VOL. X NOVEMBER, 1920 No. 11

COLORADO SCHOOL OF MINES MAGAZINE

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COLORADO SCHOOL OF MINES MAGAZINE

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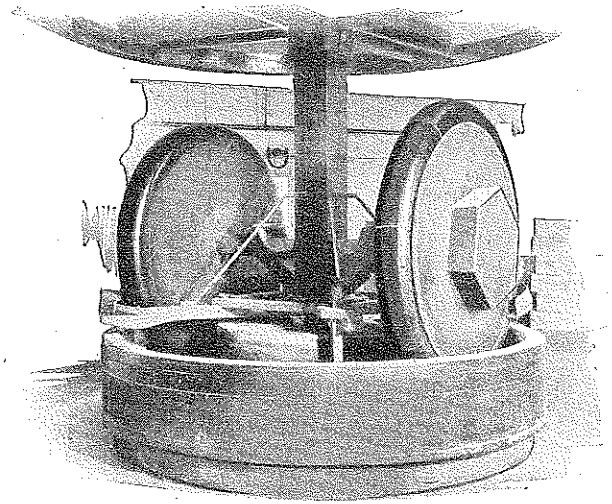
VOL. X GOLDEN, COLO., NOVEMBER, 1920 No. 11

CONTENTS

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 1866, 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.

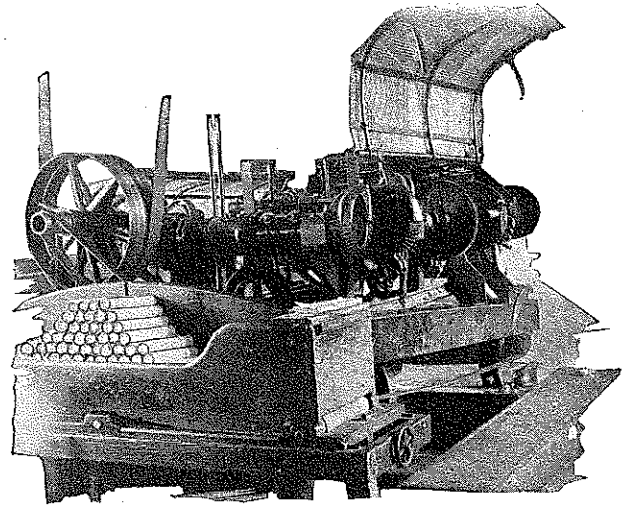


Dynamite Mixing Machine.

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 nitroglycerin at one operation, consuming 7,000 pounds of mixed acids and about 1,200 pounds of glycerin. After all the glycerin has been slowly added to the nitrator, 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 recoveries 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.

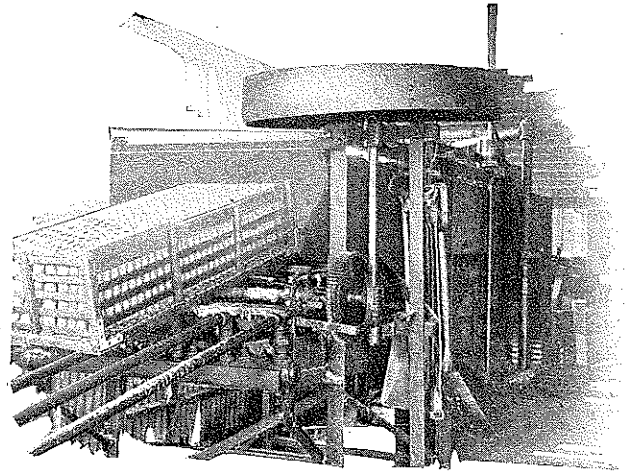
The absorbent material known as dope is prepared by mixing and screening proper proportions of dry and ground nitrate of soda, nitrate of ammonia, wood pulp, flour, starch, sulphur, chalk, etc., and is taken in fibre barrels to the mixing house and put into a dynamite mixing machine, an illustration 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



This Machine Manufactures the Paper Shells.

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. 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.

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 parafined 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 180 to 200 per minute. They are packed loosely into crates and taken by a traveling chain through a chamber, where

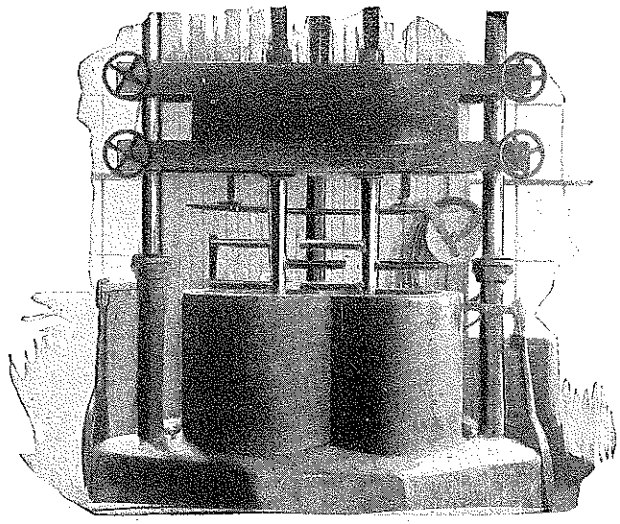


Spraying the Empty Shells with Molten Paraffine.

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. These cartridges of dynamite are then carried in 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 600 pounds of the gelatin for each charge. The mixed gelatin looks very much like ordinary dough made from war flour, although the taste may be somewhat different. This is shoveled out into 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 prod-



A Gelatin Mixing Machine.

uct must be held at a minimum, due to the serious effect water has on the ageing and strength of dynamite and gelatin.

The manufacture of nitroglycerin requires the closest supervision, 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 Hall machines determines the density of the finished dynamite and also determines the number of sticks that a 50-pound box will contain. All dynamite and gelatin is tested before shipment by obtaining samples daily, and analyzing these to determine the degree of accuracy with which the ingredients have been employed.

EXPLOSIVES SERVICE FOR THE ENGINEER.

By N. S. Greensfelder, '12.*

To obtain the E.M. degree within the allotted time requires the study of numerous subjects in a relatively short period of time. This most of us realize 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 skim over many of the subjects, which, had time permitted, could have very profitably and properly been delved into deeper. Take, for example, the subject of explosives. The writer remembers his efforts expended in helping to advance the tunnel under Mt. Zion. In this work the mysteries of the crimping cap, fuse, primers, drilling, loading and shooting a round of holes were duly expounded. 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 hardly to be expected, therefore, that the mining engineer should possess sufficient knowledge or data to efficiently undertake blasting problems that arise 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 personable equipment obtainable. It maintains laboratories at each of its plants, manned by trained chemists who are at all times in touch with the main station, where their work may be verified or amplified. A department at the Home Office, formerly known as the "Technical Department", has so enlarged its activities and scope that it is now properly designated as "The Service Division". Contact with the consumer is usually made through the Branch Offices, which are distributed all over the country. Each branch office is supplied with one or more trained service men, in addition to the regular sales force, whose members are in most cases themselves well trained in explosives practice. 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 by others, as well as its own valuable experience gained from years of specialization.

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

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

(2) To keep in touch with the latest improvements, inventions and general 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 experiences and conclusions into a channel where they are most likely to be used in a way that will make them available to others.

* Hercules Powder Co., Wilmington, Del.

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RED CROSS EXPEDITES WAR RISK CLAIMS.

The Red Cross Home 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. G. Cholmeley-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.

Formerly the soldiers' queries came to various co-operating organizations, resulting in much duplication of investigation. Now all inquiries received by the various organizations will be referred to the Red Cross, checked against their records and forwarded to Washington.

TRADE NEWS.

The Denver Fire Clay Co. of Denver, Colo., have recently issued a new catalogue on oil shale equipment. Every one interested in oil shale technology will be interested in this catalogue.

TECHNICAL REVIEW

GENERAL.

Mineral Resources of the Belgian Congo. By Sydney H. Ball and Millard K. Shaler. (E. & M. J., October 23, 1920.)

The Belgian Congo presents a field of vast resources and great expansion. Already there are over 1,000 miles of railroads. Hydroplanes are used for passenger, mail and express service. The labor is cheap, and work can be done at a low cost. However, as is so often the case, the natives are not disposed to work, and labor shortage is a chronic cause of complaint. Most of the high positions are held by American engineers, and there is great opportunity here for the young engineer to obtain an executive position at good pay. R. W. P.

MINERAL PRODUCTION OF COSTA RICA.

The Mineral Production of Costa Rica for 1919 as expressed by the statistics of exportation was as follows:

Gold	$1,557,473.00
Silver	21,456.00
Manganese	645.978.00
Total	$2,224,907.00

This total amounts to a little less than $1,000,000.00 U. S. Currency.

These figures are given by the Bureau of Statistics. The figures are short. The Aguacate Mines alone produced and exported more silver than the figure given for total export. The figure for manganese is the value of 7,861 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 gas presents a much bigger problem than the actual putting out of the fire. The chief causes of fires are:

1. Defective electrical equipment.
2. Incendiarism 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.

3. Sulfur Dioxide. Causes disagreeable and irritating feeling in the throat.

R. W. P.

Desert Prospecting. By Leroy A. Palmer. (E. & M. J., October 30, 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 force, washing away great quantities of rock and tearing huge gorges in the slopes.

R. W. P.

METALLURGY.

New Deoxidizers for Steel Manufacture. By J. R. Cain. (C. & M. E., November 3, 1920.)

Manganese shortage experienced by American steel manufacturers has led to a co-operative investigation to select some new deoxidizing alloys for trial in steel manufacture. There is not enough high grade manganese ore for the needs of the steel industry, although there is a considerable amount of ore which can be used if necessary to make deoxidizers containing less than the 80 per cent ferromanganese preferred by steel manufacturers. Seventy-three deoxidizing alloys have been found to be available. This is reassuring. R. W. P.

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 the credit for the progress made in advanced furnace design. This advancement has been a logical one in the operator's attempts to design a furnace which will offer the least possible resistance to a rapid and uniformly regular descent of the stock and at the same time permit

the furnace gases to rise through this stock column with equally regular and uniform velocity and distribution.

R. W. P.

An Improved Greaves-Etchells Electric Furnace Installation. By Edw. T. Moore. (C. & M. E., October 27, 1920.)

The Halcomb Steel Co. has recently placed in operation two 3-ton electric furnaces of a new type, manufactured by Electric Furnace Construction Co., of Philadelphia. This installation features independent regulation of the electrodes, means for distributing surge over all primary supply phases in case of a short circuit on one arc of an electrode, and a means of checking short circuits and surges. A very detailed account is given with numerous charts and diagrams.

R. W. P.

OIL.

Gasoline Cracking Processes. By Fred W. Padgett. (C. & M. E., October 10, 1920.)

The large amount of gasoline being used at the present time requires some consideration of the methods by which it is produced, and is the reason for the varied experiments to increase its production. At the present time the methods of production may be separated into five general divisions, each division including many modifications of the processes mentioned.

1. The Burton process depends upon vaporization of the crude oil under high pressure and temperature.

2. The Greenstreet method is based upon the mixing of the oil vapors and steam.

3. The Aluminum Chloride process, in which anhydrous aluminum chloride is heated and stirred in a still with the oil. Only 15 per cent yield is obtained.

4. The Dubbs, Jenkins, and Bacon methods are combinations of two or more of the above.

5. The Cherry, Ellis and Coast processes include principles not in any of the above, but do involve similar apparatus and the use of pressure. In the Cherry process, a silent electric charge is used. In the second, air is mixed with the fuel, and by the combustion of a portion of the oil, the heat necessary for cracking is generated. The third depends upon the introduction of hot gases and their contact with the oil spray.

R. W. P.

PERSONALS

'97.

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

'98.

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

'99.

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

'06.

Thos. L. Chapman is located at 902 North Kingsley Drive, Los Angeles, Calif.

Archibald L. Levy has legally changed his name to Archibald L. Lynne. He is now residing at 445 Sheridan Road, Winnetka, Illinois.

Walter D. Abel, recently of Mackay, Idaho, has moved to 3897 Sacramento Street, San Francisco, Calif.

'07.

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

'09.

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.

'10.

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

'14.

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

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

Frank L. Pittman is at Puyallup, Wash.

'15.

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

'16.

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.

'18.

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

'20.

Ernesto Ornelas and Miss Virginia Moran 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 Eulalia District.

Juan E. Serrano recently resigned as sales engineer for the Ingersol-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, Calif., where Mr. Goodwin is engaged in the tent and awning business.

EX-MINES NOTES.

'12.

V. C. 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.

'15.

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

SCHOOL NEWS.

During the week of November 8th to 12th the following prominent men gave addresses to the students on various topics relating to the human element in industry:

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

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

Frederick Rindge, 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. Rosebush, President of the Batten 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. F. W. Gunsaulus, 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 convinc-

ATHLETICS

1920 CONFERENCE FOOTBALL STANDING.

School	Won	Lost	Tie
Aggies	4	0	1
Boulder	3	0	2
C. C.	3	1	1
D. U.	1	4	0
Mines	0	5	0

Mines 6; D. U. 16.

It was a sad and pathetic day for the Mines when they journeyed to Broadway Park to play "Ministers"; in fact, the less said about the game the better. The lone Mines score came about when Jordan hurled the pigskin to McGlone, who got away for a touchdown. McGlone 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 first half 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 or other the necessary punch was conspicuous for its absence.

The game evidently was a "freak", for, but 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.	Iliff
McGlone	L. T.	Dickinson
Clough	L. G.	Morrisey
Hyland	C.	Finesilver
Squires	R. G.	Cohen
Gibbons	R. T.	Hutchinson
Linderholm	R. E.	K. McCauley
Poulin	Q B.	J. McCauley
Robertson	L. H.	Williams
Davis	R. H.	Mitchell
Jordan	F. B.	Gibson

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

Officials—Shepardson, referee; Bansbach, umpire; Schaefer, head linesman.

Mines 0; Colorado U. 7.

In a sea of mud the Ore Diggers and Colorado U. battled for sixty minutes with the odds about even on general play, but the Boulderites came out with the big end of the score of 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 them for downs. Boulder apparently had

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 overhead 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 half respectively, played strong and consistently.

The line-up follows:

MINES		COLORADO
Fisk	L. E.	Noggle
Crawford	L. T.	Zuckerman
Parkinson	L. G.	Thompson
Hyland	C.	Vidal
Squires	R. G.	Britzman
Gibbons	R. T.	Franklin
Linderholm	R. E.	Brown
Jordan	Q. B.	Willard
Robertson	L. H.	Schrepferman
Mitchell	R. H.	Starks
McGlone	F. B.	Fulghum

Substitutes—Bunte, Houssels, Townsend, Davis.

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

Mines 7; Colorado College 13.

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 Mines 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 13-7.

It was a great game. The Ore-Diggers had eleven men playing their hardest at all times of the game. Bunte and Mitchell and McGlone were, without doubt, the best players of the Mines. Bunte punted and passed to perfection; Mitchell gained consistently on end runs; while the manner in which Big Mac bucked the line and handled passes was beyond criticism.

The Ore-Diggers were penalized several times without apparent cause, which without doubt helped the Tigers materially. One of the penalties which seemed out of place was given because one of the Mines players allowed his vocabulary to run away with him. Evidently the referee was afraid that the "dainty pink shells" of the fair C. C. co-eds would be offended.

Between the halves there was a grand and glorious tangle. Evidently the C. C. crowd figured that if they could not beat the Miners on the gridiron, they might be able to beat them in a free-for-all. They did'nt. The big "Cop" hailing from the Springs, who received a "shiner" in the melee, will give full and detailed account as to the prowess of the "Ore Diggers" in this respect.

The Mines lineup follows:

Fiske	L. E.	Linderholm	R. E.
Crawford	L. T.	Jordan	Q. B.
Parkinson	L. G.	Bunte	L. H.
Hyland	C.	Mitchell	R. H.
Squires	R. G.	McGlone	F. B.
Gibbons	R. T.		

Mines Freshmen 27; Sacred Heart 0.

In one of the best football games witnessed this season, the School of Mines Freshman eleven defeated the fast Sacred Heart College team by the score of 27 to 0. The Mines plunged down the field four times for touchdowns, and three times the goal was kicked. The Mines had things their own way all through the game, and although the lighter Jesuits played hard at every stage, the "Fighting Frosh" were too much for them. Many of the freshmen are up to varsity standard and the showing they are making this year presages excellent material for next year's varsity eleven.

Guardere, Petru, Livingston, McWhorter, Cunningham, Jecusko and Ferguson were the stellar men for the freshmen.

Inter-Mural Basketball.

The Inter-mural basketball tournament will be held commencing December 6th. The Betas, Kappa Sigs, S. A. E. and Sigma Nu fraternities will be represented. The Barbs, Latin Americans and Freshmen will also enter teams.

Glaze hopes to uncover some new material by means of this tourney. Last year the tournament was won by the Barbs.

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