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Method of Mining Coal Without Powder

By D. Vance Sickman, B.S., E.E.

Part I.

This method consists of a combination of appliances which provides a simple, easily operated and purely mechanical means for breaking down coal after it has been “undercut” in the usual manner. Every detail has been carefully worked out. The method of application and the design of the appliances used, conform with established engineering principles. After the coal has been undercut, the mechanical process of breaking it down, ready for loading out, consists of the use of two mechanical elements: (a) The Slotting Machine, and (b) The Hydraulic Expanding Bar. The functions and operating characteristics of each of the machines are as follows:

(a) The Slotting Machine.

This machine represents the final achievement in the successful development of this process of mining. Its purpose is to cut rectangular slots in the coal for the insertion of the Hydraulic Bar. The important operating features of the machine are:

(1) Transportation.

In the introduction of any new or additional mining appliance, the extent to which it may interfere with or interrupt the ordinary mining processes in use, is of great importance to the operator. The transportation of coal and the necessary mining machines etc., must not be interfered with. In most mines the transportation facilities are already burdened and the introduction of any additional appliances, that would have to be transported from place to place over the same haulage ways, would result in loss of output, and further complicate underground operations in general. To overcome this difficulty the slotting machine is mounted on a self-propelling bed plate of the “chain-track,” or “caterpillar,” tractor type and driven from place to place in the mine in the same manner as the ordinary tractor is driven on the farm. This construction entirely eliminates any interference with transportation over the trackage system. It is propelled by electric motors, or rotary air engines, using the same power as the other mining machines in use. In practice this machine is driven from room to room through the “cross-cut,” thus saving traveling distance, as the “cross-cut,” by law, cannot be more than 80 feet back from the “face,” or an average of 30 feet, in order to pass from one room into the next adjacent room. The machine can travel to almost any part of the mine by keeping open the last “cross-cut.” The “chain track” of the bed plate is also provided with flanges to fit the gauge of track in use and the machine can be run upon the rails and driven to any part of the mine, should this be desirable.

The total weight of the slotting machine is approximately 6,000 pounds, and as the length of the “caterpillar track,” or what would be the “wheel base”, is approximately 5½ feet, the machine can be run on twelve pound rails.

The construction of a self-propelled, self-contained slotting machine, transported from room to room on its own bed plate, insures this part of the process being carried out with great rapidity, without interfering with any other equipment, or being itself delayed, and permits of the introduction of this process of mining without causing the slightest interference with any other operation.

(2) Manipulation.

The over-all width of the slotting machine is approximately 3 ft. 10 in., and length over-all 8 feet 4 inches. These dimensions vary somewhat with the height of the vein in which the machine is used and the depth of the undercut. Each side of the “chain-track” can be operated independently, and also reversed independently. By this construction the machine can be manipulated to make a right angle turn, or turned end for end, that is, completely around, in a space not exceeding its own length. The size of the bed plate is such that it can pass between “props” set 4 feet apart. The speed at which one “chain-track” is driven, relative to the other, can be varied at will and the machine will travel a course of any degree of curvature. The ease with which the machine can be manipulated enables it to travel from room to room, avoiding props or other obstructions and also to be quickly adjusted in position for cutting the slot in the face of the coal, or what would be the “cross-cut.” The speed of travel can be varied from barely moving up to two hundred fifty feet per minute.
(3) The Cutter Bar.

Mounted above the traveling bed plate is the cutter bar, used for cutting the slot. The entire driving and feeding mechanism is practically the old style low vein "breast machine", used for under-cutting coal for many years. Containers for the short-cutting machine turned upside down, and that part of the supporting frame removed which will permit of the bar being raised so as to cut the bottom. The bed plate itself is provided with three lifting rams, which raise and lower the cutter bar given any angle of adjustment. By manipulation of the three rams, raising the bed plate, this bar, or the cutter bar, can be adjusted so that the cutter bar will assume any angle relative to the roof. In veins of 7 feet less in thickness, three slots only are used; as close as the bar is possible, as close as the roof as possible, and parallel to the roof. Unless the roof is uneven, the cutter bar will lie parallel against the roof. Often the roof may incline at an angle, and to accomplish the position of the bar these rams are forced against the roof with a force of two thousand pounds (1,250 tons); No. 1, 30,000 pounds (1,250 tons); No. 2, one million five hundred thousand pounds (1,250 tons); No. 3, one million five hundred thousand pounds (1,250 tons); No. 4, two million six hundred thousand pounds (2,400,000) pounds. From a large number of experiments, it has been demonstrated that a force of one million (1,000,000) pounds, in a bar thirty inches long, will shear lignite or bituminous coal 7 to 8 feet in thickness, when the bar is placed 12 inches distant from the termination of the undermining, at the "rib", and parallel to the "rib" wall, the coal being undercut six feet. Lignite coal is much tougher, tenacious and harder to shear than the higher grades of bituminous coal. In the short-cutting machine of the proper width, the short-cutting machine is operated by water, and the driving mechanism is standard, having been in use for over twenty years. This slotting machine is, therefore, one of the best developed machines and will require no more than normal maintenance cost, and on account of the ease and facility of operating it, the labor cost is less than any other machine in common use in coal mining. In operation, the cutter bar is simply inserted the proper depth, from five to six feet, depending on the depth of the undermining, and then withdrawn. The forward cutting speed is from 24 to 30 inches per minute, and the pull back speed, 12 feet per minute. This cut the slot ready to insert the hydraulic expanding bar. The standard width of the slot is 4 inches, and the length is varied for the slotted machine, as the operator may desire. This is done by simply using the bar on the cutting bar of the proper width, other 18 inches, 24 inches, or 30 inches, as required.

(4) Locking Device.

When the slotting machine is in position and ready for cutting the slot, the machine is locked in position. This is done by two additional hydraulic rams which press against the roof of the mine. These rams are provided with large, round, spiked, rolling bearing shoes. The force exerted against the roof is counter-balanced by forces against the back cold. These two rams are placed on the back end of the bed plate, which are used for raising and adjusting the same. The rams are against the roof with a force of ten thousand pounds. The short side of the bar of the short-cutting machine of the proper width, 17 inches long and contains three very powerful pistons, while the long side is 27 inches long. Simply the combination of two pistons. At normal water pressure, this bar develops a total expanding force of nine hundred and seventy-five thousand pounds. This size bar is suitable for coal 4 feet to 5½ feet in thickness. In all other sizes, the bar is made up of two members, or sections, each of which is two separate bars. The shorter section is inserted so that the pistons lie parallel to the back wall of support, and the longer section is inserted parallel to the rib wall and to the "rib" wall. If both bars are properly placed in the slot, the forces are applied in planes at right angles to each other, one to shear the coal from the roof, the other along the back wall of support. Making the larger size bars in two sections, facilitates placing the bar in the slot, and parallel to the back wall, contains six very powerful pistons and weighs 150 pounds. The longer section, placed parallel to the "rib" wall, contains seven pistons and weighs 192 lbs. It should be "scored" that bars up to 200 pounds in weight can be easily handled by two men and often by one man alone, so that the above weights are within the control of a single man, and within the power of the slot for the No. 4 size bar is cut thirty inches long. This bar at normal water pressure has the enormous expansive force of two million six hundred thousand six hundred (2,400,000) pounds. From a large number of experiments, it has been demonstrated that a force of one million (1,000,000) pounds, in a bar thirty inches long, will shear lignite or bituminous coal 7 to 8 feet in thickness, when the bar is placed 12 inches distant from the termination of the undermining, at the "rib", and parallel to the "rib" wall, the coal being undercut six feet. Lignite coal is much tougher, tenacious and harder to shear than the higher grades of bituminous coal, in effect two separate bars. The bottom of the small size bar is 27 inches long and contains three very powerful pistons. The pistons used can be varied at will so that the output of capacity can be increased to meet almost any requirement. Normally, the pistons used is the section of the bar that is placed parallel to the back wall of support, although fewer in num-
ber, are larger in size and exertive force than those in the bar placed parallel to the "rib" wall. The total expanding force being about equally divided between the two sections. All types of bars are rectangular in cross section, and 4% inches in depth, which permits of the bar being readily slipped into the slot which is 4% inches wide. The width of the bar varies in accordance with the size of pistons used. A No. 1 size bar is 4% inches wide and the largest size is 5% inches wide. The one and a half million pound bar, No. 2 size, is five inches wide. This size bar is suitable for coal 5 to 8 feet in thickness. The shorter section weighs 121 pounds and the longer section 168 pounds. All parts of the bars are made of chrome vanadium heat treated steel, drop forged into proper shape and machined to dimensions. This steel has a minimum ultimate tensile strength of 200,000 pounds, as a minimum elastic limit of 150,000 pounds per square inch.

(2) Piston Construction.

The enormous forces developed by the hydraulic bar, ranging from 1,000,000 to 2,500,000 pounds exertive force, necessitates special construction of the pistons and piston chambers. Many methods of external construction, bending moments, and stresses, are developed, and to relieve the bar of these and prevent distortion, they must be eliminated. To do this the pistons are basically "reactions," one piston being ejected downward, or against the coal to be broken down, and the other upward, or against the solid roof. The pistons in the short section are telescopic, and the forces exerted are counter-balanced within 18 percent, thus relieving the piston chambers, as well as shifting off the water supply or such internal bending moments, stresses and reactions, as would otherwise cause distortion and make the bar impermeable. In effect, this leaves holding the pistons and piston chambers in position, the internal stresses tending to bend the bar itself being reduced to 18 percent of the maximum caused by any one piston. The bar is sufficiently rigid to withstand easily this force. Engineers who have examined this type of telescoping piston pronounce it a most ingenious design, yet it is simple in construction, easy to manufacture and extremely powerful. It represents the result of years of constant experimenting and designing. One of the most important and necessary operating features is that, with this construction, the total expansion of the pistons is more than twice as great as can be accomplished by any other design. In breaking the coal down an expansion in excess of 3 inches is often required. In the standard bar, 4% inches deep, the combined expansion of both pistons is nearly 1%. This insures proper expansion to make the coal fall after it has been broken and shattered, expanding bar of this type is practical in industry. In the case of the half million pound bar, except possibly the renewing of leather gaskets after a long period of use. The end of each telescopic piston (one being pressed against the coal and the other against the roof rock), is enlarged into a flat bearing surface 5 inches square. This large bearing surface prevents indentation. Even in the short section of any one piston does not exceed 1% inch when exerting full expanding force.

(3) Piston Valves.

The enormous force exerted by each piston precedes the use of holding bolts, of any description, or further fixation of any one piston, it having made its normal outward travel. At the same time, some means must be devised to maintain constant water pressure, the piston completing its outward travel without being partially ejected; in other words, each piston must continue to exert force, independent of what any other piston may be exerting, or the distance it has traveled. To operate characteristic must be made "cool proof." In this, each piston chamber with an automatic cut-off valve, actuated by the movement of the piston. This valve is very simple and effective in construction, and when actuated to shut off the water supply to a piston chamber at the instant the piston has made its proper, normal, outward expansion. The cutting off of the water supply to any particular piston does not effect in any way the pressure exerted by any other piston—the other pistons continuing to be ejected at approximately normal speed. To obtain these operating features, separate piston passages are provided, leading to certain sets of piston chambers, the water supply being controlled by separate valves. In the small size, No. 1, external valves are used, water pressure, etc. The smallest in size No. 3 size, is used, water pressure, etc. This size bar is suitable for coal 5 to 8 feet in thickness. The shorter section weighs 121 pounds and the longer section 168 pounds. All parts of the bars are made of chrome vanadium heat treated steel, drop forged into proper shape and machined to dimensions. This steel has a minimum ultimate tensile strength of 200,000 pounds, as a minimum elastic limit of 150,000 pounds per square inch.

(4) External Control Valves.

In the application of the bar it is necessary for the operator to be able to control the ejection of the pistons at certain times during the breaking down process, more satisfactory results are obtained by retarding the ejection of certain sets of pistons, or in some cases stopping their ejection entirely for a few seconds, while other sets of pistons being ejected at normal speed. To obtain these operating features, separate external control valves are provided, leading to certain sets of piston chambers, the water supply being controlled by separate valves. In the small size, No. 1, external valves are used, water pressure, etc. Tbe smallest in size, No. 3 size, is used, water pressure, etc. This size bar is suitable for coal 5 to 8 feet in thickness. The shorter section weighs 121 pounds and the longer section 168 pounds. All parts of the bars are made of chrome vanadium heat treated steel, drop forged into proper shape and machined to dimensions. This steel has a minimum ultimate tensile strength of 200,000 pounds, as a minimum elastic limit of 150,000 pounds per square inch.
square inch water pressure, but will stand 20,000 pounds without injury. When the bar is inserted in the center slot, the manipulation is practically the same, the only requirement being that the front pistons be expanded far enough to carry the coal all the way up until the back pistons produce a definite shear along the back wall, and after this is done the coal will usually fall without any further application of force. The coal has a tendency to stick to the roof, the front pistons are ejected until it is torn off and toppled over. From the above the manipulation is practically the same by the use of this form of bar are apparent. The ability to control the ejection of the pistons is of the greatest importance in the successful application of this process of mining. It is accomplished by applying scientifically, where and when required, producing results that are uniform, and which can be obtained in no other manner.

These special and particular operating and constructional characteristics produce and insure results that are mechanically and economically impossible in any other form, or type, of expanding bar. They solve the problem of applying mechanical forces for the mining of coal.

(5) Spring Return of Pistons to the Piston Chambers.

At the moment the coal falls, the pistons are ejected at least one-half their normal travel and in some cases as much as 3½ inches or even 4 inches. In this condition it is very difficult to extract the bar from the fallen coal, as these projecting pistons occupy, in a large measure, the space the coal has fallen. Also the safety of various persons are large cracks and crevices which interfere in the withdrawal of the bar, as long as the pistons remain expanded. It is, therefore, necessary to have some means for rapidly collapsing the pistons, thus reducing the bar to normal thickness, and allowing ample space for its withdrawal. This is accomplished by permitting the pistons to fall back into the piston chambers. In the collapsed position, the surface of the bar is perfectly smooth, and there are no projections to get caught in the cracks and crevices of the coal. This is accomplished by providing the return of the pistons to their collapsed position quickly, powerful springs are provided which, as soon as the water pressure is removed, force the pistons back into the piston chambers. This action is assisted somewhat by the suction of the pump which, at that time, is removing the water from the piston chambers and pumping it back into the supply tank. This suction effect is, however, comparatively feeble, as the pistons of the high pressure pump are very small and not suitable for creating a vacuum. Also, unless special gaskets are provided on the bar pistons, air can pass freely into the piston chambers and destroy any suction effect. The insertion of special gaskets, of the type used in the piston construction, so that the action of heavy springs is depended upon for forcing the pistons back into their chambers. In the collapsed position, each piston is held firmly in its chamber with a force equal to from 12 to 14 times its weight. As the piston is ejected, the force is expanded over an area of the spring action is practically constant. This is accomplished by using a compression spring in combination with a lever action, the fulcrum of which is shortened, in proportion to the travel of the piston, as it is ejected. This spring action has been very carefully worked out, as it is of considerable importance in saving time and annoyance in handling the bar and in permitting of the bar being extracted from the slot, readily and quickly, after the coal has fallen.

(6) Special Designs.

In some cases and under certain conditions it is advantageous to produce a combination of stresses, part of which are in a vertical plane and others in a horizontal plane. The result of this combination is to produce a distortion on the coal that is not being shattered in many different directions. Also, when the roof is down and forming the "pits," or other conditions make it necessary, the coal broken up in a much greater extent than would be produced by the use of straight, vertically applied force only. If this type of bar is used in coal having the usual number of natural cleavage planes, or "slips," it will cause the coal to be broken into small lumps, or "skeets," producing a greater percentage of slack coal than would be produced by the standard bar, which is normally less than 10 per cent. In a 6 foot slot. The placing of pistons in an expanding bar at an angle is an entirely new form of application and produces results that have never been possible in any other design of expanding bar. Also the ability to give the coal an outward rolling action is, in some cases, of great importance. The conditions required for this action, however, are very unusual, as normally the standard type of bar fulfills every requirement. The development of this type of bar further extends and increases the scope of this process of mining, enabling it to be successfully used under the most adverse conditions, and further permitting of its design, adapted to the character of coal in which the expanding bar is to be used.

The Hydraulic Pump.

The water pressure for ejecting the pistons of the hydraulic bar is obtained from a small triplex or quadruplex pump, driven by a 3½, 5, or 6 horse-power variable speed motor, depending on the size of the bar used. These pumps are manufactured by a number of different companies, and have no special features. The normal working pressures are ten thousand and fifteen thousand pounds per square inch, and the capacity is such that the full piston stroke is expanded in from 4½ to 5 minutes. Usually the coal will fall when the pistons have been ejected about two-thirds of their maximum travel, so that the average time required for one "shot" is from 3 to 5 minutes.

Folding Steel Tubing.

The water is conveyed from the pump to the expanding bar through specially designed, folding steel tubing. This tubing is ¾ inch outside diameter and is cut into lengths of from 20 to 24 inches, and these lengths joined together by means of a special universal joint. The joint is so constructed that it permits of the tubing being folded to any required length. The tubing and joints are indestructible and require practically no maintenance cost. Each length of tubing is provided with a coupling for attaching to the "valve head" of the hydraulic bar, while the other end is permanently attached to the discharge of the high pressure pump. The means of conveying water from the pump to the bar has proven very satisfactory and has never failed, nor caused a moment's delay, in three years of service. The joints are easily taken apart and the tubing renewed should this ever become necessary. The water, or "water emulsion" as it is called, containing just sufficient oil to provide lubrication and prevent rusting, is carried in a ten gallon tank. After the hydraulic bar has been expanded, and the coal brought down, the emulsion is pumped back into the tank. The only loss of the emulsion is that due to making connections and the drippings. A ten gallon tank will mine from 1,000 to 5,000 tons of coal.

The "emulsion" in the tank is put under a pressure of 150 pounds by air pressure, and as practically the same amount of fluid is pumped back into the tank after each expansion of the bar, this air pressure remains fairly constant after once being pumped up. A small power driven air pump can be used to furnish this air pressure or it can be pumped up by hand. As soon as the bar is inserted and the jointed tubbing connected, the valve connecting the supply tank to the
suction end of the high pressure pump, is opened, and the fluid passes through the pump valves and jointed steel tubing, into the piston chambers, thus completely filling the entire expanding mechanism, before the high pressure pump is started. This saves time and also "sets" the pistons. In the No. 2 bar, at 100 pounds pressure, each piston is exerting a force of 1,300 pounds, or the total expanding force of the bar is 12,500 pounds. With the pistons exerting this force, upon an application of the tank pressure, they are "seated" ready to receive the pump pressure at the first stroke of the pump pistons. In the No. 2 size bar, each stroke of the high pressure pump causes the pistons in the bar to be ejected, several ten-thousandths of an inch. At normal speed the pump makes five hundred strokes per minute. Each stroke drives the pistons of the bar against the coal with a combined force equal to one million, five hundred thousand pounds!

Conceive of this force being delivered to the mass of coal at the rate of five hundred impulses per minute and you will have some idea of the enormous shattering effect produced. The rapid application of these enormous impulses, causes the complete disintegration of the coal, not only at the point of application, but...
throughout the mass to a surprising distance, often ten to fifteen feet distant, from the point of application. A peculiar fact in this connection is that the harder the coal and the greater the force required to shatter it, the lower the volume of coal that will be broken at one application, and the more completely it will be broken up when it finally fails. The same effect has been noted in breaking wood beams, as the harder and more rigid the wood, the greater the force required, and when the beam is finally broken, it will be more completely shattered than a beam of less rigidity.

General Operation.

The tank, pump and motor are mounted on a small portable truck which is attached to the self-propelling slotting machine as a “trailer” and conveyed from place to place in the mine. The hydraulic bar is also carried on this truck. The slotting machine, with its trailer, carrying the pump, the hydraulic bar, the folding and other fittings and tools, is one unit. The process of slotting the coal and breaking it down is carried on as one operation. It requires three men when three “ribs” are cut, while the equipment is moved from room to room, and as general helper to the other two, while working in a “place.” The usual procedure is to first cut the face of the “room,” to detach the “trailer” from the slotting machine and push it to one side. The slotting machine then proceeds to cut the first slot, that is, the right hand “rib” side of the room, and as soon as this is done, requiring from five to seven minutes, it then moves to the other side of the room, on the first slot, and the cut, the other men proceed to insert the bar and bring down this section of the “room.” In the meantime, the center slotted slot of the “ribs” is cut, the other men proceed to insert the bar and bring down this section of the “room.” In the meantime, the center slotted slot of the “ribs” is cut, the other men proceed to insert the bar and bring down this section of the “room.” The next slot is then cut in the same manner, and the process is continued in this manner until all the “ribs” have been cut, when the slotting machine proceeds to cut the last, near the roof, as close to the roof as possible, one in the center and one close to each “rib.”

When additional slots are required, the men proceed to insert the bar and bring down this section of the “room.” In the meantime, the center slotted slot of the “ribs” is cut, the other two men proceed to insert the bar and bring down this section of the “room.” In the meantime, the center slotted slot of the “ribs” is cut, the other two men proceed to insert the bar and bring down this section of the “room.” The next slot is then cut in the same manner, and the process is continued in this manner until all the “ribs” have been cut, when the slotting machine proceeds to cut the last, near the roof, as close to the roof as possible, one in the center and one close to each “rib.”

In long wall mines, the first slot is cut near the “rib” and the coal sheared and broken down to whatever distance the coal may break. The second slot is cut from 15 to 25 feet beyond where the coal has fallen with the first application, and the success of the slotting depends upon state of wear of the pump and valves. The vacuum pump for 4½ years lifted the solution to a height of 9 feet above the top of the center of the pump. The pressure has since been taken off the pump, because it would not give the required vacuum, nor is sufficient head to keep the solution in the discharge pipes. The pressure has since been taken off the pump, because it would not give the required vacuum, nor is sufficient head to keep the solution in the discharge pipes. The pressure has since been taken off the pump, because it would not give the required vacuum, nor is sufficient head to keep the solution in the discharge pipes. The pressure has since been taken off the pump, because it would not give the required vacuum, nor is sufficient head to keep the solution in the discharge pipes. The pressure has since been taken off the pump, because it would not give the required vacuum, nor is sufficient head to keep the solution in the discharge pipes.

Life of Various Parts.

Thirty-five hours are required to recover the filter. This includes taking off the old wire, cloth and burlap, removal of all screens placed acting by hand, sluicing out of solution pipes, re-assembling, recovering and re-winding. Valves, gears and the pump are always gone over carefully and the necessary repairs made.

(1) The life of the valve plate and seat averages 4½ years without regrinding or scraping. The life thereafter depends on the skill of the mechanic.

(2) The life of the pump on this duty is about five years. Impeller and case have become worn by sand, and pinions wear out.

(3) The life of the air compressor last about four years.

(4) The valves of the air compressor last about four years.

(5) A new soft iron scraper, to remove the tailing, is replaced about every four months.

(6) Filter cover lasts eleven months. One set of burlap undercovers lasts twenty-two months.

(7) The wire winding is generally changed with the cover, though on two occasions it was used over with no trouble except in rewinding.

(8) The main driving gear lasts three years.

(9) The main driving worm lasts thirteen to fifteen months.

(10) The main driving gear and pinions—no replacements.

(11) After five years the wooden parts showed no deterioration except a few worm holes which were stopped with tar and rosin. Those holes were made during a two months’ shut-down.

Manipulation.

(1) The scraper plate tails are filed flat every shift (12 hours).
(2) The slime is agitated every two hours.
(3) The slime is pumped from the bottom of the tank by air lifts twice each shift (12 hours).

(4) The vacuum is cut off and ten lbs. of air blown through the ports after every two shifts for one revolution of the filter.

(5) The filter is cleaned every two weeks or more often, according to the amount of grit in the pulp, per min, the filter is cleaned. The cover is brushed with fiber brushes and steel brushes until it is clean. It is then given a wash of 50 gallons of 3% filter acid, and then washed off with water. The tank is sluiced out. The operation is repeated from the time of taking off the vacuum to the time of removing the cake off the clean filter.

(6) When first erected, the solution distributor did not work well. It was removed and a solution applied in a fine spray. The spray was very satisfactory so far as replacing the precipitant solution was concerned, but it could not be regulated to such a point that it washed well and at the same time did not dilute the pulp in the tank and change the cake. A burlap drag was placed in front of the distributor, the dissolved value in the pulp ran up because of channels formed by the large amount of solution running down the filter face. The capacity of the distributor was increased and the charge made with the excess barren solution.

(7) Water wash is applied in four sprays. The water strikes the cake 6 inches from the solution wash distributor.

(8) The holes in the filtering medium are covered by a square cloth (same filter cover) 1/4 inch square or longer. As it passes between the cloth squares, the cloth square is simply slipped under the wires without stopping the filter. When the cover is cleaned all the holes previously not cleaned are repaired. Hence, it is not the whole cake pie which the filter is found by putting on the water spray and blowing through the air port. Patches two feet square have been made by this method. No slime leaks through, and the cake is as thick over the patches as over the unpatched surface.

(9) When the wires break, during winding or when an end is reached, six inches of wire are worked back under that already placed, selecting a clean spot which to make the joint. Six inches of wire, always to be placed in patches is warped in the end of the wire and ready wound on the filter and the new turn to the dress by staples. The turn of the wires is now slack wire even. Then pressure is applied and the winding continued. A piece of thin sheet 1 inch by 6 inches is placed over the top of the wires. When a worn turn of wire breaks it is cut off at the soldered cleats, a new wire placed and the joints made as outlined above.

(10) If the proportion of grit material in the discharge is too small, it is allowable to wash the cake, a little sand is added in the tank.

(11) If the charge becomes too thick because of an excess of solution wash, a pulp of 15 to 20 pounds per ton is added to the charge and the filter run without solution wash, the wash on the vacuum line corresponding to the position of the solution wash on the filter is closed, and the depression which results in a separation of tungsten from the gold and the iron silicate from any free gold. He has found that the concentration of gold obtained by magnetic treatment, run in all cases less than 1 ounce per ton, but usually more than 0.75 ounce per ton. The concentration is in some of the ferberite veins other than those in which pyrite is present. In one ore of this character which was examined, small quantities of sulphide were found, and the gold is probably associated with the pyrite. They report the occurrence of small quantities of gold and silver in tungsten veins to be fairly common, but in many if not in most veins the proportions of the same general period of vein formation, are probably of later deposition than wolframite. Silver seems to occur in larger quantities than gold.

Mr. George W. Teal, president of the Gold Mining Company, states that he knows of only two veins in the county where gold and tungsten occur in appreciable quantity in the same vein. He probably refers to the Red Sign Mine, located in Boulder Cano about six miles from Boulder. From this ore concentrate were obtained containing 30 per cent WO3 and 15 to 20 ounces of gold per ton, but the quantity was not great enough to warrant the extraction of a plant for separation of gold and tungsten. He is of the opinion that there is not a deposit of ferberite carrying gold so far discovered in Boulder County, which is of sufficient grade or quantity to warrant an experimental plant for the purpose of working out a process for separation.

In the operation of the concentrator of The Tungsten Products Company, Mr. Warren F. Blecker was found that if gold occurs in the concentrate, it is in sulphides. The ore concentrate was washed over the rougher turbines of the concentrator, and in some cases the concentrate was not separated into two parts, but passed into one tank. From this ore concentrate was obtained a concentrate containing 30 per cent WO3 and 15 to 20 ounces of gold per ton, but the quantity was not great enough to warrant the extraction of a plant for separation of gold and tungsten. He is of the opinion that there is not a deposit of ferberite carrying gold so far discovered in Boulder County, which is of sufficient grade or quantity to warrant an experimental plant for the purpose of working out a process for separation.

(12) The occurrence of gold and silver in the ferberite veins of Boulder County, Colorado.*

* PERSONAL COMMUNICATIONS.
A MAMMOTH GRAIN ELEVATOR.

The immense grain elevator of the Pennsylvania Railroad at Canton, near Baltimore, one of the largest on the Atlantic coast, has reached a successful testing out of the machinery and a trial with a large amount of grain, which has been received there.

The Baltimore shippers are anticipating the full operation of the elevator in a short time, and it is expected that the facilities for speed in loading and unloading, previously enjoyed with the export of grain from Baltimore. The elevator has a capacity of 4,257,000 bushels, whereas the other seven elevators now in use here have only a total capacity of 10,000,000 bushels. The grain storage capacity at the railroad terminals, therefore, will be increased nearly 43 per cent.

This monster grain elevator is equipped throughout with eight operations and conveyors. The belt is made by the B. F. Goodrich Rubber Company. This represents the largest single order of belt ever shipped, and it required seven boxes to transport it from Akron to Baltimore. The belting totaled 44,254 feet—approximately 14 miles—and weighed 135 tons. The capacity of one of the 48-inch horizontal carrier belts is 350,000 bushels in a ten-hour day.

Accommodations are provided for the loading of five ocean liners at once, and with the new apparatus for loading that has been installed, the ships can be loaded within 10 hours.

In conjunction with the facilities that have been made for handling ship cargo, the latest device for the unloading of railroad cars has been put into operation and found to be proving a large factor in the expeditious handling of incoming grain from the Maryland, Virginia, West Virginia and Middle Western districts.

GEODETICAL FOLIO SALE.


FOR THE MAN WHO HASE NO JOB.

For the man who has no job, the man who has not the kind of job he desires, and the man who feels he has reached an impasse in his present job, Mr. George Trevor Pearson's new book, "Selling Your Services," will be of real benefit.

Political and Commercial Control of the Nitrogen Resources of the World.

This is a general review of the sources of nitrogen with the aspect of the control of nitrogen resources in normal and war times. Free nitrogen forms four-fifths of our atmosphere, but this cannot be used until it is combined with other elements. Nitrogen fixation is the key to production.

This timely article appears in the eleventh chapter of Mr. Pearson's new book, "Selling Your Services," which is over require careful handling, and the "Human Element" between employers and employees is one of the uppermost of which management should be most careful.

The results of Alfred H. White's research in Nitrogen Fixation appears in full by the permission of the Chief of Ordnance.

Walter M. Russell takes up the subject of coal and water gas plants, illustrates the article, and mentions improvements.

The United States Patent No. 658,872 on the manufacture of sulphuric acid by the multiple tangent system is described in detail by L. A. Thien.

"Selling Your Services," by Jordan-Goodwin Corporation, has been very successful. It teaches that men who have not the job they want are not dissatisfied with the job they have, but that they are dissatisfied with the conditions associated with the job they have. The conditions include such things as the work, the man, the business, the methods, the organization, the management, the public relations, the political relations, and the effects of the conditions on the public and the business.
world's chief non-ferrous metal. These articles include the copper production of the greatest copper companies, the statistics on refined and blister copper, copper exports and smelter production in the United States. The production of gold and silver, obtained from copper ores, is also given.

The First Miners and the First Civilization. By Grant H. Smith. (M. & S. P., March 27, 1920.)

This article affords a pleasant view into classical antiquity after too close proximity to the cold science demanded by modern mining and metallurgy. Among the first miners are placed the ancient miners of England who mined for first ten thousand years ago. The Egyptians opened the first metal mines six thousand years ago. Five thousand years ago the same ingenuous people were using a tubular rock drill. At the same time they led the world by centuries in the civilization of science and mechanics, but they produced no men of literature.

MINING.


The diamond drill, though not a new machine, is only recently finding the wide application for which it was designed. It is true that after ore has been found with a diamond drill it becomes necessary to drive a drift to mine it. But this is so seldom, in exploration work, compared to the instances where negative results are obtained that much fruitless development work can be spared by the intelligent use of the diamond drill. Some of the purposes for which the drill is especially adapted are:

1. Prospecting below water level.
2. Obtaining general geologic information.
3. To ascertain the limits of an ore-body before deciding on an economical method of mining it.
4. To search for faulted segments.
5. To disclose the presence of ore bodies or other underground bodies.

The author leaves no technical and general data relative to diamond drilling. He suggests contracting on a "cost plan" basis as being the most economical. He suggests contracting on a "cost plan" basis as being the most economical. He suggests contracting on a "cost plan" basis as being the most economical. He suggests contracting on a "cost plan" basis as being the most economical.

The Bunker Hill Enterprise—VII. By J. A. Rickard. (M. & S. P., April 3, 1920.)

The development of crushing and concentrating practice is outlined. The first mill was built in 1898. This was followed in 1900 by the Old South Mill, in which the first flow sheet was elaborated. The next mill, the West No. 1, began operations in 1909. Its scheme of treatment is given in detail. No complete descriptions with tables and diagrams are given of the grading system for redressing the concentrates, the influence of sizing on flotation operations, the tunneling, Bunker Hill and Callow screens, as well as other equipment. No. 2 West Mill started in 1912.


This is a report on experiments in thawing made by John H. Miles at Nome. It was found practicable to thawed 109 cubic yards in 156 hours; saturated steam thawed 83 cubic yards in 38 hours; hot water thawed 81 cubic yards in 67 hours; and cold water thawed 511 cubic yards in 128 hours. The steam penetrated clay only to a slight extent. Most of it was expended in keeping a comparatively quiet body of water hot. The hot water application showed uniform thawing, but a low efficiency. Cold water can be used only with an expensive, a slight expense, and a slight expenses.


This mine, in British Columbia, is Canada's oldest known deposit of copper. It was discovered in 1890 by J. H. Hazen. The Dolly Varden Mines Co. received the Canadian government many rights and privileges, contingent upon the completion and operation of a company to the authors, are as follows: (1) the prevention of pipe corrosion; (2) the elimination of suspended solids to prevent pipe choking; (3) the elimination in the reduction rooms of water free from precipitated salts; (4) the utilization of the water for spraying and underground washing. The current neutralizing agents are soda, calcium carbonate and lime. Soda effects precipitation the most rapidly, but it does not clear the water as well as the other reagents.

The Electrolytic Zinc Plant of the Judge Mining and Smelting Co. at Park City, Utah. By L. S. Austin. (M. & S. P., March 20, 1920.)

This mine, in Utah, produces 50 percent of the zinc, 2 percent of the iron, and 5 percent of the lead. It is situated on the thin coating over the mine; with this removed the tonnage is increased several times.


This article discusses the lignite fields in a commercial way, and shows how relatively poor coal can be used to a decided advantage by pulverizing it. The burning of pulverized lignite coal under boilers and in metallurgical plants is coming into use very rapidly. Coal is high as 30 per cent ash have been reported to have been used to this advantage. The article is very interesting in that it gives the operation of the combination equipment, advantages of burning pulverized lignite and results obtained in a power plant.

The Galcin Chloride Process. (Mining Magazine, March, 1920.)

This is a description of the Galcin chloride process for silver-lead-zinc milling. The process is much simpler than the chloride process which is being tested by the Anaconda Zinc Co., of Brooklyn. It is a British Patent, No. 20,781, of 1918 (33,965), and contains the best of information relative to the chloride process which is being tested by the Anaconda Zinc Co., Ltd.

Briefly, the process is to chlorinate lead-silver-zinc ores. Other ores are also reduced to chlorides, and the metals recovered by leaching.

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Mr. Hazen's article deals with the difficulty of separating sphalerite from sulfides.
phides of copper. Horwood's method was: First, the extract of the sulphides in a mixed concentrate; second, quick roasting of the concentrate at about 400 degrees C.; third, wet treatment. Mr. Hasen advocates a modification of the oxidation of the copper ores by roasting, and then their leaching. Flotation would then effect the final separation. The details of tests made under this modification are given in two tables. The great advantage of this system is that it does not require the delay of control as Horwood's method.

J. H.

Commercial Development of Fused Silica.

By John Schari and Wallace Savage.

(C. & M. E., March 31, 1920.)

This is the first of a series of articles on the development of the electro-thermo processes of fusing glass sand. Fused rock crystal ware is very transparent and may be used for thermometer stems and ultra-violet ray experiments. The commercial products into vogue at the present time are noted.

J. H.

Aluminum Rolling Mill Practice—II.


(C. & M. E., March 17, 1920.)

In this first article of the series Mr. Anderson declares his purpose to be the exposition of the ore deposits of Mexico in a nontechnical language. He classifies the general phenomena of fused silica. The commercial production of the concentrate at about 400 degrees C.; third, wet treatment. Mr. Hasen advocates a modification of the oxidation of the copper ores by roasting, and then their leaching. Flotation would then effect the final separation. The details of tests made under this modification are given in two tables. The great advantage of this system is that it does not require the delay of control as Horwood's method. C. E. W.

J. H.

GEOLOGY.

The Ore Deposits of Mexico—II.

By S. J. Lewis.

(M. & S. P., March 29, 1920.)

In this first article of the series Mr. Lewis declares his purpose to be the exposition of the ore deposits of Mexico in a nontechnical language. He classifies the general phenomena of fused silica. The commercial production of the concentrate at about 400 degrees C.; third, wet treatment. Mr. Hasen advocates a modification of the oxidation of the copper ores by roasting, and then their leaching. Flotation would then effect the final separation. The details of tests made under this modification are given in two tables. The great advantage of this system is that it does not require the delay of control as Horwood's method. C. E. W.

J. H.

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J. H.

Composition of Petroleum and its Relation to Industrial Use.

By C. F. Moog, S. D. (Mining Journal, March 13, 1920.)

So far as the elementary composition of petroleum is known it may be briefly stated that petroleum consists principally of a few series of hydrocarbons, with nitrogen and oxygen derivatives, which may be regarded as impurities to be removed in the preparation of commercial products. The author discusses the classification of petroleum, the commercial products, and the influence upon commercial products. The article is to be continued.

F. A. L.

Wild Boom in the North Texas Oil Fields.


The author reviews the methods of developing the various North Texas fields, laying special emphasis on Burkburnett and ranger. He describes the various promotion schemes at the different stages of development. Burkburnett has been ruined by over-drilling. Production after six months is shrinking at the rate of 30 to 60 percent per month. Field 10 percent exhausted. Yield about 8,500 barrels per acre. Average depth, 7,000 feet; cost of well, $30,000. Ranger field average production about 1,200 barrels per acre. Wells decline very rapidly. Field two-thirds exhausted. Production seems to come from crevices in limestone rather than sands. Other fields described are Deadmon's, Brookside, Petrolia, Electra, Brownwood, Marlin. A general map of Texas, showing position of wells, is included. Also a financial estimate of the operating results of a typical Ranger lease. Recommend article to anyone interested in oil industry.

C. E. W.

Oil Well Pumping Methods and Equipment.

By Seth S. Langley. (E. & M. J., March 27, 1920.)

This article contains numerous drawings, estimations of cost and other engineering data relative to the equipment used in pumping oil wells. Splendid reference article those contemplating installing oil wells.

C. E. W.

OHMS, AMPERES AND VOLTS EXPLAINED.

When an electric current is flowing in the travels' wire or electrical lighting circuit there are three factors involved. One of these is the pressure expressed in volts which causes the current to flow; another is the resistance or opposition offered by the circuit to the flow which is expressed in ohms; the last is the current strength or volume, expressed in amperes which is maintained with the circuit as a result of the pressure overcoming the resistance. The ohm is named in honor of George Simon Ohm, a distinguished German electrician. The ampere was named after Charles A. Ampere, French scientist, Ampere.

The unit of current is called the ampere. The unit of resistance is called the ohm. The unit of electric power is the volt-ampere and this is called the watt. Seven hundred cubic feet of water per hour equals one horse power. The unit of energy—the product of electric power and time—is called the joule, but this unit is too small for practical purposes and the kilowatt-hour is used instead.

The kilowatt-hour is the work done by a thousand watts working for one hour. It is just the product of the watt and the hour. For this reason it is as familiar to electrical engineers as feet and inches to the average boy; the layman does not understand because he has never been taught, has never had use the terms, has not read about it.

It is easier to understand these terms if we consider electricity as a fluid and liken it to a current of water flowing through a pipe. The head of water in the pipe depends upon the gravitation and the height of the reservoir or source above the outlet. The greater the height of the source the greater will be the pressure of water and the greater the flow in gallons per minute. It is just the same with electricity. A current flows from a high potential to a low potential whenever the two are joined by a conducting wire. It is merely a difference of level.
On March 10 the secretaries and presidents of the Alumni Association of Colorado University, Denver University, Colorado Agricultural College, Colorado College, Colorado State Teachers' College, and the Colorado School of Mines, met at a luncheon, given by the Alumni Council of Denver University, to discuss the desirability of forming a federated alumni organization. The following is the constitution which was decided upon at a subsequent meeting, held in the Denver Civic and Commercial Association's headquarters in the Chamber of Commerce Building on March 18:

CONSTITUTION
of the
COLORADO INTERCOLLEGIATE ALUMNI ASSOCIATION.

Article I—Name.
The name of this Association shall be The Colorado Intercollegiate Alumni Association.

Article II—Objects.
The objects of this Association shall be:
1. To handle all problems affecting the educational interests of Colorado colleges and universities.
2. To aid in raising the standards of educational work in all colleges and universities represented in the Association.
3. To consider and to aid in any public or political or other matters of interest to the higher educational institutions of this state.
4. To consider and to aid in any public, political or other matters of interest to the higher educational institutions of this state.

Article III—Officers.
Section 1. The officers of this Association shall be:
1. President.
2. Vice-President.
3. Secretary-Treasurer.

Sec. 2. Executive Committee. An Executive Committee shall be created consisting of the presidents and secretaries of all Alumni Associations of Colorado institutions affiliated with this Association.

Sec. 3. Advisory Board. An Advisory Board consisting of the President, Vice-President and Secretary of the Colorado Intercollegiate Alumni Association shall be elected by an assessment levied by the Executive Committee on the different Alumni Associations which shall be determined by the Executive Committee.

Article VI—Finances.
There will be no regular dues in the Association, but funds necessary for maintaining the Colorado Intercollegiate Alumni Association shall be raised by an assessment levied by the Executive Committee on the different Alumni Associations which shall be determined by the Executive Committee.

Article VII—Voting.
Section 1. All questions before the Executive Committee shall be determined by a majority vote of the Alumni Association of Colorado intercollegiate Alumni Association.

Sec. 2. Each institution or Alumni Association so affiliated shall be entitled to one vote.

Article VIII—Amendments.
These articles may be amended or added to at any meeting of the Association by a two-thirds vote of the members of Alumni Associations present, providing a notice shall have been sent to each Alumni Association represented in the State Association at least five days previous to the day of the meeting, outlining the amendment and object thereof.

The present officers of the temporary organization known as the Colorado Intercollegiate Alumni Association are:
Stuart L. Sweet, President; James H. Roberts, Vice-President; William D. Moote, Secretary.

These men will hold office until the annual meeting of the Association is held in October, 1920, as provided in the Constitution.

We trust our Alumni members will give this serious consideration. If you have any suggestions let us hear them.—
Editor.

School News

T. C. Doolittle

1920 GRADUATING CLASS.
Thirty-nine members of the Senior Class will receive the degree of Engineer of Mines on May 19. Dr. John A. Barrett, director of the Pan-American Union, Washington, D. C., will deliver the commencement address.

MINES SERVICE RECORD.
Have we your service record correct to date? We are requested by the Historian of Colorado to supply sufficient information for a book that is being prepared relative to the part the Colleges of Colorado played in the World War. Send us a concise and complete résumé at discharge, branch of service, length of service, major operations in which you participated, and wounds received. See that your friends give us this information. If we do not have it listed correctly after this is published it will be your fault.
Alumni News

ALUMNI BANQUET.

The Annual Meeting and Banquet of the Alumni Association will be held at the Metropolitan Hotel, Denver, Saturday evening May 8th at 6:30 p.m. Cost per plate $3.00.

All members of the present Senior Class are invited to attend as guests of the Alumni Association.

We urge every Alumnus to attend, and request that you immediately advise the Assistant Secretary, Dr. C. R. Wuecsh, that you will be present.

Come and renew the friendships of your college days. You will meet not only your old friends, but many who desire to meet you.


The Nominating Committee report the selection of the following candidates for the election of officers of the Alumni Association for the year 1920:

For President—W. H. Coghlin, '03; J. E. Dick, '12.

For Vice-President—A. V. Corry, '01; W. P. Simpson, '01.

For Secretary—S. Z. Kimm, '14; W. W. Piggott, Jr., '15.

For Treasurer—C. W. H. Hunt, '05; A. H. Perry, '01.

For Member Executive Committee—A. J. Hieatt, '13; H. C. Maxon, '13.

(Electric) Louis Goren, '97, CLARENCE MALSTROM, '00, CHAS. M. GLASGOW, '03, ROSS B. SMITH, '03, E. S. GRAY, '12.

Nominating Committee.

PERSONALS

William Ho Paul is consulting engineer for the information highway of Central America; address 17 Battery Place, New York City, N. Y. He is temporarily at the Utah Hotel, Salt Lake City.

J. Norman McLeod, mining engineer for the Rare Metals Refining Co., 508 So. Broadway, Los Angeles, Calif., is examining mining properties in the Western states.

Gilbert L. Davis, who is with the U. S. Reclamation Service, has moved from Saco, Mont., to Missoula, Mont.

Daniel Harrington is in the Core D'Alenes in behalf of the mine investigation investigations that he is conducting in the large mining camps of the West for the U. S. Bureau of Mines.

Karl C. Parrish is at Barranquilla, Colombia, South America.

L. P. Prewett has resigned his position with the Johns-Manville Asbestos Co. at Asbestos, Quebec, Canada, to join the engineering staff of the St. Joseph Lead Co. at Bonne Terre, Mo.

E. G. Greve is chief engineer with the Oil Well Supply Co., 215 Water St., Pittsburg, Pa.

Wm. H. Finigan is president of the MacGowan and Finigan Cordage Co., 423 Fierce Bldg., St. Louis, Mo., and Mrs. and Mrs. Max W. Ball announce the arrival of Douglas Schelling Ball at Cheyenne, Wyo., on March 5.

J. Marvin Kief is on an extensive tour of the United States. He expects to visit the various mining camps of interest in Arizona and New Mexico, the oil fields of Texas & Louisiana, and the seaports on the Eastern coast.

George S. Patterson is manager of the Cripple Creek Co., Myerstown, Pa.

George P. Moore is chemist for the Waller Barns Co., Bristol, Conn.

J. P. Golden is in the abstracting and realty business at O'Neil, Nebraska.

H. C. Armstrong is superintendent of the Buckeye Petroleum Co. and the Magnolia Oil & Refining Co. at Wichita Falls, Texas. Address, 2419 Ninth Street.

H. D. Whitehouse is with the Continental and Commercial Securities Co. of Chicago, Ill.

'09.

J. R. Boyd has returned to Colorado from New York. He is temporarily at 510 Race Street, Denver, Colo.

C. E. Lesher, Director of Statistics for the Distribution Division of the U. S. Fuel Administration, is the author of "The Distribution of Coal and Coke"—Part I, which has recently been issued. This is complete with graphs, statistics and economical aspects of the industry.

A. E. Perkins is back to his old position of Western Manager for the Colorado Steel Co., 205 Kearns Building, Salt Lake City, Utah. He was with the naval engineers during the war.

H. H. Juchem, of the Agatrones Mines, San Mateo, Costa Rica, has been examining mining and prospects in the southern part of Costa Rica.

Evelyn Broderick's address is in Ca Minerals y Metates, S. A., Monterrey, N. L., Mexico.

Georgia Smith, wife of Roy S. Smith, died at her home in Denver, on March 11, after an illness of over a year. Mr. Smith is with the Empire Zinc Co. at Gilman, Colo.

Arthur M. Sweet is manager of the American Asbestos Mining & Milling Co. at Idaho Falls, Idaho. He was a visitor in Golden during the last part of March.

O. J. Hess, Jr., superintendent of the United States Fuel Co., Hwawatha, Utah, has recently moved to Idaho Falls, Idaho.

E. W. Lemke has moved from St. Paul, Minn., and is now with the Empire Zinc Co. at Hanover, N. Mex. He is engaged in construction work.

Leon M. Banks is leasing at Metcalf, Arizona.

Charles Harrington has been transferred from Natiru, Colorado, to the Denver office of the Radium Company of Colorado.

Richard A. Lesher, assistant mill superintendent at the St. Joseph Lead Co., Bonne Terre, Mo.

Harvey Mathews has accepted a position with the Antoro Mines Co., Bonanza, Nevada County, Colo.

A. Ringgold Brouse and has joined the geological staff of the Rood Oil Corporation.

Wm. G. Zuleh is with the Vindicator of G. M. Co., 603 Symes Bldg., Denver, Colo.

G. H. Van Dorn is with the Black Hawk Consolidated Mines Co. at Vanadium, New Mexico. Van Dorn was recently married to Mrs. Mabel Hyland Money of Golden, Colo.

Mr. and Mrs. John N. Teets announce the arrival of a son, December 21, 1919, at Whitepine, Colo.

Samuel J. Burris, Jr., is engineer for the Metals Exploration Co., Denver, Colo.

V. D. Howbert has returned to Colorado Springs from California owing to the closing down of the Afterthought Copper Mine.

C. B. Gauthier is manager of the Carbonale chemical plant at Carbondale, Ill. He is associated with Dr. Herman Flesch, former Professor of Chemistry at Golden.

Frank T. A. Smith is at Burnett, Texas. He is with the Meadows Oil & Chemical Corporation of New York.

George Goldfinch is Chief Chemist for the Great Western Sugar Co. at Fort Morgan, Colo.

Lisle R. Van Burgh left Casper, Wyo., and is now geologist for the Frantz Corporation, Wutnet, Mont.

Thomas P. Allin has gone to Alaska to assist Mr. E. K. Corbett, of New York, on a four months' examination trip.

EX-MINES NOTES.

James S. James is superintendent of mines for the Radium Company of Colorado, Inc., at Naturita, Colo.

Forrest Mathez is now superintendent of the Silver King Coalition Mines Co., Park City, Utah.

Theodore Pilger is employed in the foreign sales department of the Allis-Chalmers Co., Milwaukee, Wis.

WHERE ARE THESE MEN?

Louis S. Cain, '13.

Chas. Adams, '04.

Ward Blackburn, '08.

Alan Kinsey, '07.

Donald S. Giddings, '00.

A. F. Hallwall, '09.

M. P. Valentine, '09.

W. S. Curson, '99.

Norman R. Copeland, '18.

Frank H. Jones, '98.

A. L. Levy, '08.

S. J. Clausen, Jr., '11.

A. F. Richman, '09.


Truman D. Prier, '04.

T. H. M. Crampton, '14.


C. B. Hull, '06.

Van Cleave A. Olson, '15.


Frank T. A. Smith, '09.

Alan Kissock, '12.

Ward Blackburn, '08.

Louis S. Cain, '13.

A. F. Hallett, '09.

G. J. Wackenhut, '04.

A. Deaby is assistant mill superintendent for the U. S. Bureau of Mines.

J. P. Golden is in the abstracting and realty business at O'Neil, Nebraska.

H. C. Armstrong is superintendent of the Buckeye Petroleum Co. and the Magnolia Oil & Refining Co. at Wichita Falls, Texas. Address, 2419 Ninth Street.

H. D. Whitehouse is with the Continental and Commercial Securities Co. of Chicago, Ill.

James S. James is superintendent of mines for the Radium Company of Colorado, Inc., at Naturita, Colo.

Forrest Mathez is now superintendent of the Silver King Coalition Mines Co., Park City, Utah.

Theodore Pilger is employed in the foreign sales department of the Allis-Chalmers Co., Milwaukee, Wis.
By F. A. Litchfield, '20.

ATHLETICS

BASKETBALL.

Mines 27; Aggies 21.

The Mines basketball team defeated the Agricultural team by the score of 27 to 21. The game was a fast one and the score very close at all times. The Mines forged ahead toward the end. The team work of the Mines was a big factor in their scoring. Duan, Bryant, and A. Bunte, as usual, did excellent work for the Mines.

During the first half, little scoring was done. It ended with a tie, 9 to 9. The play was fast, but neither team seemed to have much accuracy in shooting baskets.

In the second half, the Mines opened up in a brilliant fashion and soon ran up a big lead. The Farmers came back strong and for a time it looked as though they would overtake the Mines lead.


In the last basketball game of the season, Mines defeated D. U. by the score of 23 to 16.

The game was at times very rough. Towards the end it was well played. In floor work, D. U. showed well, but when it came to putting the ball through the hoop for field goals, they could not score with consistency. In fact, the team made but two field goals.

A. Bunte was disqualified because of personal fouls; he was the best scorer for Mines, and played a splendid game.


BASEBALL.

Coach Glaze is starting off the baseball season at the school with the same zest he did in football. Four players are eligible for the team. Chuck Schneider, baron on account of having four years of athletics to his credit, Severini, Medici, and Benjamin are the others who are barred because of the Conference "one year" rule. But in spite of this Glaze hopes to have a strong team this year. Judging from the material on hand, he should make a strong showing. So far he has no pitcher who can be called upon to deliver the goods, but no doubt he will develop one.

Mines have defeated the West Denver High School in a four-inning game with a 29-5 score. The first Conference game will be played with the Aggies on April 23. The schedule:

April 23—Aggies vs. Mines.
April 24—Aggies vs. Mines.
April 26—Mines vs. CC.
May 1—Mines vs. C. C.
May 4—Mines vs. D. U.
May 7—C. C. vs. Mines.
May 8—Wyoming vs. Mines.
May 14—Mines vs. Colorado.
May 21—Colorado vs. Mines.

Enough hydro-electric energy is running to waste here in the United States to equal the daily labor of 1,800,000 men—Franklin K. Lane, Secretary of the Interior.

THE COLORADO SCHOOL OF MINES MAGAZINE.

WORLD'S PRODUCTION OF CHROMITE IN 1918.

In view of the record-breaking production of chromite in the United States in 1918, reported by the United States Geological Survey, Department of the Interior, it is of interest to note the part it played in the world's output for that year.

The approximate output in round numbers for the country is expressed below:

<table>
<thead>
<tr>
<th>Country</th>
<th>Production (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>84,000</td>
</tr>
<tr>
<td>Canada</td>
<td>20,000</td>
</tr>
<tr>
<td>Cuba</td>
<td>1,300</td>
</tr>
<tr>
<td>British India</td>
<td>18,000</td>
</tr>
<tr>
<td>British South Africa</td>
<td>28,000</td>
</tr>
<tr>
<td>Turkey (Asia Minor)</td>
<td>14,000</td>
</tr>
<tr>
<td>Greece</td>
<td>10,000</td>
</tr>
<tr>
<td>Austria-Hungary</td>
<td>500</td>
</tr>
<tr>
<td>Russia</td>
<td>10,000</td>
</tr>
<tr>
<td>Italy</td>
<td>20,000</td>
</tr>
<tr>
<td>Australia</td>
<td>80,000</td>
</tr>
<tr>
<td>New Caledonia</td>
<td>26,000</td>
</tr>
<tr>
<td>Japan</td>
<td>8,000</td>
</tr>
</tbody>
</table>

France, with 9,000,000 horse power, is the richest country in Europe in waterfalls.

ALMOST AS HOT AS THE SUN.

The electric furnace in actual use has reached the temperature of 3,500 degrees C. Recent experiments have, however, developed a furnace which gives a temperature of 4,500 C, enough to volatilize diamonds. A comparison of these temperatures with that of the sun, which is estimated at 5,000 degrees C, gives a striking idea of what can be accomplished in handling refractory substances with electric heat.

The Roessler & Hassiecker Chemical Co. have moved from 160 Williams Street to their new and more commodious quarters at 709-719 Sixth Avenue, corner 41st Street, New York, N. Y.

At the Annual Meeting of Midwest Forge & Steel Co., East St. Louis, Ill., the following officers were elected: J. W. Eschenbrenner, President; T. C. (T. C.), Vice-President; and Benjamin, Secretary. The business was established in 1886, and for the past five years has been operating in Cement Mill and Mine Forgings, particularly Grinding Plates and Steel Balls.

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