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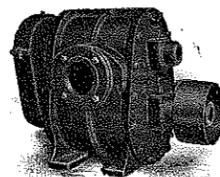
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The COLORADO SCHOOL OF MINES MAGAZINE

Starkville Mine Explosion.

*W. W. EVANS, '08

Starkville, the recent scene of one of Colorado's worst mine disasters, is four and one-half miles due south of Trinidad, Las Animas County, on the old Santa Fe Trail, and is reached by the Santa Fe main line going up to the Raton tunnel. At the point where Starkville is located the valley widens to the left, forming a splendid location for a coal camp. In the middle of this wide place, towards the east, a sharp ridge stands out on the left branch, on which 4,000 feet from the town is located the ill-fated mine known as No. 2.

This opening was started twenty-four years ago by the Santa Fe Railroad, the coal being used in operating their system. Fourteen years ago the property was taken over by the Colorado Fuel & Iron Co., who have operated it since continuously.

At one time Starkville was one of the largest producers in southern Colorado, but as property lines were reached on some sides, and the coal pinched out on others, the pillars are being drawn, so the capacity of the mine was only 1,200 tons per day at the time of the explosion.

The coal is a coking bituminous variety, with the following analysis:

Approximate	
Volatile	31.80
Fixed Carbon	52.70
Moisture	.60
Sulphur	.50
Phosphorus	.004
Ash	15.50

The slack is washed and then coked in standard bee-hive ovens.

Saturday, October 8, was a clear, warm day, as were the three days previous. The weather seemed settled, not the kind that would favor an explosion. The day shift of nearly 200 men came off at 5 p. m. As

* Engineer in charge of the Starkville mine, written by permission of J. S. Thomson, C. S. M., '00, Division Superintendent C. F. & I.

usual, both fans were running regularly, and everything had the appearance of being in its normal condition. Near 7 p. m. the man-trip with the ill-fated night shift left the tiple for the mine. On reaching the large parting on the main entrance nearly three miles from the mouth a trip of loads was picked up, and the motor returned to the outside. About 7:30, according to several witnesses, the motor was seen to leave the tiple with a string of empties. The trip was gone about 45 minutes, making it 10:15, when a sharp report was heard. This report and shock was plainly noticed by people in Trinidad. E. P. Valentine, night watchman, suspecting that all was not right with the mine, started at once for the mouth. On arriving there he found the old slope in ruins. Returning, he had the big whistle at the boiler house started, calling for help. He at once notified James Wilson, who spread the news to the surrounding country. Among the first to arrive was J. S. Thompson, '00, Division Superintendent, with T. W. Tweeddale, helmet expert, with two oxygen helmets. The C. F. & I. rescue car, which was thoroughly equipped for such work, was standing near the Santa Fe depot in Trinidad. A special engine took it to Starkville. The surrounding camps immediately sent help. Cokedale responded by sending Geo. Parker, their helmet expert, with three complete Draeger outfits, and the Stag Canon Coal Co., of Dawson sent a special automobile with Frank Wertzel, engineer, and two helmets and supplies for same. By the time that Cokedale, Dawson, and the help from the other camp arrived, Thompson and Tweeddale were leading a rescue corps with helmets into the ruins of the mine. This squad penetrated as far as the 4th South, but falls of rock and gas drove them back. The supplies for the helmets gave out and caused a retreat. This squad wanted to reach the "C" fan to see how badly it was damaged, it being the nearer of the two fans, both of which are located underground.

After the mine was further explored both fans were found to have been wrecked, and no advantage could have been gained by reaching the "C" fan. Immediately after the explosion a natural ventilation was started. The shaft at "C," which is 175 feet deep, being the return air course, and the old and new mines being the intake. This natural circulation is what enabled the men to penetrate a mile and a half on the first night before being driven back.

Further progress was blocked by the black damp, till a seven-foot, portable Stein fan could be obtained from the Robinson mine in the Walsenburg district. The fan arrived by special train at Starkville about 1 p. m., October 9. In the meantime the men at the mine were busy getting a place in readiness to set the fan. The place selected was in the air course, about 400 feet from the south of the new mine, the idea being to use both entries as intakes and force the air in, thus forcing the blackdamp back. When the fan arrived at the mouth of the mine the bed plate was taken in first. As the men were taking it through the cross-cut the ventilation suddenly changed, throwing the blackdamp out upon them, the cause of the air reversing being due to the heat. In a few minutes several men were down, but were picked up by their fellow workers and carried out. These men were near death when brought to the surface, but, by using the Draeger Pulmotor, which produces artificial respiration and forces oxygen into the lungs, all were revived.

For a while things were at a standstill, as no one dared enter the fume-laden mine. A consultation was held, and it was decided to wait till night-fall to see if the air would not change again. This proved to be correct, and at 8 p. m. the men again entered the mine. Four helmet men were stationed at the mouth of the mine in readiness to make a dash in after the men, but were not needed. All hands then started working on the installation of the fan which was put in operation after seven hours' hard work. The fan was driven by a 20 horsepower, direct-current motor, revolving at a speed of 300 revolutions per minute, which gave 50,000 cubic feet of air per minute.

On Monday morning the Engleville Mine, which connects with the Starkville at room 156, on H-1 entry, was shut down, and the main entry bratticed up and the connecting stope knocked out. The Engleville fan immediately began to pull the foul air from the Starkville. The idea seemed to prevail that the men could escape through the Engleville, but as there is about 1,000 feet of pillar drawn between the two entries this was impossible.

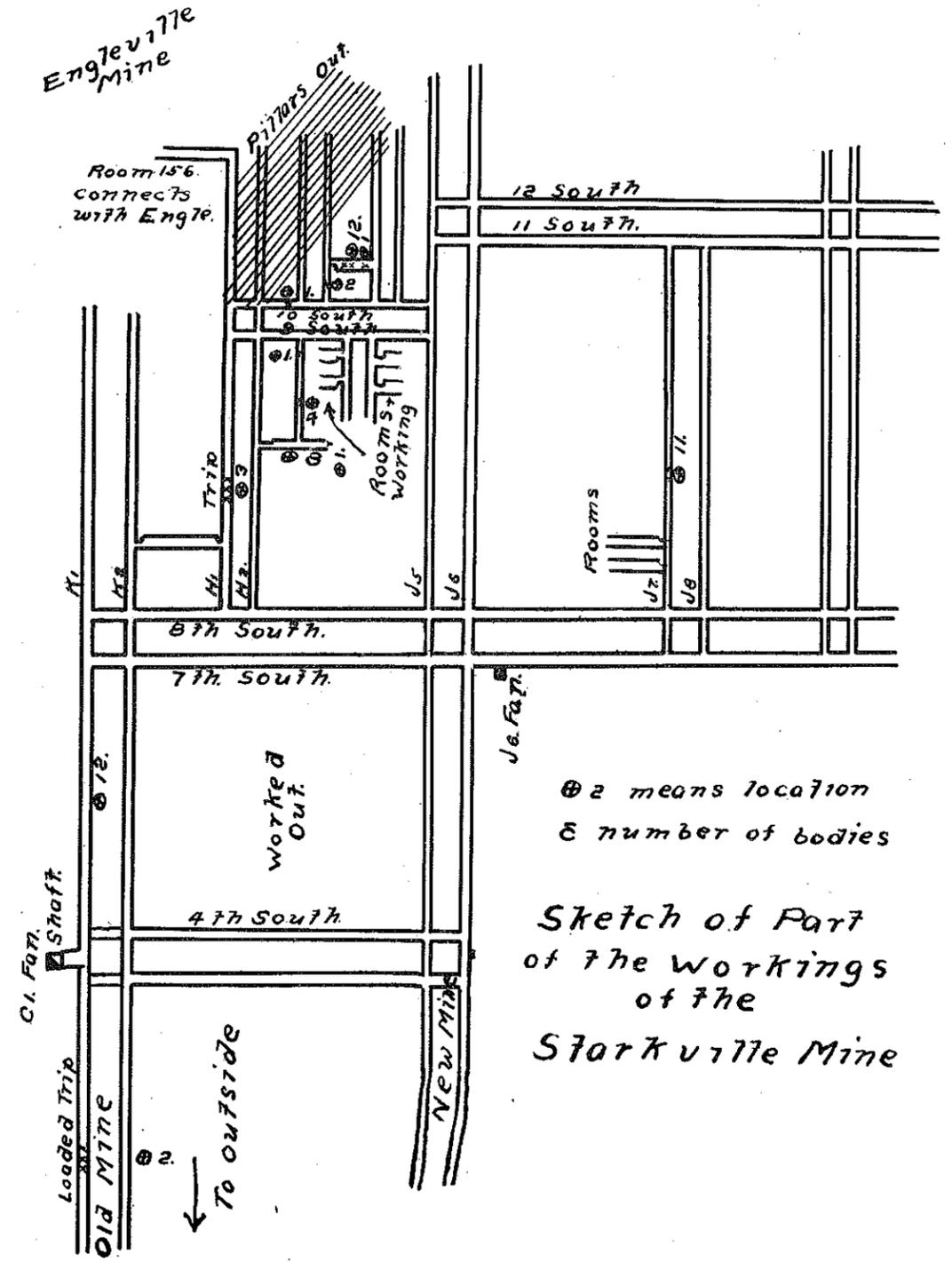
The advance into the mine was begun Monday morning. The men leading were: John Jones, State Mine Inspector; J. S.

Thomson, Division Superintendent; B. J. Manley, C. F. & I. Inspector; Chas. Chambers, Superintendent at Sopris; Chas. O'Neil, Superintendent at Tabasco; Joseph Haske, Superintendent at Primero, and others. Four helmet men, thoroughly equipped, were also in the party. Advancement was rapid as a squad had previously been sent ahead to the 4th South entry to brattice up the same, thus throwing the air straight into the mine for 9,200 feet. At a point 9,000 feet from the mouth the afterdamp was again encountered, and a hasty retreat was ordered. After a couple of hours, advance was again made, this time the 7th South entry was reached. At a point thirty feet to the right of the new entry in the 7th South entry, was located a seven-foot Stein fan, which was a total wreck. As the 7th South was reached, the nearest working places were on J-7, 800 feet to the right, and it was 1,000 feet to the nearest body. The air was turned in that direction, and by 4 p. m. room 5 on J-7 had been reached. The two shifts, following, by bratticing all leaks, were able to penetrate nearly to rooms 30-35, in which the new men worked by sending the helmet men ahead. Eleven bodies, all badly burned, were located. The two in room 30 were removed to the outside, thus the first bodies were brought to the surface 54 hours after the explosion. This is remarkable time when the distance (two and a half miles), rock falls, and gas, are considered. The day shift of helmet men removed the remaining nine bodies to a point where air had been carried so others could take them. Only one body was in any way torn apart, this body being located at room 34, in the J-7 entry. Although all the men were very badly burned, no bodies were found at the working face, which shows that all lived for a few minutes. The bodies, when found, were in bad shape, all having decayed some, which was, no doubt, due to the heat.

J-7 entry was badly wrecked, two empty cars standing on the empty track being torn to shreds. After the whole mine had been explored, this entry was seen to have been the worst damaged of all, showing that the explosion had found plenty to feed upon, and had reached a maximum at this point.

As soon as the bodies had been removed from the J-7 entry a brattice was thrown across the 7th South at the fan, forcing the air north along the 7th and 8th South towards the H-1 and H-2 entries, which run N. 75°, E. off of the 8th South. The H-1 entry was reached on the 12 o'clock shift of October 12.

The rescuers turned east along H-1 entry, and found the empty motor trip about half way up the entry, under considerable rock. On further exploration no other falls were found, although the H-1 entry was



timbered due to being "squeezed" in several places. This shows that the explosion was not very violent at this point, having again nearly died away. Three men were found on the motor, all badly burned, showing the flame had been very hot at this point, and on a subsequent trip coke was found on the "in-by" side of timbers and cross-cuts. The coke was deposited in globules and was of a silvery color, no burned dust being found. The explosion seemed to have traveled inward at this point, the deposits of coke on the "in-by" side showing that the explosion was traveling at a great speed. When the coke is deposited on the side from which the explosion is traveling, it denotes that the explosion is moving slowly. Thus, by watching the deposits of coke the speed of the explosion can be determined. Experiments by the U. S. Bureau of Mines show that these explosions travel with a speed of 1,500 feet per second and upwards.

When the day shift of October 13 was going in to work, temporary retreat was caused by the air leaking into the old working, and forcing the after-damp out into the air-way. To remedy this evil the shift immediately started bratticing up all old workings leading off in the air-way. As these workings were considerably cut up, this work was, necessarily, very slow. This latter shift removed the bodies from the motor and found eight more in an old room between H-1 and H-2 entries. All these men had their dinner pails with them, which seemed to be empty. This latter fact caused many to believe that the men had lived several hours after the explosion, but this was proven not to have been the case by the finding of four more men in the H-2½ entry, about 350 feet from the above eight, with supper still in their pails.

One of the two drivers who worked in this part on the night shift was found with the eight men above mentioned. When found he was about 1,500 feet from his mules, so there must have been some warning before the actual explosion took place to cause the men to start out. Only one of the eight men showed any signs of being burned.

After the old working had been bratticed up, the air was forced ahead into the unexplored workings, the helmet men going ahead into the gas and keeping the advance men posted as what to expect.

On the day shift of October 14 the 10th South was reached by the helmet men. The parting for this section of the mine is on this entry. Just before reaching the 10th South, through a cross-cut from the 9th South, another body was found. This man had evidently been running when overcome by the damp, as he was fifty feet from his lamp. On examining the path over which he came, it was evident that he had been down sev-

eral times before being finally overcome by the deadly gas.

On the 10th South parting there was no indication of the explosion, although a few rocks were down in the north end. One body was found on the parting. Our efforts were next turned towards a pair of stub entries going west off of the 8th South. Practically all the men were working in this place, "skipping" along the side of the old rooms off of H-2 and H-3 entries. No one was found here, but several cars were found half loaded, and the shovels were found standing against the props exactly as the diggers had left them, the explosion not having affected this section.

The two following shifts removed the four bodies found on the day shift, and further explored the old workings, but no bodies were found. By this time the rescuers were beginning to get alarmed, as there were twenty-eight working men in these parts, and only sixteen had been accounted for. The theory was that they had heard the explosion, and had spread in every direction into the old workings. If this were the case these bodies would not be found for several months, if at all; but by careful work on the part of helmet men B. P. Manly, D. S. Southerland, George Parker, T. W. Tweedale, Ford Cornwall, and the writer, the twelve remaining bodies were found in the neck of room 1, off L-2 entry, the latter entry running at right angles to the 10th South. These bodies were brought out to the 10th South, and were there carefully wrapped in canvas and sprinkled with embalming fluid. This was the only method to get the foreign laborers to go near the bodies. These bodies were about 700 feet from the nearest working place; some were lying face downward, some on their backs, while still others were leaning against the wall. Just how long they lived will forever remain a mystery, but for my part I think that 15 or 20 minutes was the longest. All their dinner pails were full, containing both food and water untouched. This alone shows that they could not have lived very long after arriving at the place where they were found.

As soon as the bodies were recovered from the L entries the air was again turned down the 8th South towards the old main haulage road. The 4 o'clock shift of October 15 advanced down this entry and encountered very few falls, and but little damp. By 10 P. M. they had reached the big parting which is 200 feet west of the intersection of the 8th South and K-2 entry. Twelve bodies were found at the parting, about 1,000 feet from their working places. All of them had been running when overcome by the deadly damp. When these twelve had been recovered there were but two left, the motorman and his helper on the loaded

trip going out. By going over the falls into the old mine they were found about 500 feet from the mouth, luckily between falls. Their bodies were recovered by the same shift that recovered the above twelve. Thus, in exactly one week, all bodies were recovered from this ill-fated mine.

After the first attempt to reach the interior with the helmets, regular squads of about six men per shift were organized. These men were sent ahead to test the air, and sent into rooms filled with gas to bring the bodies to the entries. We found it worked better not to go more than 700 feet ahead of the air. The Draeger helmets certainly played their part in this explosion, for, without them, advancement would have been much slower. Uncertainties were changed to fact by the helmet men going ahead into the gas and reporting direction of air.

It would never do to put a helmet on an inexperienced man, or one who did not possess a cool head. Though he might be all right when standing still, as soon as he begins to use his muscles a greater supply of oxygen is needed; thus, if the supply is not sufficient for a moment, a smothering sensation is undergone. The only cure for this is to lie down on your back immediately for a few seconds until you rest. In this case if the helmet were removed, death would result very shortly if you were in a gas-laden atmosphere.

VENTILATION.

Starkville had two fans for ventilation, one situated near the intersection of the new mine, and one at the 7th South. This was a Stein make, 7 feet in diameter, driven by a 25 horse-power motor, revolving at 275 revolutions per minute, and gave 45,000 cubic feet of air per minute. The blades of this fan were blown 75 feet up the 7th South, and the 25 horse-power motor was blown a distance of 50 feet. It will be seen that the intake to this fan was below atmospheric pressure, while on the return side it was above. Both the new mine and old mine, as far as the 4th South, were used as intakes. This fan forced air through the "J" entries, and to the "K's," which is the old, main haulage road. At this point the air is drawn down the "K" entry by the "C" fan, which is about 4,000 feet inside the old mine, and is connected to the surface by a shaft 175 feet deep. This fan was one manufactured at the C. F. & I. works at Pueblo, size 3 by 10, driven by a motor revolving at a speed of 110 revolutions per minute, and delivered 58,000 feet per minute on the return side. This fan was also completely wrecked.

SHIFTS.

After Monday, October 10, three shifts were organized and about fifty men assigned

to each, divided as follows: Six men for advance, at least one of these to know the mine thoroughly; six helmet men; six carpenters for bratticing; four men carrying water, and two electricians carrying a light telephone with the advance part. For the excellent telephone and electrical work great credit is due O. C. Irwin and his excellent corps of helpers. The telephone connected directly with the outside ten men carrying brattice cloth, lumber and supplies, the remaining men carried stretchers, etc. At all the main points phones were installed and a man left at each.

Two men were stationed at the mouth of the mine, and a careful check kept of all men entering and coming out, so that none would be lost.

The company did everything in its power for the men in the rescue parties, and the widows and children of the unfortunate men, the latter ones being given requisitions to buy at the store all necessities at company expense. For the rescuers they provided a splendid table and bed. Apples, coffee and sandwiches were kept constantly at the front. Thus no one needed to go hungry, as is often the case. Mr. E. H. Wertzell, manager, and J. F. Welborn, president of the company, were constantly on the ground, and nothing was left undone.

CAUSE.

To give the exact place and cause of the explosion at this time is impossible, although all of the working places have been explored. This was done in the searching for bodies rather than by an examination into the cause.

This much can be definitely stated: Beginning at a point below the 4th South, and about 3,500 feet in the old mine, the explosion started, going inward through the 4th South to the new mine, thence up to the new mine, inward to the 7th South, blowing stoppings and doors to pieces. The results were gathered from the fact that all timbers were forced towards the 7th South. The part that traveled directly in the old road, which would seem to be the path of least resistance, went only about 1,000 feet before coming to a long rock entry, which is wet. Here the explosion was killed, having nothing more to feed on. That which went to the old part traveled through the entire mine, killed the men, and did all the damage, returning down the old entry until it came to the opposite end of the above noted rock entry, where it was also stopped. Dust was no doubt the cause of the explosion, but what ignited it may forever be a mystery. At this writing Inspector Jones and the government engineer, Rice, seem to connect the loaded trip at the bottom of the hill with the starting of the explosion. The hill is about 700 feet long, averaging 5 per

cent. The motor coasts down this hill, often at a great speed.

This is one theory towards which several are leaning; the motor came down the hill at a great speed, making a great deal of dust, one of the cars got off the track, and as this entry is all timbered, knocked out a set. This caused a fall which knocked down the wire onto the track, forming an arc which ignited the dust. The trip was not under any fall, for, going at a good speed, they could have got away before the fall happened.

Mr. F. C. Miller, C. S. M., '00, Chemist and Superintendent of the washeries, was among the first to arrive at the mine. He brought with him a complete gas analyzing outfit, and set the same up, ready for business, in the mine office. Samples were taken at points in the return air course. This precaution was taken to determine if there was a fire in the mine. Following are some of his results:

Oct. 10. 11:30 a. m. At C Air Shaft:
 C O₂ 1.00%
 O 18.90
 C O .08
 C H₃ ———
 N 80.20
 Air Strong

Oct. 11. 8:30 a. m. C-1 Air Shaft:
 C O₂ .30
 O 19.20
 C O .05
 C H₃ ———
 N 89.95
 Very little air

Oct. 13. 8:15 a. m. C-1 Air Shaft:
 C O₂ .60
 O 19.20
 C O .05
 C H₃ ———
 N 80.15
 Very little gas

Oct. 14. 8:20 a. m.:
 C O₂ .60
 O 19.3
 C O .05
 C H₃ ———
 N 80.05
 Showing no fire

Oct. 14. 4 p. m. At Starkville, stoping in Engleville at 20 West Entry:

C O₂ 1.40
 O 16.80
 C O .10
 C H₃ ———
 N 81.70
 Safety lamp went out in this mixture

Oct. 15. 8:20 a. m. At C-1 Air Shaft:
 C O₂ .40
 O 19.3
 C O ———
 N 80.30

Oct. 15. At Engleville's 20 West Entry:

C O₂ 1.60
 O 17.00
 C O .10
 C H₃ ———
 N 81.30

By a glance at the above analyses it can plainly be seen that there was no great amount of afterdamp, and very little white damp. On October 13, when we carried out the eight men from the old room off H-2 entry, all were attacked by sharp headaches, and a ringing sensation in the ears. This was due, no doubt, to the trace of C O.



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Vol. I.

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No. 2

Editorial

The first issue of the magazine was published after some difficulty, but the editor is well pleased with the way in which it was received by those interested in its success. The thing to do now is to hold it to its present size and character. To do this the alumni must contribute articles of sufficient value to give the paper a good standing, and must send in interesting news items so as to make the Alumni section interesting. Another very important thing to bear in mind is that the magazine cannot run without subscriptions. At present the publication of the paper is making inroads on the money intended for the use of the Capability Exchange.

A few words in regard to what the Capability Exchange is doing and intends to do in the future. The Exchange has a large range of usefulness, both to the Alumni and undergraduates, but till the affairs of the magazine, which is to be the official means of communication, are in such shape as to permit the Assistant Secretary sufficient spare time to devote to the Exchange, very little will be accomplished. It behooves the alumni to send in interesting articles, letters, discussions, and items for the personal column of the paper. Do it now; do not wait till some time in the distant future, for that time might never come. The financial side of the paper is not to be neglected, so send in your subscription money. As it is, when the date set for the magazine to go to press comes, the magazine is never ready. This state of affairs is due to not having a single leading article, and no news items of interest to publish. Until these things are remedied, very little can be done

toward putting the Capability Exchange on a successful basis.

Up to the present time only such notices of vacancies as have come to the notice of the Assistant Secretary without effort on his part have been taken care of. Since August 15 he has received fourteen requests for men in this country and in Mexico. The majority of these requests came to President Alderson, and were turned over to the Exchange. The greater number of these were bona-fide offers, and called for assayers, chemists, and engineers. We were able to place Alumni men in six of these positions. This is a good percentage under the circumstances, and speaks well for the possibilities of the Exchange. The advantage, financially, to the men located is worthy of mention. At the present rate charged by regular employment agencies, it would have cost these men from \$60.00 to \$75.00 each for their places.

Out of the remaining eight positions at least three more could probably have been filled if the men notified of the vacancies had tried to do what was right and fair by those trying to aid them. Some of these men, after writing to us for a place and being notified of such, would not even go to the trouble of writing and saying whether they wanted to try for it or not, and others would wait several weeks before writing to us at all.

Such a state of affairs should not exist; the thing to do is for a man to notify us by return mail what he intends to do in regard to the place, and then, if he does not want it, we can probably put another man in touch with it before it is too late. When you consider that some positions are

listed with several agencies, it requires quick work on our part to fill the place.

In regard to the future, it is the intention to complete the records of the men by sending them blanks on which to bring their records to date; we will also communicate with the references given, so that all information necessary to present a candidate's

claim can be sent directly to a prospective employer. From time to time circular letters will be distributed to the mining and engineering profession to let them know that we are in a position to supply them with capable men, and in this way we will, no doubt, hear of more vacancies.

Athletic News

MINES, 0; UTAH, 6.

Salt Lake, Utah, Oct. 15.—Within four and one-half minutes of the close of today's football game between the Golden Miners and University of Utah, the latter scored a touchdown and kicked goal, the struggle ending 6 to 0. It was one of the most closely contested games ever seen on Cummings field and the Mormons had to fight hard for their victory.

The game closed with the ball in possession of the Miners.

Within three and one-half yards of Utah's line the visitors secured it on the five-yard line by blocking a punt, and in two downs advanced one and one-half yards. Just as the third down was getting into play time was called.

The score was 0 to 0 at the beginning of the fourth quarter of the game. Utah carried the ball to the five-yard line and a forward pass was attempted. A Golden man reached up into the air and touched the ball. It fell back of Golden's line and Christensen fell on the ball. There was an argument and the officials looked up the rules, calling it a touchback. Golden put the ball into play by kicking from the twenty-five-yard line. The Mormons punted back to the Miners' ten-yard line and the quarterback carried it back five yards. Utah's line held like a stone wall and the home team got the ball on downs. Richardson ran forty yards, but Utah was penalized for offside play and the oval was placed ten yards back of where Richardson got his start on the long run. Utah kicked to Wolf, who returned the ball thirty-five yards to the center of the field.

The Colorado quarterback was hurt in the tackle. Utah was penalized five yards for offside play again. Golden, failing to make distance, punted to Utah's twenty-five-yard line.

Utah failed in a forward pass and the ball went to Golden on Utah's twenty-five-yard line.

Wolff tried a place kick, but it was blocked. Richardson got the ball and started down the field, when Wolff made a beautiful tackle and was injured. He was taken out of the game.

Richardson made two pretty forward

passes and the ball was worked down to Golden's seven-yard line; then a line buck took the oval to the four-yard line. Richardson ran around left end and placed the ball behind the visitors' line for a touchdown. He kicked goal.

There was only four and one-half minutes of play left. Finally the Coloradoans got the ball by blocking a punt and had it on Utah's five-yard line. Slattery's punting against a heavy south wind was a feature of the contest. Wolff also played a brilliant game. Lon Romney was Utah's star until he was forced to retire from the game in the last quarter.

Utah, 6.

Golden, 0.

Carmichael, Deane... L. e. McGuire
Home (captain)... L. t. Young, Calvert
Young... L. g. Myers, Davis
Neilsen... C. Mertes
Christensen... R. g. Eaton
Oldsen... R. t. Ledbetter
Peterson, Riser, R. e. Rockwood,
Sommers... Marshall
Romney, Riser... L. h. Zisch
Bennion... R. h. Slattery
O. Romney, Grant... Q. b. Wolff, Zulch
Richardson... F. b. Newton, Gregg

Officials: Referee: Tobin. Umpire: Brusse. Field judge: D. A. Callahan. Head linesman: Ben Baum.—Denver Post.

Among the rooters who turned out to help the Mines were about forty old Miners, quite a few of them having played on the 'Varsity in past years. One of the most enthusiastic rooters was Harry Taylor, '00, who came all the way from Los Angeles to see the game.

MINES TRIM AGGIES; SCORE, 10-6.

Outweighed and outroughed by the husky warriors from the School of Mines, the Farmers from Colorado Agricultural College went down to defeat at Union Park October 22 after furnishing one of the real surprises of the present season. The final score was 10 to 6 in favor of the Mines.

Practically nothing was known of the Aggies when they went on the field, and the

Miners were prohibitive favorites in the betting. But once the game was started it was evident that the Aggies had it all over the Miners when it came to playing the game under the new rules. It was simply a case of a well-trained but light team trying to win by scientific methods from a heavier team which was out to win at any cost, and which fought with bulldog determination, which finally carried its opponents off their feet.

The Aggies got the first score by clever playing, taking the ball down the field by the use of forward passes and other new plays until the ten-yard line was reached, when Stuver kicked as pretty a Princeton as could be imagined. This was in the second quarter of the game, and the Miners then started in with renewed vim, but fumbling hampered them in this quarter, as it had in the first, and until the end of the half the ball was seesawed back and forth on the gridiron, except once when the Mines rushed it down to within a yard of the goal, only to be held for downs.

Returns Aggies' Kick.

It was in the opening of the second half that the Mines pulled off the most brilliant play of the day. Stuver kicked off fifty yards to Slattery, who returned five yards and then punted forty-five yards over the heads of all the players. Eaton was down the field ready for the play and when the ball hit the ground he grabbed it and took his time in covering the fifty-five yards for the Mines first touchdown. Slattery failed to kick goal.

A few minutes later, when the ball was in the Aggies' possession in the center of the field, Douglass deliberately pulled it away from Stuver and ran to the goal, only to be called back by the officials.

The Aggies began to weaken in the third quarter, for the reason that they could not stand the roughing which the Miners were handing out to them. It was in this quarter that the rough work of the Miners, real, old-fashioned football, got the entire crowd of 2,000 people on their feet, something which has not happened here this season when the new rules were being rigidly enforced.

The fourth quarter opened with the Miners ready to crush their wearying opponents, while the Aggies were there to fight for their lives. The ball was on the Aggies' five-yard line when the whistle blew and Stuver fumbled, the Miners getting the ball. Myers was jammed through the line for seven yards and a touchdown. Again Slattery failed to kick goal.

Score Second Princeton.

The Aggies managed to work the ball down to the Mines twenty-five-yard line when Stuver tried a drop kick for goal, but failed. A moment later the Aggies failed in an attempted forward pass, and the Mines

got the ball. Coach Cassidy of the Aggies was so enraged that he ran on the field and for a moment it looked as though he would mix it with the officials. For this the Aggies were penalized five yards. After Slattery had punted twenty-five yards, the Aggies worked the ball back to the ten-yard line and Stuver again dropped a Princeton between the posts.

There was considerable kicking during the game because the Mines played straight football and because the Aggies did not believe that the officials were enforcing all of the new rules. The crowd, however, was well pleased with the game, showing its greatest interest when the game was the roughest. The following is the line-up:

Mines, 10.

Aggies, 6.

Kissock, Zwetow... R. e. Chase
Ledbetter... R. t. Shaffer
Eaton... R. g. Grant
Mertes... C. Bahmeir
Davis... L. g. Blair
Calvert... L. t. Jones
McGuire... L. e. Brill
Douglas... Q. b. Stuver
Slattery... R. h. b. Gates
Zisch... L. h. b. Gooch
Myers... F. b. Cogwell

Substitutes: Eppstein for Grant, Paxton for Gooch, Marshall for McGuire. Referee: Pop Kirley (Brown). Umpire: Cates (Yale). Field judge: Owens. Head linesman: C. A. Brandenburg.—Rocky Mountain News.

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.
Colorado College, 23; Wyoming, 0.
Colorado College, 21; Utah, 17.
University of Colorado, 14; Wyoming, 4.

CLASS NOTES.

The Junior class left Golden September 29 for Breckenridge, Colorado, where they spent two days inspecting the mines and large placer operations of this section.

The same class will give an Informal Smoker in the gymnasium October 28, at 7:30 P. M. The Smoker is to be given under the auspices of the Integral Club. An interesting program will be provided for the occasion. Members of the Alumni Association have been invited to be present.

College Notes

THE NEWLY DISCOVERED ZINC ORES OF LEADVILLE.

The newly discovered material is reported to have been found in many mines; it appears to be most plentiful near the parting quartzite, but is known in some places to run through the white limestone to the white porphyry. Two distinctly different classes of ore have been found: carbonate of zinc (mainly the mineral known as smithsonite) and silicate of zinc (the mineral called calamine). In some instances these are associated, but in others they are quite distinct. In the following description of the mineral the characteristics mentioned first are those possessed by the varieties known to occur at Leadville.

SMITHSONITE.

Composition.—Carbonate of zinc. When pure it contains 52 per cent. of zinc.

Lustre.—Dull and earthy when massive, as it is commonly found. Resinous or glassy when crystalline.

Color.—Brown, yellow, gray or green; the brown and yellow colors are usually due to iron. When pure or unstained it is white.

Fracture.—Uneven when massive. When crystalline, it splits or cleaves readily in several directions. This yields smooth, polished surfaces that reflect the light brilliantly; these reflecting surfaces are usually minute.

Hardness.—The impure, massive variety may be soft enough to crumble in the fingers, but is usually harder. When pure and crystalline, it is but slightly softer than a knife-blade. All gradations between these may be found.

Acid Test.—If placed in a glass vial containing strong hydrochloric (muriatic) acid, it will effervesce vigorously. That is, it will cause the acid to appear to boil because of the rapid evolution of gas. Limestone will act thus also, but a small piece of limestone, if held in pincers, dipped in the acid, and then placed in the flame of an alcohol lamp, will tint the flame red. Smithsonite will not do this.

Occurrence.—All of the material sent to the School of Mines from Leadville has been of the dull, earthy, white to brown, rather soft, massive variety. It might easily be confused with impure oxides of iron when dark colored, and with limestone or altered feldspathic rocks when lighter. The acid and flame test, however, should distinguish it from these.

The material at Leadville often contains a considerable proportion of hydrozincite, a carbonate of zinc containing water, which tends to make it softer than it otherwise

would be, and causes it to effervesce more vigorously in acid.

Elsewhere, smithsonite often occurs in crusts or stalactites, with a glassy or resinous lustre, and a finely radiating or divergent structure. This type is usually of a very high grade. Sometimes this mineral is found in porous masses with a dull lustre and of considerable hardness. This type resembles dry bone, by which name it is known. These varieties should be sought in Leadville.

CALAMINE.

Composition.—Silicate of zinc. When pure it contains 54 per cent. of zinc.

Lustre.—Glassy.

Color.—Often brown or yellow, and then opaque. Colorless or white when pure. May then be transparent. Rarely greenish or bluish.

Fracture.—Splits or cleaves readily in two directions, and then yields long, slender, smooth, polished surfaces that reflect light brilliantly.

Hardness.—May be scratched with a knife, but only fine powder will scrape off when attempts are made to cut it.

Acid Test.—Will not effervesce or dissolve in strong, cold hydrochloric acid.

Occurrence.—Usually found as coatings or stalactitic masses of more or less transparent material with a coarsely radiating or divergent structure. Sometimes one layer will be white and rather transparent, while the next will be of darker color and more opaque. The surfaces of crusts often show small, tablet-like crystals that may be united along their flat faces.

INTEGRAL CLUB.

As a preliminary to the Mines-Aggie game, the students held a rally in the club rooms and listened to several interesting talks by prominent speakers. General John Chase and Hamlet J. Barry, '03, Wisconsin, were the principal speakers. After the speech-making everybody adjourned to a large bonfire which in the meantime had been started, on vacant ground on the campus by students of an adventurous turn of mind.

All the various yells of the school were practiced by the students while gathered around the fire. A parade was then formed and started toward town, thus ending the rally.

DANCE.

The first regular Social Club dance of the season was held in Guggenheim Hall Saturday evening, October 15, 1910. Music, as

usual, was furnished by Lohman's Orchestra, and refreshments were served by Baur.

About seventy couples were present. From remarks made by those present the dance was regarded as one of the best ever given by the Social Club.

Y. M. C. A. NOTES.

Mr. Wm. Merrill Vories, formerly of Colorado College, but now engaged in Y. M. C. A. work in Hachiman, Japan, visited the school early in the month of October. While here he was entertained at both the Beta and S. A. E. chapter houses and at the home of Prof. Hazard.

In addition to speaking to groups of men, Mr. Vories spoke to the members of the High School, and made an address at a Union Meeting, which was held at the Methodist Church in the evening.

Mr. Vories has charge of all the work in the Oni province, with a population of 800,000, and was the first Christian worker to start a permanent work there. He now has branches in six of the larger towns in different parts of the province. The Mines Y. M. C. A. will contribute to the support of the work this year.

The regular speakers at the Tuesday meetings since the last issue have been as follows: Rev. Joel Harper of Denver spoke on "College Spirit" at the first October meeting. In addition to giving a splendid address on this interesting topic, Mr. Harper sang for the men. On the 11th of the month Rev. R. R. Adams, who succeeded Dr. Henry Mayo as pastor of the M. E. Church in Golden, had as his subject "The Business Man in Politics," and made the topic appeal to all his hearers. "Dad" Bailar, the popular Assistant Professor of Chemistry, stirred up all of us by his talk on the subject, "The Field of the Slothful," in which he stated in no uncertain terms the opinion held in regard to the lazy man.

Father Wm. O'Ryan will be the speaker at the meeting of October 25th. He has been in the city of Denver since it was a small town, so he knows the West and its people as few men know them.

We are fortunate in having secured Mr. Guy V. Aldrich for November 1st and 2nd. Mr. Aldrich is a graduate of Bates, class of 1907; was General Secretary of the Y. M. C. A. in the University of Pennsylvania Medical School for two years, and has entered upon his second year as Traveling Secretary of the Student Volunteer Movement. Last year he traveled over 40,000 miles in the eastern and southern states, visiting all of the colleges in those states. He was a

prominent man in the affairs of his college, and has been a leader in his work since he was graduated. Mr. J. W. Nipps, Washburn, class of 1910, who is now Student Secretary for Colorado, will accompany Mr. Aldrich as he visits the colleges and universities of this state. It is hoped that every man in school will plan to meet these representative college men during their two days at the "Mines."

RATTO WAS FINE.

The first number of the Y. M. C. A. Entertainment Course came to Golden Friday evening, October 14th, in the person of John L. Ratto, the well-known impersonator. Mr. Ratto presented one of the most varied and best-selected programs we have ever had the pleasure of listening to in this city. He did not make the mistake of attempting characters for which he was totally unfitted, both by physique and temperament, but selected his leading characters from the ranks of grown men. His finest interpretations were those of elderly men, particularly the old clergyman at the football game, and the old farmer at the society function in the city, both of which captivated the audience and convulsed them with laughter.

Not only was Mr. Ratto strong in his humorous productions, but in his presentation of the bereaved Italian father, and his admirable impersonation of the convict pleading for his liberty he was very effective. His "make-ups" were true to life in every instance, startling one by the sudden change produced by a few strokes of the pencil and the deft adjustment of an appropriate wig.

The audience was large and appreciative, and represented the best people of the city. Many of them spoke to Mr. Ratto at the close of the program, expressing their pleasure in having been present. It seems, and is a matter of regret, that more people do not take advantage of such opportunities as are offered by the presentation of such a course of entertainments as will be given in Golden this winter. The members of the Mines' Christian Association have worked hard to make such a course possible. The students and town people should do their part by supporting the movement as it deserves.

FUTURE EVENTS.

The Mines-Boulder football game is scheduled for Thanksgiving Day. The game to be played in Denver.

The Alumni

PERSONALS.

'94.

Julius L. Saint Dizier has resigned as General Manager of the Escinilla Mines, Santa Rosala, Chihuahua, Mexico.

George M. Post is a candidate for the position of county surveyor for the City and County of Denver on the Democratic ticket.

'95.

Edward P. Arthur, who is running for county surveyor of Teller county on the Republican ticket, has been sick with typhoid fever, but is now convalescent.

'00.

Howard H. Utley has resigned as Superintendent for the American Zinc Extraction Co., Leadville, Colo., and is now Superintendent of the Arizona and Parral Mining Co., Parral, Chihuahua, Mexico.

'01.

Mr. Hugh C. Watson was married to Miss Mary Paradise, of Denver, on October 12, 1910.

'03.

Walter A. Funk has returned to Central City, Colo., from a trip to Valdez and Ellamar, Alaska.

'04.

Francis A. Thomson, Professor of Mining at Washington State College, Pullman, Wash., has been examining mining claims in Sanders and Missoula counties, Montana.

Samuel Tescher has been appointed General Superintendent of the Wooten Land & Coal Co., Trinidad, Colo.

'05.

E. M. Smith has accepted the position of Superintendent of the Skookum Copper Co., Rosalyn, Washington.

Guy N. Pfeiffer is now Instructor in Mining and Metallurgy at the Oregon Agricultural College, Corvallis, Ore.

'06.

Max W. Ball, who is with the U. S. Geological Survey, has returned to Washington after a tour of inspection in Colorado and Wyoming.

Rush T. Sill has just completed a one-hundred-ton concentration mill for the Little Bell Mining Co., Park City, Utah. He will remain with the company as Mill Superintendent.

'07.

George M. Ross is assayer and chemist for the Tularosa Copper Co., Bent, New Mexico.

Don, D. Hollis, who is connected with the General Land Office, has returned to Denver after an extended trip to Reno, Nevada, in the interests of the Land Office.

'08.

Russell R. Bryan is now with the Primos Chemical Co., Newmire, Colo.

'09.

Milne E. Bunker, County Surveyor of Jefferson County, is a candidate for re-election on the Democratic ticket.

'10.

Harold H. Juchem is assayer and chemist at the new mill recently built by George F. Powell, '97, Manager of the El Tajo Mining Co., Poza, Sonora, Mexico.

Charles E. Dyer has accepted the position of assayer and chemist for the Little Bell Mining Co., Park City, Utah.

CLASSES '98 TO '02.

Harry M. Showman, '10, wishes to announce to the members of the classes from 1898 to 1902, inclusive, that he has compiled a list of drawings made by them during their Junior and Senior years. These tracings and drawings are in the files of the Civil Engineering Department, and will be held for a reasonable length of time and then destroyed. If any men of the above classes are desirous of securing their drawings they can do so by notifying him and paying the expressage on them.

THE BULLETIN.

It has been the custom of the Alumni Association to purchase several hundred copies of the "Bulletin." In fulfilling our contract with the former manager of the "Bulletin" we have secured several hundred copies of the last, or May, 1910, issue, besides all the old issues. The articles in the May issue are exceptionally good, as will be seen from the following table of contents:

"True Meridian." By A. W. Warwick.
 "Cyanide Practice at the Dolores Mines in Mexico." By W. H. Paul, '96.
 "Some Lessons to be Drawn From Gilpin County Practice." By George E. Collins.

Members of the Alumni Association who desire this issue or any of the back numbers will receive them provided the numbers are in stock, and they will write to the Assistant Secretary for them. This step is taken to avoid the expense of mailing the magazines to men who do not care for them.

RESOLUTION.

It is the sad duty of the class of 1900 to record the death of one of its members.

On October 23, Mr. William Edward Adams, '00, died at Ouray, Colo., of pneumonia, contracted while working at the Revenue Mill.

William Edward Adams was born in Flint, Mich., Feb. 6, 1877. He was graduated at the Flint High School, and after attending the University of Michigan at Ann Arbor for some time, finally completed his college course at the Colorado School of Mines, graduating with the class of 1900.

He was first employed by the Colorado Fuel & Iron Company in several important capacities, later going to Lewiston, Idaho, where he practiced as a mining engineer, and U. S. Deputy Surveyor. Mr. Adams had a wide and varied experience throughout Idaho, both as an employe of many mining and power companies, and as an individual operator. He later returned to Denver, where he opened an office as a mining engineer.

Mr. Adams, as well as being a practical engineer, was also an earnest student of the problems of his profession, and at the time of his death was working in the Revenue Mill in a minor capacity, to further familiarize himself with the details of the milling processes there employed.

After a few days' illness at the Revenue Mill he was taken to the hospital at Ouray, October 18. Judge, and his mother, Mrs. W. H. Gabbert, were notified, and were at his bedside at the time of his death.

Whereas, We as members of the class of 1900 know and appreciate the life and character of Mr. Adams, therefore be it

Resolved, That we deeply deplore the untimely death of William Edward Adams, '00, which has deprived the class of 1900 of one of its most loved members, and the engineering profession of an able exponent, and that we extend our sincere sympathy to his family.

C. C. MALMSTROM.
 J. H. STEELE.
 F. M. DRESCHER.

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.
 James E. Dollison, '98.
 Henry R. Evans, '00.
 Louis D. Fry, '03.
 Frank H. Jones, '98.
 Robert Nye, '97.
 Jacob Weil, '04.

Abstracts of Current Articles and New Books

GEOLOGY.

A Proposed Classification of Petroleum and Natural Gas Fields Based on Structure. By F. G. Clapp.

Economic Geology, Vol. V, No. 6, p. 503.

An extremely suggestive and valuable article defending the general application of the anticlinal or structural theory, provided the structure of the productive stratum itself be considered independently of the structure of the surface beds. The author contends that all oil fields may be placed in one of the following classes or sub-classes:

I. Anticlines—

- Strong anticlines standing alone.
- Well-defined anticlines and synclines alternately.
- Monoclines.
- Terraces (variety of monoclines).
- Broad geanticlines.
- Overtured folds.

- Quaquaversal folds (domes).
 - Beds truncated and sealed by faults.
 - Beds sealed by asphaltic deposits.
 - Contacts of sedimentary and crystalline rocks.
 - In joint cracks.
 - Surrounding volcanic vents.
- The various oil and gas fields of the world are classified on this basis, and some attempt is made to explain minor irregularities and apparent discrepancies.

MINING.

San Rafael y Anexas Mining Company, Pachuca, Mexico. By E. Girault. Engineering and Mining Journal. October 1, 1910, page 643.

An instructive article, in which the methods used and cost data is given. Illustrated. Timbering in the Joplin District, by L. L. Wittich, Mines and Minerals. October, 1910, p. 144.

A two-page illustrated article describing the conditions that require large quantities of timber, with methods 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 prevention 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 Pulmotors 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