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DEPARTMENT OF GEOLOGY & MINERAL INDUSTRIES
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THE ORE.-BIN

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THE BOSS'S NUMBER OF THE ORE.-BIN

Note:

Ever notice that once in a while at any man's mine the lead mule kicks hell out of the trammer boss, or the track tender drops a Jim Crow on his foot, or the timber gang comes to work on the night shift soused to the ears, or the motorman forgets to duck a chute timber -- anyway, once in a while the boss of the outfit (who never does anything but look down the backs of employees' necks) has to don slicker and hard hat and really do a little work?

Well, this is the Boss's number and he hopes you'll like it. If you don't, remember it doesn't cost you a cockeyed cent, and (he says) it may be worth all it costs.

All right, send her down to the ninth level, and if the bloody rope breaks let's pray that the dogs catch.

WHAT'S NEW IN MINING.

by EKN.

When I was a kid 40 years ago, my mother said she would never really enjoy riding in a top buggy until it could be pulled by some kind of an engine - not by a tired horse - and could go a mile a minute. -- Said she expected to see it before she died, too. Dad and granddad and Uncle Fred and the rest said she was whacky, that it stood to reason you couldn't build any kind of a buggy that would stay together at 60 miles an hour, and further there wasn't a 40 rods of smooth, straight road in the country that you could drive that fast without turning end over applecart, and further you would kill all the chickens, cow brutes and old women in the country tearing 'round like that, not to mention scaring hell out of every farmer's team within a quarter mile of the road. That was in 1900.

Well inside of 20 years, mother rode comfortably at 60 miles an hour in the family "machine", but she didn't say "I told you so". She said, "it was inevitable. Man will always seek and find easier and cheaper and more logical ways of doing things. How I wish I were a little girl and could live the next hundred years. We little dream of what will happen." How truly she spoke.

Take mining . . . . Twenty years ago a miner with muck stick and wheel barrow would handle a few tons of ore in a shift . . three or four tons per man for the mining labor was pretty good; now any miner with half a chance,using a slusher or mechanical loader, will handle ten to twenty tons per shift, and the tons per man figure in average operations has been upped as much as 100 per cent.

Time was when we used a Cornish pump and a 30-foot column line and pump rod going all the way down the shaft, and the pump engine on the surface would just about fit inside a county courthouse; or we conveyed steam down the shaft to a set of steam pumps about a half block long to pump a thousand gallons per minute from a medium deep mine. Now we use 85% or 88% efficiency multi-stage electric pumps you could easily put in your bathroom and they kick out more water at a lot less cost than any of the slow-motion giants of forty years ago.

Time was, many years ago, when a 500-foot shaft was pretty deep and hoisting was slow because they thought that hoisting a cage much faster than a man could climb a ladder was mighty risky business. Now, ore and men are hoisted from shafts a mile deep in 3 or 4 minutes. I knew of a case in the anthracite field a few years ago where a top man kicked a car of coal off the cage, rang the cage down, then in some dizzy manner the shaft gate didn't come down and the top man walked into the open shaft. He fell 300 or 400 feet, landed on top of the cage and -- broke his leg! That is how fast the cage was going down.

As to handling material . . . the old time miner used a 1-ton car, and a glance at his punch-board at the shaft or portal told very close to how many tons he had mucked in a shift or a week. The old miner kicked out the catch in the front gate and up-ended the car of ore with a terrible bang against the back stop, the ore going directly into the skip, - or into the ore bin if he was tramming from an adit. Nowadays 4- and 5-ton cars with motor haulage are standard underground, 10-ton cars running on 80-pound rails are not uncommon, and in a few of the larger underground operations 20-ton air-dump cars on standard guage heavy railway track bring the ore out -- 'tons per day'.

In the open pit iron mines in Minnesota we used to rack our brains trying to figure some means of getting approach tracks into the ever-deepening pits. Now they bring the ore out on long conveyor belts and mine out the approach tracks.

Contractors in surface operations and quarries commonly use bulldozers, carryalls and Le Tourneaus that haul 10 or 12 cubic yards of material at a trip. In one large operation in Arizona they are using special trucks with huge pneumatic tires that haul 35 tons at a trip many hundred feet at a cost of a few cents per ton.

At Grand Coulee Dam they have been pumping more than 20,000 yards of concrete per day through a 14-inch pipe, a distance of more than 7,000 feet and lifting it 500 feet. It is an old story to move such materials as dry powders, wheat, lime, phosphate, cement aggregates, etc., through pipes from car or boat to bin or silos. Now, a certain company submits a proposal to elevate rock crushed to 3/4 inch, by their Airveyor system, up a 1,600 foot shaft, at the rate of 125 tons per hour, through a 12-inch pipe, using a vacuum at the collar of the shaft of less than 5 pounds per square inch - with no compressed air used at the bottom of the shaft. (E. L. Oliver of San Francisco is authority for the above).

What would that do to hoisting costs and methods? You'd put the crusher underground - not uncommonly done now - and shoot the product of the mine up through a pipe in the corner of the shaft or through a drill hole. Only a small shaft for men and supplies would be needed.

And shafts . . . they are now being sunk by diamond drill methods -- bored with a rotary type drill arrangement using steel shot for the cutting. A core 5½ feet in diameter is brought out and no powder used in sinking. The speed of sinking is equal to that of the conventional manner of shaft sinking, or faster, and the cost of the order of $20 per foot. In normal ground, it is stated, no timbering is required, and in bad ground less timber is needed than is usually the case because of the shape of the shaft and no shaking up of the ground due to blasting while sinking.

Diamond drilling technique is being constantly improved and the costs lessened. Twenty years ago you could tell from the sound of a drill a block off whether it was in hard rock or not. The bit normally turned over a couple of hundred times a minute and when hard rock was hit the drill would slow down and groan as the driller fed it pressure. A setter would set a couple of 8-stone bits in a shift using several carats of black diamonds worth $150-$200 per carat. Nowadays the bit turns over several hundred times per minute, takes a tiny rock "shaving" off each turn, instead of a real bite, and gets more footage at less cost. The bit now is probably set by machinery with a few dollars' worth of bortz and if a piece of it turns out of the bit the rest goes to powder and up the casing; formerly, if a diamond twisted out of the bit was apt to wreck the rest of the bit, and both driller and setter wondered if they would be hunting a new job.

Oil drilling technique has changed and been improved probably more than any other type of operation employed in mineral extraction. Twenty-five years ago in the mid-continent field, a 3,000 foot oil well was considered as a deep hole. Practically all deep drilling was then done with cable tools. A heavy drill bit and shank weighing a couple of tons were lowered into the hole on the end of a long cable. The drill was "jobbed" up and down until the hole was deepened a few feet, then the bit was hoisted out and the hole cleaned with a dart-bottomed bailer. Nowadays the rotary drill with a fish-tail or a rock bit, fastened on the end of a string of hollow "rods", bores down through rock and shale like a carpenter's bit goes through pine. Heavy (or light) mud is pumped down through the rods, out through a hole in the bit and back up the hole on the outside of the rods, thus keeping the hole from caving until the casing is lowered. A few months ago a hole was completed in California at a depth of 15,004 feet - the greatest depth below the surface of the earth ever penetrated by an instrument of man - and we are told that it may be possible and desirable to go even deeper. In such deep drilling the driller is guided in his various actions by a series of delicate and clever gauges that tell him at all times what is going on in the hole and what his tools are accomplishing. What above all that has made deep drilling possible is the advanced technique in manufacturing special alloy steels for making up drill rods, casing, and cables that must carry such tremendous strains.

Rock drilling ... When we see a miner or prospector take a hand drill and single jack and start drilling a hole "the hard way" we are reminded that he is doing almost precisely what the Grecians were doing 500 years before Christ. Of course, we now have air drills or jack hammers, but if you will consider the cost of electricity you buy to run a motor, to turn a belt, to turn a compressor, to force air several hundred feet through an iron pipe, to actuate the inefficient mechanism of an air drill, to hit one end of a piece of drill steel, to hit a very few hundred licks per minute against a hard rock . . . you will probably fail to see more than a few per cent of efficiency in the entire process, yet it is the best we have today.

But . . . we are told about the latest idea for drilling - the use of vibrations of supersonic frequency (6,000 to 10,000 per second) having an amplitude of about 1/16 of an inch at the cutting face. These vibrations would be created by vacuum tube rectifiers and transmitted to the special drilling device, presumably, by rubber-covered lamp cord. It wouldn't be necessary to have a compressor on surface and an air line down the shaft and out to the face.

Enough work has been done on this idea so that it seems reasonable to predict that something revolutionary will come of it in the not too distant future.

Then, there are extremely hard special steel alloys which are beginning to be manufactured. Tungsten carbide is one of them. I heard an engineer recently tell about seeing a 2-inch diameter hole drilled through one inch of hard glass in three minutes with no dulling of the steel bit.

Some day I expect to see a miner drill a 10- or 12-hole round in a breast of hard rock in 30 minutes. Sounds crazy, doesn't it? But how did your radio work in 1918? (You didn't have one).

How about blasting? . . . When you and I were kids and we went hunting rabbits with the old muzzle loading "zulu", we poured 3 or 4 drams of black powder down the hole, rammed down some paper, spit half a mouthful of soft shot in, rammed down some more of the weekly paper, put a cap on the firing tube, drew a bead on the bunny, and WHAM! Pretty soon the smoke cleared away and we looked out to see what had happened.

That is about what we do underground now. Our powder has plenty of kick but the powder smoke doesn't improve the underground ventilation a bit. And then, caps, either electric or regular, are tricky to handle and fuse may burn a foot a minute as it is supposed to, or, rarely, the fire may "run" in the fuse and the blast may "follow you out" of the drift. Who knows what we will be using for blasting one of these days? Liquid oxygen is being used somewhat and has a number of advantages. Of course it would improve underground ventilation in any mine. Its cost is being reduced so that it, or some other similar product, may come into common use in mining one of these times.

Now, as to prospecting . . . . nothing will ever take the place completely of the old sourdough prospector, especially in the out of the way places or new mining areas (if any). More power to him. However, in the last twenty years the smart lads with shiny leather boots, slide rules, formulae and electrical gadgets are really going places in finding concealed orebodies and oilfields. As a youngster in school I was a plane table pusher and rodman "geologist" for . a season with a well known consulting oil geologist. I belonged to a clique of fellows each of whom thought he was a pretty smart oil geologist if he could stay on one limestone member all day over several square miles of broken country. Now, with some instruction I could probably just about keep notes for a modern petroleum geologist operating a seismograph or magnetometer, but I couldn't begin to interpret the notes. It takes a schooled geophysicist and mathmetician for that. On visiting the field camp of a well known oil company in the interior of South America a few years ago I found that they had imported two Russian geophysicists, who spoke very little English, and an "Einstein" mathematician from England (whose English I could understand littler better than the Russians') to interpret seismograph results in an undrilled area.

In the last few years engineers are following deeply-concealed fault breaks, the extensions of dikes and orebodies, contacts between rocks of different kind, concealed salt domes, deeply buried intrusive masses, and they can calculate often with a fair degree of accuracy the depth to bedrock, and the depth and courses of concealed gravel channels -- all by electrical means. This geophysical work is rather expensive at present, so it can only be carried on by the larger mining and oil companies. It is becoming less expensive, as time goes on, and as methods are better perfected.

Let us not forget that airplane mapping and geological reconnaissance are becoming extremely important in mining and mineral investigation. Air reconnaissance has done wonders in Canada and in South Africa in the more inaccessible regions. Topographic mapping by air is slowly replacing the standard method of ground mapping by plane table. In many cases it is much cheaper and in some cases more accurate in detail than ground methods.

And lastly, metallurgy . . . . Forty years ago chlorination of gold ores was quite a process. It recovered the metal from ores which refused to give up their values by amalgamation. Cyanidation was just coming in and great things were expected of it. A few years later, some one - allegedly the wife of a miner - while washing her husband's pants discovered in some manner the particles of sulphide were - or seemed to be - held in the soapy froth in the washtub. That was the start of flotation. It became possible to separate sulphides from siliceous gangue by the new method of flotation. Within the last fifteen years new re-agents and new types of machines have made it possible for flotation experts not only to separate ordinary sulphides from siliceous gangue, but to "drop" or "select" any given desired or undesired sulphide, thus separating various sulphides which occur in a given ore. There are also "floating" oxidized ores and non-metallics, and a host of things which no one suspected in the beginning could be separated by flotation or any other means. Recently, a keen metallurgist has been able by the flotation process to take the ink out of certain types of waste newspaper so that the material could be used over again. Especially in the cement industry in the east, limestone is being treated by flotation to eliminate the silica and other undesirable ingredients.

This Department has recently concluded the first of a series of experiments on flotation of medium grade limestone of the Willamette Valley in the hope of raising the grade, so the rock may be used for agricultural fertilizer. Considerable encouragement has been met with in this work so far.

It has been found that magnetic separation is adaptable to the treatment of various types of ores and materials which were not supposed to be magnetic. It has been found that almost all metallic minerals have a degree of inherent magnetism, most of them very slight as compared with magnetite, of course. Some of them, however, are sufficiently magnetic to permit of satisfactory separation with the more recently developed magnetic separation machines.

Electrostatic separation, which differs considerably from magnetic separation, has come into a special use in a wide range of both metallic and non-metallic minerals. The operation is relatively cheap. The practice was described in a previous number of the Ore.-Bin and will not be repeated here.

The "sink-and-float" method of separation announced last year by the Dupont Company has commercial possibilities in the treatment of certain ores, or for the reduction of cost of some of the common methods of mineral separation. This practice, too, was covered in a recent issue of the Ore.-Bin.

The U.S. Bureau of Mines has practically perfected a method of depositing metallic manganese electrolytically. This appears to have very definite commercial value, especially in connection with replacing ferro-manganese, which is widely used in blast furnace practice, and in the manufacture of ferro-alloys. It appears that there is hope of adapting this same practice to the deposition of other metals such as chromium and magnesium, and making a commercially economic process of it. A research chemist is now working in this state on a process of extracting chromium from the low grade chromite ores in Oregon. Up to this time chromium has been very difficult to get into solution, but the chemist referred to is making some progress. Another chemist at a different laboratory is working on the preparation of the commercial manufacture of anhydrous aluminum chloride from the high alumina clays in Oregon. Preliminary work has been completed and a pilot plant is now being built. Anhydrous aluminum chloride is a standard commodity and has some market demand at the present time. To make metallic aluminum from this product requires electrolytic methods which would suit the facilities present in Oregon to a T. Another group in a laboratory in Oregon is setting up to make a series of products from the complex sulphide ores of this state. Some progress has been made and new data are being obtained, in regard to the chemical reactions that take place in a high temperature combustion chamber.

The most revolutionary metallurgical process which has appeared on the horizon is that of minerals separation employing supersonics or high frequency electrical impulses referred to above under the head of rock drilling. Much work has been done on this new practice in the last few years and there has been encouragement from results obtained in the laboratory. A plant is now being built in Utah for the separation of oil from shale, using this high frequency adaptation, and it appears that former costs of extraction may be tremendously reduced. The process itself may be described as effecting a sort of atomic or molecular dissociation of the material being treated. After this dissociation, the elements themselves have a tendency to segregate in such a fashion as to permit of collecting the various elemental substances. If the process can be worked out to apply generally to mineral separation, it will be so revolutionary in nature and presumably so cheap as compared with other methods that mineral-bearing rock not formerly classed as ore because of being so low grade may be treated commercially. That will mean that those who shout and cry about the exhaustion of mineral deposits will be extremely comforted. As a matter of fact, I heard a nationally famous technician state recently that he expected to see within a couple of decades basic igneous rock of the gabbro or diabase variety being used as an ore to produce such contained elements as iron, magnesium, platinum, chromite, lead, zinc, etc., which the rock contains in infinitesimally small quantities.

The spectroscope is coming into greater use yearly as an aid or tool in geological and mineralogical studies. It is being used in mineral separation also and as a guide in assaying. The accuracy of its determinations is being increased from year to year by the manufacturers who are able to make the extremely delicate grids with greater precision.

In summary, the business of mining and metallurgy is changing and improving rapidly from year to year. Costs are being lowered, new processes are being developed, and new materials are being found which greatly ease the manner of life of many of us who do not realize the thought and effort consumed in working out these various processes. The trend is distinctly toward more technical and more complicated methods of attack. Specialized knowledge is required, and the old luck element in mining is being eliminated rapidly, since, with all of the new practices and methods of analyzing conditions in any mine or on any property, the more easily and accurately can the ultimate answer to the commercial aspect be obtained.

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REED COLLEGE SPEAKER.

Mineral resources of the Pacific Northwest were discussed in a talk by Ray C. Treasher, geologist of the State Department of Geology and Mineral Industries, before the Institute of Northwest Affairs at Reed College on July 13.

Getting away from merely cataloging the various mineral occurrences, Mr. Treasher approached the subject from two allied points of view - (1) the use of power, and (2) the importance of the area in occurrences of so-called strategic minerals. The need for low power rates was stressed as essential in order to attract electro-metallurgical industries, and the availability of essential minerals for such industries was discussed.

A skeleton list of some of the principal metals and ferro-alloys peculiarly adapted to electric furnace manufacture was given by the speaker together with northwest occurrences of those metals so used. An analysis of the availability and application of such essential minerals as ores of aluminum, magnesium, mercury, nickel, manganese, chromium, and tungsten was made.

Mr. Treasher spoke of the importance of coal, silica, refractories, limestone, diatomite, salines, and especially clay occurrences in Oregon and Washington, as well as the vast resources of phosphate rock in Idaho.

The Institute of Northwest Affairs in this its second annual session held at Reed College from July 10th to July 21st covered a very broad field of subjects intimately connected with Oregon's present and future. Each subject was treated by the best informed speaker available.

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SILVER.

The new monetary bill which became a law July 6th provides that the U.S. Treasury shall receive domestic silver mined on or after July 1, 1939, for coinage into dollars at the rate of $1.29292 per ounce, retaining 45% as seigniorage charge for governmental services relative to handling and coinage and returning the balance to the owner or depositor of the silver. Thus 55% of $1.29292 or 71.11¢ per ounce is returned to the owner.

Under the previous law domestic silver had to be tendered to the mint prior to July 1st. The new law applies only to silver mined on or after July 1, but provides that the President's power under the old law of fixing the price shall apply to the silver mined prior to July 1 but not delivered to the mint before that date. For silver of this category a price of 64.64¢ per ounce has been fixed by the President.

The new law makes 71.11¢ per ounce equivalent to a statutory price for domestic silver mined on or after July 1. There is no time limit; the price continues indefinitely and is subject to change only by Congressional action.

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Congress passed, and the President approved, House Resolution 6977, the effect of which is to set ahead the deadline for assessment work from noon of July 1st, 1939, to noon of September 1st, 1939. The law as passed affects the doing of work for this season only.

This legislation means that in order to retain possession of governmental land held by location until noon of July 1st, 1940, assessment work if not completed must be started before noon of September 1st of this year, and prosecuted with reasonable diligence until $100 worth of labor has been performed, or improvements made equivalent to that amount on each claim or fraction of a claim so held.

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NOTICE

Demands for this monthly publication have been so great that the facilities of the Department for issuing it are beginning to be sorely taxed. We are also beginning to feel the pinch of the cost of postage involved in sending out nearly a thousand of these each month.

In the interest of economy and with the idea that there may be a goodly number who receive this and who may not be particularly interested, we are asking that each of you drop us a penny postal card and state your desire to keep on receiving this publication.

This notice will be carried for two months and those who have not indicated their interest in the publication or their wish to be kept on the list will be dropped after the September issue.