successful one-dredge business must have unusually rich gravel.

It is interesting to compare the work of the 7½-cu. ft. bucket dredge, of New Zealand type, operating in the Amagoon region, under similar climatic conditions. This dredge, with the same size buckets, though excavating easy gravel, worked only one-half as much as the American dredge. Thus, the American dredge, though working under difficult conditions, dug twice the amount that the New Zealand type did under ideal conditions. With positions reversed it is probable that the American dredge would have handled from 3500 to 5000 cu.yd. per day and that the New Zealand dredge would have broken down completely.

Mining Development Slow

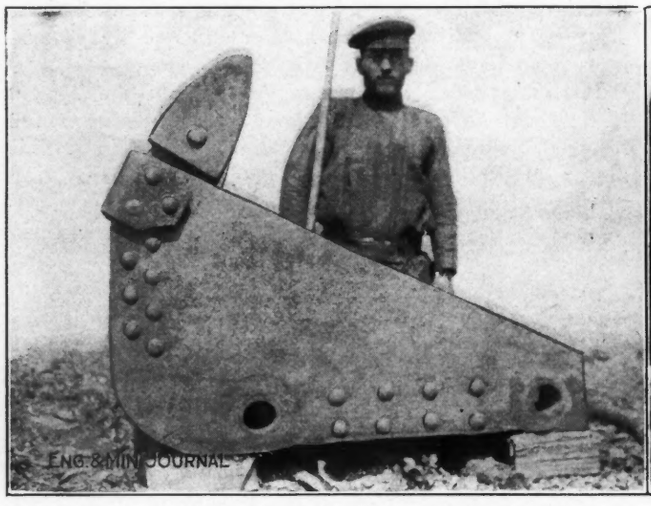
Little pioneer work in the engineering and mechanics of mining has been done in the Russian Empire. One learns rather how not to do things by studying Russian mining methods and machines. For instance, it is useless to study drift-gravel in Siberia where, with labor at less than $1 per day and supplies in proportion, it costs about $8 to $9 per cu.yd. to work unfrozen gravel that needs no blasting. The cost is said to be $6 per cu.yd. but it is actually one-third to one-half more, due to working actually from one-quarter to one-third less than claimed. In other words, it costs more per unit of volume with more than 7000 men picking ground, than to work many vein mines where rock must be drilled, blasted and milled. Further, in Russia the work costs about three times as much as mining perpetually frozen ground in Alaska, where the cost of labor and supplies is six times that in Siberia. With proper management of well designed and constructed dredges the working costs, in parts of Siberia, would be at least one-half these at present.

Disintegrating Clay

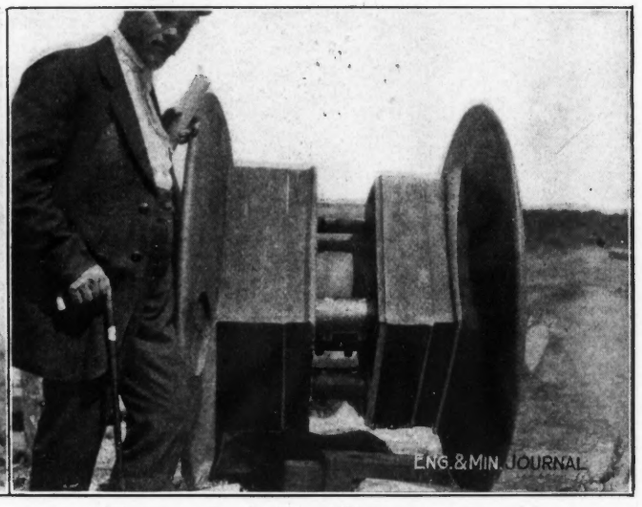
However, Russia has contributed to mining methods in having been compelled to attempt the solution of a difficult problem, that of dredging extremely clayey gravel. The alluvions of the Ural Mountains generally contain

much clay, intimately mixed with the auriferous and platiniferous gravel. When mining began there, in the 18th century, it was found necessary to disintegrate the gravel, so as to liberate the valuable content from the cohesive clayey lumps and particles. This was done first in small operations, as it often is still, by raking the gravel by hand back and forth over a perforated iron plate. Later, a mechanical device for raking and hoeing gravel in a semi-cylindrical trough was tried. This was found to be slow, unsatisfactory, wasteful of power and costly in upkeep, although it is still used in some mines. Later, the "chasha" was evolved. This resembles an arrastre but has a stirring and not a crushing action. It has 8 to 10 arms, is 4 to 5 ft. long and rotates about 20 to 30 r.p.m., giving the arms a peripheral speed of from 500 to 925 ft. per min. This gives a rapid and effective stirring motion to the finger-like projections dragging through the gravel. The bottom of the chasha has perforated cast-iron plates with ¼- to 1½-in. round holes. This device is used generally where clayey gravel is found.

Its operation is as follows: Gravel up to 10 in. in diameter is dumped or sluiced into it intermittently and stirred until it is thought to be well disintegrated, water, in the meantime, being poured in from the top, or run through the sluice. The fine material that falls through the bottom is run over tables. The oversize falls out on opening one of the bottom plates. There are, therefore, both intermittent feed and discharge, and in this respect the chasha is a poor machine. It does good work as a disintegrator and when improved with a constant feed and discharge, it will be an excellent machine.



GRAB HOOK FOR TEARING UP BEDROCK, DEMIDOFF DREDGE



LOWER TUMBLER, DEMIDOFF DREDGE

CHASHAS POORLY BUILT

The construction of the shasha is usually poor, however, some of them having no iron in their construction, except the bottom plates. In many parts of Siberia, chashas are used with all the moving parts made of wood, driven by wooden, overshot waterwheels, through wooden gears, shafts and boxes. Eventually the chasha principle will be adopted, and proper structural materials used. With such a machine having constant feed and discharge, and a water-supply under pressure from nozzles or spray pipes, clayey gravel will no longer be dreaded in any kind of placer mining.

The Pokrovsky dredge has a machine incorporating the log-washing principle, for disintegrating clay. It consists of a strong, hollow, cast-steel shaft, about 15 ft. long, rotating in a semi-cylindrical trough. Arms are bolted helically to this shaft and beat and stir the clayey gravel, as it is sluiced, with a small amount of water through the trough. The helical arrangement of the arms tends to advance the gravel to the discharge end. This machine has continuous feed and discharge but it does not do as clean work as the chasha and it cannot handle such large boulders. The latter wedge between the beaters and the sides of the trough and do damage. The chasha, when properly built, can handle 18-in. boulders without wedging or damage. The clay disintegrator of the future will be an improved chasha rather than an improved log-washer. On dredges, particularly, several chashas, in series, would be superior to a log-washer, for the chashas can be introduced without any modifications of dredge design, other than substituting them for the trommel. As the log-washer needs a revolving screen between it and the hopper, to take out boulders larger than 4 in. diameter, and another screen below it to screen the material before passing it over the tables, its use requires a long dredge. Also there must be a high bucket discharge to get the material from screen to log-washer to trommel. These features necessitate a long and wide hull. The Pokrovsky dredge which has 3½-cu.ft. buckets and digs to a 25-ft. depth, has a hull about 20 ft. longer, and a bucket discharge about 5 ft. higher than would be necessary with chashas on a dredge of similar digging depth and buckets.

BUCKET-EMPTYING DEVICES

Another need developed in Russia is a device for removing sticky gravel from dredge buckets. Sticky gravel would not fall out of the buckets, as they rounded the upper tumbler, in time to fall into the hopper and frequently buckets would not discharge at all, but would retain the clayey gravel packed in them until dug out, which had to be done several times per day. On some dredges there is now used an automatic arrangement of

weighted levers and cranks, with a projecting finger which enters into each dredge bucket as it rounds the upper tumbler. This finger is pushed into the bucket by weights supported on the opposite end of the lever, and loosens the material adhering to the hood of the bucket. Clayey material is generally packed against the hoods of the buckets and a slight loosening effort will cause complete discharge. In case the projecting finger encounters a large boulder or piece of wood, it can be pushed back and will swing clear without doing any damage. After loosening adhesive material in one bucket, the finger slips out, as the bucket rounds the upper tumbler, and is raised by the counterweights to engage the next bucket. This device has been used only with open-connected buckets, but it is likely that a similar one can be designed for close-connected buckets.

Ural Mountain Region

This is the most important dredging field in Russia. It begins about 30 miles south of Ekaterinburg, and extends to about 300 miles north of that city. The dredging areas are situated in the beds and along the banks of present rivers; and no bench or terrace gravels are being worked. The alluvion consists of detritus from the erosion of crystalline schists, limestone, granite and other rocks containing much feldspar, through a considerable period and without any great or rapid upheaval or subsidence. The deposition of the gravels has continued without any rearrangement from earth movements. As a result, clay in considerable quantity is found everywhere in the gravel section, from the uppermost layer of overburden to the bedrock. Pay-streaks seem to have a marked lateral concentration in constricted channels, and a vertical concentration close to the soft bedrocks. Only the bottom-most gravel is profitable to work. In fact, in many places more than nine-tenths of the gravel section is quite barren. This condition has an advantage, not fully appreciated in Russia. It is really unnecessary to wash the top gravel and with properly designed dredges, it could be quite cheaply and rapidly wasted as is done in other dredging fields. Large boulders and buried timbers are not often encountered and cemented gravel is not found.

The gravels are shallow, seldom more than 30 ft. deep, there is usually plenty of water to float dredges. The Perm Ry., with its branches, serves the dredging fields well, but the transport of heavy machinery by Russian horse-hauling methods is slow and expensive. To haul 5-ton pieces costs four times as much per ton as for stuff that can be loaded on one-horse wagons, and it requires about twice as many animals per unit of weight to haul the heavy as compared with the light parts. This is due not so much to the roads, which are often wide, hard and level, as to the mediæval method of hitching the horses and to the absolute ignorance of the Russian teamster about the handling of horses when hauling heavy loads.

Short Working Seasons

The climate is severe and the working season, with the Russian dredges, is only about six months per year. It is quite possible that with proper design and construction the working season in normal years could be lengthened to eight or 10 months. While there is no perpetually frozen ground, seasonal frost sometimes penetrates 5 ft. below the surface in places where snowfall is light. The topography of the Ural region is not rugged and sharp as is frequently supposed. Much of the dredging ground is less than 2000 ft. above the sea level. The topography is not favorable to hydro-electric installations and none of the dredges is run by hydro-electric power. Wood, costing about $5 per cord, or peat, which is often cheaper, are burned. Labor is plentiful and cheap, common labor costing from 25 to 35c. per day. Skilled labor ranges from 50 to 75c. per day and women are often employed at 25c. per day. Supplies are proportionately cheap.

Dredges in the Ural Region

There are about 40 dredges at work in the Ural region. More than one-half of them are working on platinum-bearing material, although some are working where no platinum exists. There are a few dredges recovering less than 1% gold with the platinum. With the platinum are found the other associated metals, iridium, osmium and palladium.

Stripping by Hand in Winter

The future of dredging in the Urals will be for the recovery of platinum, as the gold placers have been almost exhausted by hand labor. Gold was discovered in the Urals about 200 years ago and the gold placers have been worked intensively ever since. Opencutting was generally practiced; as a result, the ground was thoroughly worked and no pillars were left and little ground was lost. The old tailings piles and ground adjacent to the old opencuts, have been reworked. The Ural peasant has no work in winter, so he takes his whole family and works at the old placers. As his time is valueless, in winter, he is content with a small amount of gold. This has been going on for many winters and little is left for the gold dredge.

The richest platinum placers have likewise been exhausted but there are extensive areas of platiniferous ground, that, until the last few years, could not be worked profitably, but which are now valuable with the increased price of this metal. These areas are now controlled by large companies, which are reserving these areas for exploitation by dredging.

Platinum Dredges

About 25 dredges are working platinum placers in the Urals and they are doing bad and expensive work. This is due to unsuitable design, faulty construction and amateurish manipulation. For example, one company has six dredges working in one valley, and these are good examples of what dredges should not be. They have 8-cu.

ft., open-connected buckets with 2⅛-in. pins, and all the parts are proportionately weak. Screens are too small and too short, stackers are too short, and, with ground only 14 ft. deep, the ladders have a digging depth of 40 ft. The reason for this follows:

The valley has a fall of from 50 to 100 ft. to the mile. It was thought the dredges could not work up that grade, so dams 40 ft. high have been constructed behind each dredge, raising the water high enough to allow the ground allotted to each dredge to be worked out. The dams also permit working the low, bench deposits on the banks. Dredges are worked up steeper grades in other fields without the use of such dams and such long ladders. Each of these dredges employs 39 men per day.

The yearly production from these six dredges is worth, at the present price of platinum, about $1,620,000, or about $270,000 per dredge, each working about 150 days per year and producing $1800 worth of platinum per day from 1000 cu.yd. The total cost per cu.yd. is about 8c. With such rich returns, it seems unpardonable that so little is being done for the advancement of dredging, for this company could well afford to solve its serious clay problem. Probably from 15 to 25% of the total platinum content is lost by incomplete disintegration and faulty manipulation of the dredges.

Important deposits of platiniferous gravels are situated as terraces, and in the flat slopes between the terraces and the present stream beds. The operators think that dredges cannot be worked on these terraces and flat slopes, and plan to work them by hand or with dry excavators. Such work will cost much more than it now costs to dredge in the Urals and from four to five times what it would cost if the dredges were properly designed, constructed and operated. In general, dredging in the Urals is as inferior to that in other countries, as drift mining in the Lena region, where the working cost is $8 to $9 per cu.yd. for gravel that can be mined by pick, is inferior to drift mining elsewhere.

Advance Stripping

The Ural region is one of great vertical concentration and probably more than 90% of the metallic content is in the 2½ to 3½ ft. of gravel on the bedrock, and in the bedrock itself. No advantage has been taken of this in dredging, although the dredge operators, in several instances, are stripping for opencutting, where the top material is hand-shoveled into horse carts, only the bottom pay gravel being washed. But with the dredges all the barren and clayey top material is washed. It is strange that it has not occurred to them to strip with the dredge. The capacity of the dredges, when stripping, is two or three times as great as when washing, and there is also the great advantage of keeping "sluice-robber" clay off the tables. A dredge costing no more than the ones now being used can be designed for the Ural region, that can handle twice the material at one-half the working cost and effect a greater saving. At present, gravel, rich in platinum, is being wasted in great quantities, and the operators realize this, for they say they intend to rework all the tailings.

Hand Stripping

At one operation, where there is a heavy clay overburden, about 10 ft. of stripping is done by hand, ahead of the dredge, and in an interesting and cheap manner. In winter the material is stripped from a vertical face about 10 ft. high. Shallow cuts, 5 ft. apart, 8 to 10 in. deep and 4 in. wide, are made with a pick on these faces, and are filled with straw to prevent the bottoms freezing. When the surface has frozen to a depth of 6 to 10 in., which takes about a day, the frozen face of the block between two of the cuts is broken off in large slabs with wedges. These slabs are hauled on low, one-horse sleighs, to a waste dump, either to the side, or to the tailing pile behind the dredge. This is accomplished with a minimum of handling.

When the frozen face has been wedged off, the process is repeated. With a face several hundred feet wide, freezing progresses fast enough to permit the stripping of all the pay gravel that the dredge can work in the following summer. The cost of such work is less than 6c. per cu.yd., the contract price, and probably under 5c. per cu.yd. The dredging cost for subsequently working the pay gravel underneath was 9c. per cu.yd.

Conclusions

The future for dredging in the Russian Empire is not bright, except in the platiniferous region. The latter is small and well known, and no great expansion can be expected. The cream of the gold-placer ground has been exhausted by open cutting with hand labor and the skim milk is not good enough for profitable dredging. The watersheds of the Ob, Yenesei, Lena and Amur Rivers have been investigated thoroughly and no areas of great size or richness are likely to be found. Russia is gradually pushing its frontier south for its great length along the Chinese Empire, and into a region that produced much gold in prehistoric times. Mongolia is known to have rich placers that have been overlooked by the native miners. Whether this region has dredging possibilities is problematic, although rich deposits of other metals are not unlikely. Frozen ground is found in Mongolia at a latitude of 50° N., a serious handicap. The lack of railways will also be an obstacle for some time.

The Anadyr region, opposite Seward Peninsula, Alaska, contains gold placers, but the Russian Government interferes with the opening of this district instead of welcoming it. However, no great addition to the dredging fields of the world can be anticipated here. Conditions are more difficult than at Nome and the deposits do not seem as rich and extensive. There is a large region along the Arctic Ocean that has been quite unexplored. It is possible that placers may be found here but a condition of perpetual freezing is probably a hopeless obstacle to dredging.

Tungsten Ore in Siam

A report from Vice-Consul General C. C. Hansen at Bangkok says that mining for tungsten ore in Siam is a new development. According to a recent state report, this mineral had been known to the Chinese tin miners for a long time as "dead ore," but its commercial value was unknown until some of the ore was taken to Singapore for analysis, and this black mineral was found to be wolfram and to have a workable value.

The richest deposits of wolfram were found in Nakon Sri Tamarat on the east coast of the Siamese portion of the Malay Peninsula. Here the wolfram ore had been left in great heaps as valueless material after having been separated from the tin ore by the Chinese miners. The amount of wolfram recovered during the fiscal year 1912-

13 was 309 tons, against 119 tons for the previous year.

Not long ago a European company started working for wolfram in Koh Samui, an island near Nakon Sri Tamarat, but the experiment was not successful and the works have now been abandoned. Wolfram in moderate quantities has also been found at Puket on the west coast of the Siamese Malay Peninsula, and this mineral is said to be quite widely distributed throughout the peninsula.

Griggs, Castleton & Carter Cyanide Mill

By George T. Castleton*

This mill was erected in 1913, at Eureka, Utah, in the Tintic mining district, to leach the tailings from the concentrator owned by the May Day Mining & Milling Co. The ore was an oxidized lead-silver mixture with a little gold; the gangue was quartz and limestone. The jig tailings, originally coarser than the fines and slimes from the tables, were dumped with the fines, and the entire mass is handled without regrinding.

The general arrangement of the plant is shown in the accompanying illustrations. It will be noticed that the

Griggs, Castleton & Carter Cyanide Plant, Eureka, Utah

Old May Day Mill in the background

tanks are placed higher than the tailings dump, and this is to obtain room for the treated tailings, none being available below the dump. This necessitated hoisting the tailings to the tanks, for which purpose a 15-hp. electric hoist is used. An electric motor of 2 hp. is also used to run a rotary pump for the solutions.

One tank of 250 tons capacity was installed for leaching. A partition was placed across this tank making two, each with a capacity of 125 tons. By loading one tank one day, unloading the second the second day, loading the second tank the third day, followed by unloading the first tank the fourth day, the operation of the plant is continuous, and it has a capacity of 62½ tons per day. At this capacity, the ore has 60 hr. leaching, including washing and draining. The first solution contains 3½ lb. cyanide per ton. The lime is placed in a box, and the solution is used to slack the lime as it is added to the tailings. The solution is built up by running through the lime box, to carry from 2½ to 2.7 lb. lime per ton of solution, and the way of adding has proved satisfactory. The lime box is placed at the side of the tank above the ore. Precipitation is on zinc shavings, which cost in this market $14 per cwt. The shavings are of satisfactory quality.

*Eureka, Utah.

The slimes in the tailings dump are loosened by drawing a harrow over them. Then they are allowed to dry, after which the dry slimes are skimmed off with a scraper. This operation is repeated as often as the thin, loose layer dries.

Leaching Tanks on the May Day Dump

Lime box shown over tanks

In the following table of costs, it will be well to note that while the labor costs appear to be high, they include a team used on the dump for scraping, which costs $6 per day. The costs include the payroll, labor being

GRIGGS, CASTLETON & CARTER CYANIDE PLANT
Costs for 1913

	Per Ton
Lime	$0.017
Labor	0.463
Superintendence	0.084
Stable account	0.009
Water	0.013
Cyanide	0.227
Zinc	0.025
Mill-site rental	0.008
Power (electric)	0.024
Miscellaneous expenses	0.0195
Total	$0.8895

paid at the rate of $3.25 to $4 per 8 hr. In addition to hiring a team, the company also owns a horse used on the small drag scraper.

"The Mineral Industry"

The 22nd annual volume of "The Mineral Industry,"[1] appears under a new editorship, G. A. Roush, assistant professor in the Department of Metallurgy, at Lehigh University, being the present editor. The plan of the volume remains the same as in recent years and, in general, the system of treatment for each subject is the same as formerly, but there is a galaxy of new contributors, which has much refreshed the appearance of the work and conferred upon it a certain interest of novelty.

The real value of a volume of this kind can be determined only by actual use in the office, library and laboratory. The preliminary examination of the 22nd volume, which is all that we have yet been able to give, is satisfactory. We think that the statistics might have been brought a little more up to date, and there is not always the best discrimination among authorities on statistical and technical subjects.

However, it is not expected by anybody, not even by the editor himself, that this great volume of 1000 pages can be prepared without any flaws. As a whole, it is an excellent and valuable compilation. The present volume well maintains the usefulness, reliability and prestige of its predecessors.

[1]The Mineral Industry: Its Statistics, Technology and Trade during 1913. Edited by G. A. Roush. 6x9, pp. 1010, illus.; $10. McGraw-Hill Book Co., New York.

Modern American Rock Drills--V

By L. O. Kellogg

SYNOPSIS—Variations in design of stoping drills with telescope air-feed. The only American machine with automatic rotation is that made by McKiernan-Terry. The Ingersoll-Rand Imperial is an example of the valveless type of hammer drill.

Apart from the differences in their valve action, the most striking differences in the stoping drills lie in the telescope feed; this may be either of the "ordinary" or the "reverse" type. In the ordinary feed there is a cylinder fastened to the back of the drilling cylinder, and a plunger or piston works in this, having a point in the end, which bears against the ground. The cylinder is usually called the outer tube and the piston, the inner tube. In the reverse feed, the plunger is fastened to the drilling cylinder, and the feed cylinder is stationary. The latter type is heavier, but offers the advantage that the hose connection need not be swung with the drilling cylinder when this is rotated, since in this case the air is admitted to the feed cylinder. Furthermore, if the machine is to be mounted on a bar as a "drifter," the reverse feed is almost essential; since in this case the feed cylinder has to be clamped rigid.

The stoper consists of a drilling cylinder more or less closed by front and back heads. The front head may be a part of the cylinder, especially in the valveless type. Through bolts may be used to hold these parts together, or separate pairs of short bolts may be used for the front head and the back head. The through bolts, and the short bolts on the front head, work against helical springs. The front head may itself receive the drill-steel shank, or a separate bushing may be used. The anvil block works for the most part in the front head. The striking hammer is sometimes symmetrical and sometimes not; it is always unsymmetrical in the case of the valveless drills and in the rotating model, having a forward-projecting smaller portion.

The feed cylinder or plunger is fastened to the drilling cylinder in different ways. The joints between the plunger and the walls of its cylinder are kept tight by packing of one kind or another. A catch of some kind must be used to hold the plunger and cylinder together when the machine is being carried about. The end of the cylinder or plunger which bears on the ground is equipped with a metal point of some shape, called, usually, a spud.

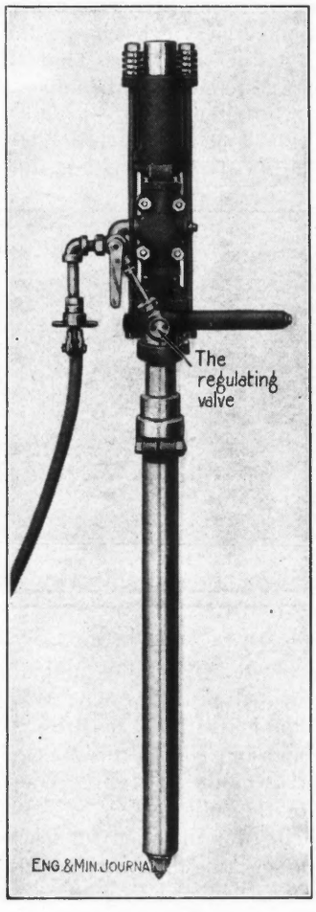
The throttle, control or air-supply valve may be built into the machine or may be separate and set in the hose connection. It is usually arranged so as to have at least four principal positions; in one of these, air is shut off; in another it is admitted to the feed cylinder only; in a third, it is admitted to the drilling cylinder so as to strike a light blow; and in a fourth a supply for full drilling speed is furnished.

When cross bits are used, as they most commonly are on stopers, it is necessary to rotate the bits continuously through at least 90° while drilling, so as to keep the hole round. This is done by rotating the whole drilling cylinder, and for this purpose a handle is attached to some part of the cylinder, usually near the back head, so as to project at right angles. The end of this handle may or may not be bent back at right angles, but ought always so to be as a safety precaution.

Special features of the several machines will be described in more detail.

McKiernan-Terry Automatically Rotating Stoper

The McKiernan-Terry Drill Co. put upon the American market the first and so far the only automatically rotating stoping machine. This stoper is actuated by a spool valve, has a ratchet mechanism in the back, and is normally fitted with a reverse telescope feed. A novel attachment is a valve for varying the pressure in the telescope feed.



McKiernan-Terry Rotating Stoper

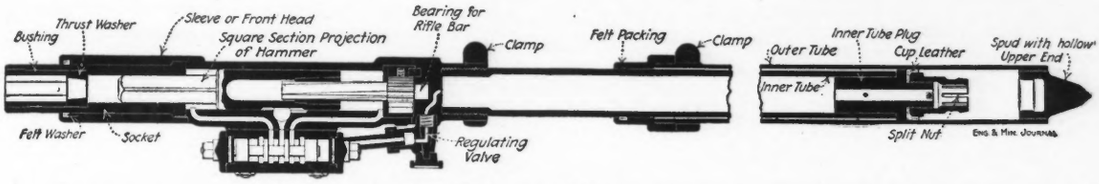
The four-spool valve is mounted in a valve chest in the center of the cylinder. It is thrown by differential pressure and its operation involves no new principles.

The hollow hammer contains a bronze rifle nut sliding on a rifle bar, in the same way that the rotation is arranged in a piston machine. The ratchet nut turns with the rifle bar, and is controlled in the direction of rotation by four pawls, held by springs in the ratchet ring. The back end of the rifle bar forms an additional bearing. On the front end of the hammer piston is a projection having a square cross-section. This fits loosely in the socket, which is thus forced to revolve with the hammer piston. Sufficient air passes the projection into the socket and thence into the drill steel, to clean the cuttings from the hole. A bushing is screwed into the front of the socket, and brings what is called a thrust washer to bear between the bushing itself and a shoulder on the inside of the socket. The bushing has normally a hexagonal cross-section inside to take the hexagonal steel. The thrust washer has a conical hole and the shank of the drill steel is also coned to fit the thrust washer through which the drill shank projects for about half an inch to receive the blow from the hammer piston. Thus the use of either an anvil block or of collars on the steel is done away with. Housing the socket, but permitting it to extend somewhat, is a sleeve, really the front head. The drill is assembled by means of two side rods which extend through from the back head to the forward end of

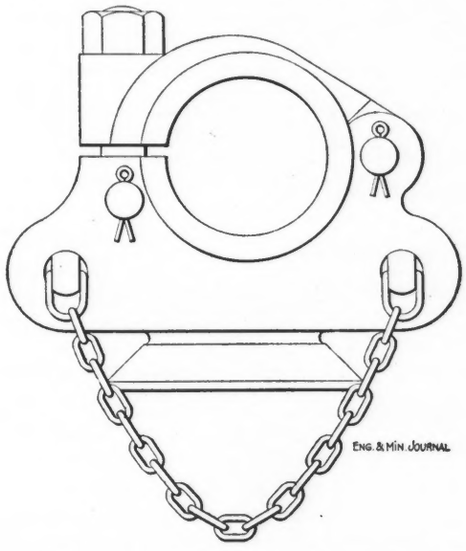
the drill. Helical springs are interposed between the nuts on the side rods and the lugs on the front head. Within this sleeve or front head and at its lower end is a groove to receive a felt washer which rests against the socket and prevents the escape of oil from the drill or the admission of cuttings.

The air supply is controlled by a three-way valve attached to the valve chest with a connection to the regulating valve of the telescope feed. Air passes first through the connection and regulating valve to the telescope feed and by a further movement of the valve control, air is admitted to the valve chest. The air supply to the telescope feed, as heretofore stated, is further controlled by a novel regulating valve enabling the pressure in the air-feed cylinder to be regulated from full pressure to zero at will. This is an ingenious device, by means of which variable pressures can be compensated for. It is common to find one mine using air at 100 lb. pressure, and another as low as 80 lb., thus making considerable difference as the area of the piston needed in the air feed. Furthermore the character of the ground being drilled is continually changing, requiring a change in the feed pressure for best efficiency. This is made possible by this valve. The operation of the valve is such that at first the air supply is gradually throttled to the proper working pressure in the air feed and by a further movement there is set up an escape or exhaust, which reduces the pressure to conform with any condition that may arise.

The air entering the inner tube of the telescope feed, passes on down through it, and exerting pressure against the closed end of the outer tube, forces the inner tube out, and holds the machine against the rock. A plug is screwed into the lower end of the inner tube, and a cap or lock-nut over this, holds a cup leather in position. The cup leather expanded against the outer tube makes the joint tight. The end of the lock-nut is split, and this is gripped by the hollowed upper end of the spud, which is screwed into the end of the outer tube. The spring of this split plug against the collar of the spud is sufficient to keep the feed from extending by itself. The top of the outer tube is closed with a screwed collar. A felt packing ring fitted in a groove in this collar and bearing against the inner tube, prevents dust from entering the telescope feed. The back head and inner tube are also screwed together and locked with a clamp.



Longitudinal Section of the McKiernan-Terry Automatically Rotating Stoper



Clamping Device for Reverse Telescopic Feed of McKiernan-Terry Rotary Stoper

The short handle provided is not for rotation, but merely to facilitate the handling of the machine. This handle, however, is utilized for lubrication. It is hollow and is packed with fibrous material. The outer end is closed with a plug; the inner end of the cavity connects with the cylinder. By removing the plug, the cavity may be filled with oil and when the drill is in operation, a small quantity of oil will be induced to flow to the cylinder by the pulsation of the drill.

This stoper is particularly designed for mounting on a bar or column and for this purpose an ingenious clamp is provided which deserves special mention. In changing long steel, it may become difficult to force the steel past the machine even when the latter is run back to the limit. This can be overcome by revolving the machine with the clamping device as a pivot, but this requires time and care to bring it back to exact line upon resuming drilling. In this clamp, not only is the top hinged so that by swinging down and bolting, the telescope tube is held securely, but also the whole upper part of the clamp is hinged, so that it will swing up and over to one side, carrying the machine with it. When the new steel is in place, the machine is swung back to exactly the same position again and there is no time lost in getting lined up. This is effected by knocking out and inserting one pin in the lower part of the clamping device.

The stoper has a stroke of 3⅝ in., a cylinder diameter of 2 in., a feed of 24 in., an overall length of 63 in., and a weight of 100 lb.

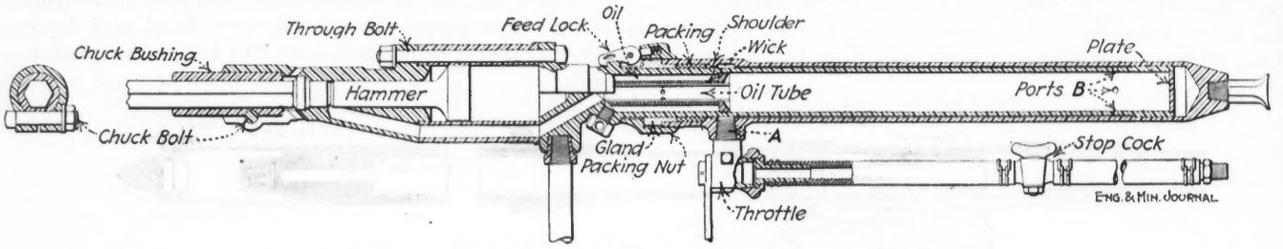
The Ingersoll-Rand Imperial Valveless

The Ingersoll-Rand Co. makes a valveless stoping machine, the Imperial type; it is valveless in that it contains no moving parts which govern the reciprocations of the hammer other than the hammer itself. The machine is usually equipped with a reverse telescope feed, i.e., the cylinder of the feed remains stationary as the machine moves up.

In Diagram 1, the piston is shown at the beginning of a back stroke. The air under pressure enters at the port *A* and is carried to the front of the small portion of the hammer, which is under the full air pressure at all times. There is no pressure back of the piston, and through

the port *B* there is free exhaust to the atmosphere. The piston is thus forced back until the small portion uncovers the port *E* of Diagram II. Through this and the passage *F*, live air is now conveyed to the back of the hammer. Since the area here is larger than at the front end, the movement of the hammer is checked and it starts forward on a striking blow. When in moving forward it passes the port *E*, air is shut off behind and motion is continued from the force of inertia and the expansion of the air, until the piston strikes the anvil block.

The machine is shown equipped with a typical reverse telescope feed. In operation, all the air used by the machine is taken in at the opening *A* of the longitudinal section through the whole machine and passes down between the two tubes until it reaches the ports *B*, through which it enters the inner tube, and thence up to the drilling cylinder. The lower end of the inner tube is closed with a plate *C*. While the clearance between the lower end of the inner tube and the outer tube is so slight as to permit this end to act as a guide, it is sufficient



LONGITUDINAL SECTION OF IMPERIAL VALVELESS STOPER

The exhaust port *H* serves to remove the air from in front of the piston until it is covered, when the entrapped air acts as a cushion to the blow; thus the piston cannot strike the front head even when there is no steel in the chuck. It should be noted that the large end of the hammer is concave. The ports *J* permit the escape of to pass a portion of the compressed air to the bottom of the outer tube, where it exerts pressure against the plate *B* and forces out the inner tube so as to hold the drill steel against the rock. When the ports *B* pass under the shoulder on the outer tube, air is shut off from the hammer and the machine stops drilling.

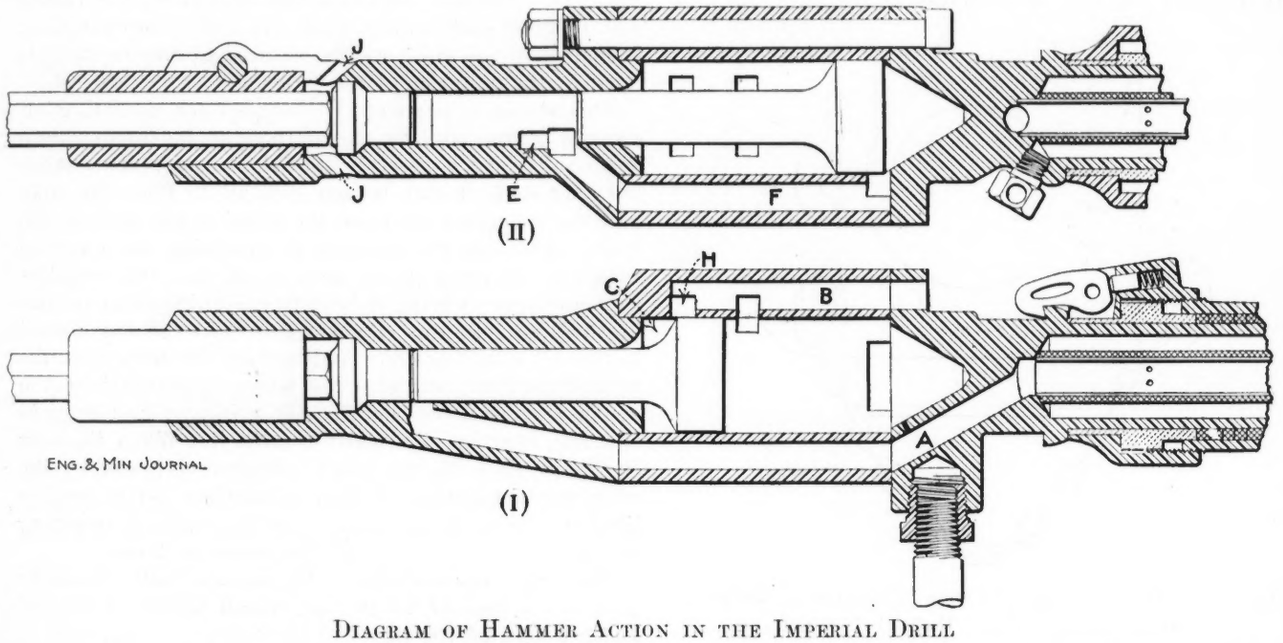


DIAGRAM OF HAMMER ACTION IN THE IMPERIAL DRILL

the slight amount of air leakage which takes place around the anvil block; the effect of this is to keep dirt and rock cuttings from working down into the machine.

The end of the front head contains the chuck bushing. This is made of a section to accommodate any of the ordinary steel cross-sections. The bushing is held in position in the head by a bolt which engages a groove in the side of the bushing. The front head is slotted longitudinally for some distance back from its end, so that by drawing up the bolt tight, the bushing is bound against all movement.

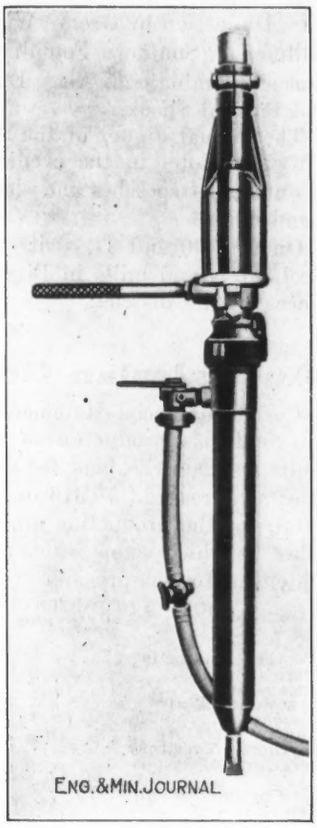
The through bolts holding together the front head, cylinder and back head pass through holes in the cylinder walls.

Two other telescope feeds of the ordinary type are furnished with this machine. These differ from each other only in the fact that one carries an extensible spud to use when a greater length of drill is required. When these ordinary feeds are applied, the lubricator is placed in the handle, as it is in the case of the butterfly-valve stoper, the throttle valve is set in the handle, and the exhaust is carried some distance in a tube down parallel to the feed.

In the reverse type of feed, a bleeder in the throttle permits the exhaust of the air in the telescope so that the machine can be run back. The end of the outer tube is screwed into a packing nut which can be adjusted to keep the gland tight on the packing, and prevent leakage of

air at that point. A hook or feed lock is provided to catch automatically over a shoulder in the inner tube whenever the telescope feed is closed. The spud is screwed into the end of the outer tube.

Lubrication is effected by a device screwed into the upper end of the inner tube. It consists of an oil tube which forms part of the circuit of the drilling air on its way to the hammer. The space between the outside of this oil tube and the inner tube of the telescope feed acts as an oil chamber. It is filled through a plugged oil hole which can be seen in the outside view of the machine. The oil tube is perforated with a series of small holes and is surrounded by a cylindrical wick, such as is used in a Rochester-burner kerosene lamp. When the machine is running, the oil is held back by pressure; when it stops, and pressure is released, the oil oozes through the holes in the oil tube and accumulates until it is carried to the hammer when the air is turned on again. The wicking acts as a filter and keeps dirt out of the cylinder.



INGERSOLL-RAND IMPERIAL VALVELESS

The throttle valve has a lever handle. It is arranged to give a closed position, a throttled-air drilling position, and a full-speed drilling position; between these points other speeds and pressures may be had. The connection to the hose consists of two short lengths of hose with a stopcock between them. This provides the double-valve control necessary to enable the machine to be disconnected without shutting off the air at the main pipe line. However, a simple single-length connection without stopcock is also furnished.

These Imperial type machines, MC-32, are made with hammer having diameters of $1\frac{3}{16}$ in. and $2\frac{1}{2}$ in., and a 4-in. stroke, the feed length is 20 in., the overall closed length 50 in., and the weight 65 pounds.

(To be continued)

Indian Mineral Production, 1913

The mineral output of British India for 1913 included the following items: Coal, 15,486,318 long tons; mica, 2183; manganese ore, 637,391 long tons; rubies, sapphires and spinels, 278,706 carats; gold, 11,019 oz.; wolfram ore, 1376 long tons; and chromite, 3414 long tons as against six in 1912.

From the official report it would appear that India also produced iron, tin, galena and other minerals, but no idea can readily be obtained as to how much.

Mine-Rescue Car in California

By Lewis H. Eddy*

U. S. Mine-Rescue Car No. 5, which entered California on Sept. 8 and began work at Grass Valley, was scheduled to complete the trip Oct. 29 at Kennett. The car goes from California direct to Billings, Mont., where it will make winter quarters. The itinerary of the car was laid out by H. M. Wolflin, mining engineer, and the operation of the car was directed by Edward Steidle, junior mining engineer, and George W. Riggs, first-aid instructor. The classes varied from four to 28 in rescue work and from 10 to 26 in first-aid work. There was a total of 62 men instructed in rescue work and 130 in first aid. At Grass Valley, the class in rescue work contained five, in first-aid work, 26; Nevada City, rescue work, four, first-aid, 10; at Jackson, rescue work, five, first-aid, 17; Jamestown, rescue work, five, first-aid, 11; Kennett, rescue work, five, first-aid, 15; Stanford University, rescue work, 10, first-aid, 26; University of California, rescue work, 28, first-aid, 25. Several mining engineers of San Francisco joined the Berkeley classes.

It was found that only two mines of those visited by the car were in possession of oxygen breathing apparatus. The North Star mine at Grass Valley has two sets; the Mammoth at Kennett has two sets. I believe that these four sets were the only ones in the state up to the time of the visit of the rescue car. There will be five sets put in by mines at Jackson and five sets by those at Jamestown.

The work taught during these visits of the rescue car attracted the attention of the mine operators, and many miners also took an interest in the proceedings. A total of about 1500 men attended the several lectures that were delivered on both rescue work and first-aid work. The operators of the various mines visited donated the time of the men engaged in the classes; that is, they allowed them full pay while they were employed in taking the lessons.

Messrs. Steidle and Riggs were formerly with car No. 6, and have endeavored to get the most practical method of training. Mr. Riggs arranges his classes in teams of five men each, designating one as captain and the team selecting one of the remaining four as a patient, the same student not being required to act as patient more than once during the demonstration. By this means all the men have an opportunity to take part in the actual demonstration of the first-aid work. Organization and discipline are insisted upon in both classes. At the mines the rescue work was carried on in every instance underground. Where demonstration in mine fires was given the end of a drift would be bulkheaded off and a fire of timbers made. When the air was reduced in oxygen to the point where a carbide lamp would not burn the men were sent in with the oxygen-breathing apparatus. In the thickest of smoke and injurious gases the men were able to work not only in extinguishing the fire, but in actual mining under the same conditions, including drilling and timbering and loading of cars. Of course, during the first day of the fire they were unable to do a great deal except explore, but at night when the smoke had passed out they proceeded to work under conditions that would be absolutely fatal to men not provided with the apparatus. The men were able to work at least two

*Associate editor, 3430 Peralta St., Oakland, Calif.

hours under such conditions, and when more than one team was being trained they alternated. The men were also drilled in the use of the life line and the horn signals. The instruction was under rules laid down by Mr. Paul, the chief mine-rescue engineer of the Bureau, and the apparatus is of the Bureau of Mines standard.

The visit of the car in California has created a great deal of interest and there will be a request for another visit next year. In fact, at the universities an effort will be made to secure annual visits of a mine-rescue car in order that students may have advantage of repeated training which will enable them to carry on permanent classes.

In addition to the work carried on by the car, A. A. Krogdahl visited points inaccessible to the car, and also visited points where the car had been and gave further instruction in first-aid work. During the time the car was in California, Mr. Krogdahl gave instruction to 150 men. He visited the mines along the Mother Lode from Plymouth to Shawmut, and assisted in the first-aid contest on Labor Day at Jackson. He visited Redding, French Gulch and Kennett in Shasta County; Weaverville, and the Globe Consolidated in Trinity County; and rejoined the car at Berkeley for comparison of methods with Riggs. While the car was concluding work at the University of California and visiting the Mammoth mine in Shasta County, Krogdahl went north into Plumas, Sierra Nevada and Placer Counties, visiting the Engles copper mine at Taylorville, and the Dairy Farm copper mine at Van Trent, near Sheridan, and mines at Sierra City, Allegheny, Pike, Nevada City and Grass Valley.

I have talked with producers, owners, miners and students regarding the value of this sort of training and they are for it seriously and earnestly. There is sufficient interest and enough work to keep a mine-rescue car employed in California, Nevada and Arizona, with headquarters at San Francisco. The relative geography of the three states is such that the car could be operated continuously and economically in this territory.

The American Iron & Steel Institute

The seventh general meeting of the institute was held at Birmingham, Ala., Oct. 29, with a large attendance. The morning session was opened by an address from President E. H. Gary, in which the leading topics were the necessity of fairness and coöperation among the leading business interests and the possibilities of future trade expansion. As to the condition of trade, Judge Gary said: "Without particularizing, it would seem safe to predict that in many important respects business conditions in the United States for the next three months will be better than they have been for the past three months. As to the long future, I don't hesitate to say with emphasis that the opportunities for progress and success in this country are greater than ever before."

At the morning session, the following papers were read and discussed: "The Use of Steam Turbines for Various Purposes," Frank G. Cutler, Birmingham, Ala. Discussed by Leif Lee, Karl Nibecker and Alexander L. Hoerr. "The Repair Department of a Modern Steel Plant," John Hulst, Pittsburgh. Discussed by Bertram D. Quarrie and Howard L. Bodwell. "The Use of Titaniferous Ores in the Blast Furnace," Frank E. Bachman, Port Henry, N. Y. Discussed by Arthur H. Lee and Richard H. Lee.

The afternoon session brought out the following papers: "The History of the Iron and Steel Industry in the South," James Bowron. Discussion by Hiram S. Chamberlain. "The Modern Development of the Iron and Steel Industry in the South," Thomas K. Glenn, Atlanta, Ga. Discussion by George W. Connors and M. P. Gentry Hillman. "Southern Foundry Pig Iron," James W. McQueen, Birmingham, Ala. Discussion by L. R. Lemoine and Paschal Shook.

The annual dinner of the Association was held at the Tutwiler Hotel in the evening, Judge Gary presiding. A number of speeches and short addresses were made by members.

On Oct. 30 and 31, visits were made to the furnaces, steel works and mills in Birmingham, Ensley and other places in the district.

Australasian Gold Production

Corrected official statements for the year 1913 bring the total gold production of the Commonwealth of Australia and New Zealand for that year up to 2,565,718 oz. fine; a decrease of 70,673 oz., or 2.7%, from 1912. The details of the production are given in the accompanying table, in which comparisons are made with the corrected statement for the previous year:

GOLD PRODUCTION OF AUSTRALASIA
(In fine ounces)

	1912	1913
Western Australia	1,282,658	1,314,043
Victoria	480,131	434,932
Queensland	347,946	265,735
New South Wales	165,295	149,657
Tasmania	37,973	33,400
South Australia	6,592	6,556
Northern Territory	5,000	3,119
Territory of Papua	....	14,681
Commonwealth	2,325,595	2,222,123
New Zealand	310,796	343,595
Total, oz.	2,636,391	2,565,718
Total value	$54,494,202	$53,033,391

Western Australia and New Zealand showed increases, but all the other states had smaller output. The territory of Papua is reported separately for the first time.

The production for 10 years past has been as follows:

GOLD PRODUCTION OF AUSTRALASIA, 10 YEARS
(Value)

1904	$87,241,662	1909	$71,254,182
1905	85,970,779	1910	64,243,704
1906	82,358,207	1911	58,322,070
1907	75,849,349	1912	54,494,202
1908	73,314,671	1913	53,033,391

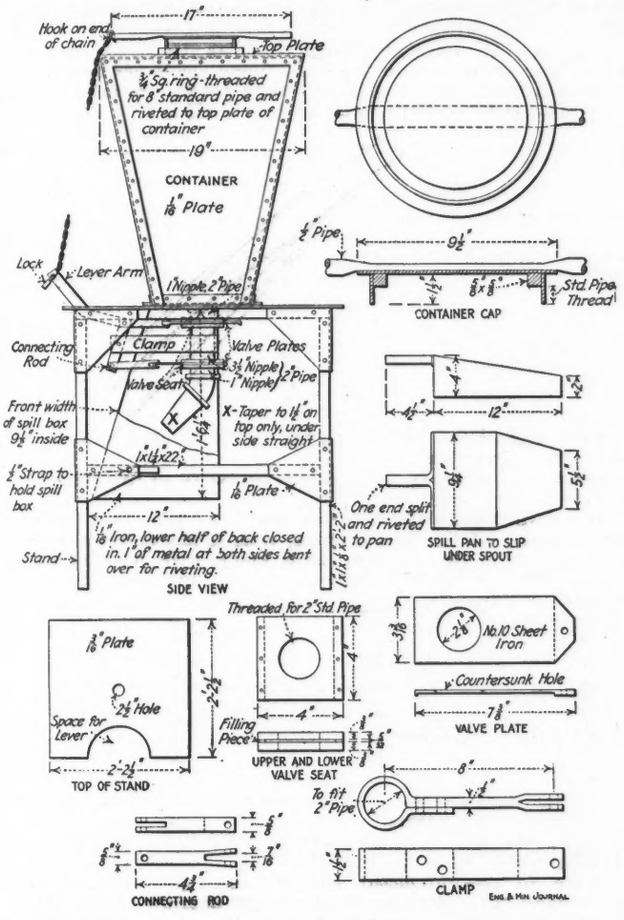
The decrease in the 10 years from this production of 1904 was $34,208,271, or 39.2%. The decrease has been continuous, being most marked in 1907, 1910 and 1911. In 1913 the movement was checked to some extent, the decrease from 1912 being only 2.7%. The reasons for the decline have been frequently discussed; there seems to be no present reason to expect a change in the course of production.

Details of Practical Mining

Carbide Container and Measurer

By E. W. R. Butcher*

With the introduction of carbide lamps, it has been found unsatisfactory to allow the miners to help themselves from the carbide cans. The Republic Iron & Steel Co. therefore furnishes each of its miners with a small can having a screw top which holds enough carbide to



The Assembled Container and Details of Certain Parts

last one shift. These cans are filled from the carbide container, a drawing of which is shown herewith.

By means of the valves, one motion of the lever arm, up or down, gives out just enough carbide to fill a miner's can. The spill pan is used to catch any carbide which falls. Since the container has been in use, the carbide consumption has been reduced nearly one-half.

A screw top with a ½-in. pipe for a lever handle is provided on the top of the container. The carbide issues from the container bottom through a 2-in. pipe connection. In this connection are set two valves, each consisting of a seat and a plate, in both of which are 2⅛-in. holes. The plate slides over the seat, and when the holes register, the valve is open and carbide can pass. When the holes do not overlap at all, the valve is closed. The sliding back and forth of the valve plates is effected by the lever arranged to close one valve while opening the other. Between the valves is a 3½-in. nipple of 2-in. pipe, which forms the measuring box. A chain connection between the pipe handle of the cap and the end of the operating lever can be kept locked. The details of the construction of the entire apparatus can be seen in the drawing.

*Mining engineer, Republic Iron & Steel Co., Gilbert, Minn.

⁂

Relation between Appearance of Carbons and Their Wearing Qualities

By E. S. Dickinson*

Some years ago while doing considerable diamond drilling in the Lake Superior iron region, I started out to gather data which would assist me in selecting carbons. I found that no two men had the same idea as to how to judge the stones. One would rely upon the specific-gravity test; another would use this as well as the acid test and boiling the stone in acid to detect doctoring; the largest number would use their own judgment after looking the stone over and making a few simple tests with a file, nippers, etc. Some wanted red-tinged stones, some greenish, others only grayish stones; some wanted broken stones so that they could see the grain, others wanted stones with the outer skin unbroken, believing this skin to be tougher and longer wearing. Some wanted stones of regular shape without any sharp corners or projections to wear or break off; others maintaining that the best stones could not be broken as desired, would select those with the more irregular shapes and with sharp corners.

I found that no reliable data could be had and furthermore that weighing each bit as it was set and again as it was cut out, and noting the footage drilled, the number of the hole and its depth at the start and finish of the run of the bit, together with the nature of the ground passed through, did not give the desired information. I therefore, in addition, had each stone weighed separately at the time of setting in the bit, and again when cut out. Each stone was numbered; when it was set the number was stamped near it on the bit; when it was cut out, it was put in a numbered compartment and kept there. The drilling was done in hard-ore and jasper-ore formation for the most part, but a little of it was in soft slates. There follows a part of the data collected:

Stone No. 1—Purchased from Mr. A. at $75. Natural, unbroken stone with yellowish, glassy, slaglike appearance and vitreous luster. Weight, 4 $^{60}/_{64}$ carats.

*Iron River, Mich.

Bit No.	Hole No.	Feet Drilled	Loss in Weight of Bit, Carats	Loss in Weight of Stone, Carats	Remarks
2	8	8	3/64	1/64	
3	38	18	2/64	0	Soft slate
6	38	17	3/64	1/64	
9	38	22	1 23/64	29/64	Stone broke

The two small pieces were afterward used as inside stones, but no longer weighed.

Stone No. 2—Purchased from Mr. A. at $75. Natural surface rounding and smooth, black with dull luster. One face flat, grayish white, with black and yellow spots. No pores visible to the eye. Fracture face gray, with white and yellow spots and small pores. One streak of white running through the stone. Weight, 5 42/64 carats.

6	38	17	8/64	1/64
9	38	22	1 23/64	1/64

Another stone broke in this bit. No further history of this stone.

Stone No. 3—Purchased from Mr. A. at $75. Small pores, black with bright luster. One face flat, looked as if it had been ground and polished. Fracture face dull, slaty black, showing minute crystals. Weight, 7 32/64 carats.

3	38	18	2/64	0
6	38	17	3/64	0
9	38	22	1 23/64	3/64

Stone No. 1 broke.

Stone No. 4—Purchased from Mr. B. at $70. Round, natural stone, not broken, with black, dull luster; medium rough. Weight, 2 58/64 carats.

6	8	7	0	0	
4	7	14	8/64	0	Set with old stones.
5	7	16	13/64	4/64	
7	11	61	22/64	20/64	Black slates and quartz.
19	8	12	3/64	0	
16	8	3½	14/64	1/64	
17	8	7	5/64	2/64	
21	8	12	6/64	2/64	
23	8	9	5/64	2/64	
25	8	16	10/64	3/64	
2	12	3½	2/64	0	
4	21	6	3/64	0	
6	21	9	3/64	1/64	
8	21	8	3/64	1/64	
10	21	7	3/64	0	
14	21	8	3/64	1/64	
16	21	2	2/64	0	

Total loss of stone, 29/64 carat in 164 ft. of drilling; 5.65 ft. per 1/64 carat loss.

Stone No. 5—Purchased from Mr. B. at $70. Brownish black, natural stone. Little luster. Comparatively flat faces and small pores. Weight, 3 16/64 carats.

4	9	10	47/64	21/64	Slates.
6	9	23	1 7/64	4/64	Slates.
8	9	37	22/64	9/64	Slates.
3	38	18	2/64	2/64	Cherty carbonate slates.
1	58	85	13/64	0	Cherty carbonate slates.
3	58	78	31/64	2/64	Cherty carbonate slates.
5	58	35	23/64	13/64	Cherty carbonate slates.

Total loss of stone, 51/64 carat in 286 ft. of drilling; 5.6 ft. per 1/64 carat loss.

Stone No. 6—Purchased from Mr. B. at $70. On natural faces black, shining luster; uneven faces; one flat face. On broken face, metallic luster. Close grained; no pores visible. Corners sharp. Weight, 5 12/64 carats.

Stone No. 7—Purchased from Mr. B. at $70. Brown, dull luster; corners well rounded. Small, shallow pores. Weight, 3 2/64 carats.

				No. 6	No. 7	
4	9	10	47/64	2/64	1/64	Slates.
6	9	23	1 7/64	10/64	1/64	Slates.
8	9	37	22/64	8/64	6/64	Slates.
10	9	54	14/64	2/64	2/64	Slates.
12	9	30	23/64	2/64	2/64	Slates.
14	9	18	12/64	1/64	1/64	Slates.
16	9	9	1 1/64	0	2/64	
18	9	19	24/64	0	10/64	
20	9	12	38/64	0	14/64	
22	9	5	3/64	0	1/64	
24	9	15	4/64	0	0	
26	9	25	1/64	0	1/64	
28	9	9	3/64	0	3/64	

This bit was used in ground which was mostly slate, but contained some hard material. Total loss of No. 6, 30/64 carat in 266 ft. of drilling; 8.87 ft. per 1/64 carat loss. Total loss of No. 7, 1 28/64 carats in 266 ft. of drilling; 2.6 ft. per 1/64 carat loss.

Stone No. 8—Purchased from Mr. C. at $75. Broken stone; no natural faces. Square in shape, with sharp edges. Grayish white, but slightly pinkish around the pores. Slight sparkle from crystal faces. Weight, 3 1/64 carats.

Stone No. 9—Purchased from Mr. C. at $75. Four broken faces. Grayish, quartz-like, highly crystalline. Good luster; numerous large pores. One face had pink and white streaks. Skin, or natural face, dull black. Weight, 2 48/64 carats.

				No. 8 Loss	No. 9 Loss	
15	21	6	11/64	3/64	1/64	Hard ore and quartz badly broken up.
18	21	3	2/64	1/64	0	
20	21	21	1/64	0	0	
22	21	4	1/64	0	2/64	
28	21	4	1/64	1/64	1/64	
31	21	12	10/64	2/64	2/64	
34	21	14	11/64	3/64	3/64	
39	21	6	4/64	1/64	2/64	
25	21	37	2/64	0	2/64	
42	21	7	4/64	2/64	2/64	
45	21	2	2/64	3/64	1/64	
49	21	3	1/64	0	0	
36	21	4	1/64	1/64	..	

Total loss of No. 8, 1 45/64 carats in 113 ft. of drilling; 1.1 ft. per 1/64 carat loss.

Total loss of No. 9, 38/64 carat in 109 ft. of drilling; 2.9 ft. per 1/64 carat loss.

Stone No. 10—Purchased from Mr. C. at $75. Two broken faces; rest of the stone with natural skin. Broken surface green, close grained, sparkled with minute crystal faces. Natural faces black with a little luster. No pores. Sharp edges. Weight, 2 51/64 carats.

Stone No. 11—Purchased from Mr. C. at $75. Two fracture faces close grained with greenish tinge, small crystal faces causing a well defined sparkle; sharp edges. Natural skin, black with some luster, and no pores. Weight, 2 51/64 carats.

				No. 10	No. 11	
7	8	18	20/64	11/64	3/64	
5	8	31	2/64	..	2/64	
9	8	16	1 2/64	3/64	3/64	From No. 11 2½ broke off; used in reamer.
11	8	42	23/64	4/64	6/64	
13	8	33	1 18/64	20/64	16/64	
15	8	40	25/64	11/64	14/64	Lost 4 3/4 carats of bortz, in this bit.
17	8	22	15/64	4/64	4/64	
19	8	30	18/64	11/64	6/64	
21	8	15	10/64	2/64	6/64	
25	8	13	4/64	3/64	6/64	
27	8	8	5/64	3/64	6/64	
29	8	15	10/64	3/64	6/64	
2	18	8	3/64	..	6/64	

Total loss of No. 10, 1 9/64 carats in 283 ft. of drilling; 3.88 ft. per 1/64 carat loss.

Total loss of No. 11, 1 18/64 carats in 291 ft. of drilling; 3.55 ft. per 1/64 carat loss.

Stone No. 12—Purchased from Mr. C. at $75. One broken face, grayish white, close grained, with a few small shallow pores, and a slight sparkle. Skin black with high shining luster. Shallow pores, yellow inside. Rounded corners Weight, 2 47/64 carats.

4	8	2	12/64	0
10	8	10	12/64	3/64
13	8	3	4/64	2/64
16	8	3	13/64	2/64
21	8	2½	3/64	0
24	8	4	4/64	3/64
27	8	6	6/64	3/64
31	8	3	2/64	0
34	8	4	4/64	1/64
37	8	4	6/64	3/64
43	8	6	4/64	3/64

The material drilled by this stone was exceptionally hard broken jasper and quartz.

Total loss, 19/64 carat per 119 ft. of drilling; 6.3 ft. per 1/64 carat loss.

Stone No. 13—Purchased from Mr. D. at $80. Highly polished black skin, with white spots and shallow pores. One fracture face gray, with yellowish white spots; dull luster; close grained; edges sharp. After use, was shown to be extremely porous.

9	9	5	14/64	0	
11	9	17	36/64	0	
14	9	1½	37/64	1/64	
6	7	14	14/64	0	Black slates.
15	9	6	10/64	2/64	
18	9	6	16/64	4/64	
20	9	9	18/64	3/64	
22	9	9	17/64	4/64	
24	9	13	25/64	4/64	
26	9	10	20/64	4/64	
3	21	9	24/64	4/64	Hole 21 hard ore; quartz and jasper badly broken up.
5	21	7	17/64	0	
7	21	3	20/64	4/64	
9	21	20	10/64	3/64	
11	21	13	4/64	4/64	
13	21	25	3/64	3/64	
18	21	22	3/64	2/64	
20	21	22	1/64	0	
23	21	6	3/64	3/64	

Total loss, 41/64 carat in 218 ft. of drilling. 4.93 ft. per 1/64 carat loss.

Stone No. 14—Purchased from Mr. E. at $55. Ballas bortz, unbroken, egg-shaped, dark, translucent, with many dark, semitranslucent spots. From a distance looked like a piece of black graphite. Weight, 2.1/64 carats.

7	11	61	43/64	0	Black slate and quartz.
16	9	3½	11/64	0	
19	9	12	3/64	0	
17	9	7	5/64	0	
21	9	12	3/64	0	
23	9	9	1/64	1/64	
25	9	16	1/64	1/64	
2	21	3	1/64	0	
4	21	6	1/64	0	
6	21	9	1/64	0	
8	21	8	1/64	0	
10	21	7	1/64	0	
14	21	8	1/64	0	
3	58	78	31/64	0	Soft red slates.

Total loss, 2/64 carat in 236 ft. of drilling; 118 ft. per 1/64 carat loss. Average for other five stones in the bit, 8.13 ft. per 1/64 carat loss.

Stone No. 15—Purchased from Mr. E. at $55. Ballas bortz, unbroken, round, yellowish white, translucent, with few dark spots. Adamantine luster. Weight, 2 23/64 carats.

4	8	10	47/64	0
10	8	54	13/64	1/64
12	8	30	39/64	13/64
3	58	78	56/64	0

Stone showed a cracked appearance and some well defined cleavage.

Total loss, 14/64 carat in 172 ft. of drilling; 12.3 ft. per 1/64 carat loss. Average for the other five stones of this bit, 6 ft. per 1/64 carat loss.

Stone No. 16—Purchased from Mr. E at $55. Ballas bortz, egg shaped, black, slightly translucent, with adamantine luster. Looks like graphite from a distance.

3	86	81	0	0	Black slate, quartz and pyrite.
1	60	105	1/64	1/64	
9	60	43	1/64	1/64	

Several stones which were regarded as doubtful proved to be excellent and a few which were regarded as good stones proved to be poor ones, but as a rule the results showed that we had been selecting good stones.

The ballas bortz served well for uniform ground and soft ground and even in hard ground showed little loss until the outer skin had been worn through, when the stone quickly went to pieces. All the ballas showed well defined cleavage under the natural skin.

The loss on these stones is large, partly on account of the ground and partly because they were new stones not worn down to shape so that all the sharp and rough edges had to be worn off.

Blasting Supplies Used

By Percy E. Barbour

The following blasting supplies were used by 20 men at Iron Mountain, Idaho, doing 475 ft. of work during four winter months, when the camp was practically snowbound and all surface conditions were such as to hinder underground progress. Of this total footage, 50 ft. was a winze and 50 ft. was a small drift from the bottom, and the remainder was a tunnel 5x7 ft. in the clear, timbered with sawed 8x8 timber, giving a total cross-section of excavation of 54 sq.ft. The progress was considered good, considering the conditions.

SUPPLIES USED

	Total	Per Ft. Driven	Per Cu.Ft. of Excavation
Powder	2600 lb.	5.4 lb.	0.112 lb.
Fuse	9600 ft.	20 ft.	0.375 ft.
Caps	1100	2.3	0.043
Candles	640 lb.	1.33 lb.	0.025 lb.

Safety in Charging Dynamite

In a consideration of the causes of untimely and disastrous explosions of dynamite while loading holes, H. N. Freeman, in *Coal Age*, Oct. 3, 1914, enumerates the following causes which may be responsible:

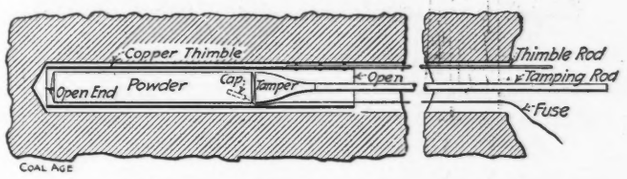
(1) The hole may not have been cleaned properly, and a small piece of coal remaining may break the cartridge and allow the powder to become distributed along the hole. This is liable to be, and often is, exploded either by forcing other cartridges into the hole and grinding the stray powder or by the friction of the tamping bar.

(2) If the powder is not properly thawed it will leave small particles of nitroglycerin on the sides of the hole, which are liable to be exploded by the friction of the tamping rod.

(3) The hole may have been bored with drills that are not of the same gage. These leave collars in the hole, so that when the powder is being inserted, it will jam against one of them.

(4) There is a practice prevailing among miners to force the powder, thereby causing the premature explosion of the charge.

(5) It frequently happens that in his hurry a miner may neglect to put the first stick of powder to the back of the hole. He then puts in the primer and forces it on to the powder, driving the charge back a couple of inches



Section through Drillhole, Showing Charging Thimble and Charge of Powder

or more. This is a common practice among miners and a large percentage of accidents may be attributable to this cause.

The accompanying figure illustrates a device that should prove a great benefit to miners in both quartz and coal. It will enable one to place his powder to the back of the hole without its coming into contact with the sides.

The charger consists of a light copper tube or thimble with a rod or handle of ⅜-in. round copper riveted to the side of the tube. The thimble is made ½ in. larger in diameter than the cartridge, and ½ in. less than the diameter of the hole. A slot is made in the tube to accommodate the fuse. The charger is open at both ends, thus enabling the tamping bar to be inserted next the powder and preventing undue pressure. Both charge and tamping bar are inserted into the hole at the same time.

After the charge has been delivered to the back of the hole, the charger is withdrawn over the tamper, and the powder is pressed into a solid mass in the back of the hole. Some miners make a practice of splitting the paper cartridge and compressing the powder to the full diameter of the hole. This can be done more safely with the charger, as the split cartridge does not come into contact with the hole at any point, thus eliminating those causes for premature discharge previously referred to.

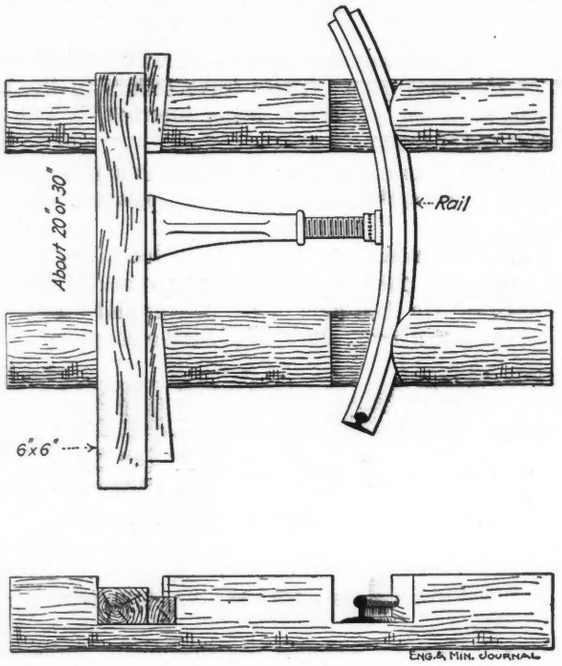
The chargers can be made for about 10c. each, and if properly used are time savers in tamping a shot, all the

powder being placed in the charger before it is inserted into the hole. They are especially useful when charging a hole drilled on an angle, as the full charge may be put into the hole at one time, while otherwise something must be used to keep one stick in place when preparing to insert the next one.

Notched-Log Rail Bender

By Charles F. Spaulding*

A sturdy and handy device for bending rails can be made of two logs, a 6x6-in. piece and a screw jack. The logs are laid side by side and two notches cut at opposite points in each. In one pair of these, the 6x6-in. piece



Screw-Jack Rail-Bender with Timber Frame

is wedged. In the other, the rail is laid. The distance between notches along the logs should be such that a 1⅛-in. or 1¼-in. jack, footed against the crosspiece, will easily reach the rail. For curves of different radius, the logs can be laid a greater or less distance apart.

Don'ts for Rescue Corps†

1. Don't fail to notify the man in charge of apparatus at once in case of trouble.
2. Don't tamper with the apparatus. It is ready for service.
3. Don't use old batteries in your lamp.
4. Don't hurry when using the apparatus.
5. Don't put the apparatus on alone and go into the danger zone without having someone make a thorough inspection of the apparatus. Don't go into the danger zone alone.
6. Don't use old cartridges in dangerous work.
7. Don't fail to look at pressure gage before going into the danger zone.
8. Don't fail to inspect all connections before putting the apparatus on.
9. Don't fail to keep in communication with the other helmet men.
10. Don't take helmet off in danger zone.
11. Don't forget that the rescue of men is the first consideration.
12. Don't forget to send for the first-aid immediately.
13. Don't chew tobacco in the helmet.
14. Don't disturb too much wreckage on first inspection. It might start something.
15. Don't fail to note conditions.
16. Don't fail to report conditions noted.
17. Don't fail to report any abnormal behavior of the apparatus.
18. Don't forget to return immediately if you think apparatus is not working properly.
19. Don't take chances—PLAY SAFE.
20. Don't fail to follow instructions.
21. Don't go into a strange mine without a guide.
22. Don't expect to be able to work as hard or as fast with the apparatus on as without it. You are carrying a load.
23. Don't, under any consideration, when exploring a mine in which electricity is used, get in contact with bare wires, unless you are sure the current is off.
24. Don't fail to take extra electric lamps with you from the rescue station—some may not work properly.
25. Don't forget the apparatus is only good for two hours.

Some Pointers for Rock Excavation

There seems to be a tendency among shovel men, when digging rock, to make the shovel "bite more than it can chew." In other words, to try to force as big a move as possible—this is a mistake for several reasons, says the *Excavating Engineer.*

In order to make an extreme move it is necessary to dig with the handle run out practically to the end. In rock work the twisting stresses are great and although a shovel will stand up to it for a while, a breakdown is very probable, due to the strains caused by hard digging in this position. A shovel does not exert its maximum power with the dipper run out as far as it will go. Furthermore. there is much more strength when the dipper is kept in as far as possible.

When an operator tries to stretch things and make a big move he often gets the front of the shovel so close to the face that in attempting to get the dipper back, he will frequently batter the front end of the car body to pieces, pound the circle, and often cut the swinging cable.

Don't try to make too big a move in rock work.

Don't dig with the handle run out to its end.

Don't run the shovel up too close to the new face.

Short moves and more of them will get you farther ahead in the end.

The Efficiency of Pump Motors on Gold Dredges deserves sideration, says Girard B. Rosenblatt ("Proc. A. I. E. E.," Aug., 1914), as the amount of total power used by the dredge for pumping is considerable, usually as high as 40%, and sometimes higher. Centrifugal pumps are ordinarily used on account of the low head and large volume to be handled, and these are best driven by direct connected squirrel-cage motors.

*Superintendent, Ogle Mountain Mining Co., Oregon City, Ore.

†From book of instructions of Susquehanna Coal Co., Wilkes-Barre, Penn. Published in "Coal Age," Oct. 3, 1914.

Details of Milling and Smelting

Effect of Acid Solutions on Bronze and Monel Metal*

In the search for acid-resisting alloys for use in the hydrometallurgical experiments on the Ajo ores, Krupp bronze and Monel metal were submitted to the following tests. Pieces of both metals were allowed to stand in acid solutions and in acidified copper-sulphate solutions of varying strengths—the bronze for two and one-half and the Monel metal for three months.

The bronze precipitated the copper completely from all but the two strongest solutions. The Monel metal precipitated no copper, but passed into solution to a greater extent than the bronze. The results were as follows:

WITH SULPHURIC ACID

Strength of Acid, Per cent. H_2SO_4	Per cent. Loss in Weight Bronze	Monel Metal
0.12	3.22	3.89
0.25	3.26	5.92
0.50	3.77	8.86
0.75	3.54	7.62
1.00	3.64	7.55
1.50	4.55	10.07

WITH ACIDIFIED COPPER SULPHATE SOLUTION

Strength of Solution, Per cent. Cu	Per cent. Loss in Weight Bronze	Monel Metal
0.05	1.22	14.50
0.10	1.22	7.20
0.20	0.76	4.73
0.30	0.82	5.08
0.40	0.10	2.17
0.50	0.22	7.87

The Monel metal was also allowed to stand about six weeks in the following solutions:

	Loss in Weight, Per cent.
10 per cent. sulphuric acid	2.81
10 per cent. sulphuric acid and 10 per cent. copper sulphate (2.5 per cent. Cu)	4.88
10 per cent. copper sulphate (2.5 per cent. Cu)	1.99

A high-silicon iron, under the trade name of "Duriron" was tested in a similar manner by these solutions. So far as could be observed at the end of a few weeks, this metal was not corroded in the least, but the experimental work was closed before this test was finished.

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

Tube-Mill Costs and Specifications

By Percy E. Barbour*

The accompanying table gives details of tube-mill specifications and quotations made to a large mining and milling company in Pachuca some time since. The prices are in U. S. currency, and have been reduced to prices per pound of tube mill complete, f.o.b. factory, and prices per cubic foot of charge when full to 2 in. above the center line. This gives two interesting methods of comparing the quotations. Mill *D* was selected, partly on account of price, although it was not the lowest in cost, and partly on account of superiority in certain mechanical features and construction.

TUBE-MILL QUOTATIONS AND SPECIFICATIONS

	A	B	C	D	E	F	G
Size	4′ 7½″ x 19′8″	4′ 6″ x 20′ 0″	5′ x 20′	5′ x 20′	5′ x 20′	4′ 6″ x 20′	5′ x 18′ 3″
Thickness of shell	Welded about ¹³⁄₃₂″	¾″	⅞″	1″	¾″	¾″	
Material in gear and pinion		Cast iron	Cast iron	Cast iron, cut	Cast iron, steel pin	Semi-steel	
Gears—face and pitch			8″ F., 2″ P.	12″ F., 1½″ P.	11″ F., 3½″ P.	8″ F., 1½″ P.	
Shaft dia. and rev. per min	125 r.p.m.	4 7/16″—142	4 7/16″—200	4 7/16″	4 7/16″—168	4 7/16″—200	—160
Clutch pulley	94½″ x 10½″	60″ x 14½″	36″ x 20″	78″ x 16″	78″ x 18″	60″ x 20″	74½″ x 10½″
Area of belt contact per min	2524 sq.ft.	2603 sq.ft.	4549 sq.ft.	3829 sq.ft.	4805 sq.ft.	4976 sq.ft.	
Size of trunnion		15″ x 15″	16″ x 18″	15″ x 18″	15″ x 18″	16″ x 18″	
Trunnion bearing pres. per sq. in.		115 lb.	118 lb.	122 lb.	131 lb.	142 lb.	
Vol. of charge 2″ above C.L. 3½″ lining	136 cu.ft.	132 cu.ft.	158 cu.ft.	161 cu.ft.	165 cu.ft.	133 cu.ft.	144 cu.ft.
Weight of charge @ 135 lb. per cu.ft.	18,300 lb.	17,800 lb.	21,300 lb.	21,700 lb.	22,300 lb.	18,000 lb.	19,400 lb.
Net weight of unlined mill	25,58C lb.						
Gross weight of unlined mill	27,120 lb.	24,050 lb.	36,600 lb.	27,625 lb.	30,000 lb.	35,000 lb.	36,960 lb.
Weight of cast-iron ribbed lining	20,290 lb.	15,000 lb.	23,500 lb.	25,000 lb.	25,000 lb.	25,000 lb.	21,200 lb.
Weight of cast-steel ribbed lining			19,000 lb.	19,500 lb.	17,600 lb.	14,500 lb.	
Net weight of unlined shell	15,430 lb.		23,500 lb.		24,000 lb.	28,500 lb.	
Gross weight mill with c. i. lining	47,410 lb.	39,050 lb.	60,100 lb.	52,625 lb.	55,000 lb.	60,000 lb.	58,160 lb.
Price unlined mill, f.o.b. factory	$2385	$1775	$2566	$1900	$1500	$2750	$2342½
Price unlined mill per lb	8.8c.	7.4c.	7.0c.	6.9c.	5.0c.	7.9c.	6.3c.
Price cast iron lining	$1095	$407.50	$799	$960	$750	$687.50	Mex. $1178
Price cast iron lining per lb	5.4c.	2.7c.	3.4c.	3.8c.	3.0c.	2.75c.	5.6c.
Price cast steel lining			$860	$1015	$1056	So. B. $440	
Price cast steel lining per lb			4.5c.	5.2c.	6.0c.	3½c.	
Price of mill with cast iron lining	$3480	$2182.50	$3365	$2860	$2250	S. F. $3437.50	$3520.50
Price of mill with c. i. lining per lb	7.3c.	5.6c.	5.6c.	5.4c.	4.1c.	5.7c.	6.1c.
Freight, fees, etc., but not duty		$ 437	$ 703	$ 547	$ 665	$ 636	
Price f.o.b. Pachuca		$2619	$4068	$3407	$2915	$4073	About $3720
Price f.o.b. Pachuca per lb		6.7c.	6.8c.	6.3c.	5.3c.	6.8c.	6.4c.
Price per cu.ft. charge, 2″ above C.L.		$19.80	$25.70	$21.20	$17.70	$30.60	$25.80
Delivery at factory	60 days	45 days	90-105 days	45 days		30 days	

*Mining engineer, 887 Middle St., Bath, Maine.

Electrostatic Fume Precipitation at Anaconda

Supplementing W. H. Howard's paper on "Electrical Fume Precipitation at Garfield," presented at the Salt Lake meeting of the American Institute of Mining Engineers, Edgar M. Dunn, of Anaconda, gives in the November *Bulletin* an account of the experiments that have been conducted at Anaconda this year, under the direction of Dr. Cottrell and the supervision of J. O. Elton and D. R. Kellogg, representing the Anaconda Smelter Commission. For the amount of gas to be treated at Anaconda, the 5-in. pipe adopted at Garfield means a cost for installation that is practically prohibitive, and experiments were made with a view of reducing installation cost by increasing the size of the pipe. The work

is as yet in the experimental stage but Mr. Dunn reports having obtained good clearance on mixed roaster and converter gases with a 3-ft. pipe treater 20 ft. long and 5-ft. velocity therein; the discharge electrode was a single No. 29 nichrome wire set in the middle of the 3-ft. pipe, with a consequent electrode spacing of 18 in. The current used had a voltage of 150,000 to 160,000 and, of course, there were troubles relating to insulation and rectifying. Blast-furnace gases did not give so good clearance, probably due to the relative poverty in moisture and SO_3 contents making the blast-furnace gases poorer in conductivity.

The experiments were sufficiently satisfactory, however, to induce the erection of an experimental plant on a somewhat larger scale in which a 4-ft. pipe, with consequent greater electrode spacing, and voltage up to 220,000 will be attempted.

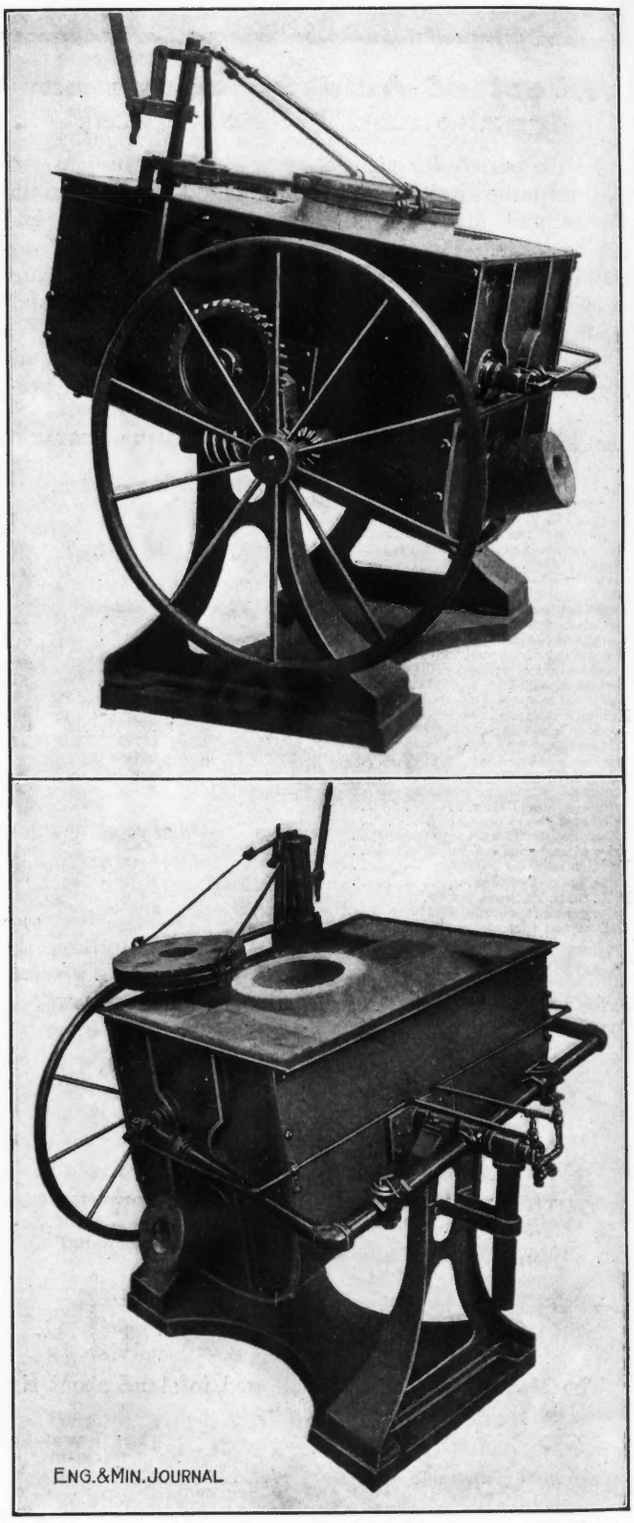
In the matter of fractional precipitation, Mr. Dunn states that this was used in the arsenic plant last December to separate As_2O_3 from the dust carried along from the first roasting furnace in the gas stream. Two treaters were used. In the first, with gases entering hot, at about 310 deg. C., practically all of the dust was precipitated; while in the second, the gases were cooled to 90 deg. C. by admission of air, and white arsenic of 99.7% purity was thrown down directly. Fractional precipitation thus eliminated the refining furnace formerly necessary.

In the regular practice, the Brunton roasting furnaces had passed so great an amount of the flue dust to the settling "kitchens" that refining of this arsenical product was necessary to eliminate the 5% to 20% of dust it contained. Hence, the manufacture of As_2O_3 was effected in two stages, with a reverberatory roast of the first product to obtain the final 99.5% As_2O_3. Part of the dusting trouble was due to too high a temperature and draft in the first roasting furnace. The process is simply one of volatilization of the As_2O_3 present in the flue dust; no chemical change of an appreciable nature occurs in this practice, the arsenates contained in the dust not being commerciably reducible below a smelting temperature. New flue-dust roasting furnaces of a different type are being installed and will be equipped with fractional-precipitation treaters. This installation is expected to eliminate the necessity of refining the product; the operation, however, is still regarded as experimental, due to change in the type of roasting furnace.

Tilting Reverberatory Furnace

In order to bring the advantage of mobility to the reverberatory furnace, the Monarch Engineering & Manufacturing Co., Baltimore, Md., has designed and built a tilting reverberatory, views of which are shown in the accompanying photograph. These furnaces are built in several sizes, with capacities varying from 500 to 2500 lb. per heat. The fuel used may be either oil or gas, two burners being placed in each furnace. The necessary air inlets are properly provided for, and there is a discharge opening through which the contents may be poured when the furnace is tilted, a large handwheel and the requisite gearing being provided for the latter purpose.

To conserve and concentrate the heat an insulating layer of sheet asbestos is placed next to the shell. Inside this is the refractory furnace lining. The top is formed of heavy molded refractory material, and there is no metal near the fire chamber. A swing-aside cover is arranged at the top or charging door. At the rear there is a door, heavily lined with fireclay, for cleaning the furnace or skimming slag during refining. The device is applicable to all reverberatory-furnace uses and is more convenient to operate than the usual stationary type.

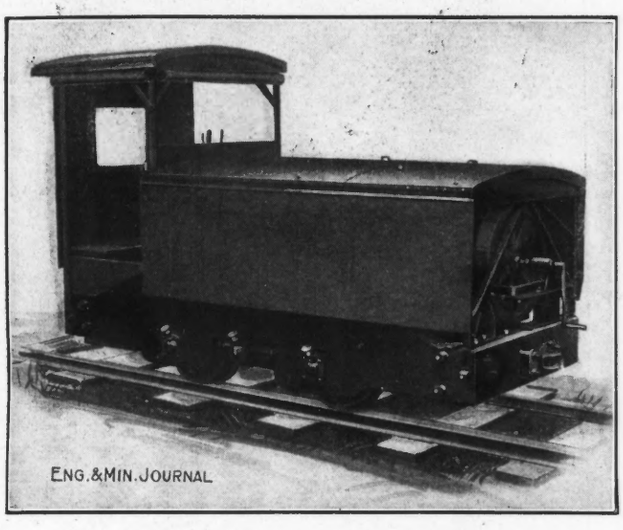


A Tilting Reverberatory Furnace

Mining & Metallurgical Machinery

Fate Gasoline Locomotive

A new gasoline industrial locomotive, recently placed on the market by the J. D. Fate Co., Plymouth, Ohio, was described in these columns, Sept. 12, 1914, p. 488. Since the preparation of that article, the manufacturers advise that instead of the two-cylinder, air-cooled Mon-

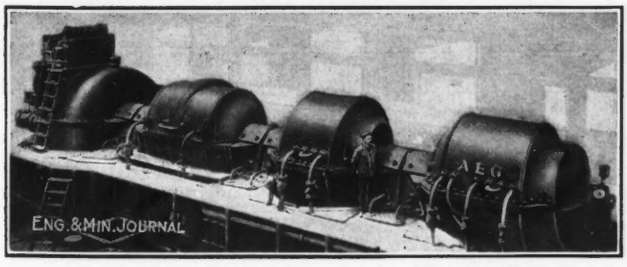


FATE GASOLINE LOCOMOTIVE

arch motor originally installed, a Continental, four-cylinder, water-cooled motor, 3¾x5 in., is now being used in this locomotive. An accompanying illustration shows the general appearance of this machine.

Large Rotary Compressor for the Rand

The accompanying photograph shows one of three sets of turbo-compressors recently ordered for the Victoria Falls & Transvaal Power Co. on the Rand. The machine



TURBO-COMPRESSOR FOR THE RAND, 100,000-CU.FT. CAPACITY

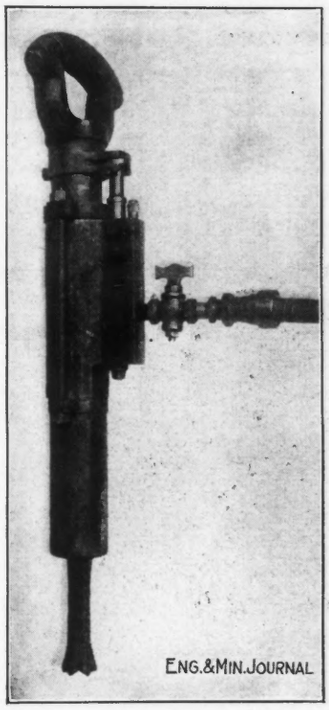
is rated at 12,000 hp. and is supposed to deliver 100,000 cu.ft. of free air per min. against a head of 10 to 12 atmospheres.

The compressor is driven by a steam turbine at one end of the set. The three compressor units are direct connected to this. The set operates at 3000 r.p.m. The compressor units are in series, the partly compressed air of the first being cooled and supplied to the second and the same with the second and third.

The machines are made by the Allgemeine Elektrizitäts Gesellschaft of Berlin.

A New Hardsocg Drill

The accompanying illustration shows a new light-weight drill, that the Hardsocg Wonder Drill Co., Ottumwa, Ia., has recently developed. Up to the present, this drill has been used practically in the slate regions of Pennsylvania, New York and Vermont, where it has given great satisfaction, but there seems to be no reason why it should not be adapted to certain kinds of ore mining. The drill is known as the Hardsocg No. 65A, and like the other drills made by this company, is a valveless machine. The machine weighs 29 lb., is equipped with an automatic push handle and is a self-rotater. In the slate work, referred to above, this drill is boring holes from 10 to 14 ft. deep, with a ¾-in. round or hexagonal hollow bit and ⅞-in. shank, and uses about 40 cu.ft. of air per minute. For work in limestone quarries, a ⅞-in. bit is being used. The drill is also well adapted for side-hole work in banks, and when fitted with a plug and feather bit, does excellent work in granite. It is being used for the latter work in the South, with solid diamond-point bits.



A NEW HARDSOCG DRILL

The design of this drill, and also the No. 65, a still lighter type, weighing 25 lb., has been changed somewhat from the earlier type of Hardsocg drills, and the result is an increased cutting speed. This is due to a difference in the position of the air intake, which permits greater speed and imparts more force to the blow of the piston. It also insures more constant and uniform rotation of the bit. The operation of the drill is simple. A slight pressure on the push handle opens the airway to the piston, which is also the valve. The rotation, which is positive with every blow, is secured by the reciprocation of the piston on a rifled bar, operated by a ratchet box. The

piston has keys on its lower end, and these keys engage ways in the rotating sleeve, and impart the rotation to the bit. All working parts are made from vanadium steel, and, including the drill barrel, are hardened.

The No. 65 drill measures 34 in. over all with bit and 22 in. without bit. The latter is held automatically in place when moving the drill. For use in slate work, the drill is furnished with ordinary 7/8-in. hexagon bushing, and if desired, the makers will also furnish 3/4-in. round, hollow bits with six- or eight-point rose bit for finishing a hole as small as 7/8 in. The following are some of the records that have been made with the No. 65 A machine: Nine inches in one minute, in limestone, with a 3/4-in. hollow bit, 7/8-in. gage; in Quincy granite, 3 1/4 in. in 30 seconds, using a solid, 7/8-in. steel, diamond-point bit; in limestone, 3 1/2 in. in one minute, with 1 1/2-in. bit, making a 1 5/8-in. hole. In the last case, a crucible, hexagon, hollow-steel bit was used, with a plug and feather.

Wernicke-Hatcher Rotary Air Compressor

An air compressor of novel design has been introduced by the Wernicke-Hatcher Pump Co. The machine delivers 75 cu.ft. of air per min. at 100-lb. pressure when running 400 r.p.m. It weighs 1400 lb., is 46 in. long, 28 in. wide and 35 in. high.

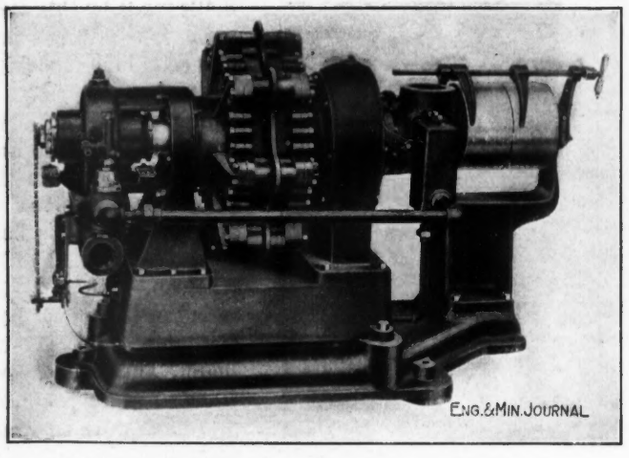


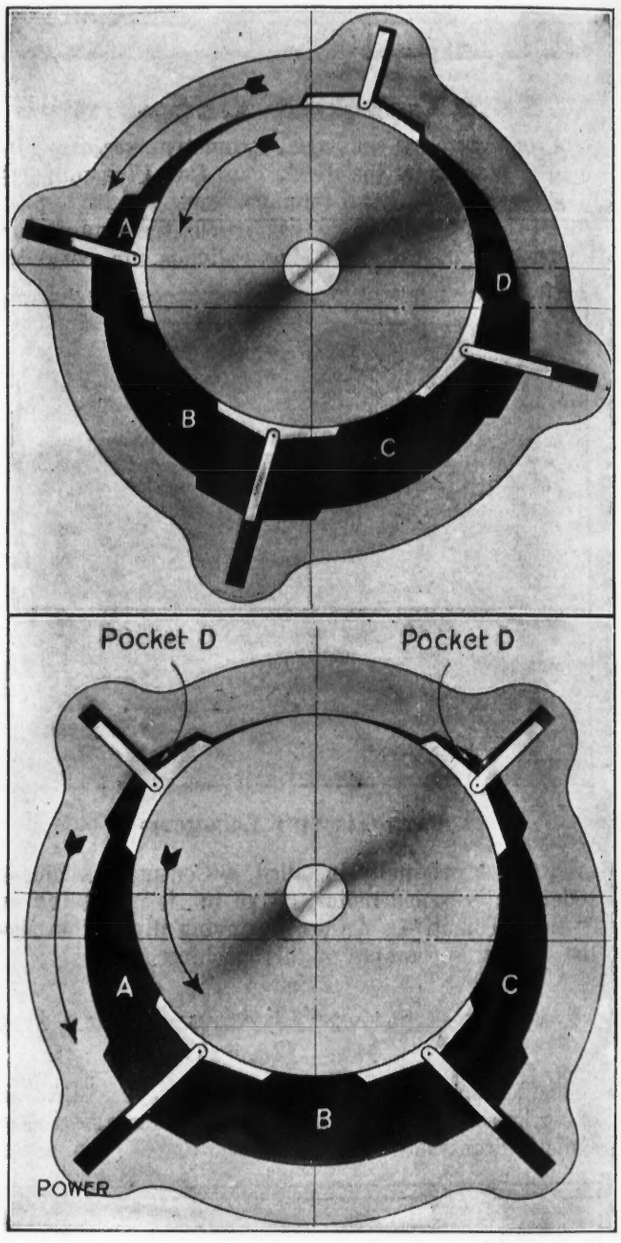
FIG. 1. WERNICKE-HATCHER COMPRESSOR

It consists principally of two elements, a rotor and a rotor casing, both of which revolve in the same direction and at the same speed on independent axes eccentric to each other. Plates extending radially from the rotor and fitting into slots in the casing and case heads, divide the displacement of the compressor into eight independent pockets. The plates are pivoted to shoes which slide on the surface of the rotor. To allow for the eccentricity and maintain a permanent seal between pockets, the plates slide back and forth in the slot.

The operation may be understood by the illustrations, in which, for simplicity, the pockets are reduced to four. In Fig. 2 *A* has begun to take air, *B* is still taking it in, *C* has begun to compress, and *D* has compressed still further.

In Fig. 3, *A* is still drawing air, *B* is completely filled, *C* is still compressing, and *D* has discharged. With eight pockets, the discharge is practically continuous.

As can be seen, the machine is compact for its capacity.



FIGS. 2 AND 3. SCHEME OF COMPRESSOR WORKING

Wear on the shoes and sliding plates is said to be small as their motion is slow. As the difference in pressure between successive pockets is only one-fourth the difference between initial and final pressures, leakage is low.

The Digging Motor of a Gold Dredge uses about 40% of the total power required by the dredge. The power for digging, writes Girard B. Rosenblatt ("Proc. A. I. E. E.," Aug., 1914), is about proportional to the yardage dug, i.e., the kilowatt-hours are proportional to the yardage handled times the number of hours during which it was dug. Mr. Rosenblatt gives the power consumption of moderate-sized dredges, with buckets of from 5 to 7 cu.ft. capacity and monthly yardage of from 60,000 to 100,000 cu.yd., as 1 1/4 to 1 3/4 kw.-hr. per cu.yd.; for larger dredges with buckets up to 15 cu.ft. capacity and monthly yardage of from 125,000 to 250,000 cu.yd., the power consumption is from 1 to 1 1/2 kw.-hr. per cu.yd. The very large dredge of the Conrey Placer Mining Co., having 17-cu.ft. buckets, has dug 520 cu.yd. of material, weighing 3000 lb. per cu.yd. per running hour, and a monthly tonnage of about 325,000 cu.yd.; this dredge has a power consumption of 1.28 kw.-hr. per cubic yard.

Men and Machinery of the Comstock--Hydraulic Machinery

By G. W. Dickie

SYNOPSIS—The connection between a hotel and a mining problem is sometimes not easy to discover, but the installation of hydraulic elevators at the Palace Hotel in San Francisco gave their originator the idea of installing the hydraulic machinery in the various Comstock mines. The idea at first was to have a central station for all the mines, but this was found to be impracticable, and in fact hydraulic-pumping machinery found many enemies among those interested in the manufacture of steam-pumping machinery and in the mine owners who already had large pumping plants. Finally, a tentative drawing of such a system was made for three of the more important mines.

In the former articles, I have considered in a brief way the various systems of deep mine pumping that had been put in operation on the Comstock in the years 1874-'75-'76; these were years of great effort on the part of the men who designed and installed these pumping works for in many cases we had to design and make the necessary tools by which to produce the character of work required. It never occurred to us to sit down and figure what we could or could not do. We had no limitations; we figured out what had to be done and set about doing it as quickly and effectively as we could. There were no data to guide us in deciding for any given mine what amount of water we would have to contend with, at what level we would encounter this dread enemy, nor did we know how deep the mine was to be. Once when he was starting a new shaft, I asked James Fair if he proposed to have a pumping plant immediately or to wait until he struck water. "My son," said he, "I am going to have the biggest and best pumping plant you fellows can design for me. My experience as a miner has been that if you have a fine pumping plant ready, the water somehow will not come into your mine, but if you have no pumping plant it is sure to break in and flood you out. A good pumping plant, my son, has a moral effect on the water." Mr. Fair's doctrine resulted in some of the finest pumping plants being installed where there was little water and these gave no trouble, but other mines where the pumping plants were not so powerful got more water than they could handle and efforts to speed up these engines resulted in disastrous breakdowns, and the possibility of draining the Comstock became a most important problem.

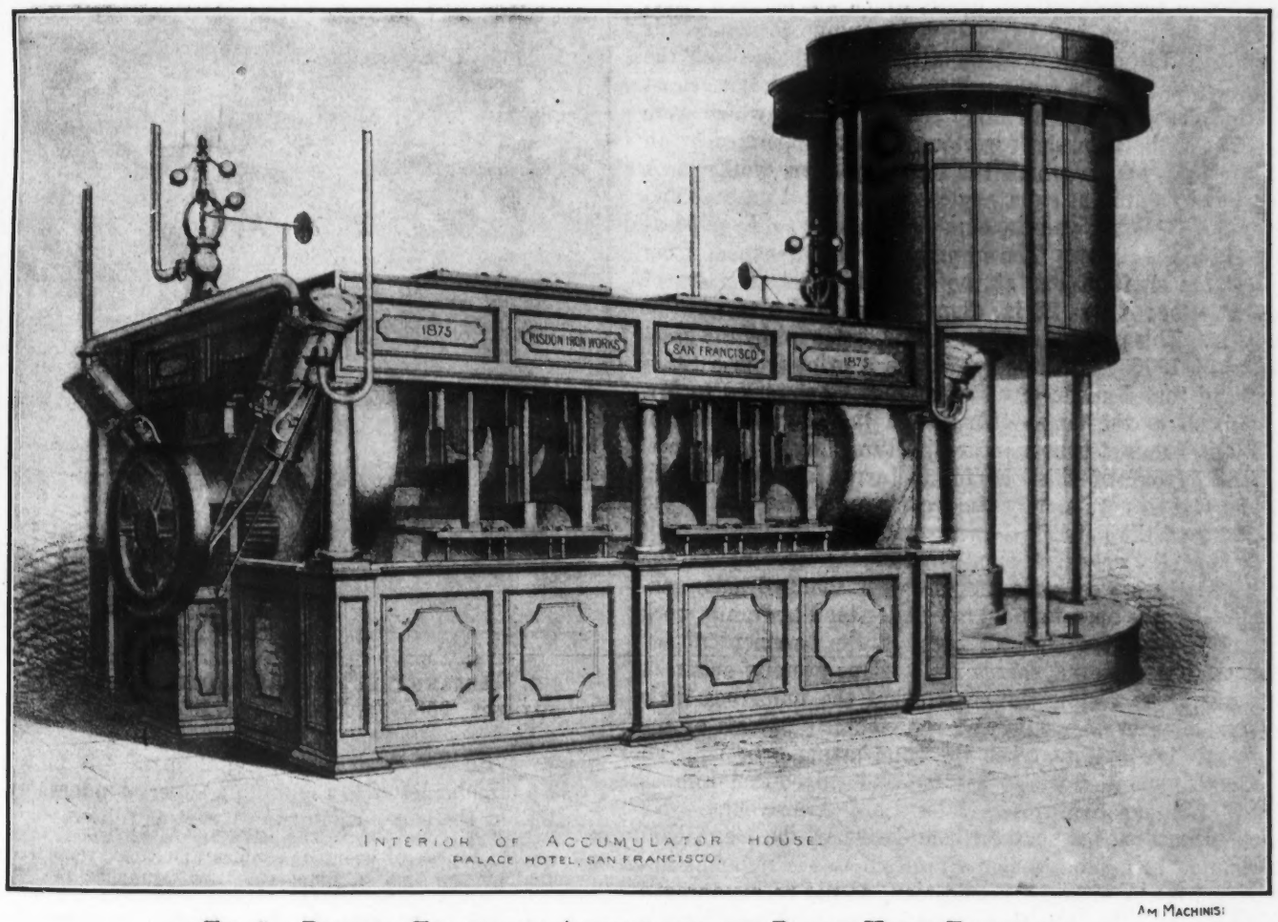


Fig. 1. Pumping Engine and Accumulator for Palace Hotel Elevators

At this time Mr. Ralston was building the old Palace Hotel in San Francisco and I was requested to design five

elevators for this. He wanted them to be fast. This was before the days of electric elevators and I decided to risk my reputation on hydraulic elevators on a more extensive scale than had ever been attempted. I decided on gearing them 12:1, that is, the elevator was to move 12 ft. for 1-ft. movement of the rams. I used five rams in the hoisting machine. The two outside rams were smaller than the other three. These small rams had the accumulator pressure always on them and their function was to balance the weight of the elevator car. The other three were the power rams. With four passengers, the center ram only was used; with eight passengers, two rams were used, the center one being out; with twelve passengers, all three rams were used. The crosshead carried six sheaves, 40 in. diameter, each with three grooves for the three steel hoisting ropes; six similar sheaves were mounted at the back end of the cylinders and were stationary; the valve gear was of the differential type operated by a rope in the elevator. Fig. 1 shows the pumping engines and the accumulator.

The Palace Hotel Elevator Machinery

Mr. Ralston had a marble wainscoting around the interior of the accumulator house, which was across a street from the hotel, and he desired the engine to match this finish. I therefore made the tank, which received the return water to be repumped into the accumulator, of cast iron, heavy enough to carry the six pumps, which were vertical, the crankshaft working in yokes, operated by an internal gear in which the engine pinions worked. A pair of engines at right angles was mounted on each end of this structure and the entablatures were so designed as to hide the guides. The accumulator ram was made from a spare shaft of one of the big side-wheel steamers of that time; it was 22 in. diameter and had a traverse of 22 ft. This piece of machinery was destroyed by the great fire of 1906. Fortunately, I have a print from a lithograph that I made of a design that I submitted to Mr. Ralston at the time—1875; from this Fig. 1 is taken. While I do not believe in architectural finish for engines, I am proud of this one for it turned out successfully and the accumulator house became an attraction for the guests of the hotel.

For two or three months after the opening of the hotel, there was some trouble with the hydraulic machinery; the operators did not understand hydraulic work and I was often kept all night in the basement of the hotel trying to put things right. One evening about 11 p.m., I was feeling downcast about the numerous little troubles that were affecting the complete success of the hydraulic elevators, when the hotel manager brought an English guest down to see me and introduced him as Sir William Armstrong (later Lord Armstrong). He complimented me on the whole design of the plant, said that he had come to San Francisco to see it, and comforted me by saying, "Young man, do not be discouraged by the little troubles that you are having. I have built a great deal of hydraulic machinery and my experience is that hydraulics need a wet nurse for the first three or four months, after which, if nothing fundamental is wrong, you are over all your troubles." He was right; but while my mind was busy with this hydraulic work it was also busy with the Comstock pumping plants and so the two got together in the plans that followed for the Comstock.

A Pumping Scheme for the Comstock

Before launching out into any comprehensive scheme, I first made some propositions to relieve certain pumping works by removing some of the lower pumps and doubling the upper sets so as to enable the engines to speed up, then taking the water from the upper rising column to work hydraulic pumps below, thus using the extra speed obtained to provide power water for the lower levels. While this was being discussed, a large body of water broke into the Savage mine, far beyond the capacities of the pumps on the Savage and the large pumping engines on the Chollar, Norcross and Savage combination shaft. This led me to propose a general hydraulic-pumping scheme for all the Comstock mines, dispensing with the great moving masses required in the spear-rod system, which limited the speed of the engines and consequently the power that could be applied to the drainage of the

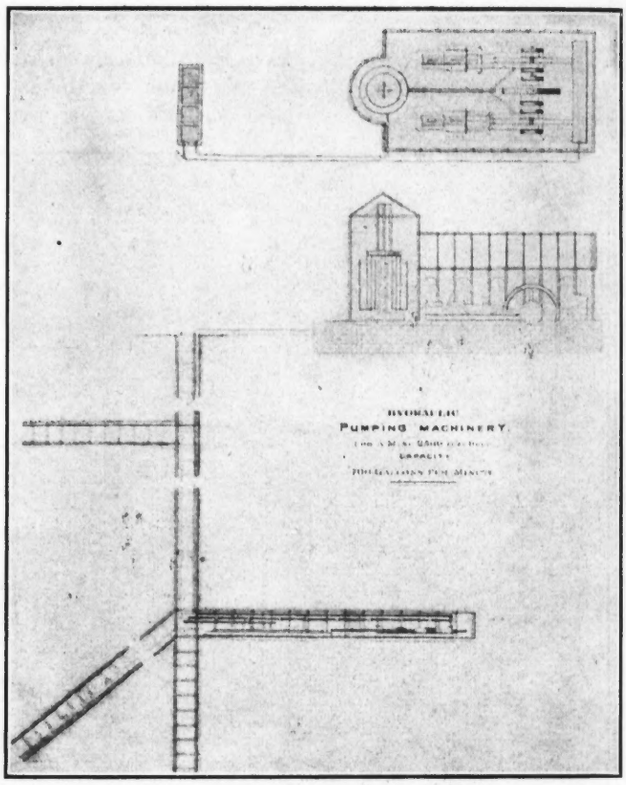
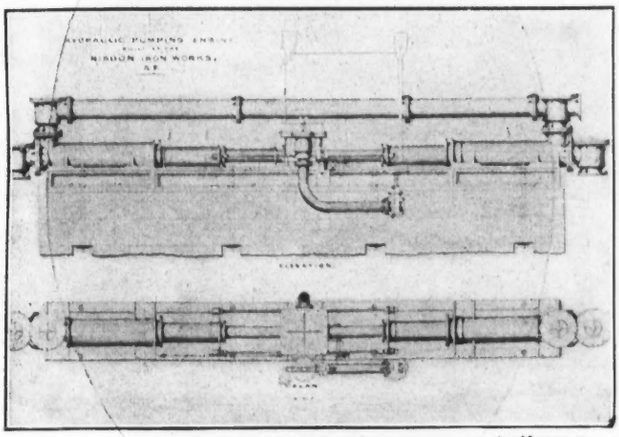


Fig. 2. Arrangement of Hydraulic-Pumping Machinery, 2500-Ft. Lift, 700 Gal. per Minute

mines. With a view to interesting them in this matter, I sent a circular letter to the mining superintendents and directors at the time, which ran in part as follows:

I would propose to group the mines and work them from a central station and, to illustrate, I will suppose the Virginia City mines to be drained in this way, and the depth to be worked to be 3000 ft. The quantity of water that power would have to be provided for would be, for the Consolidated Virginia & California, 500 gal. per min.; the Ophir and Mexican, 400 gal.; Gould & Curry, 500 gal.; Savage, 500 gal.; Hale & Norcross, 500 gal. Thus there is an aggregate of 2900 gal. to raise 3000 ft. or 72,210,000 ft. lb., equal to 2180 hp., and if I add 25 per cent. for transmission, the total horsepower would be 2735. This is considerably in excess of the pumping power now provided for these mines, but all this and more might be required before the 3000-ft. level is reached and the hydraulic pipes would have to be laid large enough to carry that amount of power. The

engine power need not be provided for the whole work until required. The central station or engine house would be located in any convenient place as near to the center of the mines to be drained as possible and made large enough for future additions to the engine power as might be required. If we suppose that 1500 hp. would be required within say 2 years after the completion of the works, then four sets of engines would be provided of 500 hp. each, the spare set being provided in case of any repairs being required in any of the others. Each set of engines would be constructed after the best type of compound condensing engines with one common separate condenser. Each engine would actuate a set of eight hydraulic pumps so arranged that any number can be thrown out of gear, all the pumps to draw water from a common cistern which receives the water that returns from the mines after doing its work, and pump it into accumulators. There would be four at the start loaded to a pressure of 800 lb. per sq.in. equal to a head of water or column of 1860 ft. These accumulators would consist of strong cast-iron cylinders 16 in. inside diameter and say 25 ft. long. The accumulator rams would be 16 in. diameter and about 28 ft. long, having a dead load of sand, stone or scrap iron heavy enough to secure the desired pressure; these weight boxes in working up and down would be guided in a suitable framework. The accumulators would be all arranged to work together and to stop and start the main engines as the requirements of the work demanded. Each accumulator ram having an area of 261.0624 sq.in., the load including ram and box would be 160,849 lb. or a little over 80 tons; the stored up power in the four accumulators would



AM. MACHINIST

FIG. 3. AN ADAPTATION OF THE DAVEY TYPE OF HYDRAULIC PUMP

therefore be equal to 512 hp. or a little over a third of a minute full work, but the power required in pumping being always a constant quantity, variations would only be slight.

Suppose one pump of 25 hp. in one of the mines to be stopped and the accumulator half down. There would be 10 min. for the main engines to accommodate themselves to the alteration in power before the accumulators reached the top; then if the pump in the mine were started up again, the engines would have 20 min. to accommodate themselves to the increase, so that the accumulator power here provided is far in excess of that usually provided in the flywheel of rotating engines. In the above statement I have endeavored to point out some of the most important features of the hydraulic pumping system showing wherein it has the advantage over the spear-rod system. The only objection that can be urged against it is that of the vested interests.

What shall be done with all the present pumping plants should such a scheme be adopted for a number of the leading mines? I might answer this in my Scotch way by asking another question: What shall be done with it anyhow when it ceases to be able to drain the mines either from an increase of water or the natural increase of depth? The time for this question is not so far away as is supposed by some. It is now time for some of the mines mentioned in this scheme to answer it. I do not suppose that the engineers of these mines are deceived themselves in regard to the capacity of those engines but they have allowed the companies interested to believe a good deal of nonsense regarding the depth to which they can go with their pumping plants. Time will settle the question of what shall be done with the present plant, in some cases very soon. The question then will be: What shall be the future plant? Then I ask for a careful study of the hydraulic system by all those interested in the progress of the mines. I know that my views are opposed by those of some of the leading engineers on the Comstock and also by my engineering brethren in the business of designing and building such machinery. I will, however, hold to my plan and urge it as the best that can be adopted as far as the work to be done is concerned. Whether the interests of several companies can be united in a general drainage scheme is not the part of the problem that belongs to me to discuss.

THE SUTRO TUNNEL AGAIN

This rather lengthy quotation serves to show the condition of the Comstock mines in regard to drainage at the end of 1875. From this time on the Sutro Tunnel was to be a marked factor in the drainage question, especially in regard to the North End mines. It intersected the Chollar, Norcross and Savage shaft at the 1600-ft. level, and I. L. Requa, who was the general superintendent of the group of mines that this shaft was intended to serve, lost no time in changing the pumping works to take advantage of the 1600-ft. reduction in the height he had to pump the water; the pumps were changed to a double line of 15-in. plungers with double-sinking pumps discharging into the Sutro Tunnel. The pumping engine on this shaft, which has already been described, was one of the finest on the Comstock and did good work on the large body of water that had to be cared for. At the time the change was made to the Sutro Tunnel for discharge, a drift had just been completed between the Savage mine and the Combination shaft on the 2400-ft. level; a great body of water broke into the Savage mine and reached the Combination shaft through this drift. By working the Savage pumping engine at eight double strokes and the Combination shaft large beam engine at eight and one-half double strokes, the water could be held stationary at the 2400-ft. level but no mining work could be done. To reduce expense and make working in the Combination shaft possible, a masonry bulkhead was built in the 2400-ft. Savage drift. I think this bulkhead or plug was 20 ft. thick, firmly rabbeted into the solid rock walls; through this wall of solid stone work, an 18-in. pipe was fitted, with a valve on the end next the combination shaft. When this piece of work was completed, the valve was closed; a pressure gage had been fitted between the valve and the bulkhead to show how high the water would rise in the Savage mine. When everything was ready the Savage pump was shut down and the water allowed to rise in that mine until it stopped, which would show the source of the water. When the water stopped rising, the gage showed 664 lb. per sq.in. pressure, corresponding to a head of 1600 ft. Many a time I looked at that gage and wondered what would happen if that thing should ever fail; but there was no chance of failure there. Mr. Requa had an underground foreman, Charley Matheson, whose work was sure. In him and his work I learned to place absolute confidence; he was a remarkable man, slow of thought and speech, but a worker who never tired. The stone bulkhead was one of his monuments.

Production of Precious and Semi-Precious Stones in 1913 in the United States was valued at $319,454 by the Geological Survey. The greater part of this value is represented by the sapphire production, principally from Montana, estimated at $238,635. The next most valuable production was opal, amounting to $15,130, there having been increased activity in the Virgin Creek district of Nevada. Other gem stones produced in amounts exceeding $5000 in value were, in the order of their importance: Agates (chalcedony, onyx, etc.), turquoise, tourmaline, spodumene (kunzite, hiddenite, etc.), diamonds, variscite (amatrice, utahlite, etc.), jasper (petrified wood and bloodstone).

Frederick Augustus Heinze

Frederick Augustus Heinze, for many years one of the picturesque figures in the mining industry, died suddenly at Saratoga Springs, N. Y., Nov. 4. A year or so previously he had been seriously ill, but he recovered, and the seizure which proved fatal, was unexpected. His death ended a spectacular career, which embraced a marvelous rise in fortune and an equally rapid decline.

Mr. Heinze was born in Brooklyn, Dec. 5, 1869, of German-Irish parentage. His father was Otto Heinze. His mother, before her marriage, was Lida Lacey. The family was well-to-do, and the children enjoyed many advantages in schooling and travel. "Fritz" Heinze was graduated from the Columbia School of Mines in 1889, and immediately afterward went to Butte as a protégé of Leonard Lewisohn, who assisted him in obtaining a position on the surveying staff of the Boston & Montana company. Heinze, who was at this time a young man of conventional habits with a liking for the good things of life, did not quite relish the drudgery of underground work, and after a year or two threw up his job. It became clear subsequently that beneath a shell of apparent slothfulness and inactivity there was a brilliant imagination and a keen power of observation.

Returning from Butte in 1891, Heinze joined the editorial staff of the ENGINEERING AND MINING JOURNAL and remained with it during most of that year. He is recollected as the only man who habitually came to the office wearing a top hat and frock coat. He was at that time a handsome young fellow, genial in manner, popular among his associates, but exhibiting no great liking for hard work and being especially averse to anything confining. During this time he referred frequently to his experiences and observations at Butte and his idea that there was a fine chance for a custom-smelting business to be inaugurated there.

About this time Heinze's father died, leaving to him and his brothers a moderate fortune. Obtaining possession of his share of the money, Fritz Heinze did just what he said he was going to do if he had the chance, viz., he went immediately to Butte to start a smelting business, this being about 1892. He organized the Montana Ore Purchasing Co. and in an incredibly short time erected his furnaces and began smelting. His plant was a rather ramshackle affair, but it worked and there was the big profit in the business that Heinze had seen in his visions. He made money quickly and thus laid the foundation for the great fortune that he was subsequently to accumulate.

In the prosecution of its custom-smelting business it came naturally to the Montana Ore Purchasing Co. to add to its ore supply by leasing small mines. Having thus become a mine operator, Heinze had some more visions. He grasped the idea of the extraordinary complexity of the vein system of Butte hill at this early date in its history and foresaw the possibilities of capturing some big veins through the acquisition of apparently insignificant surface areas. With the aid of his lawyers, he examined records and titles, and whenever he perceived an opportunity to seize an "apex" that had been overlooked by the Anaconda, Boston & Montana, and other big companies, he located it.

This is, however, somewhat anticipatory. Before he became involved in the great litigation, he made a successful venture in British Columbia. Being in possession of funds derived from his smelting works in Butte and the Rarus mine, he went to Trail, British Columbia, in 1895, and built a small smelter for the Rossland ores. Then he built a narrow-gage railroad from Trail to Rossland, and followed this with a project to build another from Trail to Victoria, B. C. This project obtained for him a land grant from the Dominion government. He also owned the Rossland *Miner*, then the only newspaper in the district. The end of his Canadian venture came when the Canadian Pacific R.R. bought him out and paid him his own price for his smelting interests, railroad, land grant, and newspaper. It was understood that he received $1,200,000. During this time, however, Heinze's chief interests and his headquarters remained at Butte.

Almost from the beginning Heinze was involved in litigation there. First there were suits over the Rarus

F. AUGUSTUS HEINZE

vein and then over other veins, and sooner or later with almost all the big companies of Butte. Heinze had friends in office and in the courts, and it was charged that legislation favorable to him and inimical to his rivals was passed and upheld much according to his wishes. Anyway, he won many of his suits and steadily added to his fortune. He was assisted by some very able lieutenants, technical, legal and political, especially the last, and owed much to them.

When the Amalgamated Copper Co. was organized, the litigation between its constituents and Heinze attained its most furious stage. It may be imagined that Mr. Rogers' great conception inspired in Heinze's mind another vision, this time of cashing in all his property, lawsuits, etc., at the expense of the alleged octopus. Anyway, Heinze raised the cry of "Standard Oil" and posed as the David who was fighting Goliath. This carried the populace with him and in those stormy days at Butte there were many occasions when the miners in the streets cheered hoarsely for "Fritz." They remained true to him ever afterward and for a long time hated the

capitalists of Boston and New York, although Heinze's protagonist was Marcus Daly, one of their own people and the original developer of Butte's mines.

To tell the whole story of the fight for fortunes at Butte would require a volume. It covered about every interest in the State of Montana from mining to agriculture. Politics boiled with it and elections turned upon it. It was a story of chicanery, bribery, besmirching of the courts, and even bloodshed. The Amalgamated Copper Co. was charged with all the crimes of the calendar and Heinze figured as a popular hero, the independent citizen who was fighting single-handed for his rights and his property against an immense corporation, no less than "Standard Oil." The Amalgamated officials of that time were guilty of many misdeeds, no doubt, but in looking back upon the events we are disposed to think that virtue was quite as much on their side as on Heinze's. The lawyers fattened as never they had before, but out of the enormous waste of money there came a redeeming feature, viz., a knowledge of the Butte ore deposits was gained to the subsequent profit of Butte that probably would not otherwise have been obtained.

In 1902 Heinze had transferred most of his interests to the United Copper Co. In 1906 this company, which was still Heinze, and the Amalgamated became tired of fighting and of the incurring of prodigious legal expense and of the stench of things generally. The Amalgamated purchased the more valuable of Heinze's property in Butte, paying him about $10,000,000, according to the popular belief. The exact amount was never officially stated, so far as we know. Thus was terminated victoriously a 10-years' fight for colossal fortune.

During the struggle Heinze had shown his versatility. He published newspapers, he started banks, he played politics, he did anything that would promote his mining interests. Having "cashed in his checks," he came to New York in 1906, a handsome, polished, daring man, willing to wager his last dollar, supremely confident that he would prevail over every obstacle. He established his brothers, Arthur and Otto, in the Stock Exchange firm of Otto C. Heinze & Co. He had an overwhelming ambition to figure as a great banking financier and this was preëminently the time of high finance. He bought control of the Mercantile National Bank from Edwin Gould, paying an enormous price, and became its president.

Working through this bank and his Stock Exchange firm, he and his friends established a chain of banks. Things were breaking big in the financial world and Heinze's name was heard wherever bankers and brokers got together. Then came the threatening days of 1907, and when every other banker was husbanding his resources Heinze started to corner United Copper. This company had been continued in existence, although most of its valuable property had been sold to the Amalgamated and the proceeds distributed. As to the value of what remained there was mystery and uncertainty. Yet the capital of the company was not written down, which was always regarded by critics as a preposterous neglect. The stock was a useful gambling medium.

The attempt of Heinze and his friends to corner United Copper failed. The firm of Otto C. Heinze & Co. failed. The State Savings Bank of Butte, Mont., a Heinze institution, suspended payments. The Clearing House committee compelled Heinze to resign from the Mercantile National Bank presidency and began an investigation of its affairs. This was the beginning of the panic of 1907. That started with the Heinze failure just as the European war started with the murder of the Austrian archduke. The first was not the cause of the panic and the second was not the cause of the war, but both were the sparks in the powder magazines.

During and after the panic there was house-cleaning, which eliminated Heinze, Charles W. Morse and some others from the banking business. Both Heinze and Morse were indicted for breaches of the banking law. Morse was convicted and served a term in Atlanta. Heinze was acquitted after a long trial. Butte went wild with joy. Then, comparatively poor, Heinze went back to Butte, but no longer had he his old buoyant, bold and enterprising spirit. Out of the wreck of his fortune he saved some things, and the Stewart mine in the Cœur d'Alene and the Mascotte tunnel in Utah subsequently turned out very well for him.

During the last few years he had been in the public eye chiefly as a litigant in actions growing out of his Wall Street career. His most recent appearance was as defendant in a suit brought by Edwin Gould to recover on promissory notes with which Heinze bought his way into the Mercantile National Bank. The judgment for more than a million dollars went against Heinze only a few months ago.

In 1910 Mr. Heinze married Mrs. Bernice Golden Henderson. A son, F. Augustus Heinze, Jr., was born on Dec. 6, 1911. A year later Mrs. Heinze sued for divorce. She obtained a decree soon afterward, fell ill and on her deathbed became reconciled to her husband and asked that the record of her divorce action be expunged from the court rolls.

Utah Copper Co.

Report of the Utah Copper Co. for the third quarter of 1914 shows production of a total of 28,686,672 lb. of copper, of which 13,768,958 lb. were produced in July, 8,245,520 in August and 6,672,194 in September. Both plants treated 1,466,606 tons of ore, 77% at the Magna plant and 23% at the Arthur plant. Average ore grade was 1.4356% copper, and 68.13% the average extraction.

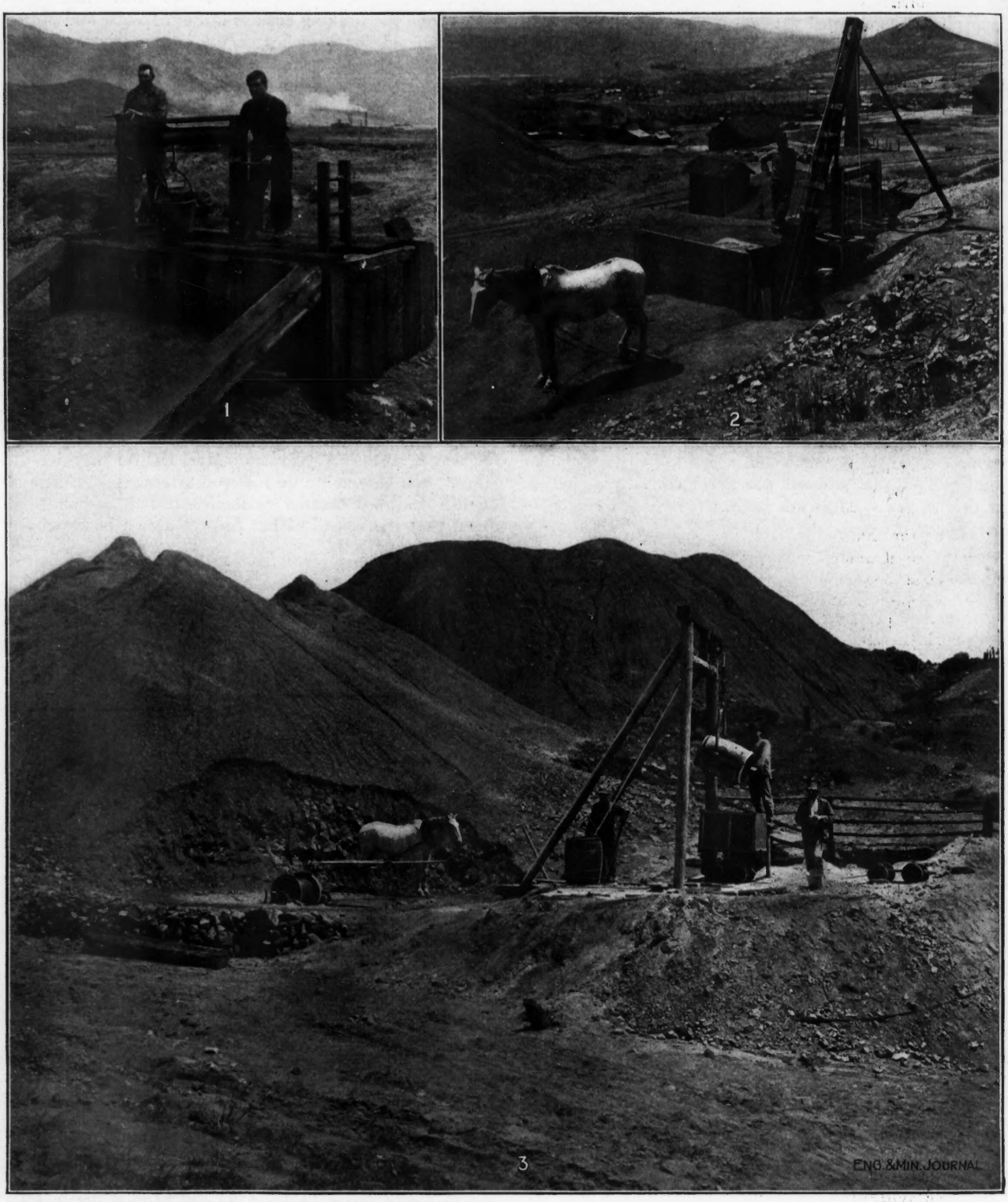
Owing to existing conditions, it was considered advisable to reduce production by half, so the Arthur plant was shut down. Average cost of net copper is 7.760c. per lb. after allowing for smelter deductions and without crediting miscellaneous income. If this income were credited, including that from the Bingham & Garfield Ry., the cost would be 6.951c. per lb. of copper.

Net profit from milling operations and other income was $1,312,738. Dividends paid amounted to $1,218,367, leaving a net surplus for the quarter of $94,371. Earnings are based on 12.48c. per lb. for copper. Total copper on hand and in transit, sold and unsold, at the end of the quarter, was 50,118,797 lb. No income came from Nevada Consolidated Copper Co., as its dividends were deferred.

Bingham & Garfield Ry. operations were curtailed. An average of 11,515 tons of ore and about 4256 tons of other freight per day were moved.

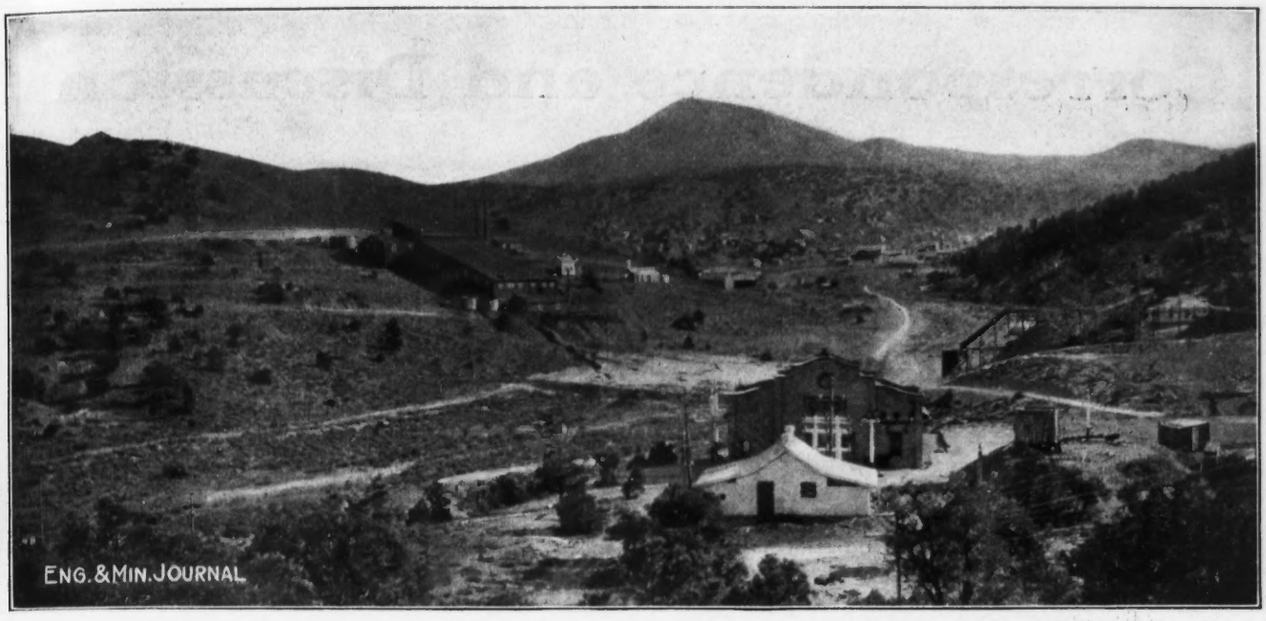
The United States Produced No Molybdenum Ore in 1913, according to the U. S. Geological Survey. Some ore was imported from British Columbia, and worked up in this country, as well as 7.8 tons of molybdenum and ferromolybdenum.

Photographs from the Field

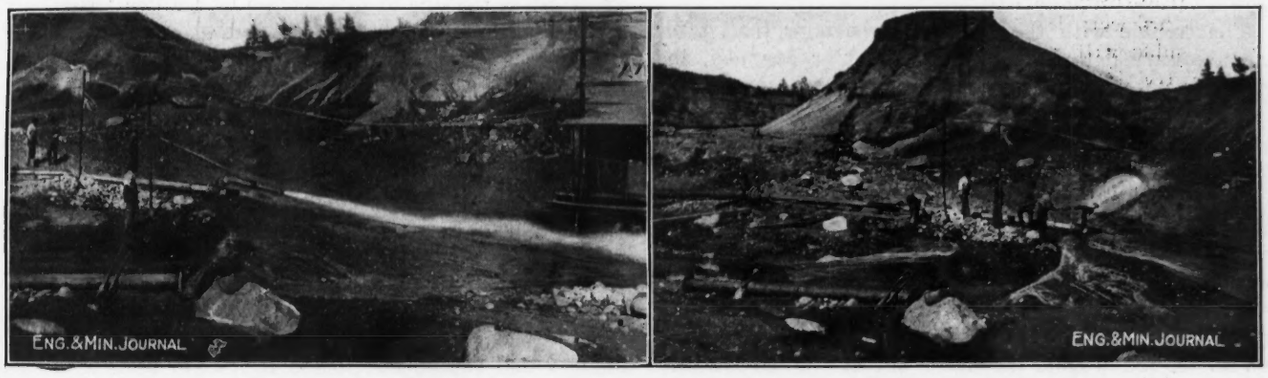


THE WAY SHAFTS ARE STARTED AT BUTTE, MONT.

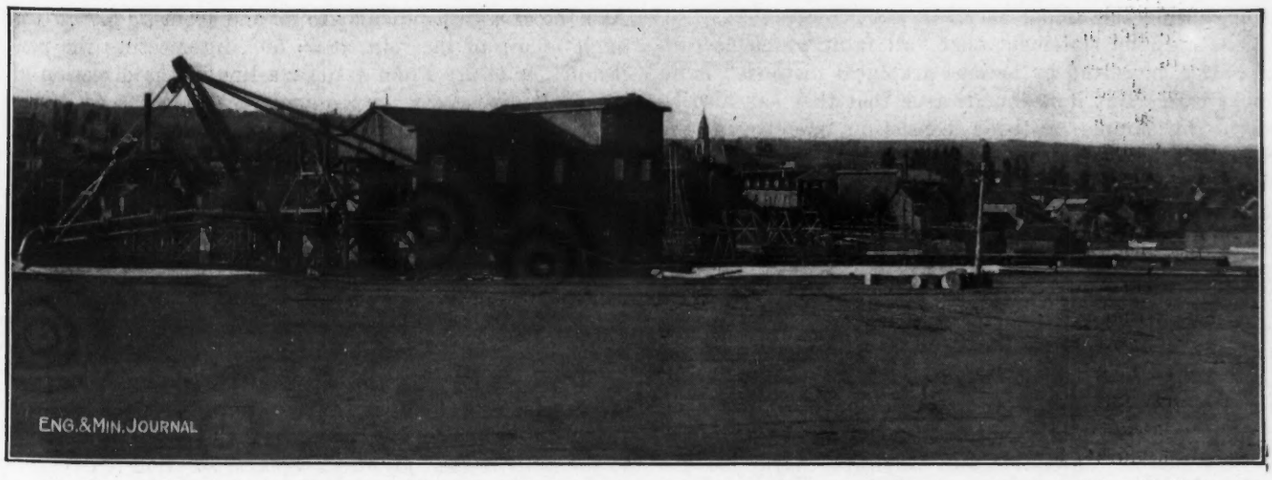
1. First step, the hand windlass. 2. Second step, the whip. 3. Third step, the whim.



WAR EAGLE MILL, AND TRANSFORMER HOUSE OF THE CALIFORNIA-NEVADA POWER CO., MANHATTAN, NEV.
Manhattan is a promising camp, reached via Tonopah. There is no railroad.



STRIPPING THE ROWE MINE, RIVERTON, MINN., CUYUNA IRON RANGE
Hydraulic system used for removing overburden.



CALUMET & HECLA DREDGE, WHICH WILL RECLAIM OLD TAILINGS FOR TREATMENT
This dredge was described in the "Journal" of Nov. 7, 1914.

Correspondence and Discussion

Finding Fault with the "Faultless Faultfinder"

Admitting that some charts may be useful when available, it has been my experience that when the engineer is confronted with a problem, it has to be solved usually at a moment's notice. Though he may know of the existence of charts facilitating the solution and may have the leisure to make himself familiar with their intricacies, at that particular moment he is, as a rule, not within reach of such charts and must therefore evolve a solution.

In an article, "The Faultless Faultfinder," in the JOURNAL of Aug. 15, Messrs. Weeks and Huntington justify the construction of their charts by the following statement: "All fault problems can, of course, be solved by tedious graphical or algebraic methods, provided the necessary data have been obtained or can be assumed. To obviate the necessity for such methods, and to effect a simple, rapid and accurate solution of many fault problems for which the data are at hand, the two charts here described were devised."

The trouble with the particular charts is that, after the necessary data have been obtained or assumed, the charts do not give an accurate solution as claimed.

Actual conditions in the field are, of course, never as ideal as those that must be assumed as a basis for calculations or graphical solutions. But after these assumptions have once been made, whatever method is employed should give results corresponding to the assumptions within reasonable limits. The authors of the charts admit that the latter permit of reading angle θ only to the nearest 5°. That may be a reasonable limit. But in problem 1, for instance, the fact that angle θ is in reality not 20° as found from the charts but 22° 30′ as obtained by graphical solution, leads to an error of nearly 100 ft. in the offset. The latter is in reality 475 ft. as found by graphical solution instead of 570 ft. as obtained from charts. To the practical miner who has to do the work and foot the bills, a hundred feet more or less of tunnel is of considerable importance.

The authors' statement that "all fault problems can, of course, be solved by tedious graphical methods" is no doubt true. But it is equally true that they can also be solved by simple methods consisting merely in the construction of two or, at the most, three ordinary right triangles. I venture the assertion that the graphical solutions presented herewith are even less tedious than is taking the desired data from the charts. They have the further advantage that they require no special tools and that the diagrams if drawn to a moderately large scale permit of reading angles to within 15′ or 30′ and distances to within a few feet. The methods I use consist simply in the application of elementary geometry to practical problems. My reason for presenting them is to discourage spending labor and energy upon the construction of unreliable and intricate charts for the solution of simple problems.

Fig. 1 is a perspective sketch, illustrating the position in space of the right triangles which are used in solving the problems. H represents a horizontal plane in space on which the strike of a vein and a fault plane are drawn as shown. The line of intersection of the two planes passes through the point a, marking the intersection of the strike lines. In the sketch, it is represented by ab. From any point b of this line drop a perpendicular upon the horizontal plane, piercing it at c. From c, draw lines cd and ce at right angles to the strikes of the vein and the fault respectively and connect b with d and e. This gives two vertical right triangles bcd and bce in which the angle bdc is the dip V of the vein and the angle bec, the dip D of the fault. It is seen that the side bc is common to both triangles. There is a third right triangle aeb, which lies in the fault plane and contains the angle θ or its supplement. Its side be is the hypotenuse of the triangle bce and its side ae is the distance between the point of intersection a of the strike lines and point e, where the perpendicular from c upon the fault strike intersects the latter. The hypotenuse of the triangle aeb is the line of intersection of the two planes.

In the graphical solutions the line dc is always drawn first and is given any convenient length. The triangles themselves are revolved into a horizontal plane, analogous to the methods used in descriptive geometry, to show them with their true sides and angles. The angle θ and the "offset" is then found by the simple means explained under problem 1.

In problem 1, a fault striking east and west, dipping 40° to the south, cuts a vein, striking N 60° E, dipping 50° to the northwest. The fault is of the reverse type. The movement of 300 ft. is in a direction 30° to the right of the dip line of the fault. It is required to find angle θ and the offset. These terms are used with the meaning given them in the original paper.

Graphical Solution—In Fig. 2, draw the strike of the vein as shown. From any point d of the strike draw the line dc at right angles to the strike and in a direction opposite to that of the dip. Make it any convenient length. At c erect a perpendicular to dc and from dc lay off the angle of dip of the vein, $V = 50°$, intersecting the perpendicular at b. From c draw a line in the direction of the fault dip, also a perpendicular $cb' = cb$. At b' lay off the complement of the fault dip ($90° - 40° = 50°$), thus forming triangle $cb'e$. Through e draw the strike of the fault, intersecting the strike of the vein at a. Prolong ec and make $eb'' = eb'$. The line ab'' is the line of intersection of the fault plane and the vein, revolved into the horizontal plane. The angle $b''ae$ is the angle θ which by graphical solution is found to be 22° 30′ and not 20° as found by the charts. Through a lay a dip line of the fault plane, also a line giving the direction of fault movement. On the latter measure off the amount of movement, 300 ft., on any convenient scale and with the same scale measure the "offset" along a line parallel to the fault strike. By this graphical solution it is found to be 475 ft., whereas the charts give it inaccurately as 570 ft.

To construct the diagrams consumes far less time than it does to describe the procedure. In actual practice, most of the annotations and some of the lines shown in the diagrams for sake of demonstration, will be omitted as self-evident.

For problem 2, the conditions are the same as for problem 1, but with the vein dipping to the southeast instead of to the northwest.

Graphical Solution (Fig. 3)—Start with the line *dc* and construct the diagram by taking the steps described under problem 1 in exactly the same rotation.

Problem 3 assumes a vertical fault plane, striking east and west cutting a vein striking N 30° W and dipping 55° to the southwest. The fault movement of 40 ft. was vertical. Find the angle θ and the offset. The graphical solution (Fig. 4) is the same as for problems 1 and

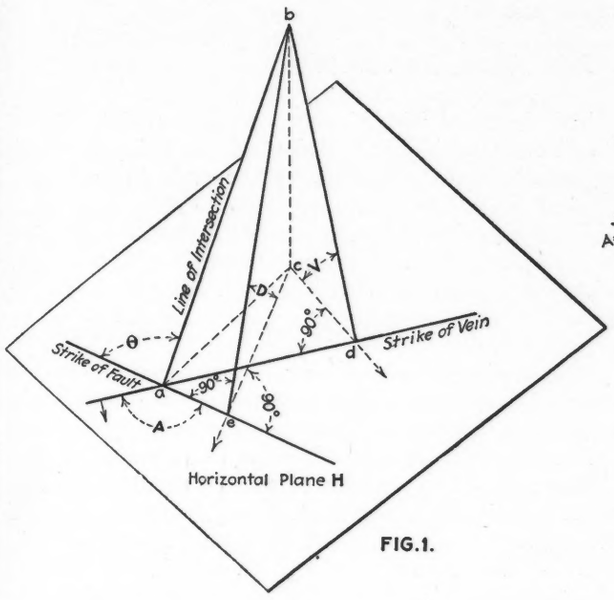


FIG. 1.

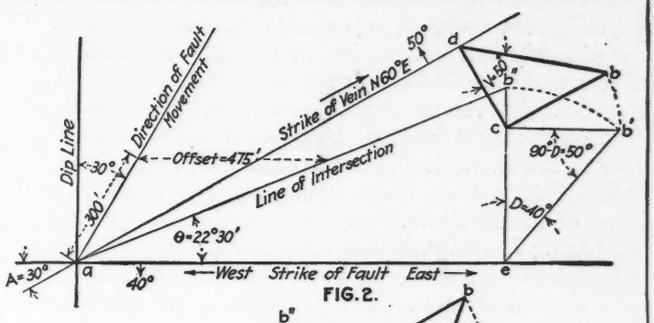


FIG. 2.

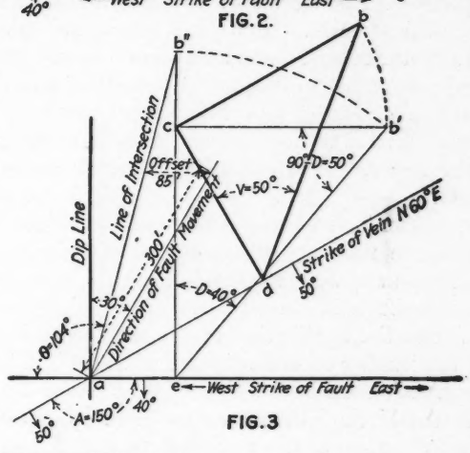


FIG. 3

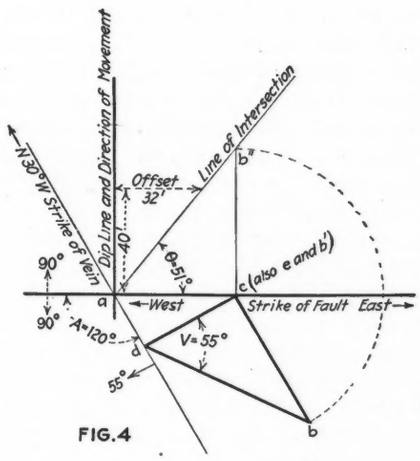


FIG. 4

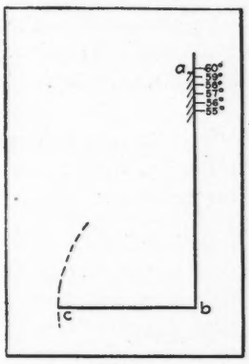


FIG. 6.

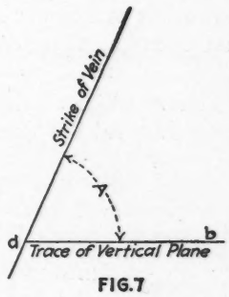


FIG. 7

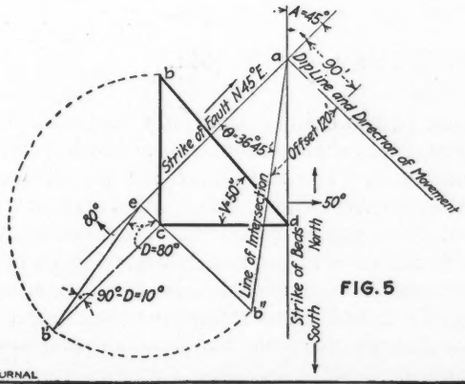


FIG. 5

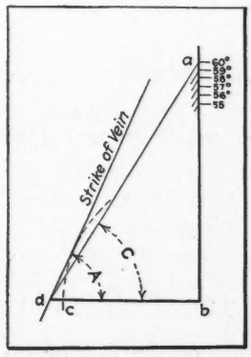


FIG. 8.

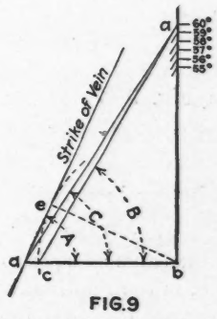


FIG. 9

ENG. & MIN. JOURNAL

DIAGRAMS OF FAULT PROBLEMS AND SOLUTIONS

2. Only two triangles are formed, triangle *ceb* being nonexistent in this case.

In problem 4, sedimentary beds are assumed striking north and south and dipping 50° to the east, cut by a fault striking N 45° E and dipping 80° to the northwest; the offset of a bed of conglomerates is 120 ft. The faulting movement is along the dip line of the fault. It is required to find θ and the amount of movement. The graphical solution is given in Fig. 5.

In Case I, taking up the use of the charts in plotting geological sections, it is required to find the apparent angle with which a vein should be plotted on a vertical section whose trace is not at right angles with the strike of the vein. I am informed that there are various charts in existence for solving this problem. The July *Transactions* of the A. I. M. E. contains a new chart by Howland Bancroft, which I discussed at the recent Salt Lake meeting of the Institute. On that occasion, I suggested the following simple graphical solution:

On a piece of tracing cloth, Fig. 6, draw a line *bc* on any convenient scale. At *b* erect a perpendicular *ba*. With a protractor cut off on *ba* a number of angles within the probable range of variation of dip, so that a line connecting *a* and *c*, for instance, forms an angle of 60° with *bc*, etc. With *b* as a center and *bc* as a radius, draw a circle through *c*. This completes the tool for solving the problem.

Fig. 7 represents the line of strike of the vein and *db* the trace of the vertical section on which vein is to be plotted with the apparent angle of dip, *C*; *A* is the angle this section makes with the strike.

Fig. 8 shows the application of the method: Place the line *cb* of the tracing over the line *db* of Fig. 7, and move forward and back until the line of the strike becomes tangent to the circle. Connect *d* with the point *a* that marks the true angle of dip as found by actual measurements, 60° in the case illustrated. The angle *adb* is the apparent angle *C* of dip to be used on the vertical section.

The proof is as follows: As is well known, this angle *C* is found from the equation:

$$\tan C = \sin A \tan B \qquad (1)$$

From Fig. 9, which is the same as Fig. 8, with a few lines added for sake of demonstration, we have:

$$\frac{ab}{bd} = \tan C; \text{ whence } ab = bd \tan C$$

also

$$\frac{ab}{bc} = \tan B; \text{ whence } ab = bc \tan B$$

whence

$$bd \tan C = bc \tan B$$

or

$$\tan C = \frac{bc}{bd} \tan B \qquad (2)$$

From Fig. 9

$$\frac{bc}{bd} = \frac{be}{bd} = \sin A$$

Introducing in equation (2) we get:

$$\tan C = \sin A \tan B \qquad (3)$$

This is the same as equation (1) and shows that angle *C*, in Fig. 8, is the required angle.

As regards Case II, the projection of the line of intersection of the vein and the fault plane upon a horizontal plane is the line *ac* in Fig. 1. It is therefore found in its true position in any of the preceding problems by connecting the points *a* and *c*. The angle which the projection makes with the strike of the vein or fault can be taken off with a protractor.

Case III assumes that the strike of a plane makes an angle of 30° with another horizontal line; the plane dips 60°. Find the angle between the strike of the plane and the vertical projection of the horizontal line on the plane.

The horizontal line in this case is the trace of the vertical section in case I. The angle *C* is the desired angle. The solution can be had by means of the method described under case I.

THEODORE SIMONS.

Butte, Mont., Aug. 29, 1914.

This letter of Mr. Simons was submitted to Messrs. Weeks and Huntington, in order to present simultaneously arguments from both sides. Their reply is as follows:

Mr. Simons' criticism of our "Faultless Faultfinder" is summed up in the following statement: "The trouble with these particular charts is that, after the necessary data have been obtained or assumed, the charts do not give an accurate solution as claimed."

This statement is not true, as any one who cares to use the charts may readily ascertain. The charts are as accurate as any similar graphical method.

Mr. Simons is laboring under a misunderstanding when he states that "the authors of the charts admit that the latter permit of reading angle θ only to the nearest 5°." What the authors really said was that in the illustrative problems worked out in the text, the angles were read only to the nearest 5°. This was done merely for simplicity of exposition. In practical use, the angle θ would, of course, be read much more accurately. In problem 1, for example, if Mr. Simons will take the trouble to go through the steps indicated in chart I, he will find that the angle θ comes out in fact 22° 30′, precisely as it should. As stated in the footnote on page 291, the charts to be supplied for field use will be even more accurate than the copy published in the JOURNAL.

Mr. Simons adds that he desires to "discourage spending labor and energy upon the construction of unreliable and intricate charts." The charts here referred to are not unreliable; and the only intricacy involved in their use is the necessity of employing a protractor for measuring an angle. As a matter of actual experiment, starting with the data of problem 1, namely $A = 30°$, $D = 40°$, $V = 50°$, the time required to obtain the angle θ by the use of chart I is less than 25 seconds.

W. S. WEEKS.
E. V. HUNTINGTON.

Cambridge, Mass., Oct. 16, 1914.

[We are of the opinion that both parties to this controversy are more or less in the right. Mr. Simons' graphical methods are most available for the mining engineer; Messrs. Weeks and Huntington's charts for the geologist. The engineer with little work of such nature to do will not care to encumber himself with the charts in addition to the other tools of his trade, whether he be permanently situated or engaged on examination work. The geologist, on the other hand, with great numbers of such problems to solve, will find that the charts save him a large amount of time. In Mr. Simons' own city of

Butte there is a case in point. We have no data on the number of fault and vein intersections and projections which Messrs. Brunton, Winchell and Sales have calculated and plotted for the Anaconda company, but beyond doubt the use of these charts for the work would have saved many days of high-priced time, for the charts are extremely fast and they are accurate. Messrs. Weeks and Huntington are correct on that point. If Mr. Simons tested the charts and found them correct only to about 2½°, the difficulty lies in the reproduction of the charts, not in their construction. The JOURNAL is printed from plates bent to cylindrical form. In this process a slight degree of distortion is inevitable. It is for this reason that the article is offered as a pamphlet printed from flat plates, in which the error will be found extremely small.

On the other hand, Mr. Simons' methods, which are excellent in their class, will be found most convenient for such engineers as may unexpectedly run into a fault in their mine workings or who may in other ways occasionally encounter such a problem.—EDITOR.]

Science vs. Business

Science has never yet made a fortune. Business has. To bring these facts within our own purviews, they may be translated into the statement that a mining engineer never accumulated much money by technical skill. Shrewd business ability, posing as technique, has gained fame and emoluments. Sometimes science aids business, but it is business that acquires money. Science alone is impotent.

The great number of nontechnical men in charge of mining operations sufficiently demonstrates the truth of my premise. In addition to those who are not mining engineers, there are many who are not technicians at all, but business men who have entered the profession by a side door and found a short cut to the top. A peculiarly striking fact is that business men are always wise enough to employ skilled technical men to direct the technical work. They usually, too, see that these men remain under cover, so that the glory of success has but one resting place. In case of failure it is good business to have a technical man or two to carry the cross.

These observations are not profound, but they emphasize a situation which has been carefully evaded in professional discussions. It should be considered, not that it is one that should not exist, but in order to point out a proper course of preparation for those entering the profession and those already in it. The student is usually told that he will rise or fall according to his technical skill.

I believe this is not true; I know it is not true. There are too many properties successfully operated by men who possess no deep technical knowledge, to hold to such a belief. Business ability is certainly a requisite—I may even say a primary requisite. Business ability plus technical skill is ideal, but business alone will gain much more, financially, than science alone. It is true not only in mining, but in every trade and profession known to the civilized world. Why not recognize the truth and advise our profession accordingly? Business first! Science if you will, but business always!

HENRY A. MARVIN.

Yonkers, N. Y., Oct. 21, 1914.

Views of the Mexican Situation

From El Paso the other day I took a short excursion into Mexico. Juarez shows evidences of having been all shot up. If the rest of Mexico looks anything like Juarez, it is high time we did something to save the remainder of the country from ruin.

Whether or not the results of the election last Tuesday contained in them any rebuke to the present administration as to the policy in Mexico, it is difficult to say, but I am inclined to think from the evidence which I collected on the border that if the American mine and cattle owners interested in Mexico had a vote, they would cast it as a unit against the present policy of "watchful waiting."

Every day Villa seems to be increasing in strength by the acquisition of men, and, above all, by additions of arms and ammunitions which he obtains from this country. If we do have to intervene in Mexico, it will be a good deal more difficult to do so when he is thoroughly armed and equipped.

The opinion of men with whom I talked in El Paso is that the men of brains and ability, capable of governing Mexico, have fled the country, and that she is in far worse straits than ever before. The opinion of the American refugee resident in El Paso seems to be that there can be no peace in Mexico so long as the present "watchful waiting" policy of the administration continues.

I do not think it necessary, or that this country wishes, to make war on Mexico. At the same time I certainly think that something should be done to protect what is left of our American interests in that country and to try in some way to readjust the situation. Surely the conditions in Cuba are an earnest of what can be done by our government in the way of controlling political situations.

However, I do not pretend to have any opinion as to how the present situation can be relieved. All I do know is that unless something is done very soon Mexico will look like the pictures of Louvain.

OLD COLORADO MINER.

New York, Nov. 5, 1914.

The remarks about elections in Mexico in the JOURNAL of Oct. 24 score 100. I still have hopes that the drumhead and bayonet election will amount to something, but the pessimism in the City of Mexico is overpowering. In the meanwhile the delay is playing hob with everything.

X. Y. Z.

Mexico, D. F., Oct. 29, 1914.

Prisoners of War

In regard to the editorial in the JOURNAL of Nov. 7, an American precedent for the use of prisoners of war in the mining industry was furnished by the drafting of about 30 of the Hessians captured at Trenton for use in the New Jersey iron works of John Jacob Faesch, at Mount Hope. A good many of them afterward settled in this region. Being mercenaries and personally disinterested in the outcome of the war, it is probable that they welcomed the original arrangement.

E. P. B.

New York, Nov. 9, 1914.

Chronology of Mining for October, 1914

Oct. 1—Phelps-Dodge introduced company-store profit-sharing plan for employees.—El Oro company resumed operations on small scale after five months' shutdown. —Cave-in at American Davey mine, in Joplin district.

Oct. 2—First withdrawal of militia from Butte.

Oct. 6—Duncan deposed as mayor of Butte.

Oct. 8—Pittsburgh meeting of A. I. M. E.—Montana supreme court rendered decision to effect that military courts in Butte were illegal.

Oct. 9—City of Antwerp taken by Germans.

Oct. 12—Boer commando mutinied in South Africa.

Oct. 14—Dunbar blast furnace of American Manganese Manufacturing Co. blown in, using Cuyuna iron-manganese ores.

Oct. 16—Additional withdrawal of militia from Butte. —Cloudburst in southeastern Missouri did great damage to railroads and mines.

Oct. 17—Mason Valley suspended operations.

Oct. 18—Butte & Superior closed down.

Oct. 19—Fire broke out in Mexican mine on Comstock, soon controlled.—St. Joseph Lead Co. announced curtailment of 25% in output of lead.

Oct. 20—Alaska coal-land leasing bill signed by President.

Oct. 21—Settlement of Silver King Coalition-Silver King Consolidated suit by compromise, each company getting certain claims.

Oct. 23—War-tax bill signed by President.

Oct. 24—Announcement of negotiations looking to establishment of Bolivian tin-smelting plant in the United States.

Oct. 26—Bullwhacker stockholders accept reorganization plans.

Oct. 27—Generals De Wet and Beyers revolted in South Africa.

Oct. 30—Col. Maritz, rebel leader in Cape Province, beaten and driven out of colony.

Sir George Paish's Views

Sir George Paish is said to have expressed the following opinions respecting business prospects in the United States:

"I think there may be a considerable revival in trade next year. There is promise that the embarrassment in connection with the marketing of the cotton crop of the United States will be removed.

"As the bottom appeared to fall out of the cotton situation, prospective buyers were naturally apprehensive, and they will be reluctant to make commitments until they are assured that improvement is in sight. I think there is a good deal in the contention that India will begin to buy cotton once it is evident that the price has reached its low level.

"Britain's ability to loan, of course, depends very largely upon the ability of the rest of the world to meet obligations to her. With its enormous crops and good markets for its products, the United States must continue to save a great deal of money. It is a question for it to decide whether it will continue to lay additional tracks on its railroads, construct costly terminals and build beautiful buildings, or whether it will take up the task of helping to furnish the capital for the world's development, and particularly for the newer countries on the American continent.

"Through the failure of some of her creditors to pay their bills, a percentage of Britain's immediate income has been cut off, and the country must place aside the sums due to capital account. These sums are involuntary savings, which must be described as contingent assets. The German and Austrian liabilities are believed to amount to $250,000,000 to $300,000,000.

"The situation in the United States has improved greatly since we have been here. There is now a feeling that the credit position has been saved.

"The operation of the federal reserve banks will materially assist the United States' position. The main result of the establishment of this system will be to give the United States much greater freedom and power to meet the present situation."

Dry Chlorination at Bunker Hill & Sullivan

President Fred. W. Bradley, of the Bunker Hill & Sullivan company, announced at a reception tendered him at Kellogg, Idaho, this week, that it was apparent that within a short time a new industry would be established in Kellogg, that of producing metallic lead. He said that a series of experiments have been carried on by S. A. Easton and his assistants at the old north mill. "If these experiments develop as they are expected to do," he said, "it will do away with the necessity of shipping the ores to the smelters for treatment. The time is almost sure to come when all of this work will be done right here."

Mr. Bradley telegraphed to the JOURNAL as follows: The experiments referred to are not yet completed and much more experimental work must be done, but all work so far done promises ultimate success. We have installed a Malm modified dry-chlorination unit to have a capacity of 50 tons raw ore per day. The greatest difficulty has been in the electrolysis of the zinc chloride, but ultimate success here also seems certain. The metallic zinc liberated is to be re-used as a precipitant, and the chlorine gas set free is to be used for chloridizing all the metallic contents of our ore, containing lead, silver, zinc, iron, copper and gold, the idea is to make the process continuous, recovering all metal contents with little loss. Experiments indicate any excess iron can be disposed of by a light roast. Lead pigments may also be made.

The Cyanide Ship

Much interest has followed the movements of tank steamship "Sun," belonging to the Sun Oil Co., of Philadelphia, which has been chartered to bring a cargo of needed merchandise, including 1000 tons of cyanide for mining purposes, from Rotterdam. The entry of the "Sun" into Falmouth harbor gave rise to a report that she had been detained by the British Government, but investigation shows that this is not the case. The "Sun" put into Falmouth, following her owners' orders, for repairs and to show that her papers were in order, the object being that she would not later be delayed by British warships. She was released promptly and left for Rotterdam, where loading is now in progress.

Editorials

The Copper Export Controversy

The international copper imbroglio would have certain humorous elements were it not that the American copper producers are so seriously affected. Like the coon up a tree, they are not in a position to see the joke. The British also are not perceptive, but that does not surprise anybody. Anyway, the joke is not on them.

The British are determined that the Germans shall not obtain any copper from the outside. This is not going to render the Germans short of copper for military purposes. They have got the output of their own Mansfeld mines, which is probably sufficient. If it be not, the Germans will get what they need from scrap, even tearing down and remelting their trolley wires, if necessary.

German industries, however, can be made to suffer severely by deprivation from copper. In this the British are inconsistent. They are willing that German manufacturers shall have cotton, but not copper.

In order to keep the Germans from getting copper, they have seized it when carried in neutral ships from one neutral country to another neutral country. Eminent international lawyers say that this is contrary to the rights of neutrals. Probably the British know that. Anyway, after some formalities and some delay, they release the detained ships. Then our Department of State cackles over its achievement. We fancy the British diplomats laugh up their sleeves.

They take an untenable position, and one that they probably have no idea of trying to hold, but by detaining copper-carrying ships they scare the ship-masters, who have come to regard copper consignments like the plague and now refuse to take them. As for the detained copper, the British offer to buy it—at a substantial discount! Thus, Britain gets some cheap copper, stifles America's export trade to everywhere but herself and France, and by limiting America's markets plays for some more cheap copper.

This preposterous procedure puts the joke wholly on the American copper producer, which is a collective name embracing many thousands of persons—including miners in Michigan, Montana, Utah and Arizona and stockholders in New York and New England. All of these citizens have been as hard hit by the industrial earthquake as have the cotton-growers of the South, but they don't "holler" so loudly. The miner loses his work, and knowing that he has no ground for kicking against his employer just fades away. The stockholder loses his dividends, perhaps the sole source of his income, and resigns himself with the remark that he is unlucky, just as the New Haven stockholders were.

Conditions are compelling the sacrifice of the livelihood of these citizens and nothing is said about it. Their Department of State is smug and complacent. Yet if that department should take a firm stand for American rights, Great Britain would probably defer to us, for she does not want to vex her best friend. Indeed, that Great Britain has done as she has is probably merely an exhibition of bureaucratic stupidity, on all fours with her censorship of the news, which also has been the subject of criticism.

Italy and Scandinavia are normally considerable consumers of copper. That their demand should now be greater than formerly is in itself neither cause for surprise nor suspicion. Germany was formerly our principal customer for copper, but what she took from us did not wholly remain in that country. She took in ingots, cakes and wirebars and she reëxported a large proportion of it as sheets, wire, brass and other manufactures to other countries, including Italy. Those countries deprived of such supply naturally increase their own manufacturing. Moreover, several countries in Europe that are still at peace are nevertheless preparing for military emergencies, which is requiring copper. Let it be taken for granted that someone may try to transfer to Germany American copper that enters Italy. The merchant in Italy who buys a million pounds of copper on the basis of 11c. per lb., New York, and succeeds in getting it into Germany and realizing 20c. per lb. makes a fortune out of one transaction, and will do it if he can. The prohibition of such traffic, however, seems to us to be a matter between the Allies and Italy, not between them and the United States.

The American copper industry has been put in the position of being the only one of the furnishers of material used largely in war that is not profiting hugely by the needs of the combatants. The exporters of automobiles, ammunition, horses, saddlery, and hundreds of things are getting big prices. The copper producer is put in the position of having to sell at England's price, which at present is less than a living price.

Thus England and her allies are obtaining some of their important war material on very low terms. The American copper producers are depleting their principal in order to furnish it; in other words, they are *giving out of their pockets* to help the Allies carry on the war. Many of their employees are out of work. And Secretary Bryan thinks he is doing all that a diplomat can do when he secures the release of a cargo.

Affairs in Mexico

The essence of republican government is the consent of the minority to the measures of the majority. Indeed, the majority can seldom pass an important measure unless there is going to be such a consent of the minority. Were it otherwise, the Democrats would undo all that the Republicans had previously done, and when the Republicans came again into power they would reverse the actions of the Democrats.

This has not yet been learned in Mexico (nobody supposed that it had been), and after Villa and Zapata had won the election at Aguascalientes, Carranza declared he would not abide by it. Hence more fighting, with Carranza in the position formerly held by Huerta. We may picture a procession of provisional presidents, who have to be successively ejected. But of course this is too much of the nature of *opéra bouffe* to last.

In the meanwhile, the north of Mexico appears to be fairly quiet under the domination of Villa, with whom the industrial interests seem to be able to get on well. Consequently, mines and metallurgical works are being reopened and actual conditions are probably better than might be inferred from the press dispatches or even the gossip along the border.

Tidiness in Metallurgy

The best metallurgical practice is usually found in the best kept plants. This is not necessarily so, nor is it the result of order *per se;* nevertheless, it is generally true. Habits of order and cleanliness seem to inculcate the spirit of efficiency in every department, and on entering a mill that is kept in order, one instinctively feels that the metallurgical practice is good, and this is usually the case. At the property of the Miami Copper Co. in Arizona one is impressed by the cleanliness and order maintained at its mill, which immediately inspires confidence in the metallurgical efficiency of the plant. The shafts in the Miami mill are polished with emery cloth, so as to make them shine; any oil that spatters on the mill floor is covered with lime and cleaned up before washing the floor at the end of every shift. The actual cost of keeping the mill clean and orderly, once this habit is established, is small. It automatically prevents the men or the mill from acquiring a slovenly appearance, and is typical of the Miami spirit of efficiency.

Polishing the line shaft and scrubbing the floor look like ultra refinements, but they are of the same order of things as the macadam roads and little grass plots of the Washoe reduction works. A metallurgical plant need not be wholly an unlovely thing. The lawns in front of the Calumet & Hecla stamp mills at Lake Linden give a pleasing distinction to that instutution. Such things create a spirit among the staff that extends to the work that is being done. Show us a tidy plant and we will prophesy the excellence of the metallurgical records before examining the books. When we find the slovenly plant, disfigured by piles of scrap iron that nobody has taken the trouble to ship to the junkman, heaps of rubbish that no one has bothered about carting off, mud holes, tumbling down buildings and the rest of the characteristic phenomena, we know that the same carelessness is to be found in the watch for the metals being treated.

New Mining Legislation

Montana's proposed workmen's-compensation law was submitted to a referendum at the election this month. This law was directed especially against the Anaconda company, whose annual accident bill would be increased about $500,000 by its terms. The proposed law, which is quite outrageous, was the demand of the labor unions, who enlisted the support of the farmers of the state so far as they could. Naturally the employers worked against it. They would not object to a reasonable law, but that which is threatening in Montana is too much to swallow gracefully. A few days ago it was believed that it had been defeated and there were congratulations about the good sense the people had displayed, but according to the last advices the vote is so close that a recount may be necessary.

Arizona has just passed a new law requiring the mining companies to have at least 80% American citizens among the men on their payrolls. This will produce trouble for some of the companies which have heretofore employed a good many Mexicans. The vexation of this law may be offset, however, by the advantages that will accrue from Arizona having voted for the prohibition of alcoholic liquor, which has been the curse of all mining camps. Colorado also has become a prohibition state.

It is understood that some of the Arizona companies will contest the constitutionality of the 80% law.

Zinc in Germany

The last batch of German papers reported a recent sitting of the Zinkverband, which is the German section of what was the International Zinc Convention. There was some discussion of the status of that association. It is our own guess that the zinc, lead, antimony, aluminum and bismuth conventions, and all other international conventions blew up on Aug. 1. The zinc business in Germany seems to be in a bad way, which is not surprising, it being there that most of the great stock existed.

If the Russian advance continues a little further, the zinc mines and smelteries of Upper Silesia are likely to suffer. The principal towns of that region—Beuthen, Kattowitz, Tarnowitz, Königshütte—are but a few miles from the Polish frontier, and but short marches from Chenstohova in Poland and Cracow in Galicia. This is a rich part of Silesia and its capture probably figures in Russian military plans.

Business conditions due to the European War have generally disturbed and demoralized the markets for the more important metals. They have also had great effect on those for the secondary or minor metals, such as antimony, aluminum and quicksilver. In the case of nearly all of these, the outbreak of war was followed by rapid and erratic advances. In most cases, these have not lasted and prices have subsided to nearly or quite their old level, demand in most cases being light. The chief exception is antimony, in which there is a real scarcity, owing to heavy demand abroad, and sales of stocks for export.

Pig-iron production in the United States has been steadily declining during the last six months, and is now at the rate of 19,800,000 tons a year. Should no further decline occur, the total for 1914 will be a little over 23,000,000 tons, or over 7,500,000 tons below the total of 1913. The decrease has been slightly greater with the merchant furnaces, which make pig iron for sale in that form, than with the steelworks stacks, the output of which is for immediate conversion into steel. As pig iron is the basic form of the iron and steel industries, it would appear that there has been this year a decline of nearly 25% in those industries.

Dr. Henry Gannett, whose death is recorded on another page, did much to aid in the success of the Geological Survey during his 32 years of service as geographer of the Survey. Never sensational or self-seeking, his intelligent work made its impression on all who knew its extent and thoroughness. He found time also for much outside work of a lasting nature. Through the National Geographic Society, of which he was one of the founders, he did much to spread the study of geography and the appreciation of its importance.

PERSONALS

George H. Garrey is examining mines in British Columbia.

Robert Sticht, of Mt. Lyell, Tasmania, is in New York. He is revisiting America after an absence of 20 years.

Dr. Kuno Heberlein, of Mexico, president of the Peñoles company, is visiting New York.

Ex-Senator W. A. Clark, who recently returned from Europe, has been visiting Butte.

H. G. C. Thofehrn has opened offices as a metallurgical engineer at 1482 Broadway, New York.

Arthur J. Hoskin, of Denver, Colo., has been engaged on some professional work in the Dahlonega district, Georgia.

Adolph Lewisohn, of New York has been chosen president of Kerr Lake Mining Co. to succeed the late William G. Nickerson.

Alexander P. Rogers has gone to Peru, where he expects to be occupied with professional work during the next eight or nine months.

Walter Harvey Weed is spending a week in New York previous to leaving for an extended trip in Montana, Nevada, Idaho and Arizona.

R. P. Doucet, European sales manager of the Asbestos Corporation of Canada, has returned to Montreal, having had considerable difficulty in getting away from Hamburg.

W. L. Johnson and C. Harrington, of the U. S. Geological Survey, who have been investigating mines and prospects in the Port Wells district, Alaska, are on their way from the North to Washington, D. C., having completed their work.

E. Mackay Heriot, a well known English mining engineer and a frequent contributor to the "Journal," writes us that he is back in London after having been a prisoner of war in Germany. He reports that he was well treated while he was held there.

H. C. Hoover cannot restrain his generous interest in public welfare. Having done wonderful work in assisting the Americans in England, he has now turned his attention to aiding the suffering Belgians, and is playing an important part in the relief measures for that unfortunate country.

Pennock Hart has been elected president of Mackintosh, Hemphill & Co., Pittsburgh, succeeding Joseph Fawell, deceased. Mr. Hart has been connected with the company since its incorporation as a limited company about 35 years ago. For nearly 30 years he has been treasurer and will continue to act in this position.

T. H. Davis, for years identified with the Bayway Chemical Co., Elizabeth, N. J., has resigned his position as vice-president and general manager of that company and has been engaged by the Rahway Coal Tar Products Co. to conduct and manage the new plant which it expects to have in operation at Rahway, N. J., early in 1915. The new company is controlled by Merck & Co., of New York.

H. A. Sutliffe, for nine years master mechanic and chief electrician with the Bully Hill Copper Mining & Smelting Co., Winthrop, Shasta County, Calif., and for the past two years master mechanic and accountant with the La Grange Mining Co., Weaverville, Calif., has purchased a half interest in the Marine Iron Works, Eureka, Humboldt County, Calif., and will take charge of the mechanical end of the business.

J. C. Farrant, European manager of the Hardinge Conical Mill Co., was lost sight of for nearly one month, he being among the English combatants. The company informs us that he has just been discovered as a prisoner in the Doeberritz detention camp near Berlin. His description was: "J. C. Farrant, seaman, R. N. V. R., London, No. 3228, D Co., Hawkes Battalion, First Brigade. Last heard of at seige of Antwerp. Oct. 8." Mr. Farrant is a member of the Institution of Mining and Metallurgy, of London; also of the American Institute of Mining Engineers.

OBITUARY

Joseph Rupprecht died in New York, Oct. 26, aged 49 years. He was born in New York and was well known as a manufacturing chemist, having been for all his active life connected with the well known chemical firm of Eimer & Amend.

Allen Roswell Tees was drowned in James Bay, Ungava, on Sept. 29. He was a resident of Montreal and a student at McGill University. He was a member of a survey party sent out by the Ungava Mining & Trading Co. to explore the territory.

Alfred E. Copp died at Brookline, Mass., Oct. 30, aged 46 years. Born in Canada, he had lived in Boston about 15 years. He was well known as a mining broker and promoter, having offices in Denver as well as Boston. He was connected with several important mining enterprises.

Charles Israel Newman died in New York, Nov. 4, aged 80 years. He was born in Prussia and came to this country when a boy. He was one of the few survivors of the Forty-niners, having gone to California in 1849 with the first adventurers from New York. He spent 16 years mining and prospecting in California and Nevada. He returned to New York in 1865, and had since been engaged in business.

Henry Gannett, president of the National Geographic Society, chairman of the United States Geographic Board, and geographer of the United States Geological Survey, died Nov. 6 in Washington, D. C. Dr. Gannett was born in Bath, Me., and was graduated from the Lawrence Scientific School of Harvard University in 1869, and from the Hooper Mining School the following year. He was an assistant at the Harvard Observatory from 1870 to 1871, and for the next seven years acted as topographer for the Hayden Survey of the territories. When the Bureau of Geological Survey was created Mr. Gannett assisted in planning its work, and in 1882 he became its chief geographer. He was geographer of the Tenth, Eleventh, and Twelfth censuses, and in 1902 was appointed assistant director of the census of the Philippine Islands. In 1907-08 he served in the same capacity in Cuba. During the years 1908-09 Mr. Gannett served as geographer of the Conservation Commission, and he was also associate editor of the "Bulletin" of the American Geographic Society, chairman of the United States Geographical Board, and a member of the American Geographic Society, the Scottish Geographic Society, the Philadelphia Geographic Society, the American Statistical Association, the Washington Academy of Sciences, and the secretary of the Eighth International Geographic Congress. He was also a member of the Cosmos Club, of Washington. Mr. Gannett was the author of a "Manual of Topographic Surveying," and prepared the statistical atlases of 1880, 1890, and 1900. He was also the author of a commercial geography, a dictionary of altitudes, and of "Building a Nation," "United States," "Stanford Compendium of Geography," "Magnetic Declination in the United States," besides many other Government reports, reports on forest conditions, and gazetteers of Massachusetts, Rhode Island, Connecticut, New Jersey, Kansas, Texas, Utah, Virginia, West Virginia, Maryland, District of Columbia and Indian Territory. He contributed to the "Encyclopædia Britannica," and also Johnson's and the New International, and was the author of the Contour Map of the United States and many other maps.

SOCIETIES

Mackay School of Mines—This school at Reno, Nev., which has heretofore been connected with the School of Engineering, has been made a separate and independent department of the University of Nevada.

American Institute of Mining Engineers—A meeting of the New York Section was held Nov. 4, at the Kaiserhof, Broadway and Thirty-ninth St., New York. The meeting was preceded by a dinner. Following the dinner Dr. James Douglas talked informally. Dr. A. R. Ledoux presided.

American Electrochemical Society—The New York Section held a joint meeting with the American Gas Institute and the Illuminating Engineers at the Chemists Club, Nov. 10. The subject of the evening was: "Contributions of Chemistry to Illuminating Engineers." Five papers were presented and discussed.

University of Washington — Placer mining is receiving special attention in the School of Mines at Seattle. The short course for practical mining men, which the school has been conducting for 17 years past, will open on Jan. 4, 1915, and will continue to Apr. 10. A year ago there was an enrollment of 44 for this course, and a larger attendance is expected this year.

American Society of Mechanical Engineers—A meeting of the New York Section was held at the Engineers' Building, Nov. 10. The subject for the meeting was "The Development of the By-Product Gas Producer Industry in Europe." Arthur H. Lymn, London, England, presented the paper of the evening. Mr. Lymn is the inventor of the Lymn process, and his talk was illustrated with lantern slides.

Editorial Correspondence

SAN FRANCISCO—Nov. 4

On the Comstock, the Mexican fire excitement is about over. A little fire remains, but appears to be under good control, and closer approach is being made to the seat of the trouble. The Mexican has removed two bulkheads on the 2000-ft. level, made pipe connections to carry water to the winze station on that level and cooled off the southwest drift. Repairs were also made on the hoist and motor at the winze.

DENVER—Nov. 5

In the District Around Red Cliff in Eagle County a good deal of work is being done although on a small scale. The Bleakhouse mine in Rock Creek has resumed operations under a contract for breaking the ore. Two grades are shipped, one silver-lead and one zinc-lead. This property has been a steady producer for several years past but has been closed on account of fire for the last eight months. Representatives of the Empire Zinc Co. have been looking over the camp thoroughly and already have acquired the Eagle Bird, St. Joe and Belden groups with several other claims on the Rock Creek side of Battle Mountain. They have had a party of surveyors in the camp most of the past summer running lines and reëstablishing old corners. The Black Iron Group at Bell's Camp is under bond to the American Zinc, Lead & Smelting Co. This is one of the old producers of the camp but had never been explored for zinc-lead ores. The outlook for large bodies is encouraging and already several cars have been shipped for trial treatment. The Iron Mask property operated by the Eagle Mining & Milling Co. is maintaining a production of 120 tons crude ore per day. During the summer a new wire-rope tram was installed to move the iron tailings from the mill. Several sets of leasers are at work on the Ben Butler, Tip Top, Maple, Pine Martin and Champion. The Wyoming group on Turkey Creek above Red Cliff is a regular shipper of high-grade silver ore. The new camps of Eagle County on Brush Creek near the town of Eagle have been quiet during the summer. A number of men have been at work on prospects but nothing equaling the Lady Belle has been uncovered.

BUTTE—Nov. 5

The Compensation Law voted on at the recent election, under the referendum, was at first reported defeated. Now it appears that the vote for and against was remarkably close, indicating that a recount will be necessary.

Election Returns up to the time of writing indicate the complete defeat of the Socialists in Silver Bow County and the election of the Democratic candidates, with the exception of sheriff, for which Charles S. Henderson, the Republican candidate, was chosen. This is equivalent to an indorsement of Governor Stewart's action in summoning the militia to maintain order in Butte, as well as of Judge Ayer's decision by which Mayor Duncan, Socialist, and Sheriff Driscoll, Democrat, were removed from office. By their votes, workingmen, miners, business and professional men and property holders have shown that to them the welfare of Butte is of chief concern; that in their efforts to continue mining operations on which every citizen is dependent, directly or indirectly, the mining companies must receive the moral support of the whole community; and that there is no occasion for antagonism, such as the members of the Socialist party and the professional agitators have been preaching unceasingly since their ascent to power here. With the defeat of the Socialistic régime, it is hoped that normal conditions will soon prevail and will result in the withdrawal of the troops and the return of civil government. [Latest reports are that Governor Stewart ordered final withdrawal of troops for Nov. 12.—Editor.]

Muckie McDonald, Joe Bradley and Joe Shannon, by an order of Judge Donlan, will be transferred in a few days from the Silver Bow jail to the Jefferson County jail at Boulder, where they will be tried next week on the charge of kidnaping.

SPOKANE—Nov. 4

In the Coeur d'Alenes mining conditions are good, considering the demoralized metal market, and the output is being maintained at almost normal level, according to Robert N. Bell, state mine inspector of Idaho. He states that the mining industry there is marking time at present. Several of the mines are closed down and others are operating at reduced capacity. The lead is produced at an average loss of ½c. per lb., and it is only the associated silver that makes it possible for any of the mines to operate and at that only a narrow margin to work on is left for most of the operators. President Bradley, of the Bunker Hill & Sullivan Co., has promised his men that that mine will continue to operate at normal capacity as long as the smelters will receive the ore, a promise it is believed he is able to fulfull by reason of foresight in making smelter contracts. A notable feature of mining development in the district is the remarkable expansion of ore resources in the deep levels of the principal mines at Burke, where the Tiger for several years has indicated exhaustion with depth. The present great ore disclosures in the deep levels of the adjacent mines, however, lead to the reasonable conclusion that the Tiger was a poor guide as to permanency. On the strike of these Cañon Creek veins in the Nine Mile district the three principal producers, Tamarack and Custer, Interstate-Callahan and Success, have more than made good their remarkable promise of a year ago in developed resources, and are simply suffering a curtailment of output at this time on account of the lack of a market for their products and inadequate capacity. In the Kellogg-Wardner district, the Bunker Hill & Sullivan continues to expand and disclose new lines of ore resources in its deepest levels. The Last Chance is still giving employment to 200 men and managing to realize a small margin of profit. The Sierra Nevada, Ontario and Stewart mines show good reserves and continue almost normal production by virtue of the contained silver in their ores. The Caledonia has developed into the bright particular star of the district and in spite of low metal-prices is now paying monthly dividends and probably making more money per man employed than any other mine ever did in Shoshone County.

CHICAGO—Nov. 7

The Arrest of J. C. Roberts was made by officers of the Federal Department of Justice, Nov. 2, in Chicago, on an indictment returned recently by the Salt Lake City Federal grand jury, charging him with using the mails to defraud. This is alleged to be in connection with the American Radium Co. Roberts denies the charges.

The White Pine Copper Co.'s Mill, now being erected in Ontanagon County, Mich., is going to be unusually interesting, inasmuch as it involves a distinct departure from the standard practice of the copper country. Last winter, Allis-Chalmers furnished a large quantity of machinery for this mill, which is to be of 1000 tons daily capacity. While exact details regarding the flow sheet are not obtainable at present, it is understood that no stamps will be used, rolls having been substituted therefor.

Manufacturers' Reports of Inquiries received in reference to mines and milling machinery in this vicinity during the last few weeks indicate that while business with the mines is below normal, it is not entirely stagnant. There are also good indications that some of the properties are using the present time to make much needed repairs. This in itself should offer a fair volume of business. The Talc Products Co., with offices in New York City and mine at Glendon, N. C., is asking for figures on a complete plant for refining talc, of a daily capacity of from 50 to 100 tons. Elm Orlu and Butte Superior are figuring on new hoists, and the latter company is also planning some changes in its mill. Symons Bros. is shipping five 48-in. Style C, Symons disc crushers to the Braden Copper Co., at Valparaiso, Chile. Four of these machines previously were supplied to the Chile Exploration Co.

DULUTH—Nov. 7

Taxation has been a subject of keen interest of late. The state tax commission is attempting to levy a tax of 4c. to 4½c per ton on ore in stockpiles, but is encountering strong opposition on the part of operators on the Vermilion and Mesabi. There are between 4,000,000 and 5,000,000 tons stocked on the Mesabi and operators maintain that the tax on this would result in curtailment of winter mining operations and hardship to the men. The Steel Corporation recently paid its taxes for the latter part of 1914, a total of $2,047,994, in St. Louis County, distributed as follows: Active mines, $1,096,108; inactive mines, $936,624; Minnesota Steel Co.'s Duluth plant, $10,741;

Wolvin Building, Duluth (company headquarters), $2390; miscellaneous timber lands, $1931. The state tax commission will have a hearing Nov. 9, on the question of the value of Cuyuna ores in the ground. Until the present season Cuyuna range ores have escaped taxation on the per-ton basis such as is employed in the older iron-mining districts.

MARQUETTE—Nov. 7

Down at Iron Mountain an agreeable surprise for the Thomas Furnace Co., of Milwaukee, was the discovery that the old Indiana mine is not so wet as supposed. The inflow is only 400 gal. per min., well under the average for the district. Repair work is in progress, and with this completed, the development of orebodies revealed by exploration elsewhere in the tract will be instituted. Following similar work by the Milwaukee, the Northwestern is engaged in ballasting its main-line fill across the Chapin pit. It will require a thousand carloads of earth to bring the tracks to grade. This work by both railroad companies seems unending. The pit is gradually deepening as ore is extracted, and the Chapin will be producing for many years yet.

The Jones Furnace was described in the "Journal," Oct. 31. The plant was given its first trial Nov. 5. John Jones, the inventor, stated after the run that while the furnace was a success it yet remained to be proved whether the iron could be placed on the market at a price low enough to insure a profit. The product made was an extremely black wrought iron, ready to be used for any purpose for which wrought iron is suitable. The ore used came from the Cuyuna range; it carried 20 to 30% of iron, and was high in manganese, a typical Cuyuna manganiferous ore. Slabs, sawdust, pieces of bark and other such refuse as comes from lumber mills, were used to deoxidize the ore; no charcoal or coke was consumed. Many people were skeptical as to whether such refuse would take the oxygen out of the ore but Mr. Jones feels certain that he proved his case. The doing away with charcoal and coke will greatly tend to reduce the costs, since the refuse can be purchased at a low figure. Although the backers of the enterprise are elated over the first run, they realize that costs are what will count and that a long test will have to be made before anything definite is determined about putting the product on the market at a profit. The furnace is different from those erected several years ago at Iron Mountain and Republic by Mr. Jones, in that he is now using a vertical tube instead of a horizontal one. It is also claimed that the lining trouble has been settled and that the lining now used will last a long time. The furnace is a blast furnace without the blast and the action which takes place is similar to the action which goes on in the top of a blast furnace. The next ore to be tested will be hard hematite from the Barron mine of the Breitung Co. at Republic. The ore is now at the plant and ready to be run through.

HOUGHTON—Nov. 7

Mass Consolidated is frankly up against a situation which will call for drastic action. If existing metal conditions continue, Mass Consolidated can either cut wages again or suspend. Every other means of curtailing expenses has been applied. The management has already made one cut in wages, like every neighboring company, and has no desire to make another. It knows that the wages are as low as the men can stand. But the other alternative, shutting down altogether, would be still worse for the workingmen. Manager Walker contemplates a canvass of his employees to get their opinion. Mass is averaging a thousand tons daily and is working 340 men.

General Living Conditions, according to Doctors Olson and Patton, experts in the public-health section of the U. S. Treasury Department, are better in the Copper Country than in any other mining district in the United States. These men have been for several weeks making a thorough underground and surface examination of every mine in the district, as well as of the company locations, the homes of the workingmen, the provisions for the care of health and the general arrangements. They said that there was nothing to complain about and everything to praise, that locations were so far ahead of the average mining district that there was no basis for comparison; that general conditions were much better than in the most advanced industrial towns, manufacturing districts or agricultural sections. Furthermore they said that practically all of the company houses were better arranged from a sanitary viewpoint than the average privately owned residence.

JOPLIN—Nov. 7

The U. S. Public Health Service sent Dr. Anthony J. Lanza to the Joplin district, Nov. 7, to make a survey of hygienic and sanitary conditions in the zinc and lead mines, with a view to recommending measures to help the miners who have been suffering so greatly from tuberculosis. Doctor Lanza will, in connection with Messrs. Burch, Holmes and Harlan, state mine inspectors, go over the ground carefully, and then make his report and recommendations. The statistics of deaths from phthisis for the last year in the Joplin district have brought the attention of every thinking man to this problem. They have been so high as to seem impossible and many who saw the statistics for the first time did not credit them. Investigation has, however, seemed to establish their correctness. The number of patients being treated by nurses of the Anti-tuberculosis Society now reaches 150, besides those who have only begun to show signs of the disease.

Manipulation of Prices is being investigated by the Department of Commerce at the instance of Joplin ore producers. The investigation started Oct. 26; it will endeavor to ascertain whether the spelter and ore markets are manipulated by certain groups of smelting companies and metal selling agencies to the detriment of both the ore producers and the spelter consumers. The work in the Joplin field is in the hands of T. M. Barclay of the Department of Commerce. Little is known of the purposes of the Department's agent but among the ore producers there is great readiness to tell of the ideas which prompted their demand for an investigation. They charge that in their opinion, based on the fluctuations of the market and the action of certain buying agents, there is being made from time to time a speculative market, in which, part of the time, they are made the victims and part of the time they are used as pawns to victimize the consumers of the metal, when a bull market is created. To settle this question and if possible to stabilize the spelter and ore markets they asked the Department, through the district's congressman, to make this investigation and to finish the investigation started by the Department of Justice some time ago when the matters of controlling spelter prices, spelter output, and the interlocking directorates of a group of smelters were being considered seriously with a view to an indictment of the alleged combination.

SAN LUIS POTOSI—Nov. 3

Matters of Interest in the Mexican situation are the convention of chieftains at Aguascalientes, the proclamation of Villa in which he refuses to further recognize the authority of Carranza, the reply of Carranza to Villa's proclamation, and the departure of the Belgian ambassador.

The Convention succeeded in gathering under one roof representatives of Villa, Zapata, Carranza, and others, without damage to person or property, which in itself is a noteworthy achievement. This afforded an excellent opportunity for oratorical relief which in itself will help to clear up the atmosphere.

Villa's Proclamation charged Carranza with being false to his promises; with treating the Catholic clergy and Catholic charitable and educational institutions with unnecessary severity; with issuing some 130 millions of currency without anything behind it which has had a tendency to greatly depreciate the currency of the country; with usurping all executive, legislative and judicial powers. Carranza in answer charged Villa with being influenced too greatly by the reactionary elements; and with being unable to keep any semblance of order in that part of the country in which he is in control. He stated that if he dealt severely with the clergy, Villa did also; that if he issued many millions of currency it was because he thought best to do so; that if he took over the prerogative of the executive, legislative and judicial branches of the government it was because he considered it necessary. In other words he appears to proclaim himself another dictator similar to Huerta but having different ideas as to what should be done. At this writing it looks much as if the convention will permit Carranza, Villa, and Zapata to retire from all authority, appoint a provisional president to work in harmony with the various representatives of the convention in carrying out the reforms thought to be necessary and set about establishing order through the republic.

The Belgian Ambassador, Paul May, is said to have addressed the authorities in Mexico City in a sarcastic manner regarding their inability or lack of desire to punish offenders who mistreated a Belgian subject. Mr. May was advised that he was persona non grata and requested to leave Mexico City within 24 hours.

Business continues at a standstill. But little freight is moving, and without it little business can be done. Passenger trains between Mexico City and Laredo have had insufficient accommodations, and trains leave the stations with aisles and platforms full of standing passengers. It appears to have been considered more necessary to provide the delegates to the Aguascalientes convention with private cars than to encourage passenger traffic.

The Mining News

ALABAMA

AMERICAN TAR PRODUCTS CO. (Birmingham)—Contracts let to construct plant to utilize tar output of Woodward Iron Co. coke ovens.

ALASKA

DAN SUTHERLAND AND PARTNERS on Greenstone Creek near Ruby took out about $30,000 during the season just closed.

HUSTLING BUSINESS MEN of Ruby have bought automobile to make regular trips to Long Creek during winter, when trails are good. Have also bought new Keystone drill to operate on Big Creek, about five miles from town. Good pay found there.

CANADIAN-KLONDYKE (Dawson)—No. 4 dredge working on Klondike River recently made world's record, according to report, handling 14,575 yd. gravel in week's run.

ARIZONA

Cochise County

SHATTUCK (Bisbee)—Reported production stopped; only development to be continued. Company will sell no copper under 13c.

Gila County

IRON CAP (Copper Hill)—Stockholders notified by Pres. Frank P. Knight that mine and plant closed down Nov. I. Mine and plant in good shape; former is dry; so no pumping expense incurred.

CALIFORNIA

Amador County

ORIGINAL AMADOR (Amador City)—Dam for impounding tailings being constructed on Amador Creek; estimated will hold over 1,000,000 tons.

KENNEDY (Jackson)—Construction of reinforced-concrete dam to impound tailings from 100-stamp mill in progress; dam 440 ft. long, 30 ft. high; estimated will impound waste for five years.

Butte County

OLD COAL (Nimshew)—This former producer being reopened. E. C. Wilson is interested.

SOUTH BANNER (Oroville)—Old tunnels and shafts being retimbered and cleaned out preparatory to continuing development. Richard Phillips, superintendent.

OROVILLE UNION GOLD DREDGING CO. (Oroville)—Dredging operations will begin soon on ground recently purchased, at present occupied by a prune orchard; Pennsylvania dredge purchased and being moved to new position, digging channel from Feather River to irrigation canal.

Eldorado County

CRAWFORD MINING & INVESTMENT CO. (Mt. Pleasant)—Company formed to take over Crawford and Murford claims owned by J. D. Crawford.

RED WING (El Dorado)—Property bonded to W. H. Diener, of Oakland, who contemplates installing compressor, drills and other machinery. Mr. Diener general manager of the Original Amador mines.

Glenn County

CHROME DEPOSITS in Newville district may be opened up following demand created by war. Former prices did not warrant operation of mines and they have been closed several years. Fruta, nearest railroad point, 30 miles distant; use of auto trucks contemplated. F. X. Templay, of Willows, interested.

Inyo County

BLACK EAGLE (Bishop)—Milling operations resumed. Mill thoroughly overhauled and new gasoline engine installed.

KRUGER (Keeler)—Three-stamp Hendy mill being installed. Stamps weigh 1250 lb. each, operated by gasoline engine. Ore low grade.

WILSHIRE BISHOP CREEK (Bishop)—Grading for new cyanide plant completed and erection of mill under way. Headframe moved from mine shaft to mill site and new skipway built. Mill capacity, 65 tons.

Kern County

PHILLIPS & CRANE—R. W. Graff, who has an option on 14 claims comprising this group in Amalie district, will sink 200-ft. shaft for development purposes.

ZENDA—This property in Amalie district equipped with mill and cyanide plant last summer, producing regularly; 30 men employed. Joe Fawcett manager.

GOLD PEAK—Tracy Engineering Co., of Los Angeles, which has purchased this property, will erect custom mill. This is third mill to be erected in Amalie mining district, as result of recent discoveries.

Mariposa County

DALY (Hornitos)—Erection of stamp mill contemplated. D. L. Oneto superintendent.

NUMBER ONE (Hornitos)—Shaft to be deepened 200 ft. James McGinn superintendent.

NUMBER FIVE (Hornitos)—New Lane mill, daily capacity 50 tons, installed. C. H. Gage superintendent.

RUTH PIERCE (Hornitos)—Electric power being installed. New compressor and hoist contemplated.

RED BANKS (Bagby)—Mine being cleaned out preparatory to thorough sampling. If ore warrants, mill will be erected. H. C. Callahan, of San Francisco, is owner.

CLEARING HOUSE (El Portal)—Property closed down owing to scarcity of water for operating power plant. As soon as the Merced River, on which mine is located, rises, operations will resume.

Modoc County

BIG FOUR (Highgrade)—Reported that Tonopah Belmont Development Co. has purchased this property and will commence extensive operations in spring.

San Luis Obispo County

CAMBRIA QUICKSILVER MINES (Cambria)—Mines reopened after being closed about four years.

Shasta County

MAMMOTH COPPER (Kennett)—George Baker, owning 229 acres of land in vicinity of Mammoth plant, has brought suit for $10,000 against company, alleging fume damage. Suit in line with those filed by Shasta County Farmers' Protective Association, which has been seeking to harass smelting operations of company.

Siskiyou County

SIXES MINING CO. (Etna Mills)—Company opening large hydraulic property on Klamath River. Lumber being sawed for flumes. Water for operation of mine will be piped from China Creek. Suspension bridge being erected across river. P. K. Kelsey superintendent.

Trinity County

BONANZA KING (Trinity Center)—Vein intersected in No. 4 tunnel. Mill will be moved to new entrance to expedite handling of ore.

HORSESHOE MINING CO. (Lewiston)—New concrete dam, just completed in Trinity River at cost of $10,000, washed out by first high water of season. Part of dam built in previous season and point of weakness developed where new and old work joined. Dam built to divert waters of river through tunnel so as to leave river bed open for mining operations.

Tuolumne County

ATLAS (Tuttletown)—Option taken on this property by E. J. Carter, of Los Angeles, and W. W. Elmer, of Portland. Will prosecute active development.

DE WERDT (Columbia)—Property bonded by Clark Sullivan, of Berkeley. Crosscut being driven from shaft to intersect ledge. Mine formerly good producer.

COLORADO

San Miguel County

SMUGGLER-UNION (Smuggler)—Contract taken to treat certain quantity of ore from Black Bear mine in north fork of Ingram Basin. Surveyors started on tramway route from mine to Pandora mill. Bear will mine ore for 30 stamps, probably 200 tons. Pandora equipment pretty well adapted for Bear gold-silver-copper-lead ore.

Teller County

EL PASO (Cripple Creek)—Shaft house and buildings at main shaft completely destroyed by fire Nov. 5. Loss estimated $150,000. Nicholls shaft not reached by fire. Work on drainage tunnel temporarily suspended, since it was carried on through El Paso main shaft.

IDAHO

IN SUIT AGAINST STEWART MINING CO., brought by Bourne and Bunker Hill & Sullivan, U. S. circuit court of appeals in San Francisco confirmed decision of district court in Idaho in favor of plaintiff.

MICHIGAN

Copper

WOLVERINE (Kearsarge)—Sinking started at No. 4 shaft from 37 to 38 level, Jackhamers being used.

MOHAWK (Mohawk)—From No. 6 shaft, most southerly and most promising, three levels driven to southern boundary, now ready for stoping back to shaft. This new shaft richer in general run of rock than any other of mine. Mine working 75 machine drills at present.

Iron

JONES & LAUGHLIN will not buy Mary Charlotte and Breitung Hematite mines. Rumor to that effect in circulation has no foundation in fact. Mines not for sale.

ASHLAND (Ironwood)—Most active property on Gobegic range at present. Force of 260 men working seven days a week in order to ship quantity contracted for.

CLEVELAND-CLIFFS (Ishpeming)—Company has started to drill property of Barnes Land Co., six miles west of here. Chase mine on this property is being operated. Iron-bearing formation extends across the forty, but only ore known to exist there at present is that being worked.

OLIVER (Iron Mountain)—O. C. Davidson, district superintendent, states Oliver mines on Menominee range will

be worked on half time. Decision reached after conference with President W. J. Olcott, of Duluth, and D. J. Kerr, of Pittsburgh. Not known whether same plan will be adopted on other ranges.

REPUBLIC (Republic)—Steam shovel at work cutting into hillside to make more stockpile room. Will give space for storage of about 20,000 tons.

AMERICAN (Diorite)—Mine will be opened again before first of year. Task of repairing shaft going ahead rapidly. Steel sets being put in for entire distance. Shaft was concreted to depth of 160 ft. to fill in places where ore was removed close to shaft a number of years ago. Old shaft was in bad shape and caused much trouble. Shaft 8 ft. by 20 ft. 2 in. inside sets, will have four compartments, skip roads, cage road and ladder- and pipe-way. Company also sinking small shaft and installing electric pumps to supply water to village of Diorite.

ATHENS (Negaunee)—Average advance of 60 ft. per month being attained; sinking was started last June. Operations hampered by water; expected progress will be increased soon to 75 ft. monthly. Present depth 250 ft. Three crews, six men each, employed in eight-hour shifts. For each blast 36 5-ft. holes drilled. Each charged with four sticks 80% powder. Shaft being concreted. Concrete mixed on surface by machine and run down through pipe. Each section requires 48 hr. to set. Steel dividers put in place as forms are removed. Mine has electrical hoisting machinery, air compressors, pumps and other equipment adequate for next five years. Capt. Joseph Thomas in charge of underground operations, with Capt. John Phillips assisting.

MINNESOTA

STEEL CORPORATION EXHIBIT at San Francisco will cost $100,000. Will include model of Alpena mine, Virginia, complete in every detail, including shaft houses, stripping and stockpiles, as well as underground operations.

CLOSE OF SHIPPING—According to schedule, Missabe docks at Duluth closed Nov. 7, steamer "Pollock" being last boat loaded. This dock loaded about 6,320,000 tons this season, as against 11,869,992 in 1913. Other docks still open; number of boats running later than anticipated, particularly Pickands-Mather fleet. Up to Nov. 1, Great Northern docks had shipped 10,319,415 tons, as against 12,273,689 last season, being best showing made by any Lake Superior road. This due to increased activity on Great Northern leases by Steel Corporation, leases providing for transportation via Great Northern. Soo Line dock handled 679,857 tons and N. P. 100,086, up to Nov. 1. These two handle total output of Cuyuna range, which is therefore 779,943 tons to Nov. 1, a little more than last season.

Cuyuna Range

H. J. KRUSE won suit against Chester D. Tripp to recover share of royalties from handling 80-acre tract of land adjacent to Armour mine. Kruse claimed Tripp was secretly receiving royalties and did not share with him, according to partnership agreement.

ROWE (Riverton)—One hydraulic unit suspended operations for present, leaving one unit and one shovel to continue stripping. No more shipments this season. Stated construction work on concentrating plant will begin during winter months.

CUYUNA-SULTANA (Crosby)—Work of getting No. 2 shaft through quicksand in progress. Plan, devised by A. R. McGuire, in charge of operations, as follows: Timbering suspended by wire cables from heavy oak bearers on surface, reinforced by heavy truss. Sand-box, or rather iron sump, forced down into the quicksand by jack-screws. Oak lath driven at angle immediately beneath last set, and hay put in behind to keep sand in place. Then sand and water taken from around iron sump, and next set put in place. Then iron sump emptied, another course of lath driven under set last placed, and sump again forced down to desired point to continue and make preparations for placing another set. Shaft now about 10 ft. above ledge. Company's property adjoins Cuyuna-Mille Lacs property on east; expected product is manganiferous iron ore, with manganese content 10 to 15%.

Mesabi Range

MAHONING (Hibbing)—Will probably continue shipping longer than any other Mesabi mine. Loading 200 cars a day. Should pass 1,500,000 for season.

GRAHAM (Virginia)—Closed for season Nov. 5, after shipping 200,000 tons; 50 men out of employment. Property's first full season, operating two shovels continuously. Is Oliver property.

MISSOURI—KANSAS—OKLAHOMA

ON THE T. B. CARPENTER LEASE on Moore farm, east of Galena, Kan., sublessees are finding good orebodies; practically virgin ground.

EXTENSIVE WATER in sheet-ground zinc field north of Webb City, Mo., may throw 1000 men out of employment. Effort to be made to erect large pumping station by joint action of land owners.

OLD CYCLONE LAND, owned by W. J. Land, Galena, Kan., rapidly coming to front as ore producer. Land lies inside of city, has been idle some time on account of strong water flow. Difficulty recently overcome by installing larger pumps and as fast as the water was lowered land was subleased to miners.

LITTLE PEACOCK MINES (Galena, Kan.)—Shut down for two weeks, to install pump and steam hoist, have been working on 60-ft. level, for some time one of the best producers in the district, but having good ore in bottom of drift, will sink shaft deeper and take up stope. W. G. Scott in charge.

NEVADA

Clark County

BOSS (Goodsprings)—Reported sold to Seeley Mudd and associates. Price named, $250,000; $50,000 paid down. Mine described in "Journal," Oct. 10. Rich platinum ore found. New owners to take charge Nov. 1 and do extensive development work.

Esmeralda County

REVIVAL OF ACTIVITY AT CUPRITE, 14 miles south of Goldfield. Recent discoveries of silver-copper ore made; surface indications said to resemble those of Bisbee. On Jupiter group, rich ore found in surface workings and profitable shipments made. Buildings being erected and machinery for shaft sinking installed. On Kurigen-Smith-Evans property vein cut at depth of 200 ft.; gold-silver oreshoot of shipping grade found.

DIAMONDFIELD-BLACK BUTTE (Goldfield)—Stated high-grade shoot opened recently in "flat" vein. Large tonnage of milling-grade ore developed and five-stamp mill may be built soon.

SILVER PICK CONSOLIDATED (Goldfield)—Winze from "hanging-wall drift" 600 ft. deep. Main shaft will be sunk to this depth and connection made. Oreshoot opened in drift for 100 ft.

Lander County

AUSTIN-DAKOTA (Austin)—Sinking inclined winze from 250-ft. level resumed. Crosscut driven, sump sunk and pump installed on 250-ft. level to handle water from deeper work. Pump delivering water from this level to surface repaired; expected water can be easily handled and work will continue all winter. Satisfactory results obtained in development work on lower level.

Lincoln County

LEASE ON TAILINGS DUMP at Bristol taken by Ely men. Stated other mines may be examined with intention of taking leases.

Lyon County

READING MERCANTILE & TRANSPORTATION CO. (Hudson)—Three five-ton and two three-ton auto-trucks and several teams now used to transport supplies from Hudson to Aurora.

NEVADA-DOUGLAS (Ludwig)—All orders for leaching plant machinery placed and most of material at site. Grading and foundations finished; force of 30 men employed; hoped plant will be completed by January. Plant designed to treat 50 tons sulphide ore daily; acid derived from this will be sufficient to treat 200 tons oxidized ore daily, making total capacity 250 tons.

Mineral County

TRUCKEE RIVER GENERAL ELECTRIC CO.—Power line extension from Pine Grove to Rockland completed.

ROCKLAND MINE (Rockland)—Old mill remodeled and new cyanide plant nearing completion. Roll crushing will be done; electric power used throughout. Capacity 100 tons. Development work under way for one year and estimated sufficient tonnage $10 to $12 ore blocked out to supply mill for two years.

Nye County

FIRE IN TONOPAH, Oct. 29, destroyed two blocks; damage estimated $20,000. Fire started in Nevada heater. Inadequate water supply and high wind prevented successful fighting. Head frame of West End Consolidated saved only by building bulkhead and dynamiting surrounding houses.

BIG PINE (Manhattan)—Mushett & Wittenberg, operators, have new mill coming; should reach Manhattan Nov. 10. Grading for mill-site begun. By last of November, mill should be in operation. Comprises 5x20-ft. tube mill, Dorr classifier, amalgamating plates, etc. Blake crusher now installed at collar of working shaft, will do coarse crushing for new mill. When installed and in operation, mill will handle minimum of 200 tons per day. Two Big Pine glory-holes now merged into one. Dimensions on surface, 300 ft. in length by 40 ft. at one end and 100 ft. at other. Four miners break all ore necessary to keep mill going, average hoisted over 200 tons per day, which after crushing and screening means 100 tons to mill.

WHITE CAPS (Manhattan)—Operations in Mushett-Wittenberg 10-stamp mill on White Caps oxidized ores surpassing expectations. On $10 gold ore tailings run from 40c. to 60c. In one shift per day, 30 to 35 tons of ore milled. Ore comes from glory-hole in east orebody. Churn-drill holes break down ore from between walls 35 ft. apart. This dropped to first level into large chutes, trammed to shaft, hoisted and dropped through large grizzly into bin. Grade raised one-third by the screening process. Since starting milling, total mine cost given as $1 per ton, to be still further reduced coming month. Raise being extended in west orebody, to connect with first level. Now up from bottom level about 70 ft., still showing black sulphide ore, said to average $30 to $40. As soon as Mushett & Wittenberg have new mill installed on Big Pine, White Caps will take over mill now used by both operators, and will then treat 60 to 70 tons per day, reducing costs still further. Estimation of oxidized ores in White Caps made by Engineer John M. Fox last month showed $40,000 worth of $10 ore available with probable and possible ore exceeding that from 15 to 20%. Ore should be mined, hauled two miles and milled for not more than $4 per ton.

White Pine County

NEVADA CONSOLIDATED (Ely)—Large blast set off in Liberty pit recently. Twelve holes, 65 to 125 ft. deep, were loaded with 58,050 lb. powder, mostly dynamite, and fired simultaneously. Estimated 200,000 cu.yd. broken. Mass raised to height of 18 ft. and fell to next lower level of pit, breaking well in good condition for steam shoveling. Cost estimated at $10,000. Moving pictures taken.

NEW MEXICO

Grant County

MAP OF PINOS ALTOS DISTRICT, first to be compiled showing entire area three miles north and south and four miles east and west, issued by J. C. McKee, mineral surveyor at Silver City.

EIGHTY-FIVE (Lordsburg)—Company making additions to forces. Reported contract made for 3000 tons copper ore.

JERRY BOYLE (Lordsburg)—Mine being unwatered; main shaft down 300 ft. Abandoned 30 years ago. Stated ore in sight.

CHINO (Santa Rita)—Drilling for ventilation in lower workings of old Santa Rita mine in progress; cave-in said to have excluded air. Working conditions in camp unchanged.

LA FORTUNA (Pinos Altos)—Norris & Spitzley in drifting encountered good-grade galena carrying silver. Will go down and begin shipping soon. Property latest in district to be developed; is on main-vein system of camp, extension of Tip-Top.

Sierra County

COMPANY BEING INCORPORATED to develop mines in Caballo Mountains by Clyde N. Becker and associates at Rincon. Claims being consolidated. Vein showed content of gold and copper. Manganese ore developed in region.

NORTH CAROLINA

IOLA (Candor)—Mill again running after two months' shutdown. Uwarra mill also again running steadily.

COGGINS (Candor)—Extension of 272-ft. main shaft begun; will be carried to 500 ft. Mill running on development product.

OREGON

VALUE OF SALT DEPOSITS of Summer and Abert Lakes in Lake County determined by State Bureau of Mines, and deposits will be advertised for lease; Dec. 10 set for receiving bids. Bidders required to file $10,000 surety bond; leases will be on per-ton royalty basis. Bidders will also be required to name minimum annual royalty so that there will be no delay in beginning operations after contract is awarded. Jason Moore, representing New York syndicate, a few months ago offered $1,275,000 outright for lakes; understood he will be bidder for lease.

ORIOLE GOLD MINING CO. (Galice)—Suit filed by company in circuit court of Multnomah County against B. F. Rowland, president, for accounting. Complaint signed by M. J. Anderson, secretary and member of the board of directors, and demands $50,000 alleged due company. Investors mostly eastern people. In complaint Anderson charges that bulk of money did not go into development, charges that probably $200,000 was secured and about $80,000 used on property. Oriole good property, but stockholders were led to believe $20,000 milling plant was being erected when second-hand mill and concentrator were purchased for $1000. Anderson says development work will be kept up and mine is in good shape to pay.

UTAH

Beaver County

HORN SILVER (Frisco)—This mine closed down Oct. 31. Zinc ores being shipped to large extent and low price of this metal supposed to be the cause of shutdown. About 60 men were employed.

Iron County

OPHIR (Stateline)—Lease taken on this property by P. Kimball, who is working eight or 10 men. Several small veins being developed, and some material running well in gold encountered.

GOLD SPRINGS MINING & POWER (Modena)—Affairs of this company, which owns Jenny mine, and power plant at Modena, in hands of receiver, on account of debts to Capitol Trust Co. and Western Electric Co. Endeavor to sell for $22,000 having proved unsuccessful, receiver petitioned court for permission to advertise property at $12,000. On Nov. 2, order was issued permitting sale at this figure.

Salt Lake County

UTAH METAL & TUNNEL CO. (Bingham)—Former Utah Metal Co. reorganized under above name; in good financial condition, with large reserve in treasury. Some additional ground acquired.

OHIO COPPER (Bingham)—New trustees Clark Grove, Edward McCormick, and Charles F. Lark have qualified, filed bonds, and assumed charge of affairs. Alfred Frank and M. H. Sowles named by them as local representatives of company. Mr. Sowles, secretary of Salt Lake Hardware Co., named chairman of local creditors' committee at meeting held shortly after receivers had been appointed. Mr. Frank, formerly manager of company, has charge of Bingham Central Ry.

CARDIFF (Salt Lake)—Ore recently opened in this property in South Fork of Big Cottonwood has been followed 75 ft., and is up to 9 ft. in width. Tunnel being driven along contact of quartzite and limestone is in 2600 ft. Seven feet of ore carrying galena in breast. Tunnel being driven to cut intersection of two ore-bearing fissures; 225 tons of ore has been taken out in development thus far. Road between portal and main roadway down cañon being put in order. Haul of about 20 miles to Murray smelting plant.

Summit County

THREE KINGS (Park City)—New electric hoist received and wires being strung to connect with Silver King Consolidated power line. Property is in Nigger Hollow. E. F. Fisher general manager.

SILVER KING CONSOLIDATED (Park City)—Shipment resumed, following improvement in roads, and arrival of machinery now in process of installation. Daily rate of production, 40 to 50 tons first-class ore. No effort being made to crowd output on account of low metal-price. Ore followed for 1000 ft. from 1500 level to side line of Silver King Coalition, with which connections have recently been completed; 1100 level of Coalition connects with 1500 of Consolidated. Better air will be provided both companies, and an exit in case of accident.

WASHINGTON

WENATCHEE GOLD MINING CO. (Entiat)—Charles F. Pfeiffer, manager, retained by new board elected at recent annual stockholders' meeting. Property situated on Entiat River. Plans made to run 800-ft. tunnel to tap vein at lower level. In last two years, mines of company produced $75,000 and paid $14,000 in dividends.

CANADA

British Columbia

IN SANDON DISTRICT numerous mines active. Mountain Con. has packed down over 1000 tons of ore. On Reco Hill several lessees at work; Emerson & Johnson have big showing, expected to begin shipping soon. George Mayready will pack 20 tons from claim to Rambler mill. Payne mine started again after closing for repairs. J. Keene has taken lease on Ivanhoe mill for treating ore from the Surprise and the Wonderful.

STANDARD SILVER-LEAD (Silverton)—September report shows net operating loss of $19,762. Company has on hand 955 tons ore, 330 produced in September, which, if sold, would have wiped out loss.

SILVER WEDGE GROUP—T. S. Palmer, owner, says this property in Kootenay Lake district will have two-stamp mill in spring. Ore is high-grade silver-lead with small vein of free-milling gold near by.

SURF INLET—Mine held under option by Tonopah Belmont. Recently inspected by Frederick Bradshaw. Says he is well satisfied with work to date, although this has been largely surface improvements. Development been proceeding three months. Old lower tunnel driven on vein and ore showing satisfactory. Crosscut also started to tap vein at 360 ft. below tunnel; now in 450 ft., has cut foot wall of vein but not yet reached west or hanging-wall vein. Drifting started north on foot wall to get under shoots exposed in upper tunnel.

Ontario

MAPES-JOHNSTON (Elk Lake)—Mine opened up, using temporarily Silver Lake company's buildings, its own having been destroyed by fire. Short but rich oreshoot developed at 100-ft. level and same vein picked up at 180-ft.

BAILEY (Cobalt)—Another attempt to reorganize being made. Outstanding stock $5,250,000; proposed that new company capitalized at $600,000 take over the property, giving E. A. Benson, former president, mortgage for $90,000 for which he holds judgment against company. Bailey stockholders will get one share of stock in new company for every ten. Stated ore reserves amount to 400,000 ounces.

BEAVER (Cobalt)—Station on 900-ft. level being cut, and preparations made to sink another 100 ft. which will give Beaver deepest shaft in northern Ontario; while sinking to 900-, work was suspended on 700- and 800-ft. levels; this now resumed. Beyond short crosscut towards main vein no work will be attempted at 900-ft. level until shaft reaches 1000 feet.

KERR LAKE (Cobalt)—Draining operations of lake resulted in discovery of western extension of Fleming vein, which appears strong, and carries considerable high grade Crown Reserve has not so far discovered anything on its section of lake bed, as prospecting is more difficult there; bottom shelves steeply, heavily covered with mud, necessitating stripping and trenching before discoveries may be expected.

McKINLEY-DARRAGH-SAVAGE (Cobalt)—New vein recently found on 140-ft. level of Savage claim encountered in long exploratory crosscut about 600 ft. east of No. 4 shaft. Winze sunk 22 ft. on orebody has to date yielded nearly $30,000 and at bottom shows 4 in. of 8000-oz. ore. Within 100 ft. of new showing good indications of ore observed on two other leads, and management intends to investigate them soon. Heavy overburden has prevented surface exploration.

HUDSON BAY (Cobalt)—Report that company would pass next dividend later denied. However, since mine is about exhausted and company has assumed control of Dome Lake at Porcupine and is prosecuting development there, it is extremely likely dividends will be materially reduced or stopped altogether. Hudson Bay was most sensational dividend payer in Cobalt; had nominal capitalization of $25,000, actual $7761; will have paid by Nov. 10, $1,940,250, 25,000% on actual capitalization. Passing may be considered to mark epoch in history of camp.

MEXICO

Durango

PENOLES (Mapimi)—Mining and smelting resumed about end of October. Property had been idle during revolution. No damage suffered. Operations not yet on full scale.

Mexico

IN CAMP OF EL ORO, El Oro M. & R., Mexico and Esperanza working, El Oro and Mexico having begun Oct. 1 and Esperanza earlier. Des Estrellos still closed. There is great lack of foreign labor.

San Luis Potosi

J. T. MURPHY has been making some shipments to Monterrey. No work yet commenced at Esperanza mine, one of Murphy properties.

IN CHARCAS DISTRICT mines still idle are Alianza, Anaconda, Aurora, Bibiana y Anexas, Buen Suceso, Buena Suerte, Bufa (belonging to Empire Zinc Co.), Concordia, Cuprita (belonging to Tiro General), Denver y Anexas, Fortunas, Gallega, Garibaldi, Gitana, Guadelupe, Hermiga, Moctezuma, Morelos (belonging to Empire Zinc), Palomas, Plomoso, Potosi, Reforma, Reina, San Carlos y Anexas, San Diego, San Ricardo, San Sebastian (belonging to the Leschens of St. Louis, Mo.), Santa Eulalia, Santa Inez, Santa Rosa, and Trinidad.

TRES AMERICAS—This mine, about five miles west of Charcas, extracting ore and piling it on patio awaiting resumption of operations at Aguascalientes smelting plant. A 7x10-in. station pump and No. 3 Cameron sinker being installed. W. H. Simpson, manager, now at property.

TIRO GENERAL (Charcas)—Shipments of 100 to 200 tons of ore from dumps being made daily to Monterrey smelter. Said that water has reached fifth level since pumps were removed, but believed it will be pumped out as soon as it is definitely settled no further political disturbances will occur.

The Market Report

METAL MARKETS

NEW YORK—Nov. 11

Copper and lead have been distinctly stronger. Spelter, on the other hand, has been a little weaker.

The present freight rate on copper and spelter to English ports is 16¾c. per 100 lb. The war risk insurance is now down to ¾@1%. The differential between London and New York prices for copper is reckoned as about 30 points; between London and St. Louis prices for spelter as about 37 points.

The London Metal Exchange reopened on Nov. 9, but the scope of transactions is still limited.

Copper, Tin, Lead and Zinc

Copper—At the beginning of our week of record, copper was still at about 11.10c., New York. A rather large business was done at 11.05c. with a seller who evidently needed to realize, while sales to consumers in Connecticut were made at 11¼c., regular terms, and bids of 11.05@11.10c., cash, New York, were received from Europe. About the same conditions prevailed during the two following days, European buyers raising their bids a little. On Monday a further increase of interest by domestic consumers was exhibited and sales were reported at 11¼@11⅜c., regular terms. By Tuesday the market had become well established on the basis of 11⅜c., regular terms, although this price was shaded a little in certain quarters. On the other hand, 11½c. was realized on some transactions, although these were not considered to be representative of the market. In the aggregate a rather consideraple business was done, including some million-pound transactions. At close, copper is still offered at 11⅜c., regular terms.

The behavior of the copper market during the last four weeks has been encouraging. Having fallen to its lowest stage, it rallied by reason of some substantial buying, and then received some very bad news without declining more than a trifle; since which it has rallied again. The reasons for this are that domestic consumption is probably increasing, while it is certain that some of the largest producers will not sell liberally at the present level of price.

The Department of State issued the following announcement on Nov. 10: "The British Ambassador today informed the State Department that he has been advised by his government that Italy prohibits the export of copper, but does not prevent its transit over Italian territory. The ambassador said that in view of that fact, the British Government would feel compelled to detain copper shipments to Italy unless assured that they were for domestic consumption or were in transit to Switzerland." This amounts to a demand by the British Government that it shall supervise the copper export business of the United States.

The brass business in Connecticut is reported as being much better than for any time in the last year or two. The demand for brass for munitions of war is very large.

The copper on the steamship "Kroonland," held at Gibraltar, has been removed and the steamship has been allowed to proceed. The copper has been sent to a prize court for adjudication.

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

Tin—This market has been very strong for spot supplies, which are scarce. Futures are lower and not in demand.

Beginning Nov. 9, the New York Metal Exchange started business in tin as follows:

First—A "call" on tin in Manhattan warehouse in spot lots of five tons.

Second—A "call" on tin in 25-ton lots of spot, dock or store, port of New York.

Third—A "call" on tin in 25-ton lots, for shipment from European ports.

Fourth—A "call" on tin in 25-ton lots, for shipment from Eastern ports.

The Banka tin sale, which was appointed for Nov. 10, has been indefinitely postponed.

Lead—A rather heavy business was done again this week. Apparently the New York business is still going chiefly to the largest interest, the price of which remains 3.50c. In St. Louis, however, where several producers have been sellers, the market became fully established on the basis of 3.40c. early in the week, while in the latter part as high as 3.42½c. was realized.

Spelter—This market has been dull and weaker. A business of several hundreds of tons daily is reported, including some export business, which is going on right along, but the aggregate of all transactions is not large.

Zinc Dust is quoted at 10c. per pound.

Minor Metals—Quotations for **Bismuth** are $2.75 per lb., a decline of 10@25c. from the previous quotation.—**Magnesium,** $1.50 per lb., New York.—**Selenium,** $3@3.25 per lb. for lots of 100 lb. or over, $5 per lb. for small quantities.

Nickel—Shot, blocks or plaquettes are 40@45c. per lb. Electrolytic is 5c. per lb. higher.

DAILY PRICES OF METALS

NEW YORK

Nov.	Sterling Exchange	Silver, Cts. per Oz.	Copper	Tin	Lead		Zinc	
			Electrolytic, Cts. per Lb.	Cts. per Lb.	New York, Cts. per Lb.	St. Louis Cts. per Lb.	New York, Cts. per Lb.	St. Louis, Cts. per Lb.
5	4.8975	49⅞	11.05 @11.15	34	3.50	3.37½ @3.42½	4.97½ @5.02½	4.82½ @4.87½
6	4.9025	49⅞	11.05 @11.15	34	3.50	3.37½ @3.42½	4.97½ @5.02½	4.82½ @4.87½
7	4.9075	49⅞	11.10 @11.15	34	3.50	3.40 @3.42½	4.95 @5.00	4.80 @4.85
9	4.9063	49⅝	11.15 @11.25	34¼	3.50	3.40 @3.42½	4.95 @5.00	4.80 @4.85
10	4.9013	49⅜	11.20 @11.30	34¼	3.50	3.40 @3.42½	4.92½ @4.97½	4.77½ @4.82½
11	4.8950	49	11.20 @11.30	34¼	3.50	3.40 @3.42½	4.92½ @4.97½	4.77½ @4.82½

The quotations herein given are our appraisal of the markets for copper, lead spelter and tin based on wholesale contracts; and represent, to the best of our judgment, the prevailing values of the metals specified as indicated by sales by producers and agencies, reduced to basis of New York, cash, except where St. Louis is given as the basing point. St. Louis and New York are normally quoted 0.15c. apart.

Some current freight rates on metals per 100 lb., are: St. Louis-New York, 15½c.; St. Louis-Chicago, 6c.; St. Louis-Pittsburgh, 12½c.; Chicago-Baltimore, 10½c.; Chicago-New York, 13½c.

LONDON

Nov.	Silver	Copper				Tin		Lead		Zinc	
		Spot		3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton	Cts. per Lb.
		£ per Ton	Cts. per Lb.								
5	23	*	*	*	*	*	*	*	*	*	*
6	23	*	*	*	*	*	*	*	*	*	*
7	23	*	*	*	*	*	*	*	*	*	*
9	22⅞	50¼	10.91	51¼	*	139½	*	18⅛	3.94	24¼	5.27
10	22¾	50⅛	10.97	51⅛	*	139	*	18	3.91	24¼	5.27
11	22⅞	50¾	11.03	51⅛	*	138	*	18	3.91	24¼	5.27

*No quotations.

Imports of Silver in Great Britain nine months ended Sept. 30 were £9,157,915; exports, £9,609,190; excess of exports, £451,275, which compares with an excess of imports of £1,621,177 last year.

Other Metals

Aluminum—Business is still quiet, with no special feature. Current quotations are unchanged, at 18@18.50c. per lb. for No. 1 ingots, New York.

Antimony—No more exports are reported this week. Prices have been too high, and stocks are not large enough to induce underselling. Ordinary brands—Chinese, Hungarian, etc.—are held at 12@15c. per lb., New York; while 17½@18c. is asked for Cookson's.

Quicksilver—The market for this metal has been greatly upset by importations of Italian and Spanish metal. Some quantities of Mexican mercury also have been coming here. These supplies have made New York more of a primary market than it has been heretofore. There is an unsold stock of about 1500 flasks of Italian quicksilver that is depressing prices. The market is about like this: The agents of the California producers ask $50 but are willing to take $45. Consumers bid $35 but are willing to pay $40. Business apparently is consummated at about $42@43, though the range in bid and asked prices is $35@50. Today the market is reported stronger, with sales at $45. London prices are altogether nominal.

Gold, Silver and Platinum

Gold—Shipments of gold from New York to Canada on British account were $8,500,000 during the week. There is nothing new in the gold situation.

Iridium—This metal continues scarce and dealers do not quote prices definitely, as they are settled by negotiation.

Platinum—The market is slow and prices are weaker. Sales are reported at $44@46 per oz. for refined platinum. Hard metal is from $4 to $6 per oz. higher, according to quality.

The latest report received from our Russian correspondent says the export of platinum has been entirely stopped, and at Petrograd no sales have been made for the home market. Consequently, there are no quotations. The platinum producers have petitioned the government to allow the State Bank to make advances on platinum at the rate of 20,000 rubles per pood.

Silver—A small order, said to be on India account, stiffened price to 23d., but after its execution the price again receded. The market closes quiet.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Nov. 7

The base price paid this week for 60% zinc ore was $43@44 per ton. Lead sales were made under contract.

SHIPMENTS WEEK ENDED NOV. 7

	Zinc Ore, lb.	Lead Ore, lb.	Sulphur Ore, lb.
Week	5,758,590	214,250	418,920
Year	140,624,500	4,444,950	29,269,550

Shipped during week to separating plants, 2,638,150 lb. zinc ore.

JOPLIN, MO.—Nov. 7

Blende, high price, $48.50; assay base, 60% zinc, $40@45; metal base suspended; calamine base, 40% zinc, $22@23; average, all grades of zinc, $42.54 per ton.

Lead, high price $43.50; base, $42 per ton of 80% metal content; average, all grades of lead, $42.12 per ton.

It is reported here that the American Metal Co. has closed down a large portion of its smelting furnaces, and producers are expecting this restriction of metal production to help the spelter market materially.

SHIPMENTS WEEK ENDED NOV. 7

	Blende	Calamine	Lead	Value
Totals this week.	8,162,020	613,570	1,610,680	$220,570
45 weeks	443,860,940	33,302,960	77,059,750	$11,018,090

Blende value, the week, $179,080; 45 weeks, $8,828,610.
Calamine value, the week, $7550; 45 weeks, $389,500.
Lead value, the week, $33,940; 45 weeks, $1,799,980.

IRON TRADE REVIEW

NEW YORK—Nov. 11

While business continues light and production has not increased, there seems to be a slightly better tone and a more cheerful sentiment in the trade. A feeling that the turn is not far off seems to be quite general.

Pig Iron Production in October showed another decrease. The statistics of the furnaces, as collected and published by the "Iron Age," show that on Nov. 1 there were 158 coke and anthracite stacks in blast, having a total daily capacity of 53,250 tons, a decrease of 7200 tons from Oct. 1. Making allowance for the charcoal furnaces, the total production of pig iron in the United States in October is estimated at 1,809,000 long tons; for the 10 months ended Oct. 31, it was 20,106,000 tons. Of this produceion, 14,202,000 tons, or 70.6% of the total, were made by the furnaces owned or operated by steel companies.

PITTSBURGH—Nov. 10

The Steel Corporation's report of 3,461,097 tons of unfilled business at the end of October indicates a loss of 326,570 tons during October, against a loss of 425,664 tons in September. The showing is thus less unfavorable by 100,000 tons. Shipments may be estimated to have decreased about 43,000 tons a day; bookings increased about 1000 tons a day.

Actual shipping orders received by steel mills, including fresh orders and specifications against contracts—the Steel Corporation's report referring to contracts rather than to specifications—have been stationary in the past week, probably ending the long decrease and promising an early though possibly slight increase.

Steel-mill operations are averaging about 40% of capacity, and as bookings are at a lower rates the trend in production promises to continue downward, but the lowest point should be found very soon. General business prospects are regarded as decidedly improved. Some large mills are running at 35% or less, but others are doing better than 50%. Operations are lightest in rails, plates and shapes and heaviest in wire, sheets and tubular goods. There continues to be a heavy export demand for barb wire and to a lesser extent for nails.

While steel prices show a sagging rather than a firming up tendency, it is believed they are very close to bottom.

Pig Iron—Despite the extremely light production of merchant pig iron, stocks continue to accumulate at some of the furnaces. The foundries have very little business and the steel mills that use purchased pig iron are particularly poor consumers, as they are employing especially large percentages of scrap, both heavy melting steel and heavy cast scrap being available at little over $10, delivered Pittsburgh. Two sales of bessemer of 500 tons each are reported, at $13.75, Valley. Basic can be had at $12.50, Valley, though no sales are reported. It is possible that on a large lot $12.25 could be done. We quote: Bessemer, $13.75; basic, $12.50; No. 2 foundry and malleable, $12.75@13; gray forge, $12.50@12.75, at Valley furnaces. Prices delivered Pittsburgh are 95c. higher.

Steel—We quote the market largely nominal at $19 for billets and $19.50 for sheet bars, at maker's mill, Youngstown, prices at maker's mill, Pittsburgh, being about 50c. higher. Rods are about $25.50, Pittsburgh.

COKE

Coke production of the Connellsville region for the week is reported by the "Courier" at 205,964 short tons; shipments, 207,004 tons. Shipments of Greensburg and Upper Connellsville districts, 29,042 tons.

Anthracite Shipments in October were 6,644,476 long tons, an increase of 306,282 tons over October, 1913. For the 10 months ended Oct. 31 the total shipments were 57,620,079 tons in 1913, and 56,712,057 tons in 1914; a decrease of 908,022 tons, or 1.6%, this year.

CHEMICALS

NEW YORK—Nov. 11

The general market is in about the same condition as for several weeks past.

Arsenic—There has been no change and quotations remain at about $3.75 per 100 lb., in a quiet market.

Copper Sulphate—Business is reported fairly steady. Quotations are a little lower, $4.25 per 100 lb. for carload lots, and $4.50 per 100 lb. for smaller parcels.

Nitrate of Soda—Business is quiet. There is no change, prices holding about 1.87½c. per lb. for November and December; 1.90@1.92½c. per lb. for deliveries in January and later.

The war has seriously affected exports of nitrate from Chile. Shipments from Iquique in August were 27,100,669 quintals, against 57,019,988 quintals in July.

Potash Salts—One shipment of potash salts, about 4000 tons, has been received since the opening of the war. It is said this was divided between the two leading fertilizer companies. There is not much prospect for any additional supplies at present.