The Western Chemical Manufacturing Co.
General Chemical Company, Successors

Manufacturers of
COMMERCIAL SULPHURIC,
(Any Strength Including Oleum)
MURIATIC and NITRIC ACIDS,
MIXED ACID,
(Any Formula)
ELECTROLYTE,
STRICTLY CHEMICALLY PURE
SULPHURIC, HYDROCHLORIC and
NITRIC ACIDS and AMMONIA,
AQUA and ANHYDROUS AMMONIA,
SALT CAKE and NITRE CAKE
GRADE A ELECTROLYTIC ZINC,
WESCHEMCO BRAND, and ZINC DUST
Buyers of
MIXED ZINC-LEAD-IRON SULPHIDES

DENVER, COLORADO, U. S. A.
Hercules Explosives for Mining Engineers

Quantity production and low working cost must be maintained to adequately supply the present day demand for the products of your mines. Efficiency is one of the biggest problems of mining engineers and the use of Hercules explosives will aid materially in solving this problem.

Many mines yielding copper, zinc, coal, iron, aluminum, salt and sulphur have increased their production and cut costs through the use of Hercules explosives. One or other of the formulas and strengths of Hercules explosives will fit your needs—will directly aid you to increase the output of your mine.

Should you have a special blasting problem in which you think we can help you, write to our nearest branch office. Your inquiries will receive prompt and careful attention.

HERCULES POWDER CO.

At night a Sea Gulls retreat, In the Day a Hustling Conveyor.

At the furthermost point of Staten Island, the prey of the wintry gale, the target of the summer sun, enwrapped the year round in the dripping night fog—is a Goodrich “LONGLIFE” conveyor Belt. When day comes a contractor pumps sand and gravel from the ocean bed and sluices it down the belt.

Night and day, winter and summer, alternately the hustling conveyor and the perch for ocean gulls—good, old “LONGLIFE” sticks to the job. And for all the assaults of wind and wave this “LONGLIFE” Belt still retains remarkable flexibility and sound body, emphasizing its pronounced ageing qualities and abrasive resistance.

A wonderful Belt is “LONGLIFE.” Before replacing your present conveyor, send for a Goodrich Belting Catalogue and read the many fine points on “LONGLIFE.”

SIGNIFICANT: The world’s record for belt conveyed tonnage is held by “LONGLIFE.” From 1914 to 1918 in a Utah Copper Mine a “LONGLIFE” Belt carried 7,313,400 tons of ore at a cost of less than twenty cents per thousand tons.

Goodrich “Longlife” Conveyor Belts

THE B. F. GOODRICH RUBBER COMPANY
Akron, Ohio
Laboratory tests on properly designed apparatus enable you to determine the milling process best adapted to your ore before building the mill—they help you regulate every step of the process for highest efficiency—and the cost is insignificant as compared with a mill run. MASSCO Laboratory Milling Equipment saves money, and minimizes the possibility of failure in ore treatment—why not equip your laboratory with MASSCO ore testing specialties?

WILFLEY TABLE No. 12
A laboratory size Wilfley complete in every detail—enclosed head motion—tilting device—and two interchangeable decks with Wilfley roughing and finishing riffles—a duplicate of our large tables at a low cost that will surprise you.

THE MCCOOK PULVERIZER AND SAMPSON CRUSHER
Two machines that enable you to quickly prepare the pulp for testing purposes, crushed or ground to any desired degree of fineness—they can be depended upon for long service.

THE RUTH FLATION MACHINE
Consisting of an agitation compartment, impeller and spitzkasten, furnishes an ideal outfit for determining the floation properties of any ore and the effect of various oils and reagents. The pulp thoroughly mixed with air drawn down the hollow impeller shaft is aerated and forced in a steady stream toward the spitzkasten and froth discharge lip—it is a complete laboratory model of the large Ruth Machines.

Write for our Bulletins. Massco Equipment includes every laboratory requirement.

The Mine & Smelter Supply Co.
DENVER, COLORADO
New York Office: 42 Broadway A Service Station within reach of you.
MANUFACTURERS OF THE MARCY BALL MILL.
Unloading the 35-B Shortwall Machine from the Handi-Truck.

A Rapid Cutter and an Easy Machine to Handle

The Jeffrey 35-B

Shortwall Mining Machine Equipped with Self-Propelling Handi-Truck

With the Handi-Truck your machine runner can pick the best spot for unloading the machine. The truck is provided with a tilting frame mounted so that it can be turned at any angle to the truck. The Handi-Truck means quicker handling of machine when the gob lies close to the face or where posts are set close to the face. When making break-through, machine can be unloaded and loaded without interfering with the track and ties.

The slogan—Safety First, gentlemen, is symbolic of the efforts, the attainments, the idealism, the dream of the altruist, the organization and outcome ofidences and devoted work for the protection of others and answers the Biblical query: "Am I my brother's keeper?" and gives impetus to the Golden Rule "Do unto others."

Evolution.

All ages, from the earliest to the present practiced self-preservation. Safety first manifests itself in the form of mass protection in history, as the guarding of tribal fires, the building of walls to withstand invasion, and so down the centuries to the present, where we have on the sea the lifebelts, boats and rafts, with the wireless to appeal for assistance, in our social communities the highly efficient fire, police and traffic departments, and in our industries, organizations promoting Safety First and Welfare Work.

Safety First is in another sense the inalienable moral right of every individual, to protection from danger emanating from sources over which he has no control.

Welfare work, on the other hand, can not be damaged from our minds, as undoubtedly it is the solution of the greatest question of the hour—how to allay the present social unrest and eradicate selfishness.

The Safety Movement is not of "ancient vintage," it is only within the last decade appreciable progress has been made. And a comparison of the fact that accidents and catastrophes are not altogether happenstances. Preventative measures have been inaugurated and are receiving the approval and cooperation of all. A few short years ago the only protection afforded, in many industries, was what the statutes provided, and which were the result of the public indignation over some horrible accident or series of catastrophes, hence compelling our legislative bodies to enact laws, often in opposition to the interests affected, then trusting a repetition would not occur there, letting the matter rest.

How different now—legislation is sought and welcomed which affords such protection, and efforts are constantly making with success, ordinances in civic communities, and amendments to the mining codes are frequent in many states.

* Address before Colorado Metal Mining Association, January 21, 1920.

United States Bureau of Mines.

With the formation of the Bureau of Mines, the "Apostle of Safety" of the Mining Industry appeared, Dr. J. A. Holmes, a martyr to the cause, who, as we all know, contracted the dread malady and later died as a result of exposure brought on by his devotion in performance of duties while attempting to rescue entombed miners. Intellectual, spiritual and intensely humane, a man of visions, but rational and practical; a man whose virtue, attainments and self-sacrifice is commemorated, I am proud to say, by this great state, which created the Joseph A. Holmes Memorial Chair of Safety and Efficiency at the Colorado School of Mines, and occupied by our worthy friend and pioneer of Safety, Dr. J. C. Roberts.

The fundamental principles of Safety First as expounded by Dr. Holmes have revolutionized the status of the moral obligation which binds our mining social structure, placing human life above everything, cementing our interest in the welfare of our fellow men, awakening our dormant impulse to protect others, sustaining a sublime effort to concentrate forces which tend to reduce suffering, misery and grief.

What is Life? Can it be replaced? What is misery—grief? Can they be staunched or recompensed by a handful of gold? Can a limb be replaced or features remodeled? Such are the spiritual and moral phases we must answer when our doubts assail us, when a life is sacrificed or limbs destroyed, where such have been committed to our care.

The outcome of this great work by the Bureau of Mines, now led by Hon. Van H. Manning, has been the standardization of methods pertaining to the rescue, treatment and care of entombed or disabled miners, the promulgation of organization for Safety and Welfare; research work with reference to efficiency and safety of processes from the minerals of carnotite, winning of uranium for medicinal purposes, the use of pitchblende and vanadium ores, all to the interest of Safety and for the protection of man; and on the other hand, the comm
The commercial side of the industry has met with sincere cooperation; many valuable processes have been evolved, among these, one process that has received the present time to our state—"extraction of oil from shale." In passing, one of these processes, known as the Cottrell Process for treatment of smelter fumes, is the greatest innovation in the smelting industry for ages.

Again, the commercial production of helium, a gas of which little is known, for the purpose of inflating dirigibles and balloons, which would make them comparatively safe, as helium is non-inflammable. Results, gentlemen, we have known, for the purpose of inflating dirigibles and balloons, which would make them comparatively safe, as helium is non-inflammable.

Greatest innovation in the smelting industry for ages is the recognition that accidents are largely preventable, that the great human trait of carelessness and indifference, and that measures must be adopted that will bring realization to the most ignorant that his life, and the lives of others as well, are valuable and must be protected. This must be accomplished by measures which do not antagonize, but appeal to that spark which every man possesses, and nurture that respect which men express in various ways.

It is, then, the mining game are of rough and ready character, "roughnecks," as they often politely call themselves; men with a ready appreciation of any instant to face any danger, undertake any task matter how arduous. A man trained to rescue a threatened man, as exemplified by our valiant boys of the regular engineers, mainly men from the mines, who, are, is supposed to the British at Vimy Ridge, accomplished a feat of great pride and honor to the nation.

Safety First is to be best effected by taking advantage of the means offered, and the application of personal interest and sympathy by those in charge of operations.

First, clean house—put yourself in accord with the safety movement and the put into practice those features which appear in the moral sense. Education is the greatest of all; convince those who work with you of the principle and demand allegiance and adherence to Safety First from all. Have all men instructed in the hazards of their particular occupation—especially the green ones. Use the bulletin board. National Safety Council supplies lessons dealing with every conceivable accident, which many who follow the mining game are of rough and ready character, "roughnecks," as they often politely call themselves; men with a ready appreciation of any instant to face any danger, undertake any task matter how arduous.

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interested in the welfare of your men, and such efforts are repaid in many ways.

Mechanical Appliances, and Uses, Commercial Firms.

Under this head come the various appliances as indicated heretofore—on the engine, cable, shaft stations, Powder magazines, which, without proper education in their use are nothing more than signposts of carelessness and inefficiency.

Signs, to my mind, fill a whole volume and are heeded where often a spoken word is disregarded.

The adopted breathing apparatus for mine recovery, in addition to the Edison lamp, Gibbs Apparatus, First Aid Materials, goggles and dozens of kindred safety materials and devices, and the premier men in the commercial field of safety, Strong, Kenna & Nutt of Cleveland have not yet entered the mining field in all phases, but nevertheless is composed of live wires which lay the foundation for adding materially new safety and equipment. The Pacific Coast has built San Francisco and H. H. Sander son of Seattle, a great awakening which has manifested itself in the Safety Movement. Time will not permit an exhaustive explanation of the various appliances, but it should be understood that there is only one big plant where safety and efficiency are in vogue, to witness the inestimable value, where broken legs are not only rare, but negligible.

The difficulty to throw a switch or turn a valve carelessly.

Every mine or mining community should have breathing apparatus available, in the event of an explosion or in the presence of gases, as touched hereofore, we never know when a calamity may overtak us. The adopted breathing apparatus for mine recovery on the market are all similar in principle; a supply of oxygen under pressure, reduced through valves, a cartridge or quantity of caustic soda to absorb the carbonic acid gas, and a mask to fit the wearer, so arranged as to make a complete circuit, self-contained, with no communication with the outside air, and differing only in name and appearance. The cost of all of the apparatus. The first machine in the field was the Draeger, then the Westphalia, both German; Floss, the English machine, and the last the Gibbes.—American—and approved by the U. S. Bureau of Mines.

Like Mr. Stonehouse with his signs, I wish to call attention to the commercial side and name The Mine Safety Appliance Company of Pittsburgh, represented by Messrs. Jones & Riggs in this territory. This concern started small, but today is supplying the safety requirements of mines with the Edison lamp, and developing the safety work in Colorado.

Financial Value.

Heretofore I have spoken of the spiritual and moral sides of Safety First, and now I take up certain aspects of the pro duct dollar. All can recall some accidents, where, if preventive measures had been taken, a fire would not have occurred, a man shot, an accident would not have happened, a man electrocuted, blasted or back or limbs broken. A preventable, serious accident, costs more than the safety officer or company can realize. Safety devices or rescue apparatus would have saved the cost and the money expended gone forever. Safety First, when correctly applied, pays returns which money never, produce contented workmen and fire fighting equipment, and play an important part in the category of what may be said to be mechanical, as they are without power to move, and intelligent endeavor must often be used in their adoption.

Insurance.

Fire insurance is good business and is considered necessary as an anchor to seaward. Safety First is practiced under the head of Fire Prevention, in construction, where the first feature of this plan is the posting of general instructions regarding carelessness practices. Compensation insurance is compulsory and all here are familiar with it. Little need be said of the subject except to remark that there is an assurance of recompense in case of accident. With the probability of a Merit Rating Schedule for Metal Mines, on which I understand a committee is working, the features pointed out in the preceding sections will bear a strong relation to the rating which will apply in determining the premium. Should this be adopted, a great impetus will be given, furthering and development of the safety work in Colorado.

Experience rating is another phase whereby results obtained from Safety First practices are recognized and based on the ratio of losses against payroll—credit given when warranted; thus we have a fixed rate with an adjustment once a year.

On the other hand, under a merit rating plan, we have a fixed base rate from which results obtained against payroll will determine, through statistical analysis, each mine's rates either up or down, based on actual existing conditions as reported by inspectors.

Recent application of experience rating to Utah mine payrolls are amazing in that from twenty to fifty percent reduction of premium was obtained. Approximately $7,000,000 annual payroll entitles a concern for rating under this plan.

Why not obtain this for Colorado mines and mining communities?

A few years of reduced premiums will pay for installation and upkeep on all devices, signs and equipment necessary. Is it worth while?

Welfare.

This term is generally applied to the people of a community, and is best exemplified in Colorado by the Rockefeller Foundation, in the Southern Coal Fields.

Community Work, Visiting Nurses, Clinics and Dispensaries are one group. Schools for the education of foreigners, opportunity schools, meetings for training in First Aid, lectures on Safety Methods and Practices form another.

Group Life Insurance: Wherein an employee is given a policy for his beneficiary group, if he returns, pays returns which money never, produce contented workmen and fire fighting equipment, and play an important part in the category of what may be said to be mechanical, as they are without power to move, and intelligent endeavor must often be used in their adoption. A few years of reduced premiums will pay for installation and upkeep on all devices, signs and equipment necessary. Is it worth while?

TRANSPORTATION IN PALESTINE.

Crossing the Dead Sea proved no easy task in a land where commerce is at a standstill and transportation facilities are virtually nil. A Red Cross engineer who came back from Palestine tells now it was done:

"It was necessary to carry a boat from Jaffa, on the seacoast, to Jerusalem in order to cross the Dead Sea to Jericho to gain access to the Dead Sea region. The journey of something more than 120 miles was over an almost impassable terrain, some of it lowland, hundreds of feet below sea level, and much of it rugged, mountainous country. The Dead Sea itself is one thousand feet below sea level. This is typical of transport difficulties all over Palestine."
Transmission belts, like delicate machinery, must be given proper care. If the user expects them to give good service, the consequences are like to be disastrous. Every manufacturer can cite dozens of cases. Recently the Diamond Rubber Company was asked to make an adjustment on a belt which had been torn along the length of the belt for several yards at either end. The user was vehement in his claims that the belt was defective, but when an examination of the belt was made, it was clearly shown that the only cause for the injury was improper lacing. The holes for the lacing had been punched haphazardly and with no regard for providing an even strain on the belt. The result was that when the belt was put in use, it ripped apart, and the belt was practically ruined.

Improper lacing is probably the most common cause of injury. If the holes are made, and yet it is in the one which causes the most serious trouble, often completely nullifying all the knowledge and skill which the manufacturer used in making it. There is no excuse for ruining a good belt in this way. By observing the following simple rules, the belt will give the best service possible. Use an awl rather than a punch, whenever possible.

(1) Cut the ends of the belt absolutely straight across the width {lengthwise. This is likely to result in tearing the belt. The middle view shows a belt which was returned to the manufacturer by the user. It was torn along the length for several yards at either end and the user asked the manufacturer for an adjustment, asserting that the belt was defective. An examination showed that the only cause for the injury was improper lacing. The holes were punched haphazardly, and when the belt was put in use the strain upon it was taken up unevenly, that is, it ripped.\r

(2) Make the holes as small as possible. Use an awl rather than a punch, whenever possible.

(3) Leave a sufficient margin at the edge of the belt without holes so as to not impair its strength. In belts two inches wide to 6 inches the holes should not be nearer to the edge than 1/4 inch, in belts 6 inches to 12 inches wide not narrower than 1/2 inch, belts 12 inches to 18 inches wide not narrower than 7/8 inch.

(4) Make two rows of holes, in parallel lines straight across the width of the belt, and stagger the holes, so that the strain comes upon different portions of the belt.

(5) Be sure that the holes in the two ends to be joined match exactly. Otherwise there will be a “kip” in the belt, and this is likely to result in tearing the belt lengthwise.

(6) Use flexible lacing, being careful to have it proportionate to the size of the belt. A heavy lacing is likely to cause trouble.

(7) In lacing the belt, make the pulley side as smooth as possible. Rough places and ends should be turned away from the belt.

Besides improper lacing, there are many other abuses which cut down the life of belts. Shafting that is out of line may cause an undue strain upon the belt and make it run off the pulley. Oil may be allowed to drip upon the belt and ruin it. The belt may be applied with an initial tension so great as to produce an unnecessary strain.

Many complaints regarding unsatisfactory belt performance can be traced to the fact that the wrong belt was used on the job. No matter how good a belt is or how good treatment it receives, it will fail to give satisfactory service if not adapted to the use for which it is put.

In deciding upon the right belt for any particular installation, there are eight factors to be considered: (1) distance between pulley centers; (2) diameter of the pulleys; (3) width of the pulleys; (4) use of idlers, cone pulleys, quarter turn, half turn, etc.; (5) speed; (6) horsepower to be transmitted; (7) load jery or constant, and (8) conditions such as contact with moisture, oil or other deteriorating factors which are under the belt man's control. The factors which are under the belt man's control are these:

(1) The kind of belting to be used—such as rubber, leather, canvas, etc.; (2) the grade—whether cheap, medium or high grade; and (3) The weight of the belt—such as 4 or 6 ply, single or double.

In determining the kind of belting to be used, the merits of rubber belting should receive full consideration. It is economical in first cost, extremely efficient in service, and frequently outlasts constructions. On the other hand, constructions where constant contact with oil is unavoidable, a rubber belt will not give good service. The constant use of shifters is also injurious to a rubber belt.

In deciding upon the right grade for a particular installation, the points to be especially considered are the size of the pulleys, the presence of idlers or other unusual conditions, and the speed. Small pulleys, operated at high speed, necessitate a high quality belt. The reason for this is the internal wear between the various plies of fabric, and even between the fibers in each ply, as the belt rounds the pulley. A high-grade rubber friction is the best possible protection against this internal wear, because it protects each fiber with an elastic coating which remains uninjured and which indeed retains its life and elasticity longer when in use than when lying idle.

In this connection, it should never be forgotten that the value of a particular rubber friction cannot be determined merely by the test showing "pounds pull".
The Colorado School of Mines Magazine.

If the pulleys were fastened together with glue, this test would show a very high grade belt, but we all know that such a bond could not give service. The best method is to use the size of the pulleys, width of the belt, and the horse power to be delivered. The belt itself should be at least one inch less in width than the face of the pulley. With this in mind, the proper ply can be determined by consulting the table of horsepower and pulley sizes given on this page. To illustrate, if you have a pulley 24-inch wide, operating at a speed of 4000 ft. per minute, with a maximum load of 100 H.P., you will find by referring to the table that a 12-inch wide belt operating at 4000 ft. per minute will transmit 109 H.P. If so, you will specify accordingly. In specifying the ply, it must also be remembered that the greatest number of pulleys to be used on a 12-inch wide belt is four, on an 18-inch pulley five plyes, and on a 30-inch pulley 6 plyes, 40-inch 7 plyes, and 48-inch 8 plyes.

### TABLE FOR FINDING THE HORSEPOWER OF A BELT

<table>
<thead>
<tr>
<th>Width Ply</th>
<th>200</th>
<th>500</th>
<th>1000</th>
<th>1500</th>
<th>2000</th>
<th>2500</th>
<th>3000</th>
<th>3500</th>
<th>4000</th>
<th>4500</th>
<th>5000</th>
<th>5500</th>
<th>6000</th>
</tr>
</thead>
<tbody>
<tr>
<td>4&quot;</td>
<td>1.45</td>
<td>3.64</td>
<td>7.27</td>
<td>10.9</td>
<td>14.5</td>
<td>18.2</td>
<td>21.8</td>
<td>25.4</td>
<td>29.0</td>
<td>32.7</td>
<td>36.4</td>
<td>40.4</td>
<td>43.4</td>
</tr>
<tr>
<td>5&quot;</td>
<td>1.62</td>
<td>4.55</td>
<td>9.11</td>
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Method of Mining Coal Without Powder

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

Part II:—(Concluded from May Issue.)

How and Why this Process is a Success.

Ever since coal has been mined, inventors have endeavored to perfect a system of mining without powder. Many types of mechanical wedges, expanding bars, etc., have been developed and tried in an endeavor to eliminate the explosive devices have been applied in the same manner as powder—that is, by drilling a hole into the face of the coal and inserting a wedge in the manner of expanding bar, in the same general manner as the powder charge. In attempting to break down coal in this manner there are a number of conflicting difficulties, to be met two of which, at least, make this method of application impractical, commercially. One of these is a mechanical difficulty, and the other is the force exerted by any type of expanding device applied in this manner cannot possibly produce effective and satisfactory results. These difficulties are more or less theoretically and practically applied. For over ten years the writer experimented with round type hydraulic expanding bars, and arrived at the conclusion that some type of bar could be successfully applied in this manner. He then developed and built six different types of bars, each one being an improvement over the former models, until the last type of bar fulfilled every requirement, mechanically, of a bar to be used in this manner. It is true that this last type of bar did not mine coal; in fact, under favorable conditions, it, at times, produced very satisfactory results. They are theoreti-

(Continued in next issue.)
and thus the difficulties of the drilling process multiply. Also with bars developing inadequate force to mine the coal effectively, it is virtually impossible to mine coal of anything but the smallest grades. Hence this form of expansion has been virtually abandoned.

Furthermore, in bars of small diameter, unless reaction type pistons are used, the internal reactions and stresses develop to such an extent that the bar will bend and twist the bar to such an extent as to make it ineffectual, if the bar is supplied with water at sufficiently high pressure. On the other hand, if the bar is supplied with water at sufficiently high pressure, it is possible to mine coal of any grade, provided that the pressure is sufficient to develop the necessary forces to effect the breaking of the coal. The forces exerted are in the same plane as the plane of the bar. There have been no definite shear stresses applied to shearing off the back wall of support. It is just as necessary to shearing off this wall as to the shearing off the face wall. It is true that some shearing stresses are developed along the back wall, as a result of the expansion of the bar, but they are not concentrated in a plane parallel to the axis of the bar. In the rectangular type bar, with its two sections, the stresses exerted along the back wall are not of the same magnitude as those exerted along the back wall of the rectangular type bar, and hence these forces are not developed in the same plane.

(c) Consider further a room of coal 25 to 40 feet wide, and 7 feet in thickness. Except that part of the coal in the immediate vicinity of the ribs, the coal may be considered as suspended in the form of a cantilever beam. If this beam were suddenly released and allowed to fall, the body of coal would, of course, fall down. Consider three round holes bored into this body of coal, one near each rib and a third in the middle of the mass as near the roof as possible, and a round type hydraulic bar inserted into one of the rib holes. As this bar is expanded it will shear off the coal along this rib (if powerful enough) and likewise when inserted in the other rib hole. The plane of the force exerted is in each case parallel to the "rib walls." Now insert the same bar into the center hole. The forces exerted are in the same plane as the plane of the bar. There have been no definite shear stresses applied to shearing off the back wall of support. It is just as necessary to shearing off this wall as to the shearing off the face wall. It is true that some shearing stresses are developed along the back wall, as a result of the expansion of the bar, but they are not concentrated in a plane parallel to the axis of the bar. In the rectangular type bar, with its two sections, the stresses exerted along the back wall are not of the same magnitude as those exerted along the back wall of the rectangular type bar, and hence these forces are not developed in the same plane.
tempts, to apply expanding bars to mine the coal for the application of the hydraulic pressure of 1,500 lbs. per sq. in. (and at 10,000 lbs. per sq. in., the applied forces will develop adequate pressure for breaking down coal, up to at least 8 feet in thickness), there is no reason why the pressure of 30,000 lbs. per sq. in., or even greater, should not be constructed. In fact, a bar using 25,000 pounds water pressure, instead of hydraulic pressure, would overcome any particular engineering difficulties.

A bar using water pressure of 20,000 lbs. per sq. in. would be considerably lighter in weight, in proportion to the excessive expanding force. A bar using 10,000 pounds or if made the same weight, would have at least 65 per cent greater expanding force. The possibility of using this type of bar is entirely different, as at least twice that now proposed, involves no engineering or constructional difficulties in either the pump, the jointed steel tubing, or the bar, and opens up unlimited possibilities for the application of expanding bars for the breaking down of coal. In the near future we will be referring to 20,000 lbs. per sq. in. water pressure as standard practice. Conceive the enormous force that can be developed and applied by the use of water at this pressure and you will arrive at the conclusion that the hydraulic expanding bar of the future will mine a large percentage of our coal production.

The Theory of Application of Mechanical Forces for Mining Coal.

The general results that can be obtained by using the slow expanding force for breaking down coal were demonstrated over 70 years ago, when unslashed lime was tamped into a hole bored and expanded, and by the expansion of the lime, the coal was broken up, and made to fall. This method is still in use in some of the deep, "gas" mines of England, so there powder is prohibited. In general, the theory is that of "the dissipation of applied forces throughout a mass that is not homogeneous." This is the condition of coal, and is composed of seams and stratifications that vary in density, hardness, thickness, etc., and this change in general characteristics occurs in horizontal and vertical strata. Also, in the early stages, when coal is in the process of making, it was at one time in a plastic or semi-fluid state, and while in this condition, the earth strata were shifted by violent action, or by the intrusion of dikes, etc., disturbing this plastic mass, with the result that many definite cleavage planes, or "slides," were formed in the mass, which will be noted by observing any pile of coal, as the faces of these slips have a smooth, glassy surface. When the force is used, the mass is broken up and scattered, and the result is that when desired, the transport of the undercutting machines on "Caterpillar" Type Trucks.

As the last and final element contributing materially to the successful application of this system of mining, a "Caterpillar" type of truck is used. It is of the type which can be used to transport the undercutting machines about the mine in the same manner as the slotting machines. By using a truck of this type that can travel practically any part of the mine by passing through the crosscuts, etc., on its own self-propelled bed-plate, eliminates any intermediate the use of "props." The bed-plate, being 40 inches apart, the roof cleavage was found that the entire mass is broken and the coal loaded out. The pit cars loaded with coal looked as if the blocks had been picked apart and loaded out. The pit cars loaded with coal had "piles" in them, so the same results have been obtained. When the use of black powder was allowed, the percentage of lump coal produced was sufficient to produce the same effects as the so-called "permissible powder." This is due to the fact that the black powder is much "slower," giving time for the forces to be spread throughout the mass, while with the permissible powder, which is much faster, the forces are more instantaneous. If a charge of T.N.T. is sufficient to produce the same explosive force as the powder charges were, there would not be any lump coal at all, as the forces would simply blow out a coal car carrying a small quantity of coal and this would be in small fragments. The quantity of coal brought down with a charge of black powder was much greater than the "faster" powder. In proportion to the coal brought down, the same general theory has been stated above is found in the breaking of wooden beams. If a beam is loaded to the point of breaking down, the beam, the beam in question along the "grain" or natural "slips" in the wood, the length of time.

Some Economic Considerations.

A purely mechanical means for mining coal and the elimination of the use of explosives effects the general operators, and results in economies in production, that can hardly be appreciated, even by
the experienced mining engineer or operator. This is due to the fact that, although the idea is old, the possibility of its ever being accomplished, has, in the past, been so remote that it has never been seriously considered. The saving of life and property by the elimination of explosions and mining accidents, and the saving of coal by the prevention of accidents, are general; the improvement in the sanitary and working conditions due to the elimination of powder smoke and fumes, the saving in ventilation cost; the saving in timbering cost and the subsequent cost of cleaning up the “roof fall” that usually results; the saving in costs due to the elimination of other highly paid labor; the saving in timbering costs due to the elimination of all vibration and shattering effects to the roof strata by powder explosions, are all results; the saving in costs due to the elimination of all smoke, all of these things will appeal to you quite forcibly. How much it would be worth to you, please for any other advantages of this system of mining and then estimate how much it would be worth to you.

Second—a continuous mechanical process of mining effects every operation in the mine, and goes back into every item of production cost. Although the elimination of explosives and the many advantages incident thereto—the reduction in the percentage of slack, etc.—are truly big things, separately and collectively, effective in all conditions, they do not affect the general production costs to the extent that will result from being able to mine coal continuously. This one advantage alone is worth a mine.

One operator recently said that he would reduce the production of slack coal by one half. It was estimated as compared with present method, that, with a six foot vein, one room at a time, an increase in the percentage of extraction and saving slack, in the cost of ventilation, etc., and at an increase in percentage of extraction; the saving in the cost of ventilation, etc., and at least something for the many other incidental savings, due to increased efficiency, all of which will effect a material reduction in production costs.

The new system can be developed with great rapidity as compared with present methods. If the new development work is fairly well concentrated and under these conditions, it is but a few cents more per ton than present cost, and if you give proper credit for the cost of equipment and interest, which would be in existence today and paying dividends had this been possible in the past.

In addition to the above, many other advantages affecting production costs can be mentioned. If you consider them and narrow places can be economically advanced four “cuts” every twenty-four hours. A great many coal companies would be in existence today and paying dividends had this been possible in the past.

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WHAT IS THE FINAL RESULT?

A recapitulation of the mechanical and operating characteristics of the appliances used in this process of mining, and the economic advantages that result, justify the following conclusions:

(1) The development of the “slotted machine” solves the problem of a rapid, efficient, labor saving means for preparing the coal for the application of the hydraulic jumbo, setting aside all the usual operating and labor difficulties that formerly made the introduction of all other forms of mechanical appliances for mining coal commercially impractical.

(2) The mounting of the slotted machine on a self-propelling tractor type bed-place, producing a self-contained, independently operated unit, that does not interfere with, or cause any delay in, the continuous work, is a great saving of time and labor, which the large-scale mining companies have been continually seeking in substitute for explosives.
any other process, or operation in the mine, sets aside all objections and overcomes all difficulties incident to the introduction of a new and additional mining appliance.

3) The cutting of a rectangular slot in the coal, instead of a round hole, permits of using a hydraulic bar, rectangular in section, having much greater strength, and permitting of much better mechanical cohesion than is possible in a round bar.

4) The cutting of a rectangular slot permits of the insertion of a type of bar that produces a definite shearing stress along, and parallel to, the back wall of support which is impossible in any other form of application. By carrying the width of the slot and also the size of the pistons, any force necessary to perform this function can be obtained.

5) The mounting of a power driven pump on a separate truck, and conveying the water from the pump to the bar through folding steel tubing, provides an efficient, reliable means of supplying water to the bar for the expulsion of the pistons, at very high pressure, and volatilizing form a magnitude that can be obtained in no other way. This construction also permits of using a high pressure pump of standard design, having large working parts and mechanically adapted to the requirements.

6) The cutting of the slotting machine, the hydraulic bar, the high pressure, and power-fed self-propelled unit, permits the entire process of breaking down the coal to be done rapidly and in one operation, resulting in a saving of labor and increased efficiency, that would occur if the two appliances were divided, and the equipment necessary for each, conveyable about the mine as self-propelled machines.

7) The mounting of the undercutting machines on self-propelled "caterpillar type" trucks enables them to be transported with the same rapidity and efficiency as the slotting machine; permitting this part of the process to be carried on without retarding, interrupting, or interfering with other operation, or with travel of men to co-ordinate with the breaking down process in such a manner as to result in a rapid and continuous process of mining.

The combination of all these elements results in a practical, purely mechanical means of mining coal, a process insuring safety and increased earnings for every man employed; a constant and continuous output of coal, and a mine that can be operated, and in economical and operating advantages to the mine owner which makes it a profitable operation.

School News
2020 COMMENCEMENT.

The Commencement Address was delivered by Mr. John Barrett, Director-General of the Pan-American Union of Washington, D.C., who discussed the Pan-American Union and the relations of the United States with South American Republics. There was a huge attendance. The history of mining in Colorado is traced, and the Science of Mining was conferred upon Mr. E. P. Mathewson of New York City, the foremost copper metallurgist of the world.

Faculty Resignations and Appointments.

Mr. Thomas O. Walton, professor of mathematics; Mr. C. W. Botkin, associate professor of chemistry; and Mr. S. J. Krumm, assistant professor of metallurgy, have resigned to accept other positions.

Mr. A. J. Franks, fellow in chemistry, has been appointed chemist at the Experimental Plant.

Mr. Rodney J. Barnwell, prominent Denver attorney, has been appointed a member of the Board of Trustees to succeed Mr. Frank Willis, who has resigned.

Alumni News

The annual meeting and banquet of the Alumni Association were held at the Mon-roe Hotel on May 8. There was an attendance of about 60 alumni and seniors. Mr. R. B. Paul, President of the Association, presided, President of Colorado: The speakers were Dr. Regis Chauvelet, Mr. W. E. Ball, '06; Mr. F. C. Carstensen, '05; and Mr. C. M. Schneider, '05.

The following officers were elected for the year 1920:

President—W. H. Coghlan, '03.
Vice-President—A. V. Corry, '03.
Secretary—W. E. Ball, '03.
Treasurer—R. T. Sill, '08.
Executive Committee—E. R. Ramsey, '12.

MINES SERVICE RECORD.

Have we your service record correct to date? We are requested by the Honorary Secretary of Colorado to supply sufficient information for a book that is being prepared relative to the past to the Colleges of Colorado played in the World War. Send us a concise statement of your rank 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 you listed correctly after the year 1918, send us your service record correct to date. Thank you.

TECHNICAL REVIEW

GENERAL.

Engineering Council Accomplishments.

The activities of Engineering Council include all matters of general interest. In the past two years, the Engineering Council has furnished men for war service; organized employment bureau; produced a Department of Public Works; drafted a general law for the registration of engineers; and assisted the State of New York in reorganizing its government.

J. H.

Stabilization of the Bituminous Coal Industry.

By Edwin Ludlow. (M. & M., April, 1920.)

This report on the discussion of the subject by the A. I. M. E., reviews the criticisms of the industry at present, and the suggested remedies. 1. A change from half-time to full-time must be gradual. 2. Proper development cannot be assured as long as small speculators are operating mines with a view only to profit. 3. An unnecessary surplus of men, with a corresponding increase in cost of production is due to the policy of the labor unions. Lack of co-operation between mines and railroads is blamed for much of the trouble. Underwater storage was shown to be safe and efficient, if the mines would encourage it by offering lower prices during the summer. The held of activities of Engineering Council includes all matters of general interest.

J. A. H.

Mineral Production of Canada During 1919, By J. McR. N, (M. & S. P., April, 1920.)

The production of the year 1919 bears out the expectation of the Canadian mining industries, production is again being increased and is expected to be normal this year. Some of the silver production, and nickel production, as compared with that of 1918, fell to one half. The gold production increased about one-third, and the silver production decreased almost two million dollars. Lead production increased about one million dollars, and zinc about 180,000,000 tons. The other products more intimately associated with the automobile are in an even greater proportion. Petroleum was produced in small quantities that the country had to rely chiefly on imports.

MINING.

The Levant Disaster. Report by H. A. Abbott. (Mining Magazine, April, 1920.)

The report gives the official data on the accident at the Levant Mine last October, when 31 men were killed and 19 injured owing to the break-down of the man-raise. The following is a description of the mine shows how the accident occurred, resulting in one of the strangest of the kind ever known.

J. A. H.


This article is founded upon the fact that because drinking water is the cause of all epidemics. Pure water contains no disease-producing bacteria, or excess of organic material of any kind. Micro-organic life grades together so imperceptibly it is difficult to distinguish between animal and vegetable forms. The use of four types of bacteria, spherical, rod-shaped, spiral, and filamentous, live upon oxygen and increase by splitting one cell into two. Bacteria may be determined quantitatively by mixing a sample of the water with a culture medium and allowing the germs to incubate until they are sufficiently numerous to be counted. The writer became especially interested in this problem at Wyandotte, Michigan, where impure water was causing much disease. His experiments showed that water passed through tubes producing ultraviolet rays was freed from all harmful bacteria.

J. A. H.
The Colorado School of Mines Magazine.

The Mining Industry of Bolivia. By George W. Schneider and Benjamin L. Miller. (E. & M. J., April 10, 1920.)

Bolivia's greatest industry is the mining of silver, gold, copper, tin, bismuth, tungsten, antimony and lead. To handle the exportation of these minerals, more railroad are being built and the acquisition of silver, gold, copper, tin, bismuth, antimony or lead. To handle the mining of silver, gold, copper, tin, bismuth, antimony, and a few other valuable minerals about 5.90 a ton. J. A. H.

New Mining Fields in Eastern Nicaragua. By Louis Garbrecht. (E. & M. J., April 10, 1920.)

In spite of adverse conditions such as scarcity of water, lahar, lahar, and revolution, Nicaragua has increased its gold output to over a million dollars in 1919, with favorable chances of doing even better in the future. A small amount of silver is produced, and the country being composed of granite rocks, is not common, the great mass of the country is composed of granite and andesite, which carry great numbers of gold-bearing quartz veins, amounting about $5.90 a ton. J. A. H.


This article is a discussion of the difficulties in obtaining complete, accurate, and representative samples of concentrates and ores, and in obtaining an accepted standard for the fundamental differences between the two cases. From the writer's point of view, the most important difficulty is that of obtaining an explanation of the fundamental differences between the two cases. Aside from helpful information in the construction and design of cisterns, the remedial measures, such as the use of natural and discourse iron pipes reinforced with concrete and lengthened slightly with wooden pegs. J. A. H.

METALLURGY AND ORE DRESSING.


This article is concluded from March issue, page 157. It gives in detail the Geometric methods of determining metallic aluminum of alloys and powders. It also takes up the evaluation of reducing and precipitating power of Aluminum Dust.

The article is accompanied by illustrative apparatus used and problems treated. It also contains other valuable information about Aluminum Dust and its uses. F. A. L.


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In refutation of the idea that the stamp mills are obsolete, the author points out that three-fourths of the world's gold supply comes from ore reduced by stamp mills. This type of mill originated with the ancient gravity type and has been developed along with the improvements in separating gold from the native rock. While the stamp mill was better adapted to amalgamation, the ball-mill prepares the ore for flotation, and the stamp mill, however, is more flexible and permits a greater range of adjustments. The writer quotes six reports on the adjustments of stamp mills in different places, and the efficiency with which they performed their work. J. A. H.


From his experience in the Consolidated Mine at Goldfield, Nevada, the writer believes that the mining motor is to be preferred to a combination of plain motor and friction clutch. The standard high-speed motors of similar design are recommended because interchangeable parts simplify repairs. The highest efficiency and highest power factor will be obtained when the motors are directly connected to the main line. The motor is required to do, except when this work has a wide range of variation. Starters for electric motors are explained, especially the features which prevent damage when the normal current is exceeded. Starters are necessary under some conditions and are recommended for all higher powered motors, so that they cost less than a safe switch and are much more efficient. Questions of wiring, transformers, and voltage must be solved with proper consideration. Mains of fuses are attributed to loss of bearing, also loaded winding, and crystallization due to vibration. Many motor troubles may be eliminated if the electrician makes inspection trips at regular intervals. J. A. H.

METALLURGY AND ORE DRESSING.
Branner in Bulletin 30 of the Geologi- 
cal Society of America. (E. & M. J., 
April 3, 1920.)

Mr. Miller states Dr. Branner's paper as 
the foremost geologic article on Bra-
asil. It includes the geologic data col-
lected by Dr. Branner himself as well as 
what he has learned from other geologists. 
The various geologic periods are tabu-
dated, with descriptions of the formations 
representing them. The article ends 
with a list of the Brazilian states, giving 
the important formations and the economic 
products of each.

J. A. H.

Asbestos—a Canadian Specialty. By F. 
C. Lynch. (M. & S. P., April 10, 1920.)

Before the war 87 percent of the 
world's asbestos came from a compar-
tively small area in Quebec. It is of 
the variety chrysotile and can be spun into 
very fine thread, composed of fine filaments 
numbering about 25,000 to the linear inch. 
Geologically, ollive was metamorphosed 
some little distance from a source, and 
deposited in shrinkage cracks, averaging three-
eight of an inch in thickness. Excellent 
transportation facilities and an apparent-
ly unlimited supplies of chrysotile indi-
cate that the industry will have a long 
life. Operations were begun near Ther-
ford in 1917, and the industry has rapidly 
expanded.

J. A. H.

DISCUSSION

The Editor:
The article, "The Status of Gold," by 
Col. Chester T. Kennan, in the March, 
1920, issue of the Magazine, has created 
some little discussion among my 
colleagues, and I desire to make a con-
tribution to the discussion to which I hope the 
article will create.

At the outset, I wish to state that 
I have not been taken in, or that I have 
not taken the subject in a light spirit, 
and that I do not take the position 
of an incontrollable authority on 
it, but am only pointing out those things 
in the article which seem to me to be untenable 
from the standpoint of the principles of 
economics.

The position of the gold mining 
industry is of importance at this time, and 
ides to almost needless to say that I heartily 
approve of any justifiable and economi-
cally sound procedure which will assure 
the prosperity of that industry on a profit-
able basis, for most assuredly the world 
needs gold; and I certainly do not agree 
with those economists who place the 
blame for our present high prices on 
the overproduction of gold.

Col. Kennan advocates the re-standard-
ization of gold, or as I would state it, the 
re-definition of the dollar, our standard 
monetary unit, for this reason: First, 
the standard of mining industry; second, 
to keep in agreement with the present 
high wages and prices of 
commodities, with the result that they 
will be reduced and kept from becoming 
more expensive; and, third, as a means of 
helping to pay the huge debts of the 
nation contracted largely because 
of the war. To accomplish this, Kennan 
proposes that we re-define the dollar, or 
more accurately, to define it as the 
value of the dollar in terms of gold. 
This will, he says, help to pay the 
taxes and debt.

I believe that this is about right, but 
that it is not so easy to do. Kennan 
states that we should re-define the dollar, 
and I agree with him, but I do not 
agree with him that it can be done 
readily. I believe that it is a very 
important and difficult task, and that it 
will take a long time to carry it out.

First, the re-definition of the dollar will 
only take place if the government 
agrees to it. The government is 
responsible for the value of the dollar, 
and it is unlikely that it will agree to 
re-define the dollar without some 
compensation for the government.

Second, the re-definition of the dollar 
will only take place if the public 
agrees to it. The public is 
responsible for the value of the dollar, 
and it is unlikely that it will agree to 
re-define the dollar without some 
compensation for the public.

Third, the re-definition of the dollar 
will only take place if the banks 
agree to it. The banks are 
responsible for the value of the dollar, 
and it is unlikely that they will agree 
to re-define the dollar without some 
compensation for the banks.

In conclusion, I believe that the re-
definition of the dollar is a task 
that will take a long time to carry out, 
and that it is unlikely to be successful 
without some compensation for the 
government, the public, and the banks.

F. A. L.
Gold has so nearly disappeared from circulation for two reasons: First, the system of credit has taken its place because it is easier and cheaper to do business with it than with gold coin because the value of a gold piece can be added on an adding machine with less chance of inaccuracy; and, second, because the majority of people seem to prefer its paper substitute; try to pass out a $20 gold piece instead of a "yellow-back" at any bank in the East. I know, of course, than any system of credit should be "secured" to a large extent of its face value by gold as coin or bullion, and the present extent of "security" should be increased, but that is no sign that we need an extensive circulation of $20 gold pieces between merchants and banks.

I hope that other readers of your Magazine will contribute as highly important as well as interesting subject so that the position of this nation at least those of them that read the Magazine, will have its minds fully alive and prepared to meet a proposal fully as futile, as possible, as the "silver" proposition of 1896. Fraternally yours,

WM. R. CHEDSEY,
Professor of Mining, School of Mines,
The Pennsylvania State College.

PERSONALS

Sidney B. Tyler is superintendent of the Ferro Alloy Co., Denver, Colo.

Hugh C. Waterton, formerly with the Newman M. & L. Co., is now manager of the Michigan-Cubo of Bedrock, Montana City, Colo.

R. L. Hallett is chemist in the research department of the American Smelting and Refining Co., Boston, Mass.

L. B. Eames, formerly of Pueblo, is now engineer for the Stearns-Roger Mfg. Co., Denver.

Homer D. Ford is superintendent of the Hit Alumina Co., Colorado Springs, Colo.

Albert J. Kercher is general manager of the Koenitzer Rolling Co., 1212 South Michigan Ave., Saginaw, Mich.

C. L. Colburn of Washington, D. C., was a Golden visitor recently.

Wm. R. Chedsey, professor of mining, at the Pennsylvania State College, has just returned from the annual junior trip through Ohio and Pennsylvania and is now in charge of the Zuma Mining Co., Eureka, Utah.

B. W. Knowles is mine superintendent for the Healy Mining Co., Ltd., Redfield, B. C., Canada.

Clarence T. Emrich is assistant superintendent of the International Smelting Co., Milwaukie, Ariz.

Dudley M. Wilson is construction engineer with the Texas Construction Co., Dallas, Texas.

Herbert C. Wilson has accepted a position as chief engineer with the Petroleum Refining Co., of California, at San Francisco, Calif.

P. A. Goode has just returned from examining-alluvial mines in Queensland, Australia. His present address is Coffs, Calif., care You Bet Mining Co., George M. Lee has been transferred from Grand Forks, B. C., to Anyan, B. C. He is with the Granby Consolidated Mining Co., Smelting and Power Co.

John B. Barnum has been transferred from Denver to the Yachats of the A. S. & R. Co., Leadville, Colo.

A. E. Perkins was an entertaining guest at the Alumni Banquet on May 3 in the absence of C. B. Wadsworth, Robert M. Keene is acting as editor of the Magazine.

F. M. McHugh has been made General Sales Manager of the Dorr Co. and has moved to New York. His address is 101 Park Avenue, New York.

Samuel R. Brown, Jr., has left Kinnikinnick, Mont., and his present address is Montana, Colo.

Mr. Harvey is mine superintendent.

Earle D. Andrews is sales engineer for the Atlantic Refining Co., Chicago, Ill.

E. R. Ramsey has been made Sales Manager of the Dorr Co., Cooper Bldg., Denver, Colo.


Donald Hyman is general superintendent of the Akron Mines, Whitetop, Colo.

Chris. M. Arthur is with the Great Western Sugar Co., 500 Sugar Bldg., Denver, Colo.

Edward Stein's present address is R. F. D. No. 1, Oregon, Pa.

R. H. Cronin has resigned as chemist at the Experimental Plant to enter private practice.

Chas. E. Prior's address is Cherry Creek, Colorado.

S. Z. Krumm has resigned as Assistant Professor of Metallurgy to enter private metallurgical work.

E. V. Vonne was editor of the Magazine, is making mine examinations in Central America, and will return to Golden in September. His address is El Salvador Mining Co., Divisadero, Department, Manzanillo, El Salvador, C. A.

Arthur Krohn was a Golden visitor recently. He is at present stopping at the Standard Hotel, Denver.

Joe H. Woolf ("Tuffie") has returned to his home in Grecia, Colorado, after a stay of four years in Mexico. He left Colte February 1 and made a tour of Japan, China and the Philippines Islands. While in Peking he met Chick Ho, who is now in China, and when he returned to the United States of America, he met with the Braden Copper Co., Butte, Mont.

Nicholas V. Gallucci has accepted a position as engineer with the New Sibiu Co., Coatesburg, Mexico.

George V. Dunn, William S. Loring and William B. Case have accepted positions as geologists with the Midwest Roofing Co.

John B. Davis will sail from New York the latter part of May for Rancagua, Chile, S. A., where he has accepted a position with the Medinal Co., Monterrey, N. L., Mexico.

Myron L. Sisson has accepted a position with the U. S. Fuel Co., Mohawk, Utah.

Edward J. Kierle expects to leave soon for Matamoros, New Mexico, where he has accepted a position with the St. Louis, Rocky Mt. & Pacific Co.
**ATHLETICS**

By F. A. Lichtenheld, ’20.

**MINES; C. C. 6.**

Colorado Springs—April 30—Bun-ching hits with Tiger errors in the third inning after two were out, the School of Mines baseball team scored seven runs and assumed a comfortable lead that the Col-leagians did not threaten throughout the game, the Mines winning by a score of 13 to 6. In this inning Briggs misjudged Newman’s liner and it sailed to center field for a home run, while MacDougall and Flegal bobbled, putting the Ore Diggers in position to score when solid hits followed.

Krause kept the Tiger hits well scattered and struck out seven batters. Newbold pitched a strong game in spots but missed his control on two occasions when his teammates failed to take care of easy putouts, he was touched up for the necessary hits to produce runs.

Hughes, star boxer for the Tigers last year, will hurt the game. This will be his first appearance of the season.

**Score:** Mines 4; D. U. 8.

E. Hughes, p 3 1 0 3

* A’worth 1 1 0 0

**MARKS—Two-base hits:** Flegal, 2; Serafini, 1; Henderson, 1. Three-base hits: Serafini, 1; Williamson, 1. Home runs: Strock, 3; by Henderson, 1. Sacrifice hits: Phillips, 1; by Watkins, 1; by Krause, 2. Passed on balls: Off Krause, 3; off Watkins, 2. Hit by pitched ball: By Krause (Chase, Pfaff), 2; N. Jones (on bases), 2. Passed, 2. Hit by pitched ball: Ward, W. Hughes, 1.

**Mines 11; D. U. 8.**

Denver University’s baseball team came back yesterday afternoon. It defeated the School of Mines in one of the most played baseball games on a Colorado field this year. The game took place at University Park. Score 8 to 1.

The game resulted in a 9-run lead. In the third inning D. U. jumped into the lead by scoring three runs, a lead it maintained throughout the remainder of the game.

In the sixth inning, Watkins was sent to theOaks to take Krause’s place as pitcher. Watkins held D. U. for the remainder of the game.

**MINES.**

**AB** | **H** | **PO** | **A** | **E**
---|---|---|---|---
Mines | 11 | 27 | 9 | 3

**COLORADO COLLEGE.**

**AB** | **H** | **PO** | **A** | **E**
---|---|---|---|---
Blenstein, 3b | 5 | 9 | 6 | 3
MacDougall, ss | 5 | 3 | 3 | 0
Flegal, rf | 5 | 1 | 1 | 0
Hughes, c | 4 | 1 | 3 | 5
McCool, If | 3 | 0 | 6 | 0
Briggs, cf | 4 | 3 | 0 | 0
Wilkin, 3b | 4 | 1 | 0 | 0
Newbold, p | 2 | 0 | 0 | 3

**Totals** | 26 | 10 | 27 | 9 | 3

**TIGERS.**

**AB** | **H** | **PO** | **A** | **E**
---|---|---|---|---
Phillips, 3b | 3 | 1 | 0 | 2
Bond, ss | 2 | 0 | 2 | 1
Strock, 3b | 5 | 2 | 1 | 3
Serafini, cf | 2 | 1 | 0 | 1
Bunte, rf | 1 | 0 | 0 | 0
Henderson, p | 1 | 1 | 0 | 1
Williamson, c | 1 | 1 | 0 | 1
Ward, 2b | 2 | 3 | 1 | 4
Frenzel, 1b | 3 | 0 | 8 | 0

**Totals** | 26 | 10 | 27 | 9 | 3

**DEBRON UNIVERSITY.**

**AB** | **H** | **PO** | **A** | **E**
---|---|---|---|---
Phillips, 3b | 3 | 1 | 0 | 2
Glaze, ss | 2 | 0 | 2 | 1
Allen, 2b | 4 | 3 | 1 | 2
Liggett, ss | 3 | 0 | 1 | 1
MacKenzie, 1b | 3 | 1 | 0 | 1
Russell, If | 2 | 1 | 0 | 1
Cook, rf | 1 | 1 | 0 | 0
Hughes, c | 1 | 4 | 2 | 1
McCool, If | 3 | 1 | 0 | 0
Enstrom, cf | 1 | 0 | 0 | 0
Gee, cf | 1 | 0 | 0 | 0
Wright, rf | 1 | 0 | 0 | 0
Graham, If | 1 | 0 | 0 | 0

**Totals** | 31 | 10 | 27 | 9 | 4

**Mines 1; D. U. 8.**

Denver University, 0:0:0:0:0:0:0:0:0:1.

**Summary—Two-base hits:** MacDougall, 2; Flegal, 2; Hughes, 2; Pfeifer, 1

**OBITUARY.**

Ex’00.

E. M. Stewart, Ex’05, was killed in an automobile accident April 5. It is supposed that he fell asleep while driving, causing the machine to run off the road and turn over. He was one of our most promising athletes and will be greatly missed in the years to come.
PROFESSIONAL CARDS

BEELER, HENRY C.
Mining Engineer.
229 Coronado Bldg., Denver, Colo.

BURLINGAME, WALTER E.
Chemist and Assayer.
1738-38 Lawrence Street, Denver, Colo.

BURT, G. MONTAGUE
Mining and Geological Engineer.
Dean College of Mines and Engineering, University of Arizona, Tucson.

CORBY, ARTHUR V.
Member Harper, Macdonald & Co., Mining Engineers, Butte, Mont.

DUGAN, WILLIAM F.
General Agent for Southern California.
Columbia National Life Insurance Company.
Old Time, Low Cost Life Insurance, Accident and Health Insurance.
718-719 Trust & Savings Bldg., Los Angeles, California.

HAMILTON, JOHN HAYS
Mining Engineer.
71 Broadway, New York.

HAMILTON, WILLIAM E.
Mining Engineer and Metallurgist.
749-10 Mining Exchange Bldg., Denver, Colo.

MONTANA LABORATORY CO.
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Chemist and Assayer.
Phillipsburg, Mont.

MONTAGUE, FRANK E.
Geologist and Oil Expert.
Reports and Investigations.
Box 325, Casper, Wyo.

NIELSEN, WILLIAM B.
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709-10 Mining Exchange Bldg., Denver, Colo.

TAYLOR, FRANK B.
Geologist and Oil Expert.
Reports and Investigations.
Box 325, Casper, Wyo.

WALTZMAN, W. D.
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WOLF, HARRY J.
Mining Engineer.
42 Broadway, New York.

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