A two-page illustrated article describing the conditions that require large quantities of timber, with methors of placing.

Mining, Preparing, and Coking Coal, Mines and Minerals. Vol. XXXI, No. 3, p. 171.

A descriptive article on the plants and methods used at Marting, West Virginia.

Compressed Air Plant, by Robert Peele. John Wiley & Sons, Publishers; $3.00.

Of this book Professor A. J. Hoskins, of the Colorado School of Mines, says: "Two years ago Professor Peale brought out his splendid work entitled, "Compressed Air Plant for Mines." This new publication is really a second edition of that first book, and it would seem that the change in title is really unwarranted except possibly upon the basis of a briefer or handier nomenclature. This new edition is really intended for the use of mining men, since, with the addition of the four new chapters it is a valuable reference work for every official about a mine plant. There are over 200 illustrations, so selected as to render the text matter fully intelligible, and the whole book is written in language that will serve all classes of readers. The book is sure to prove popular as a college text-book.

To give an idea of the scope of this work, it may be explained that there are two chief parts, the first dealing with the Production of Compressed Air, while the second handles the Transmission and Use of this same medium of power. A few of the salient points given discussion are: development of air compressors; relative advantage of compressed air and steam for use about mines; types of compressors; theory of compression; details of valves and valve gears; efficiencies; receivers and coolers; governors and unloaders; effects of altitude on compression; explosions in compressors; compression by falling water; conveyance of air in pipes; air-driven engines; causes, phenomena, and preventation of "freezing"; reheating; air rock drills of all kinds, with consumptions and efficiencies; coal-cutting machinery; mine pumps operated by compressed air; air lift systems; air locomotives for mines.

METALLURGY, CHEMISTRY AND ASSAYING.

The Parke's Process for Desilvering Lead, by John K. Archer.

Mining World, Oct. 15, 1910, p. 701.

A three-column article, giving some of the practical details of the process as used in Australia.

The New Clancy Method of Ore Treatment.

Mining World, Oct. 15, 1910, p. 713.

This is a three-page article, and is a copy of the patent specifications.

Electrolytic Copper Refining in Australia, by G. H. Blakemore.

Engineering and Mining Journal, Vol. XC, p. 717 and p. 769.

These two articles by the same author give in detail the practice at Lithgow, New South Wales.

Zinc Ore Dressing in Colorado, by H. C. Parmelee, Metallurgical and Chemical Engineering, Vol. XIII, No. 10, p. 568.

Describes the methods in use at the Marion Mines and Mills Company plant in Custer County, Colorado.

Smelting Briquetted Zinc Ore, by T. J. Hoover.

Engineering and Mining Journal, Vol. XC, p. 323.

Gives the results of tests made on briquettes made from mixed concentrates.

Basic-Lined Converters for Leady Copper Mattes, by R. R. Moore.

Engineering and Mining Journal, Vol. XC, p. 263.

Discusses the successful operation of basic lined converters.

Fume Filtration for the Production of Pure Spelter, by J. S. G. Primrose.

Engineering and Mining Journal, Vol. XC, p. 415.

Describe the process in use at Irvine, Scotland.

The Electrolytic Determination of Zinc in Ores, by Geo. Kemmerer.

The Journal of Industrial and Engineering Chemistry, September, 1910, p. 375.

The author, after exhaustive tests, concludes that zinc can be accurately determined, electrolytically, provided the proper amount of sodium hydroxide is used in the electrolyte, and the proper strength of current is used; also, that it is more rapid than the usual gravimetric methods.

Analytical Methods in the Cananea Laboratory, by F. G. Hawley.

Engineering and Mining Journal, Vol. XC, p. 647.

This is a four-page article describing the methods and routine followed in the determination of ore, fluxes, and furnace products.

The
COLORADO SCHOOL OF MINES MAGAZINE

RESCUE CARS OF THE BUREAU OF MINES.

One of the first important acts of the new Bureau of Mines, under Director Joseph A. Holmes, is the extension of the mine rescue work that has already been started by the Technologic Branch of the United States Geological Survey, by the establishment of mine rescue cars. These cars will be able to accomplish more than a permanent station could, in that the latter has only a limited field, but the cars can be taken into every small coal camp in their assigned districts and can train a greater number of coal workers in rescue work.

The Bureau of Mines has purchased six Pullman cars from the Pullman Car Company, and is having the necessary alterations made. These altered cars will be delivered to the government for the nominal sum of $1,500 each, a great reduction in price, as they are valued at $10,000 each. Free transportation for the car and its crew is furnished by the railroads.

The cars are divided into two sections, one the living quarters for the crew and the other the "smoke room," which contains the rescue equipment. The living quarters consist of a bathroom, with a shower bath, a pantry, and kitchen, office, with desk, and four berths; in all sufficient room to accommodate the crew of four men, which consists of the mining engineer in charge, one first-aid man, one helmet expert, and the cook. The other part of the car is called the "smoke room," as this part can be filled with smoke or other noxious gases and the value of the rescue apparatus demonstrated. The lower berths have been removed so that there is sufficient floor space to carry on the work of demonstration and provide room for the rescue apparatus. In the case of necessity this part of the car can be used as an emergency hospital and the patients can be placed in the upper berths.

The rescue equipment consists of ten Draeger oxygen helmets and accessories; six large tanks charged with oxygen at 2,000 pounds pressure for charging the smaller helmet tanks; two Draeger Pulmoters for producing artificial respiration; pump for charging the small oxygen cylinders; stretchers; chemical fire extinguishers; first-aid packets, which contain bandages, gauze, surgeons' box and other necessary supplies; Wolf safety lamps and Hubbell electric lamps; axes and crowbars.

For a period of two years the Draeger apparatus will be admitted free from import duty by special act of Congress.

Two cars are now completed, and one has been assigned to the Colorado, New Mexico and Arizona coal fields, with headquarters at Trinidad, Colo. One of the first trips of the car after its arrival at Trinidad was made to Golden, Colo., on November 8, the day before the Delagua explosion, to show it to the students of the Colorado School of Mines. Prof. J. C. Roberts, formerly Professor of Metallurgy at the above school, mining engineer in charge of the car, assisted by T. W. Tweeddale, helmet man, a former student of the school, and a first-aid man, gave an interesting lecture to the students on the object of the rescue service, together with demonstrations of first-aid principles and the use of the rescue apparatus. As stated by Prof. Roberts, the main object of the rescue service is one of instruction along lines that will familiarize the mine workers with the use of the rescue apparatus, so that they will not, through ignorance or gross carelessness, cause mine fires and explosions; also to impress upon the mine officials the value of the apparatus in case of explosions and fires so that they will avail themselves of the opportunity to purchase the equipment before the import duty is again placed on it, and to maintain rescue corps at their respective mines. The car will visit each mine in its district, and with the permission of the mine officials will endeavor to train thoroughly at each mine four crews of eight men each, two crews to be inside men and the other two to be outside men. The reason of this arrangement is obvious; in case the inside men are caught in an explosion there will still be two crews left to carry on the rescue work till other help arrives. The training begins by sending each man into the "smoke room" without a helmet, so that he may find out that he cannot breathe. He will then be sent in with a helmet, and will stay in two hours, which is as long as the supply of oxygen in the apparatus will last. In this way he will learn to have confidence in the helmets, so that he will not be afraid

to go any place in them. After a crew has become familiar with the helmets they will be sent into the mine to build stoppings, clear away falls, and do other work which they might be called upon to do when serving on a rescue party. By doing this they also become used to working with a forty-pound weight on their back, and learn in addition how to save their strength.

Methods of dressing wounds and the placing of splints on various forms of fractures will be taught, so that in case of accidents the injured man will be turned over to the doctor in better condition than he would be otherwise.

When the car is away from headquarters the mine operators in the district are notified each day where it is located, so in case of an explosion no time will be lost in locating it. Upon receipt of a message announcing some disaster the car will leave immediately for the scene, using the first available engine, and will have right of way over other trains. On arrival at the mine the crew will aid in every way possible.

It is the present intention of the Bureau of Mines to station cars in the following places: Rock Springs, Wyo.; Salt Lake City, Utah; Wilkes-Barre, Pa.; Knoxville, Tenn., and Evansville, Ind.

DETERMINING THE SUN'S DECLINATION FROM AN OLD EPHEMERIS.*

(By A. W. Warwick.)

Engineers working in isolated parts of the world encounter many unforeseen difficulties This is especially true in regard to surveying problems. Several years ago, while in Mexico, I had occasion to determine the true meridian. The ephemeris for the current year had been sent for, but had been intercepted or lost in the mail. The problem was to obtain the declination of the sun for the current year from a previous year's ephemeris. Of course, this problem could be solved by the ordinary astronomical computer's methods, but these are generally beyond the mining engineer's skill, even if he had the necessary elements for making the calculation.

Under such circumstances an easily remembered rule which can be applied mentally is useful and accurate enough for all ordinary surveying purposes. The rule is:

Take out the declination for the corresponding date in the previous year's ephemeris as well as the hourly difference in seconds; move the decimal place one figure to the left and call them minutes. Add or subtract, inversely as the declination north or south is gaining or losing.

*Engineering and Mining Journal, August 13, 1910.

Principle of the Rule.

The principle of the rule is simple. The solar year is approximately 365¼ days. The normal calendar year is 365 days. Hence the calendar year gains six hours on the solar year. It is obvious,

	Deg.	Min.
Dec. of sun June 1, 1909.....N	22	0.5
Diff. for 1 hour 20.8 sec.: correction		2.08
Dec. of sun June 1, 1910.....N	21	58.42
Check with ephemeris 1910....N	21	58.50
Error	0	0.08

therefore, that the declination of the sun for noon, June 1, 1910, should be the same as the declination of the sun at 6 a. m. June 1, 1909. Hence, by multiplying the hourly difference in seconds (June 1, 1909) by 6 and dividing by 60, gives the correction, in minutes, to be applied. The declination is gaining north, hence the correction must be subtracted, and the result is the sun's declination for noon June 1, 1910.

It is obvious that if the ephemeris is two years old the correction to be applied must be multiplied by two. Of course, this correction takes no account of the change in the sun's declination due to precession, etc. Remembering, however, that the year would be 20 minutes longer if there were no precession, the declination can be calculated for the current year, even from an ephemeris 10 years old.

Leap year causes no confusion if one remembers that the date in leap year corresponds to the date of the previous year plus one, after Feb. 28. Thus, March 2, 1908, corresponds to March 3, 1907. Hence to calculate the declination March 2, 1908, from the ephemeris for 1907, the following steps are taken:

	Deg.	Min.
Dec. of sun March 3, 1907..... S	7	8.09
Diff. for 1 hour 57.26 min.: correction		5.67
	S 7	14.57
Ephemeris 1908 gives..... S	7	14.50
Error	0	0.07

The sun's declination was diminishing, hence the correction was added. It is interesting to note that, allowing 20 minutes each year for precession, the declination for Jan. 1, 1910, was calculated from a 1902 ephemeris, with an error of five seconds, which is quite negligible for the surveyor's purpose when using a light mountain transit.

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Editorial

The recent disaster at Delagua is keenly felt by the Alumni Association and the Colorado School of Mines, in that one of our members, Willis W. Evans, class of 1908, was one of those who passed out of this life as a result. Until recently he was engineer at the Starkville mine, and after the explosion of that mine aided in the rescue work as a helmet man. Shortly before the explosion at Delagua he was placed in charge of the Colorado Fuel and Iron Company's rescue car. Upon receipt of news of the Delagua explosion the car was ordered to the scene. On entering the mine, shortly after the arrival of the car, four miners were found in one of the entries, where they had saved themselves by bratticing themselves in a room where the air was still fair. In their weakened condition they could not be safely carried through the foul air in the entry. Evans gave his oxygen helmet to one of them, and was himself overcome by black damp shortly after the party left him in the room in which the men were found, where he was to remain till they returned. All efforts to revive him were of no avail. The body was brought to Denver, where it was buried Sunday, November 13, 1910

His death is felt by this magazine, in that he was the first to respond to the call for contributions, writing the "Starkville Mine Explosion," which appeared in the November issue, and had promised another article on rescue work at a later date.

As a result of the recent coal mine disasters, the special session of the Legislature, shortly after the Starkville explosion, passed a resolution authorizing the Governor to appoint a commission to investigate the causes of mine explosions and to formulate remedial legislation and report to the Eighteenth General Assembly. It is the intention to use the report as a basis to formulate new mining laws to better protect life and property.

The commissioners are: Chairman, President Victor C. Alderson, of the Colorado School of Mines; Professor John B. Ekeley, of the University of Colorado, and Deputy Mine Inspector James Dalrymple.

Athletic News.

TIGERS WIN FROM MINERS.

SCORE, 8-0.

Colorado Springs, Colo., Oct. 29.—The fiercest football battle ever witnessed on Washburn field ended at dusk tonight with the score of 8 to 0 in favor of Coach Rothgeb's Colorado College Tigers and the Miners from Golden, the nothing end of the deal. It was a case of the new style of football against the old, and speed vs. beef, as the Miners outweighed the Tigers four pounds to the man.

The Tigers more than held their own in the first two periods, and then turned in and literally ran the Miners off their feet in the second and third. While the only touchdown of the game was made in the second period, when Vandemoer crossed the line with a beautiful interference for the necessary yard and a half, the ball was in Mines territory every minute of the last two periods, and the Tigers failed to carry the ball over at least half a dozen times when within the five-yard line by using the forward pass when straight football might have netted them a much larger total. Not a Tiger was forced to leave the game, while Coach Stuart was forced to put in a half dozen new recruits in the last period to relieve men who were either so thoroughly exhausted that they could not stand on their feet or were laid out by the fierce onslaught of the Tigers' speedy backs. No one, however, was seriously injured, although the Mines had a large hospital list. Except for a little stiffness the Tigers are in as good condition as when they entered the game.

Tigers' Line in Great Form.

One of the big surprises of the contest was the way the Tigers' line, playing low, rushed the heavy Mines forward off their feet and time after time ripped great holes in the line, allowing their backs almost a clear field. Not once during the entire game did the visitors make their distance, they being forced to kick or try a forward pass on every third down. The Tigers, on the other hand, covered the necessary ground through the line and around the ends repeatedly during the first and second periods and almost at will in the third and fourth.

Another surprise of the game was that the Tigers, although they persistently tried the forward pass, in which they were supposed to be so skilled, worked it successfully not more than four or five times. Their failure to pull it off is attributed by Coach Rothgeb to the fact that the Mines used undue interference, carefully violating the rules so that the officials could not see their work.

Vandemoer a Star.

The bright star of the game was Captain Vandemoer of the Tigers. Van was simply irresistible. Every few minutes he plunged through the line, skirted the end or carried the ball through the mass of players on a trick formation that brought the two thousands fans to their feet, wild with excitement. Even after he was tackled he frequently gained his feet before the ball was declared down, and continued on his march toward the goal line. He also outkicked Slattery an average of twenty yards to the punt.

But Vandemoer had a close rival in Wolf, the plucky Mines' quarter. Wolf wriggled, twisted, jumped, sprinted and crawled, until the fans became fairly electrified. His run down the field after catching a punt was one of the most spectacular features of the game, that was full of sensations.

No Score in First Period.

The first period of the game ended 0 to 0, although there was a dispute toward the close of the period as to whether a punt caught by a Tiger behind his goal was a safety or a touchback. It was clearly a touchback, however, and all the officials so ruled with one accord. This was ten minutes after the game opened and came when the Miners were forced to kick from the 35-yard line, where they secured the ball on a Tiger fumble. This was the only time in the game that the Miners looked really dangerous. From then on Rothgeb's lightning-like machine wound up, and it was simply a question of how large a score they could roll up against a team that was just a little slower, but none less determined.

Only two goals were attempted during the game, and both of these were by the Mines in the first period, and neither came close. The Tigers did not kick, because their old standby, Van Stone, is out of the game for the season.

Following is the line-up:

MINES.	COLORADO COLLEGE.
Zwetow, r. e.	Thompson, l. e.
Rockwood, r. e.	Bowers, l. t.
Eaton, r. t.	Hedbloom, l. g.
Young, r. g.	Witherow, c.
Mertes, c.	Black, r. g.
Davis, l. g.	Cook, r. t.
Cadot, Gregg, Calvert, l. t.	Sinton, r. e.
McGuire, Marshall, l. e.	Reed, q. b.
Wolf, q. b.	Vandemoer (capt.), r. h. b.
	Heald, l. h. b.
Slattery, r. h. b.	Acker, f. b.
Myers, Gregg, f. b.	
Douglas, l. h. b.	

Officials: Referee—Witham (Dartmouth). Umpire—Patton (Nebraska). Field Judge—Force (California). Head Linesman—Brandenberg (Denver).—Denver Post.

DENVER UNIVERSITY BEATS MINERS;

SCORE, 17-0.

Smashing line plunges, brilliant end runs, sensational punting and other old-time football features made the game at Union Park November 5 the best contest of the season here, Denver University getting away with a victory over the School of Mines by the score of 17 to 0. The best team won.

Time after time Clem Crowley circled the Mines' ends and time after time Walker plowed through the Mines' line. These two players were the bright particular stars of the game, and both showed form which entitles them to a place on the All-Colorado team for this season.

The Mines' rooters were out 500 strong and made enough noise to satisfy the crowd of 5,000 people which was present. The Ministers also had their shouters, but the Mines outyelled D. U., even though the former lost the game.

The Miners were beaten for the good and sufficient reason that they could not play the game as well as can the Ministers. When Crowley would start to circle the ends he would be protected by almost perfect interference, but when a Miner was sent around he had to go it alone.

It was the general opinion of those who saw the game that taken man for man there was little to choose between the teams, but Coach Koehler of the Ministers has taught his men to play together and has pounded a lot of good old plays into them, while Coach Stuart of the Miners has failed to bring out all that is in his men.

This condition is particularly noticeable in the kicking department. Yesterday the Miners were outkicked almost two to one, and this in the face of the fact that Stuart is considered a great kicker and the proper man to develop material.

There was very little of the new football attempted by either team yesterday with the exception of the quarter-back line plunges made by Walker. Forward passing was not frequent and was markedly unsuccessful except in one or two instances. Both teams started out to play regular football, and it must be said that the D. U. boys proved to be the better at this game. The Miners fought every inch of the way, but could not stand against the mass plays of the Ministers.

The Miners looked better in the first period than at any time during the game. Then they kept the ball in Denver's territory most of the time, and showed great defensive strength.

Crowley and Walker cut loose in the second period, and after only a few minutes of play advanced the ball from Denver's 15-yard line to the other end of the field, when Walker went over for the first touchdown and kicked goal. The Ministers continued to batter away at the Mines' line throughout the period, and the pounding began to tell on the Miners, but they prevented further scoring.

Zwetow kicked off for a touchback at the opening of the second half, and the ball was put in scrimmage on Denver's 25-yard line. Line bucks, quarter-back and end runs, during which Crowley covered twenty-seven yards, Koonsman thirty-two, and Walker twenty-eight yards, were worked, and Koonsman went over for a touchdown. Only once did a play fail, and that was when Crowley was thrown back for a slight loss. Walker failed to kick goal.

The last score came in the last period, which opened with the ball in the Miners' possession on their 50-yard line. Slattery tried a forward pass, which Large captured. Crowley went through for ten yards, and Walker added five by a quarter-back run. Herbert was held, but Walker made up the distance with a forward pass to Crowley, which was good for twenty-seven yards, placing the ball on the Mines' 15-yard line. Koonsman went through for eight yards, and Walker got one more. Koonsman got two yards, and then went through the line for a touchdown, Walker kicking goal. The line-up:

MINES.	D. U.
Douglas, r. e.	Herbert, l. e.
Eaton, r. t.	Curtis, l. t.
Young, r. g.	Fike, l. g.
Mertes, c.	Sterling r. g.
Davis, l. g.	Taylor, r. t.
Calvert, l. t.	Darden, c.
Marshall, l. e.	Large, r. e.
Woolf, q. b.	Walker, q. b.
Slattery, r. h.	Bailey, l. h.
Myers, f. b.	Crowley, r. h.
Zwetow, l. h.	Koonsman, f. b.

Substitutes: Cadot for Mertes; Wettengill for Herbert; Gregg for Myers; Arthur for Slattery; McGuire for Marshall. Touchdowns: Walker, Koonsman (2). Goals: Walker 2. Umpire: Cotton. Referee: Main. Field judge: Steele. Head linesman: Cates, —Denver Post.

MINES DEFEAT WYOMING.

SCORE, 9-8.

There was a near mine disaster out at Union park November 8, and Ted Stuart's eleven from Golden came mighty near being the victims. For the greater part of the

game with the University of Wyoming the Mines was forced to play on the defensive, and it was only a break in the luck which gave them a 9 to 8 victory.

With the score 8 to 3 in favor of Wyoming, and less than six minutes to play, Quarterback Burgess of the Cowboys made the mistake of accepting a kick-off on his five-yard line instead of allowing the ball to go across for a touchback, which would have resulted in Wyoming getting the pigskin at their twenty-five yard line for scrimmage. Burgess followed this error of judgment by another mistake when after catching the ball he walked up the field instead of running. Had he ran he would have returned the ball thirty or thirty-five yards, for the Miners were slow in getting down the field. But instead he walked and trotted leisurely up to the twenty-yard line, and when a Mines man tackled him he dropped the ball. It was recovered by the Mines and the touchdown quickly followed. When Wolfe kicked the goal it gave his team the victory.

The game was witnessed by a fair-sized crowd. Despite the fact that Wyoming is not in the Rocky Mountain Conference, and the games it participates in have no bearing on the championship, there were several hundred fans on hand, and they were well rewarded.

Captain Douglas of the Miners won the toss-up and chose to kick off. The ball went over the goal line, and was brought out to the twenty-five-yard line and put in scrimmage by Wyoming. Two line plays failed, and Burgess punted to Wolfe at the middle of the field. The Mines' quarterback made a brilliant twenty-yard return before he was downed. On the first two plays Wolfe and Douglas made ten yards, and on the next six plays the Mines back field carried the ball to the fifteen-yard line, where the Cowboys held them. On a third down Wolfe dropped back to the twenty-two-yard line and made a drop kick.

In the second period Wyoming started off with a rush, and it looked for a few minutes as if they would carry the ball clear across the field for a touchdown. However, they slowed up after getting within the Mines' thirty-yard zone, and the Mines promptly punted. There were several exchanges of punts. Burgess slightly outpunted the Miners' kickers, but the brilliant manner in which Wolfe ran the ball back more than offset this. Toward the latter part of the period the Miners did much better work, and by a series of line plunges, in which Wolfe figured extensively, dashing end runs and several well-executed forward passes carried the ball almost to the goal line.

The Mines did its best playing of the game early in the third period. After Wyoming received the kick-off they punted to Wolfe, who returned to the center of the field. The Mines then carried the ball thirty yards and finally lost it when a forward pass was intercepted. Burgess was forced to punt, and again the Mines came down the field, only to lose on downs at the thirty-yard line. An exchange of punts netted Wyoming about twenty yards, and then the Cowboys delivered the goods in the most approved fashion. Dashing end runs and short forward passes carried the ball to the Mines' twenty-yard line, and after two line plays failed Grant forward passes to C. Jones, who dashed across the Mines' line for a touchdown. Burgess missed the goal from a difficult angle.

Early in the fourth period the Mines attempted to punt at their thirty-five-yard line. The ball was blocked by Staugh of Wyoming, and after a general scramble by all the players, Hill of Wyoming recovered at the 15-yard line. The Cowboys could not gain and Burgess dropped back to the twenty-yard line and drop kicked, making the total score for Wyoming 8.

On the kick-off by the Mines, Burgess caught the ball on his five-yard line instead of allowing it to go across for a touchback, and the Mines scored a touchdown and goal, as previously explained, making the total score one point in their favor. The line-up:

WYOMING.	MINES.
Fuller, l. e.	Rockwood, r. e.
Price, l. t.	Zisch, r. t.
H. Hill, l. g.	Cadot, r. g.
J. Jones, c.	Young, c.
Covert, r. g.	Davis, l. g.
Pitz, r. t.	Calver, l. t.
C. Jones, r. e.	Zwetow, l. e.
Burgess, q. b.	Wolfe, q. b.
Irish, l. h. b.	Archer, r. h. b.
Oviatt, r. h. b.	McGuire, l. h. b.
Grant, f. b.	Douglas, f. b.

Officials: Main (Dartmouth), referee; Owens (Columbia), umpire; Steele, field judge; Brandenburg, head linesman. Time of periods, 12 and 15 minutes.

As a curtain-raiser to the Mines-Wyoming game, the Mines freshmen downed the South Denver High School eleven by a score of 24 to 10. The high school boys were outweighed and outplayed. The Mines freshmen put up a rattling good game, and are a decided credit to Grant Stuart, the former Dartmouth player, who coached them. There is some fine material on this eleven, which will come in handy for the Mines 'varsity next season.—Denver Post.

MINES FRESHMEN WIN, 10-6.

The Mines freshmen defeated Sacred Heart College at football November 19 in a stubbornly fought contest, 10 to 6. An exhibition of old-style football against new was given, with the odds by far in favor of the old. Time and again the freshmen carried the ball down the field by a series of line bucks and end runs. The Miners would probably have run up a larger score but for the short periods and the deep sand that covered the Sacred Heart college grounds.

Sacred Heart played a scrappy game, but the lighter college team could not gain an inch on the freshmen except with trick plays. Neither side was able to score during the first period. Sacred Heart pulled off some pretty forward passes, but the Jesuits were thrown for a loss every time they tried straight football. The freshmen scored on a safety near the beginning of the second quarter, when King's punt was blocked by a Sacred Heart man behind the goal line. Another safety was scored by a blocked kick behind the goal in the third period. A touchdown was made in the third quarter on straight bucks and end runs. Tolman kicked goal.

Sacred Heart made its only score early in the third quarter by a trick play. Cain ran forty yards for a touchdown, and King kicked a difficult goal.

The 'varsity had no workout yesterday, and attended the freshmen game. Line-up:

FRESHMEN.	SACRED HEART.
Ellis, l. e.	Bigley, l. e.
Essic, l. t.	Cain, l. t.
Jackling, l. g.	Cook, l. g.
Caldwell, c.	Pass. c.
Taylor, l. g.	Dalavan, l. g.
De Lathe, r. t.	Vaughan, r. t
Bettles, r. e.	King, r. e
Pearce, q. b.	Purcell, q. b.
Tolman, r. h.	Hughes, r. h.
Wuensch, f. b.	T. Cook, f. b.
Anderson, l. h.	McGannon, l. h.

Referee: Ted Stuart. Umpire: McAndrews. Field judge: Slattery. Head linesman: Floyd. Time of periods: 5, 10, 10, 15 minutes.—Denver Post.

COLORADO CONFERENCE GAMES.

The following games have been played to date, and will give an idea of the strength of the other teams in the league:

Denver University, 0; Marquette, 0
Denver University, 17; Wyoming, 3.
Denver University, 0; Nebraska, 27.
Denver University, 0; Utah, 20
University of Colorado, 11; Utah, 0.
University of Colorado, 44; Aggie, 0.
University of Colorado, 14; Wyoming, 0.
Colorado College 21; Utah 17.
Colorado College, 24 Aggie, 0.
Colorado College, 23; Wyoming 0.

THE UNIVERSITY OF COLORADO DEFEATS THE MINES.

SCORE, 19-0.

College Notes.

Work on the new ore-testing plant is now progressing rapidly. The foundations have been in place for some time, but as the structural steel was not forthcoming, very little was done until about the first of November. The steel is now on the ground and is being rapidly put in place by the structural steel workers.

ENGINEERS' CORPS.

Several weeks ago General John Chase gave a talk to the students in the Integral Club on the proposed engineers' corps to be organized by the National Guard of Colorado. This movement progressed rapidly and resulted in a detachment being mustered into the service of the State by Adjutant Smith, November 4, 1910. This is a new departure in military affairs, as this is the only engineering corps in the West.

The officers elected are Joseph C. Taylor, Chaplain, and L. K. Taylor, First Liuetenant. About thirty Miners have joined the company so far. The drills will be held in the armory, over Koenig's store, on Tuesday night of each week.

TECHNICAL AND ENGINEERING SOCIETY.

The first meeting of the Society was held Thursday evening, October 28, in the Geology lecture room. The meeting was called to order by Emory M. Marshall, who then introduced the speaker of the evening, Frank E. Shepard, President of the Denver Engineering Works.

Mr. Shepard delivered an interesting and instructive talk on the subject of "Coarse Crushing," which was highly appreciated by those present. After the lecture, points which were not quite clear were explained more fully.

It is hoped that Mr. Shepard can be induced to favor the Society with lectures on other phases of crushing and ore dressing in general.

Y. M. C. A. Notes.

WEEK OF PRAYER WAS OBSERVED.

All over the world, during the week of November 13th, meetings were being held in observance of what has become known among Young Men's Christian Associations as the Week of Prayer. At the School of Mines five meetings were held in Guggenheim Hall, beginning Monday evening at 6:30, when Judge Edwin Van Cise was the speaker. Judge Van Cise chose as his subject "Duties and Responsibilities of Leadership" and made one of the finest addresses of the year. He spoke from the viewpoint of the teacher, the lawyer, the business man, the engineer and the politician, and proved conclusively that every professional man owed a duty to those in his vicinity, and that he was responsible for performing that duty. Mrs. Patton's vocal solo was very enjoyable.

Joel T. Traylor, a young business man of Denver, spoke Tuesday night on the popular topic, "The Square Deal." In his treatment of the subject Mr. Traylor showed that the man who lived according to this idea profited reflexly by so doing. The special music was a delightful solo by Mrs. C. R. Burger.

Wednesday night the special music consisted of two violin solos by W. H. Neiswender, '12, who is a player of ability. The speaker was Prof. G. M. Butler and his subject was "Good Citizenship." Those who have heard this speaker need not be told that he gave an excellent address.

Few business men are strong public speakers, but in the Business Manager of the Denver News, James T. Temple, there is a marked exception. He spoke on "Christianity, a Working Force," and crowded more solid proof into a twenty-five minute address than anyone expects to hear in an hour ordinarily. No one could go from that meeting doubting that Christianity is working today as it has, and always will continue to work. A vocal solo by Mrs. T. C. Doolittle, beautifully given, was the musical offering for the evening.

At the closing meeting of the week Dr. C. B. Wilcox, of the Trinity Methodist Church in Denver, spoke in his forceful manner on "The Call to Moral Heroism." He scored the men who claim to be Christians when in a nonchristian country, and who are ashamed to be known as Christians at home. Moral heroism is as much needed now as in the time when the early church was being persecuted. Mrs. Burger sang again at this meeting and added greatly to the enjoyment of everyone present.

MISSIONS AND MISSION STUDY.

Dr. John Inglis, formerly physician and surgeon in charge of the large American hospital in Peking, China, during the Boxer trouble and subsequent siege of the city of Peking, was the speaker Nov. 22nd. Dr. Inglis raised the question, "Do Missions Pay?" and answered it in the affirmative so decisively that the 45 people present will doubt it no longer, if they ever had doubts. Taking the commercial side as an example Dr. Inglis showed that every dollar invested in Foreign Missions brings forty dollars in trade to this country. He told of one small church in Peking where 58 out of 60 Christians were killed rather than give up their new faith, which shows that these people are worthy of having this religion taken to them.

A canvass for the enrollment of men for the study of some of the great Mission fields resulted in the decision to start at least two new classes, one for China, and one for South America. Men desiring to enter either of these classes will please hand their names to V. C. Robbins, '12, or to the General Secretary, at their first opportunity.

RELIGIOUS MEETINGS.

Guy V. Aldrich, Traveling Secretary of the Student Volunteer Movement, and J. W. Nipps, State Student Secretary of Colorado, spent two days at the School of Mines recently. Mr. Aldrich, in addition to addressing the largest student meeting of the year, spoke before three of the four Fraternities in their chapter houses, where he was entertained, and before Tau Beta Pi in their room in Guggenheim Hall.

Mr. Aldrich is particularly interested in Missions and contends that it is the duty of every Christian man to decide whether or not he should have a part in taking a knowledge of his belief to those who have never heard of Christianity. He made a strong impression upon the men here and has been the means of starting a class for the study of conditions in the great mission fields. It is expected that other classes will be started in the near future to investigate conditions in particular fields, as in China, Japan and South America.

THE ENGLISH CLASS FOR CHINESE STUDENTS.

A class has been formed to help the Chinese students to overcome their difficulties in mastering the English language, and to acquaint them with the technical expressions so common in this school. This class is in charge of Henry M. Showman, '10, Instructor in Mathematics, and meets every Wednesday evening at 7:00 p. m. Dr. V. C. Alderson has been a constant attendant and has greatly helped the men by his suggestions, advice, and encouragement.

THE STUDENT VOLUNTEER CONVENTION.

Closely following the visit of Mr. Aldrich a Convention was held at Colorado College in the interest of the Student Volunteer Movement. The School of Mines was represented by six delegates, and all the Colleges of the State were represented. Addresses were made by President Slocum of Colorado College; Dr. John Inglis, formerly surgeon in charge of the great American hospital in Peking, China, during the Boxer uprising; Rev. Moore, who but recently returned from his work in Korea; Arthur Rugh, Intercollegiate Secretary for China, now on furlough; Guy V. Aldrich, of New York City, and several less noted men and women.

The Alumni.

WILLIS W. EVANS.

Willis W. Evans, known as Farmer Evans to all those who were in school with him, was killed at the Delagua mine November 8, 1910.

Evans entered the Colorado School of Mines in Setember, 1904. His only schooling previous to this had been obtained during his three years' attendance at a small country school house. This, with what individual study he could find time for, was his sole preparation, not only for the entrance examinations, but also for holding his own in what is known to be one of the most difficult college courses in the country. That he did hold his own, barely, at first and that he later attained a high rank among his fellows was characteristic of the man both in the classroom and on the football field. His first two years at school were notable only for steady, persistent, hard work. In the class room he was a plugger, and in football he played with scrubs. Then the efforts of work began to appear. The elements of mathematics and science acquired by most men in their preparatory course, and by him only as the pressing need for them arose in his daily work, were at last mastered, and the plugger arose to a place in the leadership of his class at the same time that the scrub became a star on the championship football team. The summer vacations were spent working in the mines at Russell Gulch for the purpose of earning money to enable him to continue at school.

After graduation in 1908 Evans went to Leadville and worked for four months as assistant engineer at the Yak Tunnel. In October, 1908, he returned to school to undertake advanced work in chemistry and also, at the earliest solicitation of the football coach, to attempt to strengthen a none too fortunate football team. These plans were cut short by the death of his father in the spring of 1909, which made it necessary for him to assume the support of his mother, sisters and brothers.

He entered the employ of the Colorado Fuel and Iron Company, working as engineer at Starkville. He took with him one of his brothers as assistant, teaching him surveying, and training him to be able to fill the position himself as a preparation for his future course at the School of Mines. While at Starkville Evans showed a keen interest in rescue work, and distinguished himself at the recent Starkville explosion for the possession of both bravery and ability. On the first of November he was put in charge of the Colorado Fuel and Iron Company's rescue car in the Trinidad district. On receiving word of the disaster at the Delagua Mine of the Victor Fuel Company this car was ordered there. At 11 p. m. some seven or eight hours after the explosion Evans with three other men, all wearing helmets, entered the tunnel and after extinguishing the fire proceeded down the entry. After going for some distance through the smoke and afterdamp they reached a place where the air was good and found four men alive. It was agreed that the best way to save these men was for two of the helmet men to give up their helmet to two of the rescued men who were to be taken out by the two remaining helmet men. This was done and Evans and one of the rescuers stayed behind with the other two rescued men. While waiting for the return of the helmets Evans started on a search for more survivors telling the other three men to stay where they were. They, however, becoming impatient, started out and succeeded in getting through the smoke safely. Three hours elapsed before Evans was found, overcome by gas. He had gone from room No 15 to No. 4 in his search. When found he was still alive but died a few hours later in spite of all efforts to revive him.

Evans was 24 years old when he died and had just begun a career, each step of which gave splendid promise for the future. He brought to bear in his work the same energy and effort which had won him success at school. His last supreme act of salf-sacrifice was characteristic of him and had been preceded by hundreds of others which while less dramatic were no less unselfish. By his death the C. S. M. loses a favorite graduate and the mining engineering profession a most worthy member but both gain a splendid victory.

M. M. STUART, '08.
C. B. HILL, '09.

PERSONALS.

'83.

Walter H. Wiley is at present making a three months' trip to various mining districts in Peru, South America.

'86.

Charles A. Gehrman, for some time past located in Goldfield and other Nevada mining camps, is now permanently located at San Francisco, with an office in the Mill Building. On November 14 he was in Golden and delivered an address on "Prospecting" to the Junior and Senior classes.

'92.

William B. Budrow, formerly connected with the mining and smelting industries at Fudicion, Senora, Mexico, is now in Guadalajara, Mexico.

'94.

At the recent election George M. Post was the successful candidate for the position of county surveyor for the City and County of Denver.

'97.

John Gross is at present in Sonora, Mexico.

Arthur H. Roller, manager of the Hudson Mill at Idaho Springs, Colo., has remodeled the mill in such a way as to decrease the cost and increase the percentage of saving by electro-amalgamation. The mill now handles custom ore on a flat rate basis and assumes all risk of loss, a radical departure from the usual custom.

'98.

J. E. Norman has been assisting J. H. Robeson, Superintendent of mines for the North American Smelting Company, of Golden, in the examination of the Santiago mines in upper Clear Creek County. The North American Company has an option to purchase the group at a stated consideration of $500,000.

'00.

Amos Slater has moved his office from the American Bank Building, Seattle, Wash., to the Henry Building, room 1043. He is making a specialty of coal examinations, and reports designs, estimates and installations of coal and coal briquetting plants.

'01.

J. W. Chandler, Jr., till recently superintendent of the MacNamara Mining Company, of Tonopah, Nevada, is now with the Birchville Mining Company, near Graniteville, California. His home address is 2815 Channing Way, Berkeley, California.

'03.

W. L. Fleming is manager of a new line of business which he has originated. He has opened offices of "The Mines Report Bureau" at 66 Broadway, New York City, to supply small investors with reliable, brief reports concerning any mining company.

'04.

Axel E. Anderson recently addressed the Senior class on "Explosives." He is with the Technical Division of the Du Pont Powder Company.

'05.

W. O. Chamberlin was married in Hinsdale, Ill., on September 21 to Miss Beatrice Hales. They are now at home, 200 Pearl street, Denver, Colo.

Frank J. Reinhart has returned to Golden from a trip to Scott's Bluff, Nebraska.

'06.

J. C. Ingersoll, of the firm of Ingersoll & Bell, has completed a survey and report of the property of the San Pedro Mining Company, of Ouray, Colo. An active campaign of development will follow as a result of the report.

H. E. Nyberg, Assistant Superintendent of the Tezuitlan Copper Company, of Aire Libre, Puebla, Mexico, has been in Denver on a vacation.

'07.

Reuben E. Knight was recently married to Miss Florence McKean in Denver, and will be at home in Alliance, Nebraska.

'08.

A. C. Ellsworth, former coach of the Mines football team, acted as field judge at the Boulder-Utah game played at Union park October 29.

'09.

Milne E. Bunger was defeated for re-election to the office of County Surveyor of Jefferson County. The successful Republican candidate, Irving B. Williams, class of 1911, won by about 300 majority.

Clarence T. Emrich is the father of a baby girl, born November 5, 1910.

The Alumni Association gave a Dutch luncheon to the graduates of the school November 5, 1910, in the Pipe and Bowl Room of the University Club of Denver. All expressed themselves as having a good time.

At the business meeting held at the same time two motions were carried, as follows:

"The Executive Committee shall have the power to call upon any of the graduates for an article to appear in the Magazine, to designate the subject, and to insist upon receiving it."

"A committee of three shall be appointed, with power to act, to assist the Assistant Secretary in devising ways and means to get in closer touch with the members of the Association and placing the Capability Exchange on a better footing."

This committee is composed of Marshall D. Draper, '97; Louis C. Cohen, '97, and Louis B. Skinner, '95.

The Committee on Instruction was called on for a report, but had nothing to offer at this time, but stated that at some future meeting they would have a report to offer.

The Committee on Athletics reported "bum."

NOTICE.

The Alumni Association has for some time been trying to locate several of the graduates. Some of these have not sent in their address for several years. If any of the readers of the magazine know the whereabouts of any of the following men, they will be helping the work along by sending what information they can to the Assistant Secretary at Golden:

Neil A. Anderson, '02.
Harry F. Bruce, '00.
Herbert A. Canning, '97.
Wm. R. Davey, '98.
Henry R. Evans, '00.
Louis D. Fry, '03.
Frank H. Jones, '98.
Robert Nye, '97.
Jacob Weil, '04.
Walter J. Atkinson, '96.
Arthur H. Buck, '97.
Frank R. Hamilton, '98.
Hugh C. Watson, '01.
Floyd Weed, '97.
R. Howard Hawley, '93.
George F. Hoyt, '96.
Gilbert E. Jewel, '93.
N. W. Logue, '97.
Robert McCart, '05.
Wm. B. Middleton, '83.
J. C. Rodriguez, '98.
Charles D. Root, '08.
Enrique A. Schuman, '97.
Burt C. Stannard, '95.
Wm. E. Newman, '96.
Horace F. Parsons, '03.
W. B. Phelps, '07.

FUTURE EVENTS.

The Freshman Ball will be held at Guggenheim Hall, Friday night, December 9, 1910. The Alumni are cordially invited to be present.

Abstracts of Current Articles and New Books.

GEOLOGY.

Prof. G. Montague Bulter.

Elementary Crystallography, by W. S. Bayley, Ph. D. McGraw-Hill Book Company, New York, 241 pages, $2.00.

It is difficult to decide just what field this volume is intended to cover, since the author states that it "does not pretend to be a treatise on Crystallography. It is merely a guide for those attempting to gain some insight into the fundamental principles underlying the science. It is not intended to be a description of crystal forms, nor an illustrated list of crystallographic symbols. It is hoped that it may serve as an aid in teaching, but it is not expected to serve as a reference book."

Unfortunately, the vagueness of this description is justified in Part I (Geometrical Crystallography), since the subject matter is often so burdened with relatively unessential details that it must prove unnecessarily confusing to the student; yet the work is not sufficiently comprehensive to serve as a general reference treatise.

That theory is exalted above practice is shown by the total lack of simple rules for the recognition of unmodified or combined forms, and of statements of the practical distinctions existing between divisions or forms that may resemble each other.

Another unfortunate feature is the general looseness of the definitions. As illustrations of this may be cited those referring to principal symmetry planes (p. 28) and to twins (p. 151). According to these, all the symmetry planes in the orthorhombic system are principal ones, and the Carlsbad twins of orthoclase feldspar are not twins at all! However, it is only just to state that the context usually supplies the essential factor missing in the definition itself.

The system followed is, in general, very similar to that taught in the School of Mines, although the fundamental concepts are not presented as simple, and, where there is a variation in nomenclature, the book nearly always tends toward greater length and difficulty; pyramids are all called "bipyramids."

To Part II. (Physical Crystallography) and Part III. (Chemical Crystallography) only praise can be given. As these subjects are not emphasized in the Crystallography course given at the Mines, they may be studied with much profit by anyone who seriously desires to become a good crystallographer and mineralogist.

The make-up of the volume leaves nothing to be desired; it is well bound in cloth, and paper, printing, and illustrations are unusually good.

MINING.

Engineering Methods Applied to Coal Mining, by Warren R. Roberts.

Mining World, Nov. 12, 1910, p. 913.

An article dealing with the necessity of engaging competent engineers to design coal mine plants along efficient and economic lines, and not depend on guess work.

Mining Coal in Southern Indiana, by L. W. Parsons.

Egineering and Mining Journal, Oct. 29, 1910, p. 869.

Gives the details of the methods employed in this field where shooting from the solid prevails. The cost of mining and amount of powder used is given.

Royalty System in the Joplin District, by Newman B. Gregory.

Mining World, Oct. 29, 1910, p. 808.

An article giving data on a new royalty scale, which is claimed to be fair to both the lessee and lessor.

The Drop Shaft Method of Sinking.

Engineering and Mining Journal, Nov. 15, 1910, p. 918.

Describes in detail the method used in sinking the Astley Green shaft at Astley, Manchester, where a strong flow of water was encountered.

Mining Methods employed at Cananea, Mexico, I., by Morris J. Elsing.

Engineering and Mining Journal, Vol. 90, p. 914.

The following methods are explained: Open cut mining at Puertocitos; square set mining; and the slicing system. The reason for abandoning the square set system in favor of the slicing method is stated.

Prospecting with Churn Drills at Miami, Arizona, by H. A. Fuld.

Engineering and Mining Journal, Oct. 22, 1910, p. 804.

An article containing much valuable information in regard to the use of the churn drill in this section.

METALLURGY, CHEMISTRY AND ASSAYING.

Present Tendencies in Cyanide Practice, by Mark B. Lamb.

Engineering and Mining Journal, Oct. 29, 1910, p. 855.

An article compiled from information furnished by cyanide superintendents. Reviews the subject from the initial crushing of the ore to the refining of the precipitates.

Slime Settler or Dewaterer, by R. E. Huntly.

Mining World, Nov. 5, 1910, p. 854.

An article giving a description and plans of a settler in successful operation at the Broomfield Con. Gold Mine, Kalgoorlie, West Australia.

The Florence-Goldfield Company's Mill, Nevada, by A. H. Martin.

Mining World, Nov. 12, 1910, p. 911.

Gives a complete description of the mill and the treatment used.

Treatment of Low-Grade Gold Ores in Brazil, by R. H. Kendall.

Mining World, Vol. 33, No. 19, p, 851, and No. 20, p. 907.

The practice of the Ouro Preto Mine is given in full under the following heads: Character of ore; treatment of ore; treatment of concentrates; treatment of rich concentrates; treatment of sands; treatment of slime; clean-up of zinc-box precipitates; and refining of gold.

Copper Precipitation in the Butte District.

Metallurgical and Chemical Engineering, Vol. VIII., No. 11, p. 614.

An article treating of the precipitation of copper from the mine and tailings water. 700,000 pounds of copper is recovered this way each month.

Zinc Ore Dressing in Colorado, II., by H. C. Parmelee.

Metallurgical and Chemical Engineering, Vol. VIII., No 11, p. 620.

Describes the method in use at the Wellington mine, near Breckenridge, Colo.

Electrostatic Separation, by H. A. Wentworth.

Mining and Scientific Press, Oct. 29, 1910, p. 567.

An explanation of the principles involved in electrostatic and magnetic separation.

A Modification of Pachuca Tank Practice, by Amos J. Yager.

Mining and Scientific Press, Oct, 22, 1910, p. 539.

An article dealing with the agitation and aeration of pulp in Pachuca tanks, with a method of increasing the aeration. Precipitation by zinc-dust is discussed.

Assay of Arsenical Nickel-Cobalt Silver Ore, by Denison K. Bullens.

Engineering and Mining Journal, Oct. 22, 1910, p. 809.

Gives a summation of the difficulties found in assaying ores of the Cobalt district, with the methods used in overcoming them. A valuable article which should be in the notes of every assayer and chemist.

The
COLORADO SCHOOL OF MINES
MAGAZINE

Yerington-Buckskin Copper District*

(By Frank A. Goodale, '10.)

The Yerington-Buckskin Copper District is situated partially in Lyon County and partially in Douglas County, in that western part of Nevada which lies between Reno and Hawthorne.

Virginia City is about thirty miles to the north; and Bodie, California, sixty miles south. A railroad is under construction at the present time by the Nevada Douglas Copper Company which will pass through the middle of the district. The name of it is "The Nevada Copper Belt Railroad." It branches off at Wabuska from the Hazen-Mina branch of the Southern Pacific. The district covers a part of Mason and Smith Valleys, both of which are fertile. The Walker River flows through Mason Valley and the upper end of Smith Valley, the water from which is used mostly for irrigation purposes. The valleys both yield bountiful crops of alfalfa, potatoes, and many other farm products, so that the cost of living is low compared with other parts of Nevada. Both Mason and Smith Valleys are from four to six miles wide, and only a part of each is irrigable with the present available supply of water.

The beauty of the valleys, with their green fields and rows of poplars, is enhanced by contrast with the barren-looking hills dividing them, and within which the large deposits of copper are contained. One writer, in describing the district, has said: "It is the only place where a miner can hit a drill with one hand and pick peaches with the other."

There are several towns in the district, the principal one of which is Yerington. It lies in the center of Mason Valley, in Lyon County, and has a population of about fifteen hundred. Yerington is the principal supply point for the district, and is very prosperous. Mason City is the next city of importance. It lies on the east side at the base of the range which contains the principal mines, and is the nearest supply point on that side. Mason City is modern and up-to-date. Good water works and sewerage systems have been installed, so that it is the ideal mining camp of Nevada. The railroad now building will run through the town.

Morningstar townsite lies on the west side at the foot of the range. It is the nearest supply point on that side and will be the terminus of the railroad. Buckskin is due west of Morningstar, about four miles distant, and is the principal town and supply point for the mines on the west side of Smith Valley.

The principal mines are in the mountain ridge dividing Mason and Smith Valleys, which is called by the Indians, "Singatse," and is also known as the Smith Valley Range. This ridge has an average width of about four miles. The general line of its crest is from 1,600 to 2,000 feet above Mason Valley, and 1,000 to 5,000 feet above Smith Valley. The average altitude of the ridge is about 6,500 feet. West of this range, across Smith Valley, is an arm branching from the Pine Nut Range of Mountains, at the eastern foot of which is the town of Buckskin, in which the principal mines of that section are located. The line dividing Lyon and Douglas counties runs through the center of Buckskin, and causes most of the mines in that part of the district to be located in Douglas county.

History and Distribution of the Mines.

The history of the district dates back thirty or forty years, but up to date only one mine, the Ludwig, has produced abundantly or continuously. Several of the mines on the east side of the Smith Valley Range supplied natural bluestone to the amalgamating mills in Virginia City during its boom days, but until the last three or four years have been idle. A couple of

*Thesis for degree of Mining Engineer, class 1910, Colorado School of Mines.

the mines at the time erected small smelteries and attempted to run on the partially oxidized ores near the surface, but no great production was attained. Later operations have been confined to exploration work and experiments in ore treatment.

The mines on the east slope of the Smith Valley Range make a chain about two miles in length. Running from north to south are the Bluestone, Mason Valley, Malachite, McConnell, and Western Nevada. Those on the west slope are the Intervalley, Martha Washington, Albany Copper Company, Honest Endeavor, Union Blue, Nevada Queen, Yerington Central, Nevada Bonanza, Ludwig and Nevada Douglas mines. East of Yerington and across Mason Valley are the Blue Jay, Bradley, Yerington, and Black Rock mines and prospects. On the Buckskin side lie the Wabuska Copper Company, Nevada Calumet, Burke and McLaughlin, Hardie, Kennedy Consolidated, Ashley Consolidated, and Buckskin Gold Nugget Mining companies.

A number of these have shipped some ore, but at present those that are working are confining their efforts to the development of the sulphide zone, or, as at the Mason Valley, to the zone of mixed oxides and sulphides. The most developed mines are on the east slope of the Smith Valley Range, except the Nevada Douglas and Ludwig on the west slope. The rest are still in the prospect class.

Geology of the District.
(See Foot Note.)

The Smith Valley Range, as has been stated before, is a low, narrow mountain ridge, dividing Mason and Smith Valleys. It merges on the north with the Pine Nut Range, and on the south spreads out broadly into a series of volcanic mesas, which connect farther south with a spur of the Sierras north of Lake Mono.

The range is essentially volcanic, but may be divided into two groups of marked difference in age and structure. The older group, or Pre-Tertiary, is made up of schists and limestones, with intrusive masses of granodiorite and related porphyries. The younger group is of volcanic origin and is non-comformable with the older altered sedimentaries and intrusive rocks.

The schists are mainly on the east side of the Smith Valley Range and are tough, dark gray rocks of dense texture. The minerals recognizable with the naked eye are feldspar, hornblende and epidote, distributed through a finely crystalline ground mass. They probably are a metamorphosed igneous rock, as the original porphyritic texture can still be recognized. The schist is cut in many places by dikes of quartz-monzonite or granodiorite, and is stained in places by salts of copper. South of Mickey Pass, on the western slope of Smith Valley Range, a similar schist occurs.

On both slopes of the range, masses of limestone are folded with the schist. These are small and isolated, as a rule.

There is one fairly continuous band on the eastern slope which contains the Western Nevada, McConnell, Mason Valley and Bluestone mines. It is about 1,000 feet wide and disappears a little north of the Bluestone. A similar band on the west slope, near the base of the range, contains the Ludwig, Nevada Douglas, Yerington Central and Nevada Queen mines.

The majority of the limestone is metamorphosed, although some of it is of the pure crystalline variety. That which has been altered contains garnet, pyroxene, amphibole, epidote and pyrite. The rocks resulting from the metamorphism of the limestone were lime silicate hornfels, and garnetiferous limestone. It is possible that some of the schists are an alteration of the limestone and andesitic rocks which has been folded and metamorphosed at the same period. The cause of the metamorphism was the intrusion of the granodiorite and related porphyries.

The granodiorite occupies, in general, that part of the ridge between the summit and eastern belt of limestone from the Mickey Pass southward. On the summit and west slope the contact is irregular and sends out dikes into the schists and limestones (of which many masses are included by these dikes). On the eastern slope, the line of contact between the limestone and intrusive rock is fairly straight and has a northerly and southerly trend. It appears to be a fault which has dropped the limestone against the intrusive rock.

The granodiorite is a rock of general granitic appearance, the constituent minerals of which are feldspar, quartz, biotite, and hornblende with secondary epidote. The plagioclase feldspar is more abundant than the orthoclase, although the rock is nearer quartz-monzonite than anything else. It is stained in many places with salts of copper, and several hills about one and one-half miles west of Yerington, thus stained, have the appearance of large masses of ore. A smeltery was erected some years ago and an attempt made to mine and smelt the copper-stained rock.

The prevailing rock in the hills east of Yerington, in which are situated the Blue Jay, Yerington and other mines, is a similar granodiorite, which shows that the rock mass was not all intruded at the same time. There is an absence of sedimentary rocks.

Note—From Bul. U. S. G. S. No. 208, Geology of Nevada, South of Fortieth Parrallel, by J. E. Spurr, and Bul. U. S. G. S. No. 380. Contributions to Economic Geology, by F. L. Ransome.

On the Buckskin side, the main mass of rock is andesite, porphyry and quartz-porphyry, similar in composition to the granodiorite of the Smith Valley Range. At the extreme northwest part of the district, wherein is located the Wabuska copper mine, the schists and limestones occur. The limestone has not been altered to a great extent and is more of a pure crystalline variety.

The second group is composed principally of Tertiary lavas, which are younger than the ores. The northern part of the Smith Valley Range is composed almost wholly of these lavas. East of the Bluestone mine there is an apparent downfault of these rocks into the older series. The strike of the flows is almost north and south, and they dip to the west. There is a thin flow of rhyolitic glass, overlaid by a thick series of flows of yellow rhyolite. These are overlaid by a coarse andesite-breccia and well bedded grits.

The newer volcanic rocks generally rest on the older schists, limestones and granodiorite, and show that the rocks were much eroded and deformed before the eruption began. On the Buckskin side there are numerous intrusions of andesite and rhyolite.

Ore Deposits.
(See Foot Note.)

There are four classes of ore deposits found in the Yerington-Buckskin district.

First: Irregular bodies formed by metasomatic replacement of limestone. Under this class may be placed the Bluestone, Mason Valley, Malachite, McConnell, Western Nevada and part of the Nevada Douglas mines.

Second: Metasomatic vein deposits and altered limestone. The only important deposits of this class are those of the Ludwig and part of the Nevada Douglas and Yerington Central mines.

Third: Metasomatic vein deposits in granodiorite. The deposits of this class include those of the Intervalley, Martha Washington, Nevada Calumet, Albany, Honest Endeavor, Union Blue, Nevada Queen, Nevada Bonanza, Empire Nevada, Blue Jay, Yerington, Bradley, and Black Rock mines and prospects.

Fourth: Metasomatic replacement in andesite porphyry. This is the class which includes the ore deposits on the Buckskin side.

Ore Deposits of First Class—Bluestone Mine.

The Bluestone mine lies four miles southeast of Yerington, about the middle of the eastern slope of the Smith Valley Range. It was worked a number of years ago, when a smeltery was built and operated for some time on the partially oxidized ores above the 100-foot level.

The development work consists of three levels, of a total length of nearly 8,000 linear feet, and connected with the surface by adits. The principal drifts and crosscuts are in ore bodies, elliptical in shape, and 400 feet long by 300 feet wide. Between 2,000,000 and 3,000,000 tons of 3 per cent. copper ore are blocked out.

The ore is contained mostly in limestone, near the contact of the rock and granodiorite. This contact is due to faulting and strikes a little east of north. Much shearing and crushing has taken place. There is no sharp separation between the ore and limestone, except a small seam on the footwall side of the ore body. There is a gradation from well mineralized to pure limestone. The ore consists essentially of chalcopyrite, disseminated through the limestone, which has been altered considerably. It is almost free from pyrite, but the sulphide takes the place of the chalcopyrite as the ore grades into country rock. Oxidation has taken place to only about the 100-foot level, while some sulphide is present in its croppings. The oxidation products are malachite, azurite, cuprite, and melachonite.

The experimental process now being used to work the ore is one of magnetic separation. The ore is crushed and slightly roasted, rendering the chalcopyrite magnetic, after which it is passed through magnetic separators.

Mason Valley Mine.

The Mason Valley mine is three-quarters of a mile south of the Bluestone. It also was worked a number of years ago. Most of the development was done by means of four adits, varying in elevation from 60 to 125 feet between each. The recent work, as in the Bluestone, has been that of exploitation.

The ore occurs in an altered limestone, which is of curved and irregular shape. The ore body is about 2,000 feet long and 150 feet wide, and occurs in the limestone in irregular masses, grading into the country rock as in the Bluestone.

The sulphide ore is essentially chalcopyrite, with some garnet, pyoxene and calcite. Pyrite is contained more extensively than in the Bluestone. Oxidation has penetrated several hundred feet and, in one of the lowest levels, there occurs a large body of rich, earthly cuprite, with much disseminated native copper. The ore will run about 20 per cent. copper. Some of the chalcocite occurs in soft, sooty condition. The minerals found in the oxidized zone are malachite, azurite, cuprite, native copper and gypsum.

Foot Note—The above four classes are according to F. L. Ransome, in Bul. U. S. G. S. No. 380.

Malachite.

The Malachite mine is situated one-half a mile south of the Mason Valley mine, on the same general zone of mineralization. There are a number of old tunnels which were worked in the early days of the district, and from which partially oxidized ore was taken, similar to that of the Mason Valley. The recent work done on the property consists of a shaft in the limestone below the old tunnels, designed to reach the ore bodies at considerable depth.

The ore bodies here are similar to those of the Mason Valley.

McConnell.

The McConnell mine is about one-half of a mile southwest of the Malachite and two miles from Mickey Pass.

The ore body, which crops for a considerable distance northerly and southerly, is about 300 yards wide and is composed of mineralized limestone. The western contact and the eastern contact is a schist. The limestone is a fine-grained, gray variety and is not much altered. The ore bodies are at the western edge of the limestone, near the granodiorite and consist essentially of the same minerals as in the previously mentioned properties.

The workings of the McConnell mine comprise a number of short tunnels and open cuts on oxidized ore, with one adit several hundred feet long in the sulphide zone. A shaft 400 feet deep was sunk in limestone near the portal of the main tunnel. The sulphide ores in this property resemble those of the Mason Valley to a considerable extent.

The Western Nevada.

The Western Nevada mine is about one-half of a mile south of the McConnell on the same mineralized belt. The ore bodies lie in a zone of mineralization about one-quarter of a mile wide, and consist of irregular bodies of sulphides and silicates. Some of the ore bodies are close to the granodiorite and some are separated by a gray, unaltered limestone.

The contact between the limestone granodiorite is due to faulting, with a fairly steep dip to the east. A seam of gouge on the footwall and the limestone hanging wall is much broken. The fault fissure is unmineralized. East of this fault there is a zone of crushing in the limestone, with quartz veins carrying pyrite, but no ore of commercial value.

There are cappings of younger lavas over the croppings of the ore bodies of this mine and the ore is practically the same as that found in the Malachite and McConnell. There are a number of old workings, mostly open cuts and prospect holes. The main tunnel is over 1,000 feet long, from which a number of drifts have been run and a winze about 300 feet deep sunk.

The Nevada Douglas Mine.

The Nevada Douglas mine is situated on the crest of a small spur, about two miles west of the Mason Valley mine, and 500 feet above the valley. The country rock consists mainly of limestone, which is extensively and irregularly altered to garnet rock. This garnetiferous limestone zone is about 600 feet wide and strikes northerly and southerly.

The ore formerly shipped was mostly oxidized material, and consisted of malachite, azurite, and chrysocolla. Below the oxidized ores, which extend to a shallow depth, are fine-grained, masses of pyrite, chalcopyrite and garnet. Some secondary enrichment of these minerals has occurred, as chalcocite shows on the surfaces and in the cracks of the older sulphides.

The old workings are rather extensive and consist of a number of tunnels, shafts and open cuts, which expose the various ore bodies over the property. A new tunnel has been started west of the old workings, about 2,000 feet, to cut the ore bodies at greater depth, but little or no work has been done of late.

The ore bodies of the first class are composed of irregular bodies formed by metasomatic replacement of the limestone, and are, in general character, unenriched contact metamorphic deposits, although they are not very closely related to the igneous contacts. They owe their present proximity to the granodiorite to faulting.

The gangue minerals are pyroxene, amphibole, epidote, garnet and calcite. The ore bodies do not, as a rule, average more than 3 per cent. copper where there has been no secondary enrichment.

The ore bodies of this class are partial replacement of the limestone by chalcopyrite, this replacement being accompanied by metamorphism of the limestone to epidote and other silicates, and by formation of disseminated pyrite. The ore deposition seems to have been completed before the limestone was faulted down to its present position. The original copper-bearing solutions presumably penetrated the limestone through small fractures under great heat and pressure. It is probable that the deposition of the ore was closely connected with the intrusion of the granodiorite.

The proofs of the metasomatic action in connection with these ore bodies are found in the general character of the deposits; in the absence of symmetrical banding or of cavities in the veins; in the irregularity in thickness of the bodies; and in the lack of freshness in the appearance of the vein matter. Well defined alterations of the original minerals into secondary ones, and some pseudomorphism, are shown. The chief alteration products are amphibole, epidote and garnet.

The ore, deposited by ascending waters, should continue to a great depth, and since the primary ores come so close to the surface, the future mining of this part of the district will depend on the handling of low grade ores. With the completion of the railroad and smelter, which are now under construction, the chief difficulties will be overcome and a large production can be expected. The development work which has been done is mostly superficial. However, the commencement of a steady production will stimulate the now inactive properties to sink deeper, and no doubt large bodies of ore extending to a great depth will be developed.

ORE DEPOSITS OF THE SECOND CLASS

Metasomatic Vein Deposits in Altered Limestone.

The Ludwig mine is situated on the western slope of the Smith Valley range at the edge of Smith Valley.

The formation around this mine consists essentially of limestone and intrusive masses of granodiorite and porphyry. Unlike the other deposits on the eastern slope of the range on which it is situated, it is lode-like in form, with a steep dip to the east. The lode is from 50 to 60 feet wide in the upper levels and was widened to 100 feet and more at the 650-foot level. The general trend of the lode is northerly. The footwall is a gray limestone, which has been very much altered to a solid, alabastine gypsum, for at least 50 feet, by acid solutions from the oxidizing sulphides. The hanging wall limestone contains garnet with other metamorphic silicates. This is cut by intruded masses of granodiorite and porphyry; these intrusives even form the hanging wall of the lode just north of the shaft.

The mine has been worked for the last thirty or forty years, more or less continuously, and has shipped, by far, the most of the ore that has been sent from the district. Until recently, it has worked through a vertical shaft 400 feet deep, with an inclined winze from the bottom of the shaft which dips about 45 degrees, to the 650 level. The work is now confined to those levels below 400 feet deep, as the ones above have been practically worked out. Within the last year, the inclined winze has been extended to the surface, through which winze the hoisting is now done.

The ore from the surface to the 500-foot level is mainly oxidized. The surface cropping is a large body of gossan, heavily stained with salts of iron. Some small stringers of azurite and malachite are enclosed within the cropping. From the surface down to the 400-foot level, the limestone is shattered and the interstices and fissures are filled with coarsely crystalline calcite. The vein matter which once contained sulphides, is now oxidized and enriched by downward working waters. The oxidized ores are malachite, azurite, chrysocolla, and earthy oxides. These are formed and concentrated in solution cavities along zones of crushing in the original vein material. The ore thus formed is in bunches distributed through the lode. Some unoxidized ore, which consists of pyrite and chalcopyrite in a gangue of calcite, garnet and quartz, remains in the south end of the 400-foot level, and shows the probable character of the primary ore. These enriched ores were very high grade and form the bulk of what has been produced. The azurite, malachite, and chrysocolla, suitable for cutting into jewelry occurred in considerable quantities, and formed a source of revenue to the original owners.

Origin of Ore in the Ludwig.

The formation of the Ludwig ore body is undoubtedly due to ascending hot waters carrying the metals and gangue matter in solution. The present condition of the deposit, however, is not due to the ascending waters alone, but to a number of stages of concentration, each concentrating the previous stage, thereby causing the ore to grow richer. This mine forms a good example of the different zones of enrichment usually met in a fissure vein.

The surface cropping is due to the combination of repeated chemical and mechanical disintegrations of the original ore body. The iron sulphides contained in the primary ore were transformed by oxidation into iron sulphates, and the copper sulphides to copper sulphates. As such, they were soluble in waters containing carbon dioxide. These downward circulating meteoric waters through various causes deposited part of their burdens as carbonates, oxides and even metallic copper. Part of the minerals in solution were carried down to or near the water level, which is about 500 feet, and were there deposited as a sulphide. There was formed a zone of secondary enrichment composed exclusively of sulphides. The chief mineral in this zone of secondary enrichment is chalcocite. The ore of the Ludwig, near the water level, has its copper content mostly due to that mineral, and the body, which is from 75 to 100 feet wide, will average between 6 per cent. and 7 per cent. copper.

Below the permanent water level the ore is leaner as the mine workings approach the zone of primary deposition.

There are now from 800,000 to 1,000,000 tons of ore developed in the Ludwig. This ore will run between 4 and 7 per cent. copper. The mine is fully equipped with all the necessary machinery for extracting the ore, and when the railroad is completed

to the property it will undoubtedly be one of the largest producers in the district.

There are also many thousands of tons of almost pure gypsum, which can be shipped and will be a source of much revenue to the company.

Part of the Nevada Douglas and Yerington Central may be grouped under this second class of ore deposits. They have not been sufficiently developed to determine the true character of their ore bodies, but it is not improbable that, with depth, they will show the same characteristics as the Ludwig.

Ore Deposits of the Third Class.

The deposits of the third class include those previously mentioned under this heading and none have been sufficiently developed to be called other than prospects. They are characterized by the development of chalcopyrite and pyrite in zones of fissuring cutting the granodiorite. In a number of them there has been some filling of open spaces, and, in others, the sulphides have developed within the rock alongside.

When there has been filling of open spaces, the workings show the ores to be chrysocolla, malachite, azurite, melachonite, bornite and covellite. Mineralization has usually worked metasomatically outward from the contact between the dikes and enclosing walls, which produced low grade sulphide deposits. These have been enriched to some extent by downward working waters. The deposits are believed to represent a stage of mineralization a little later than those of the first and second classes. The economic importance of the deposits of the third class is still unproved. There is every reason to believe, however, that there will be developed some large bodies of low grade ore which can be economically mined.

The third class deposits have also been formed by ascending hot waters, working their way along crevices and fissures, and into the country rock forming the walls, replacing it with ore. The deposition has always taken place along the walls of the channel through which the water passed, and, after filling them, the solutions have eaten their way into the wall rocks and there replaced them.

Ore Deposits of the Fourth Class.

The ore deposits of this class differ from those already mentioned, in that they contain considerable amounts of gold and silver, along with copper, lead and zinc. They occur almost entirely on the Buckskin side of Smith Valley, which is situated on the western slope of a spur from the Pine Nut Range, about 4½ miles west of the Ludwig mine.

The formation is composed essentially of andesites, rhyolites, porphyries and some diorites. Several large bodies of limonite and hematite crop along the foot of the range.

The Kennedy Consolidated is the largest and most developed mine on this side. It was discovered in March, 1906, by a prospector named Kennedy, who located the property and started the townsite, which he named Buckskin, after his buckskin pony.

A number of prospect shafts, from 50 to 200 feet deep have been put down, and those which have reached a depth of 100 feet or more encountered considerable water.

The ore occurs as a metasomatic replacement deposit in an altered andesite. The ore bearing minerals are pyrite, and sulphides of copper, silver, lead and zinc, in a gangue of quartz, gypsum, chlorite and epidote.

The veins are propylitic in type, in that the whole body in which the ore occurs is metasomatically altered. The zone of oxidation is very shallow here as the primary minerals are formed at water level, within 100 feet of the surface. They even come to the surface in places.

The deposit of the Kennedy Consolidated mine has a northerly and southerly trend. There has not been enough development work to show the limits of the ore. Several shafts were put down along the general trend of the ore body and have exposed it for at least a mile in length. Drifts from the main shaft of the Kennedy Consolidated show the body to be at that point, over 100 feet wide. The ore will run about 3½ per cent. copper, with about $2.00 per ton in gold and silver. The lead and zinc occur in small bunches disseminated through the deposits, and are not of much economic importance. It is an excellent ore to concentrate.

The croppings are considerably leached and altered and contain in places much free gold. There has been very little secondary concentration, due to the shallow depth to which oxidization has taken place.

With development large bodies of low grade ore should be exposed, which will be profitable to mine. The natural conditions are very favorable. There is plenty of wood and water within easy access, an electric power transmission line within a short distance, supplies are reasonable, the altitude and climate good, and a railroad now being built within a few miles of Buckskin.

The ore has been deposited from solution by ascending hot waters. There are many small cross veins which run into the main body at nearly right angles to its trend. Some of these are mineralized and some are not.

Conclusion.

The general character of the ore bodies of the district is that of large low grade replacement deposits. As their origin is due to ascending hot waters, they should continue to great depths. They cannot, however, be expected to get richer with depth, but on the contrary, leaner, as the primary ores come so near the surface.

The

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Editorial

When, at the beginning of the present school year, the Alumni Association employed an Assistant Secretary, it was the intention that he should place the previously established Capability Exchange on such a basis that it would be of more benefit to the graduates and undergraduates than it has been in the past. After a trial period of four months, in which the service was gratis, it has been found necessary to secure funds to carry on the work of the department properly. The income from the annual dues, paid by the members of the Association, is just sufficient to pay the general running expenses of the Association, so it is only fair that those who benefit by securing positions through the Exchange should stand this extra expense by the payment of a reasonable commission.

In the Alumni section of this issue, the action of the committee appointed to investigate and draw up the necessary plans, the ratification of these plans by the Executive Committee, and the terms of the contract to be signed by the applicants, are given more fully.

"The Assistant Secretary desires to call particular attention to the letter of Mr. Emrich, published under Alumni News, and the reply of the President thereto. The Alumni Association fails to appreciate the consistency of Mr. Emrich's position. The Assistant Secretary would be glad to receive and publish letters addressed to the monthly, discussing the criticism raised by this letter.

"How are we going to accomplish anything as an alumni association unless we pull together? Although Mr. Emrich may not feel that his brother alumni can do him any good, it is more than probable that by joining the association and lending his support and encouragement, he will be able to help them."