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New York Office: 42 Broadway A Service Station within reach of you.
MANUFACTURERS OF THE MARCY BALL MILL.

Colorado School of Mines Magazine

Published every month in the year, at Golden, Colo., by the Alumni Association of the Colorado School of Mines.
C. ERB WUENSCH, '14, EDITOR.
Advertising rates on application.
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The Alumni Association of the Colorado School of Mines has a CAPABILITY EXCHANGE which renders efficient Employment Service; if you want a man or a new position wire them.
How Large is an Atom?

Atoms are so infinitesimal that to be seen under the most powerful microscope one hundred million must be grouped. The atom used to be the smallest indivisible unit of matter. When the X-rays and radium were discovered physicists found that they were dealing with smaller things than atoms—with particles they call “electrons.”

Atoms are built up of electrons, just as the solar system is built up of sun and planets. Magnify the hydrogen atom, says Sir Oliver Lodge, to the size of a cathedral, and an electron, in comparison, will be no bigger than a bird-shot.

Not much substantial progress can be made in chemical and electrical industries unless the action of electrons is studied. For that reason the chemists and physicists in the Research Laboratories of the General Electric Company are as much concerned with the very constitution of matter as they are with the development of new inventions. They use the X-Ray tube as if it were a machine-gun; for by its means electrons are shot at targets in new ways so as to reveal more about the structure of matter.

As the result of such experiments, the X-Ray tube has been greatly improved and the vacuum tube, now so indispensable in radio communication, has been developed into a kind of trigger device for guiding electrons by radio waves.

Years may thus be spent in what seems to be merely a purely “theoretical” investigation. Yet nothing is so practical as a good theory. The whole structure of modern mechanical engineering is reared on Newton’s laws of gravitation and motion—theories stated in the form of immutable propositions.

In the past the theories that resulted from purely scientific research usually came from the university laboratories, whereupon the industries applied them. The Research Laboratories of the General Electric Company conceive it as part of their task to explore the unknown in the same spirit, even though there may be no immediate commercial goal in view. Sooner or later the world profits by such research in pure science. Wireless communication, for example, was accomplished largely as the result of Hertz’s brilliant series of purely scientific experiments demonstrating the existence of wireless waves.

Dynamite Mixing Machine.

The Manufacture of Dynamite and Gelatin

By E. M. Symmes.

Dynamite is unique in not having been invented by the Chinese or mentioned by Shakespeare. It was first introduced by Nobel, the Swedish engineer, in 1867, after numerous accidents had resulted from the use of nitroglycerin alone. Mr. Nobel discovered that by mixing nitroglycerin with kieselguhr, an absorbent earth, it became safe to handle, and its explosive power was not seriously reduced. Modern practice has eliminated kieselguhr in spite of statements to the contrary in nearly every text book on the subject and substituted an absorbent composed of nitrate of soda, nitrate of ammonia, wood pulp, flour, etc., which give an active dope, that is, one that will assist in the explosion instead of acting as an absorbent only, as is the case with kieselguhr.

The method of manufacture and preparation of the various ingredients will be considered briefly before discussing the actual making of dynamite according to the process employed by the Hercules Powder Company.

Nitroglycerin is made by adding slowly to a mixture of strong nitric and sulphuric acids a comparatively pure glycerin, agitating the mixture meanwhile by large, mechanically driven paddles and removing the heat by coils through which cold brine is circulated. A modern nitrator produces about 3,000 pounds of nitro-glycerin at one operation, consuming 7,000 pounds of mixed acids and about 1,300 pounds of glycerin. After all the glycerin has been slowly added to the nitric acid, which consists merely of a steel tank with the brine coils around its outer edge, the mixture is let down into a lead tank and allowed to stand until the nitroglycerin rises to the top and the acid falls to the bottom. The top layer of nitroglycerin is then drawn off and delivered to a tank of warm water, where it is washed free from acid by agitation with compressed air. The acid left from this operation is treated at the acid recovery plant to regain the nitric and sulphuric acids contained in it. The nitroglycerin is then given a final wash with soda ash solution to remove the last traces of acid, as acid nitroglycerin cannot be kept any length of time without serious decomposition, with possible danger of explosion.

The absorbent material known as dope is prepared by mixing and screening proper proportions of dry and ground nitrate of soda, nitrate of ammonia, wood pulp, flour, starch, sulphur, chalk, etc., and is taken in fibre barrels to the mixing house and put into a dynamite mixing machine, an illustration of which accompanies this article. Nitroglycerin, after preparation and treatment as outlined above, is taken by means of the copper lined rubber-tired buggies to
The machine manufactures the paper shells.

This mixing machine consists of a wooden bowl with large wooden wheels running in it. These wheels are edged with ebonite, or hard rubber, thus allowing no metal actually in contact with the dynamite while being mixed. The driving of these machines is done with large overhead pulleys made of wood, which obviate any possibility of rubbing metal, thereby producing sparks. Five minutes' kneading under the wheels of the mixed suffices in most cases properly to incorporate the nitroglycerin throughout the mass of dope.

The mixing house and is added to the dope. This mixing machine consists of a wooden bowl with large wooden wheels running in it. These wheels are edged with ebonite, or hard rubber, thus allowing no metal actually in contact with the dynamite while being mixed. Five minutes' kneading under the wheels of the mixed suffices in most cases properly to incorporate the nitroglycerin throughout the mass of dope.

This material, which is now loose dynamite, is removed from the machine by wooden shovels and put into wooden tubs, which are used to transport it to the Hall machines, where it is packed into paraffin paper shells by the action of wooden tamps, tipped with rubber. These shells are made by a machine which takes roll paper of from 18 to 24 inches wide, cuts, prints, and crimps one end, and discharges into the collector, as shown in the illustration, at the rate of from 100 to 300 per minute. They are packed loosely into crates and taken by a traveling chain through a chamber, where they are sprayed with hot paraffin to impregnate the paper and prevent absorption of the nitroglycerin. They are then delivered by tram truck to the Hall or the gelatin machines.

These Hall machines mentioned above are very nearly automatic and it is only necessary to maintain a supply of loose powder and sufficient shells in order to perform the complete operation of filling the cartridges to the required amount, crimping the top, and laying them out on a table. They pack at each revolution either 25 or 30 cartridges and have a capacity of approximately 30,000 pounds every eight hours. This is a great improvement over the old days when each shell was filled through a funnel by hand operation, requiring every stick to be handled several times. The filled cartridges of dynamite are then carried in wooden boxes by the wooden scoops, and taken to a machine which by the action of a worm forces this material through nipples into paraffin-paper shells placed directly underneath. This is known as the gelatin machine or Schrader and is necessary because such a sticky mixture as gelatin cannot be handled through the Hall machines mentioned above. The rest of the operation of gelatin manufacture, consisting of packing in boxes and storage in magazines, is exactly the same as that of dynamite. The manufacture of dynamite or gelatin may seem like a very simple process, but very close attention is necessary at every stage. The amount of moisture in the finished product discovered that the addition of small amounts of nitro cotton to the mixture of nitroglycerin with various absorbents produced a material somewhat similar to jelly. This material resists the action of water exceedingly well and is known as gelatin dynamite. Due to its nature, gelatin manufacture has to be carried on differently from that of dynamite. The nitroglycerin and dopes, prepared as outlined above, are taken to a gelatin mixing machine which consists of a bronze bowl surrounded by a lead jacket containing warm water and two bronze paddles used for kneading the dough-like mixture. These hold from 500 to 900 pounds of the gelatin for each charge. The mixed gelatin looks very much like ordinary dough made from flour, although the taste may be somewhat different. This is shoved out into wooden tubs to the packing house, where they are sealed so that the dynamite can not absorb moisture by being dipped for an instant in molten paraffin. They are then placed in paraffin-paper lined boxes, containing a small amount of sawdust, for a cushion, are weighed, and nailed up by an automatic nailing machine which completely fastens the cover in two operations. From there the boxes of powder are taken to the magazine, which is merely an unheated, barricaded storehouse situated on a broad-gauge spur for convenience in shipping. This completes the manufacture of dynamite.

Since dynamite does not withstand the action of water very well, it was long ago discovered that the addition of small amounts of nitro cotton to the mixture of nitroglycerin with various absorbents produced a material somewhat similar to jelly. This material resists the action of water exceedingly well and is known as gelatin dynamite. Due to its nature, gelatin manufacture has to be carried on differently from that of dynamite. The nitroglycerin and dopes, prepared as outlined above, are taken to a gelatin mixing machine which consists of a bronze bowl surrounded by a lead jacket containing warm water and two bronze paddles used for kneading the dough-like mixture. These hold from 500 to 900 pounds of the gelatin for each charge. The mixed gelatin looks very much like ordinary dough made from flour, although the taste may be somewhat different. This is shoved out into wooden tubs to the packing house, where they are sealed so that the dynamite can not absorb moisture by being dipped for an instant in molten paraffin. They are then placed in paraffin-paper lined boxes, containing a small amount of sawdust, for a cushion, are weighed, and nailed up by an automatic nailing machine which completely fastens the cover in two operations. From there the boxes of powder are taken to the magazine, which is merely an unheated, barricaded storehouse situated on a broad-gauge spur for convenience in shipping. This completes the manufacture of dynamite.

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OBSTACLES TO MINING.

By N. S. Greensfelder, "Ed.

To obtain the E.M. degrees within the allotted time requires the study of numerous subjects in a relatively short period of time. This must be realized in looking back to our college days (few or many, as the case may be). In order to incorporate all of the courses into the curriculum, it was necessary to add one of the subjects, which had time, but it is properly and properly been delved into deeper. Take, for example, the subject of explosives. The writer re-members his efforts expended in helping advance the tunnel under Mt. Zion. In this work the mysteries of the crimping case, fuse, primers, drilling, loading and shooting a round of holes were fully explained. The technology of explosives, however, was something that was barely touched upon, either in the field or lecture room. There was too much else to learn.

It is hard to be expected, therefore, that the mining engineer should possess sufficient knowledge or data to efficiently undertake his profession in practice. And it is not necessary for him to have this. At this stage, the manufacturer of explosives should be consulted. For example, the Hercules Powder Company, with whose organization I am familiar, realize that "consulting explosive engineering service" is something due to the industries, which they serve. The consumer, without cost or obligation, is entitled to call upon this service department to assist him in solving his problems.

This company has established a central experimental station equipped with the best personnel, not only from the standpoint of danger, but also to obtain the best results possible. The fineness of the nitrate of ammonia and nitrate of soda used in the dope is an important factor, and also requires close supervision. The pressure of the tamps in the Hull machines determines the density of the charge, and also determines the number of sticks that a 50-pound box will contain. All dynamite and gelatin is tested before shipment by experienced chemists who are at all times in touch with the main station, where their work may be verified or amplified.

The report of the "Technical Department" has been enlarged its activities and scope that it is now properly designated as "The Service Division". The consumer is usually made through the Branch Offices, which are distributed all over the country. Each branch office is supplied with on or more trained service men, in addition to the regular sales force, whose members are in most cases themselves well trained in explosives. The service man, however, gives his undivided attention to the needs of the operator. His reports are referred to the Service Division of the Main Office. This division cooperates with the Experimental Stations and laboratories and consults them whenever necessary.

The consumer, or engineer, therefore, has at his command a highly trained organization of field men, chemists and engineers specializing in explosives. This organization has complete equipment with which to work, and has at its finger tips the collected information gathered from others, as well as valuable experience gained from years of specialization.

The progressive mining engineer and operator, therefore, will confer with the division of the explosive business for the following reasons:

1. To make a careful analysis (if he has not already done so) of methods and techniques obtained on his work where explosives are being used, with the object to increase their efficiency.

2. To keep in touch with the latest improvements, both in the explosives and in explosive developments in explosive practice.

3. To have a ready source of information and assistance to which he can turn when the necessity arises.

4. To fulfill the highest ideals of his profession by turning his own experience on the necessary work to be done in a channel where they are most likely to be used in a way that will make them available.

5. To do the above work more efficiently than it can be done by himself.


By-Product Furnaces in the Cement Industry, Concrete, Dec., 1916, vol. 9, No. 6, pp. 57-58.


Enormous Deposits of Potash on Which America May Draw. Manufacturers' Record, January 17, 1918, vol. 72, pp. 67-68.


E. A. (Deals with fieldspars as a source of potash.)


Potash from Blast Furnaces. The Mining Magazine, London, vol. xvii, No. 2, February, 1918, pp. 57-58 and 104-106. (Refers to a paper on the manufacture of potash in English iron blast furnaces, read by Kenneth M. Chance before a meeting of the Cleveland Inst. of Engrs., held at Middlesbrough in January, 1918.)

Application of the Cotrell Processes to Foundry Dust Problems; a paper presented by H. D. Rieger, at the Milwaukee Meeting of the American Foundrymen's Association, October 7, 1918.


RED CROSS EXPEDITES WAR RISK CLAIMS.

The Red Cross Homes Service has been designated as the official clearing house for all soldiers' inquiries regarding War Risk Insurance. At a conference of organizations co-operating with the Bureau of War Risk Insurance, Director R. C. Holmes-Jones announced this plan to aid former service men to facilitate adjustment of their allotment and allowance accounts, compensation and claims, and re-instatement of lapsed or canceled insurance.

These figures are given by the Bureau of Statistics. The figures are short. The Agnacuate Mines alone produced and exported more than the figure given for total export. The figure for manganese is the value of 1,938 metric tons. More than 20,000 metric tons were exported.

MINING.

Fighting Mine Fires. (M. & S. Press, October 30, 1920.)

In combating a mine fire, the handling of the gases is of the utmost importance. The gases from a mine fire are a mixture of carbon monoxide, hydrogen, and water vapor. These gases are highly toxic and can cause death in a very short time. The chief causes of fires are:

1. Defective electrical equipment.
2. Incendiary or carelessness.
3. Spontaneous combustion.

Three principal gases are encountered:

1. Carbon monoxide. The presence of this gas can be detected by use of small birds or mice.
2. Carbon dioxide. Has no poisonous effect on human system, but is dangerous in that it replaces oxygen in the air.

METALLURGY.


Manganese shortage experienced by American steel manufacturers has led to a search for new and satisfactory substitutes. Some new deoxidizing alloys for steel have been tried. However, none of these have proved satisfactory. The new deoxidizers mentioned in this article are the result of empirical development. To date most blast furnace design has been the result of empirical development. The practical furnace operator deserves credit for the progress made in advanced furnace design. This advance has been a logical one in the operator's attempts to design a furnace which will offer the least resistance to the rapid and uniform descent of the blast and at the same time permit the blast to burn more completely.

DESERT PROSPECTING.

By Leroi A. Palmer. (C. & M. E., November 3, 1920.)

Those interested in desert prospecting may be interested in the various geologic and topographic conditions characteristic of arid regions. Disintegration of desert rocks is largely due to the extreme temperature changes. Erosion by elements is of considerable importance. Although there are no perennial streams, and the mean annual rainfall is low, the precipitation on the higher slopes from year to year is considerable, and this precipitation may be concentrated in a few heavy storms, with consequent desert floods, which exert tremendous forces, washing away great quantities of rock and tearing huge gorges in the slopes.

Trade News.

The Blast Furnace Hearth. By Walter Mathesius. (C. & M.E., November 3, 1920.)

Although the theory of blast furnace process has received much attention, little has been paid to furnace design. To date most blast furnace design has been the result of empirical development. The practical furnace operator deserves credit for the progress made in advanced furnace design. This advance has been a logical one in the operator's attempts to design a furnace which will offer the least possible resistance to the rapid and uniform descent of the blast and at the same time permit the blast to burn more completely.
the furnace gases to rise through this stock column with equally regular and uniform velocity and distribution.

R. W. P.

PERSONALS

Louis Cohen's address is 228 W. Irvington Place, Denver, Colo.

Orville R. Whitaker has just returned from Denver to a trip to Mexico.

Stuart S. Bruce is now residing at 153 Olive Street, Victoria, B. C., Canada.

Thos. L. Chapman is located at 902 North Kingsley Drive, Los Angeles, Calif. Archibald L. Levy has legally changed his name to Archibald J. Lyane. He is now residing at 445 Sheridan Road, Winnetka, Illinois.

Walter D. Abel, recently of Mackay, Idaho, has moved to 3979 Sacramento Street, San Francisco, Calif.

N. G. Coserous, of Creede, Colorado, attended the recent convention of the American Mining Congress.

Robert I. Kirchman, of Silver City, New Mexico, attended the American Mining Congress Convention, which was held in Denver during the week of November 15th to 20th. Kirchman is developing a manganese-silver property at Silver City.

Samuel M. Soufford, consulting engineer at the Snelling Department of the American Smelting and Refining Co., Salt Lake City, Utah, attended the American Mining Congress Convention in Denver.

Carl L. Kliatt and Miss Clara Cooper were married in Denver on November 8th. After a short honeymoon the couple will make their home in Blaine, Arizona.

Karl L. Koelker attended the Mining Congress Convention in Denver. He is engaged in zinc mining in the Picher District, Oklahoma.

Frank L. Pintman is at Puyallup, Wash.

P. J. McGuire is at Delta, Colorado, installing sugar machinery for the Dorr Company.

Wayne A. Harrod has been examining some mining properties in southern Arizona.

Walter N. Ralph has gone from Morenci, Arizona, to Tyrone, New Mexico. He is with the Burro Mountain Copper Co.

Thos. H. Allan has decided to remain in the Yukon this winter for the Forty Mile Power and Dredging Co.

Ernesto Ornelas and Miss Virginia Morran were married at Washington, D. C., on October 27th. They will reside in Chihuahua City, Chihuahua, Mexico. Ornelas is Secretary of the Compania Minera de San Juan, S. A., in the Santa Elena District.

Joan E. Graham recently resigned as sales engineer for the Ingersoll-Rand Co., and has accepted a position as geologist with the Huasteca Petroleum Co., Tampico, Mexico.

George G. Goodwin and Miss Gail Hamilton were married in St. Louis on November 11. After a short trip to New York Mr. and Mrs. Goodwin will reside at Fresno, Cal., where Mr. Goodwin is engaged in the tent and awning business.

EX-MINES NOTES.

V. O. Robbins has resigned his position with the Southern Anthracite Coal Mining Co., to become senior mining engineer for the McAlester Fuel Co. at McAlester, Okla.

James Ord is with the Burro Mountain Copper Co. at Tyrone, New Mexico.

SCHOOL NEWS.

During the week of November 5th to 12th the following prominent men gave addresses to the students on various topics relating to the human element in industry:

Mr. Litchy, Vice-President of the Colorado Fuel & Iron Co.

Robert Linton, President of the North Butte Copper Mining Co.

Frederick Ringle, Director of Industrial Service Movement, New York.

G. F. Blessing, Dean of Engineering, Swarthmore College, Pa.

Clarence Howard, President of the Commonwealth Steel Co., St. Louis, Mo.

J. G. Ricebusch, President of the Butler Paper Co., Appleton, Wis.

John Frey, Editor of the Iron Molders' Journal, Cincinnati, Ohio.

C. J. Hicks, Executive Assistant to the President, Standard Oil Co of New Jersey.

Dr. W. Gunnsaulus, President of Armour Institute of Technology.

The meetings were well attended and proved very instructive to the students. The speakers, without exception, were very eloquent and their appeals convincing.

ATHLETICS

1920 CONFERENCE FOOTBALL STANDING.

<table>
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<th>Team</th>
<th>Won</th>
<th>Lost</th>
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<tr>
<td>Mines</td>
<td>6</td>
<td>D. U. 16</td>
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It was a sad and pathetic day for the Mines when they journeyed to Broadway Farm to play Miners. In fact, the loss added a new gloss to the better. The lone Mines score came about when Jordan hurled the pigskin to McCallon, who got away for a touchdown. McCallon is by no means a ten-second man, but he sure did clip the record in that thirty-five yard run through the entire D. U. backfield for a touchdown. Jordan failed to kick the goal. The score ended with the score 9 to 6. It was to be expected that the Mines would come back in the second half stronger than ever, but somehow the new enemy punch was conspicuous for its absence.

The game evidently was a "freak", for, within two weeks later, the Mines beat D. U. in a practice game by four touchdowns.

The line-up follows:

MINES D. U.

Mitchell............L. E.............Dill McCallon
Clough.............G. C.............Morrissey
Hyland..........C................Finegold
Squires........R. G.............Coben
Mackabine.........R. T.............Hinchion
Linderholms.........E. E............K. McCauley
Poulin..............Q. B.............McCauley
Roberts.............L. H.............Williams
Davis...............R. M.............Merrill
Johnson.............F. P................Gibson

Substitutes for Mines—Dute, Peete, Miller, Farlow and Swift.

Officials—Shepardson, referee; Bannach, umpire; Schnee, first line.~m.~

Mines 0; Colorado U. 7.

In a sea of mud the Ore Diggers and Colorado U. battled for sixty minutes with the odds always against general play, but the Diggers came out on the losing end of the score 7-0. The State men proved to be the better mud-hens in the first period and quickly rushed the ball through the Mines territory for a touchdown. This ended the scoring, although the Mines goal was threatened several times during the rest of the game, but each time the Mines line held firm. Boulder apparently had

Mines 0; Colorado U. 7
nothing but straight line bucks, which were ineffective. This was notably true in the final period, when Colorado had the ball twice within the Mines 10-yard line, first down, and failed to put it over. In each instance they hit the line right through center.

The heavy field gave little opportunity to display anything of a startling nature. Straight football featured the contest, with now and then an attempt to make something by the overhand route. Just three forward passes were completed in the hour of play, Mines getting two.

McGlone played exceptionally well at full-back. This was his first game at that position. His plunging was hard and consistent, and twice he broke through for long gains, once going fully thirty-five yards. He was about the only man that could gain consistently for the Miners. Defensively the Mines team played a strong game, holding well at critical times. "Red" Mitchell and Robertson, at right and left, respectively, played strong and consistently.

The line-up follows:

Mines \[L. H. Schrepferman\]
\[R. H. Linderholm\]
\[L. G. Brown\]
\[R. E. Brown\]
\[L. H. Thompson\]
\[R. E. Schaefer\]
\[E. M. Butts\]
\[J. W. Crawford\]
\[J. E. Noggle\]
\[C. Vidal\]
\[H. B. Fulghum\]
\[J. E. Parkinson\]
\[J. E. Parkinson\]
\[R. T. Franklin\]
\[R. T. Franklin\]
\[R. T. Franklin\]
\[R. T. Franklin\]
\[R. T. Franklin\]

Substitutes—Bunte, Houssels, Townend, Davis.

Officials—Crowley (referee), Bansbach (umpire), Schenker (head-linesman).

The 1920 football season was brought to a close on Thanksgiving Day when the team journeyed to Colorado Springs to play the Tigers. In the first half the team played stellar football. The half closed with the Miners on the big end of the tally, Mines 7; C. C. 0.

In the second half the Miners apparently thought for a time that they could rest on their laurels, while C. C. went into the period with thirteen men, including the referee and the head linesman. The Tigers in this period made two goals from placement and a touchdown, the game ending 18-7.

It was a great game. The Ore-Diggers had eleven men playing their hardest at all times, the gas buckets and Mitchell and McGlone were, without doubt, the best players of the Mines.
COLORADO SCHOOL OF MINES
GOLDEN, COLORADO

UNEXCELLED
LOCATION
AND
EQUIPMENT

A State institution in which tuition is free to bona-fide residents of Colorado. Offers four-year courses in Metal Mining, Coal Mining, Metallurgy and Mining Geology, leading to the degree of Engineer of Mines. Graduates generally in demand by best mining companies; employment secured through Capability Exchange maintained by the Alumni Association.

A well-equipped club and gymnasium provide social diversion and athletic training.

For further information address
THE REGISTRAR, COLORADO SCHOOL OF MINES, GOLDEN, COLORADO

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Clothier and Furnisher

Sole Agents: Arrow Collars and Shirts
"SINCERITY" CLOTHES
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For best results, the mine should be laid out systematically with just enough loading machines in each section to keep one cutting machine busy. For instance, Figure 1 shows a system of ten rooms. In rooms 1 to 5 are loading machines; in rooms 6 to 10 a Shortwall machine. Each room is loaded out in half a shift—one gathering Locomotive will handle cars for the five loading machines. If fairly good sized cars are used.

Figure 1—System of Mining suggested for adoption with Coal Loading Machines.

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