Reports

Delagua Mine

A. E. THOMPSON, 34 YEARS,
RESCUE APPARATUS MAN.

About 1:30 P. M., somebody from Delagua telephoned to Hastings that there was a fire in the mine, and wanted rescue apparatus immediately. I was at the polls when Mr. Cameron came down and told me there was a fire in the Delagua mine, and for me to get the rescue apparatus, that the train was there waiting. As I reached the Hastings office, they said Lewis wanted me on the 'phone. It was Mr. Rees, instead of Mr. Lewis, at the phone, and he said the mine had just exploded. That was somewhere around two o'clock. We got the rescue apparatus loaded, went into Hastings mine and got some of the helmet men out, and came to Delagua as soon as we could get here. Mr. Cameron and myself and Holman and some others got to Delagua about 2:45. Got the stuff out of the car and looked around for the management, and found they were in the mine. Mr. Cameron, Billy Murray, Carr Robson and myself went in through the fan without helmets. Mr. Cameron said we would go in and see what the conditions were in the air course. The

ventilation had been stopped, and we progressed down the entry about 600 or 700 feet, between the 3rd and 4th North, and came back. Examined the cross-cuts, and found the air was going in through this opening. On Mr. Cameron's suggestion, I came out and got men started in with material to brattice up the stoppings as far as the 4th North. In the meantime, Mr. Cameron stayed inside to take charge of the work, and I was back and forth with the party getting material in. I think I made four trips with the party in the material gang.

At 5:30, we had reached a point inside the 4th north pass-by. Mr. Cameron and Billy Murray went around the empty track; Mr. Robson and myself went around the loaded track. We met on the inside of the parting, and then advanced probably 75 feet along the entry. The air was pretty heavy at that time. Came back to the end of the parting and sat there about ten minutes to see if it was clearing up any. On the second advance, we reached a point opposite the slant from the main entry to the back entry. Mr. Cameron asked us how we felt, and all of us said our heads were in a whirl, and he said his was too. He said we had better go back, and

we went back to a cross-cut opposite the hoist, and met Getchell, Jolly and Walker coming down the back entry. Mr. Cameron suggested that I come outside with Mr. Rees and go and tell the boarding-house to have lunch sent to the mouth of the mine and have it sent in, so they could keep at work. While I was doing this, Getchell, Jolly, Walker and Griffiths went on down the 4th North entry and got down as far as the fire, so they said. Mr. Getchell sent Walker out to tell us to come in with the helmets and fire extinguishers. When we came back, the C. F. & I. rescue car had arrived, and Evans and his party were sitting by their helmets ready to go in. Bert Lloyd, Pollard, Evans, another Cokedale men and Walker and myself went in. Evans and I were the last two getting in with the extinguishers. I stopped and told Mr. Warfield not to allow anybody to pass in without some material of some kind, and send extinguishers in as fast as he could get men to follow us.

We six went down on the original route through the cross-cut into the 4th North entry, down the 4th north entry opposite a hauling cross-cut between the 2nd and 3rd west entries. There we found the fire. Mr. Getchell and Griffiths

were on the intake side, about 40 feet behind that cross-cut, and told us the fire was in the next cross-cut. Lloyd and Walker went into the cross-cut and emptied their extinguisher. We followed with our extinguisher. Pollard claimed there was something with his apparatus, and he retired. That left 5 of us. The fire was now so we could get over it; and as somebody had reported the fire to be in room 7 on the 4th west, we started in there. Just through the cross-cut it had burned, and the end of the cross-cut had fallen down. The door was gone and timbers had burned down and some of the props in cross-cut were still smouldering. There was a little time slapsed between the time we put the fire out. We fell back and Griffiths and Getchell and others talked over conditions that might exist inside. I fell back to dump. The other men with helmets had gone in through the cross-cut before I got started. Just around the turn at the 4th west, there were two mules and two loads. I found an electric light hanging on the wire. I tried to figure out what the signal was, and advanced on down the entry quite a ways, and then figured that maybe they had wanted me to stay there and had hung the

lamp up for that purpose, that they might go on down the 4th west and come out the 3rd west. I returned to the cars and waited a few minutes; then went on back and through the cross-cut and asked them if they had come out. They told me not, and to go back and take a stand in there and see if I could see anything of them. I heard them coming, and advanced on to meet them. Found them coming out with four other men. Two of them had pulled off their helmets and given them to two of the diggers. I pulled mine off and put it on one of the other fellows. The exchange took place just at the entrance of the 4th west entry. The digger I had given my helmet to started out following the other four with helmets, but turned around and came back, saying he was going to wait for his partner. Then Evans and myself, the Cokedale man and two diggers stayed there. One of the diggers was overcome and was down; I looked around and the fellow with the helmet on was down. I told Evans that we had better get just as far toward the rescue party as we could, as a foot advanced toward them would save a foot for them. He said he was feeling all right and agreed we would go as far as we could. The Cokedale man got up and ran out without a helmet. Evans said

we will take this helmet off this fellow and put it on you, and I will get behind this car, where I will be out of the return air so much. We tried to get the helmet off the digger, but he held the hose tight, and we had a hard time. I finally got the helmet on, but didn't get it inflated or the oxygen turned on. The last thing I remember, there was a mule and car somewhere between us and the cross-cut where the fire was, as I remember crawling over the mule, and that was the last thing I remember until I was brought to out in the haulage road of the 4th north. The helmet men hadcome in and gotten me, as well as the two diggers. We were all out except Evans. I remember somebody said Evans was out, and somebody said he was not out. Some one asked if there was anybody there who would put on a helmet to go in after him. Cornwall volunteered, and they put a helmet on him. I don't remember anything that transpired after that until I got outside. It was probably ten o'clock when we rescued the four men.

CLIFFORD A SWANK, 33, ELECTRICIAN FOUR MONTHS IN DELAGUA; TWO YEARS FORMERLY.

About 1:30, some one called my attention to the smoke coming out of the fan. I ran there with Woodward. As I passed the mouth of the mine, Evans was lighting his lamp. He told me not to shut off the fan unless it was on fire, until he got the men out; that we might have to slow it down for a time. The power house man had shut off the current, and the fan was slowing down. I told Woodward not to shut down the fan, and gave him orders to start up again. It never wholly stopped. When I reached the fan house, two men came out and said the fire was in the mine. Several men came up. Jim Young and others. McMullen went on top of the fan and reported that it was not hot. I told Read, who was one of the two men to come out the air course, to go to the mouth of the mine and see what word Evans sent out. I waited at the fan for 5 or 10 minutes for some word about the fan. Didn't hear anything, but did hear talk about water and I went to the mouth. Motor had come out when I arrived. Young said

something about hose. Five minutes later, Young started in, and said he would go and measure the pipe connection. Kilpatrick was with him. Young gave orders to put the hose in the car connection end out. Tom Jennings, MacLeod and others were standing by the motor in the mouth waiting for men to drag up the hose. Jennings told them to step back as no one could tell what might happen. I was assisting Jennings to load the hose, and had loaded about 20 feet when the explosion occurred. I was leaning over the car and was only slightly burned. The sound of the explosion was like the dumping of a pit car. I pulled myself together and ran to the fan without the slightest thought that any damage had been done at the mouth of the mine, although the air was black with smoke and dust. Fan had stopped. I walked down the road and met Jennings mourning about the death of his brother.

He says he was at the mouth of No. 2 mine about 10 o'clock Sunday and saw two cars of water going in, but does not know the names of men in charge. Later, he was at his station in the haulage house and inquired why more trips did not come out of the 3rd North. He was told that the rails were so wet they could not handle the cars.

Only one trip came out during the forenoon. About 4 o'clock on Sunday afternoon, he met Bennett, the motorman, and Bennett said he had been watering the slope of No. 3 with Smith ever since 7 o'clock in the morning. He did not say whether he had hauled water in, but did remark that he had been using hose.

ED McMULLEN, 39 YEARS,
WITH COMPANY SINCE APRIL.

About 1:40 P. M., Tuesday, I was in the office. Lewis and W. J. Evans also there. Some top man ran in and called attention to smoke coming out of No. 3 fan. We looked out the window and saw it. Lewis, Evans and I started from the office. They went to the mouth of the mine. I went immediately to the fan. The boys had begun to lay hose from the Jap house past the fan to the mouth of the mine. Examination of the fan house disclosed that the fire was not there, although my impression was that it was not very far away. The smoke first seen was not thick, but rather white. I then went to the mouth of the mine. Young and his man "Sport" and others were there. Young was giving instructions as to laying the hose for the purpose of filling barrels at the mouth of the mine. I then returned to the fan house, thinking that the fire must be close to the fan, and went on top and felt of the casing, and found no heat. It was cool. Had some boys disconnecting the hose to take down in the mine, Young having suggested that this would be

necessary. The barrels at the mouth of the slope were filled from a hose from the tank. I then observed that the smoke at the fan house was very dense. I walked hurriedly toward the fan to make another examination. Just before I reached there, the smoke cleared noticeably, and I stopped and watched it for half a minute; it came out white again. I then returned to the mouth of the mine, or started, when the explosion occurred. I was standing about 30 feet from the fan house, and heard the rattle of planks and boards, and the falling of material, rather than any severe noise and shock. The smoke and dust were exceedingly dense, and when I started back to the fan to stop it, it was rattling as if a plank or board were striking on the blades. When I got there, I couldn't enter on account of the smoke. Then I started to the ower house. Had difficulty in crossing tracks on account of smoke. When I got to the power house, I called to the engineer who was just coming out of the sub-station to pull the switch, which he did. I spent about five minutes there at the sub-station with Charles Young, who was inquiring about his father. I told him the last I saw of his father was at the mouth of the mine. Then

I returned to the fan house and met Swank coming over the hill to the fan, which had stopped, and found he was injured. Then I hurried to the mouth of the slope past MacLeod, saw that he was injured, and the Bennett boy who was injured, who was hollowing on the hill that his brother was killed. I passed by the slope mouth and saw a number were injured and killed, and started to the office and 'phoned to Hastings to send all the help they could, doctors and helmet men. Right after that, I met Billy Murray, and he told me he was going to brattice the mouth of No. 2. Told him I would get the boards and had a bunch of Greeks get the boards. I went to the fan at No. 1 and told Read to come with me, and found fan running all right. When I came back, I looked for Mr. Woods, the fan tender from No. 3, and sent him to the No. 1 fan, and told him to stay there until he was relieved.

STATEMENT OF F. E. GOVE
FROM FOUR RESCUED MEN.

I had a talk with John Siomcis, John Brotevic, Joe Lugo and Tony Brovetic. These are the four men that were brought out at 10 o'clock Tuesday night with helmets. They went to work at about 6:30 in the morning near the end of the 4th West. They had their lunch together about 11 o'clock, and went back to work. They knew nothing of any trouble until a colored driver told John Brotevic that there was "big fire, get out John." John was tamping a shot. John Siomcis was loading a car. The latter told the other boys there was a big fire and to get out. They put on their jackets, got their dinner pails and started out the 4th West. One of the men was 200 or 300 feet behind the other three; when they got opposite room #6, they encountered smoke. It was very bad, but they pushed ahead until the three leaders were within 10 feet of the back entry. At this instant, the explosion occurred. The three leaders were knocked down, and the lights of all four were extinguished. The man in the rear was not knocked down, but lighted his lamp and came up to the other

three. In response to his questions, they all testified that they were dead, but he dragged them up and back to about room #8. The air was very bad, however, and they retreated to the face of the 4th west. They walled themselves off with canvas. At about four o'clock, the air became very bad, and they all fell down. At 4:30, they felt better and tried to get out. They were obliged to return to their canvas quarters. At 8 o'clock, they made another effort to escape, but were compelled to retreat. At 10 o'clock, four men with helmets noticed the light behind their canvas, came in to where they were, and proceeded to persuade them that the air was sufficiently good to permit their escape. They recognized Jolly and McAllister as two of the helmet men. Each helmet man took one of the four, and they proceeded to a point near the fire, when all four became exhausted. Thereupon two of the helmet men took off their helmets and put them on two of the diggers. Two of the diggers were taken out with helmets on, and later men returned with helmets and rescued the other two.

One of these four diggers, Joe Lugo, had a watch. Immediately after the explosion, he lighted his lamp and it was 2:02 P. M. This was about seven minutes after the driver first in-

formed them of the existence of a fire.

STATEMENT OF FRANK LEVECK, 25 YEARS OLD, COAL DIGGER, AT DELAGUA FIVE WEEKS THIS TIME; HAD WORKED BEFORE AT DELAGUA.

I went into the mine about 6:45 A. M. day of explosion, quitting work for lunch about 11:30. Took lunch in our room, No. 6 in 4th West off of 4th North. Two colored drivers, Lynch and Sampson, ate their lunch on some benches which they had about six feet from the door in the old haulage road, toward the back entry. Know this because my "buddie" went out to the place about 12:50 to find out if the drivers had gone home on account of election, as we were out of cars. The drivers were there eating, and said they would give us the first car after dinner. Would judge the distance between door and back entry to be 12 feet, and drivers were lying on benches about half way between that distance, or 6 feet from door. In few minutes, we did get a car and loaded it while Sampson was going after another one, and started to go home when we met Sampson coming in, he having left his mule and car standing between rooms 3 and 4 in 4th west. Sampson asked us if we had any water in our buckets, and we said no and asked him what he wanted with it. He said there was a fire at the door in the cross-cut. We went on out

and he went on down the entry, presumably looking for water. That was about 1:45 P. M. We (buddie and me) came on out to see where fire was and got to the parting and saw the smoke coming out pretty bad. Tried to make it under the smoke, but could not. Went back to our room in 4th west to get an axe to try to break through the cross-cut and get on to the main haulage road. Picked up two men in #5 room and two men in #4 room, with axes, and started back to the 4th North just about the time the driver was coming out with his loaded car. We tried the smoke once more, but could not make it. At this time, the smoke showed red on top, and it was "whishing" back and forth at the cross-cut, the smoke rolling over and over. We went back to the first cross-cut inside the 4th west on the back entry and started to break through the stopping. Sampson would not stay with us and went on through the door between the 3rd and 4th west, which I had closed to keep the smoke back from us. When he opened the door and went through, the fire was rumbling and whishing and the smoke rolling over and over. After he went through the door, I opened it once to see where he was, and could not see him at all. The

fire was then making quite a noise and roaring, spreading a short distance both ways in sort of puffs. Two of the men who came with my buddie and me forgot their lights, and the lights of the others had gone out. I had an acetylene light and it was all right, but was the only light among the six of us. I had a hard time to get the other two fellows with lamps to take a light from mine, but finally got them. My buddie and I took turns about at breaking the brattice, each chopping and scrapping back the dirt from the other side. It took us about four or five minutes to chop through the stopping and get into the main haulage road of the 4th North. The reason we did not try to get out by way of the back entry is because I knew it was full of water and had some falls in it, as I had tried to come down that way once before when I was working in the 3rd North, and had been compelled to go back and come by way of the haulage road. When we broke through and got on to the haulage road, the smoke was about 10 feet from us on the haulage road. We tried to make it out on the haulage road through the smoke beyond the fire, but could not, so started in to get out No. 2. As we were going in, we met Evans and the nipper

Red coming out. We tried to get them to come with us, but they wouldn't. The nipper asked us if we were afraid of a little fire like that. The other four men had followed my buddie and me through the brattice and were with us. We went on down the 4th north to the 13th east, and then went over to the 3rd north. We met the drivers from the Rock Island land on the entry and brought them with us, and probably picked up twenty-five men on the way before we finally got out. We went in on the 3rd North and got to No. 2 opening, and came out that way. We didn't feel any explosion at all, but about the time we got on to #2 road, we felt a little jar of the air, which was probably when the explosion happened. We thought nothing of it, and it never occurred to us that there had been an explosion of any kind. Didn't know anything about it until we came out of the mine and they told us. We had looked for an explosion while we were on the 4th North, but after we got beyond that and didn't feel anything, we thought it was all safe. On the way out on #2, we met Charles Young, who was going in with the motor. I tried to tell him there was a fire inside, but he said no, it was only a fall. I tried to convince him there was a fire, but came on out and he went on in. I

know now that he knew there was a fire, but didn't want to scare us by telling us and he was going in after the men. When we got out, the air was all clear around the mouth of the mine. I never did go up to the mouth of the slope, but talked to some folks around the office and then went home.

When the drivers ate in the cross-cut, they generally set their lamps down beside them somewhere. There was some canvas in the cross-cut, but it was fire proof canvas. There were also some chips lying around in there. I never knew of any trouble about this door before. Never thought how the door could have caught on fire. I know that the track layers have sometimes sat on the other side of the door, but couldn't tell if they were there this day. The smell from the smoke was that of heavy coal smoke. We were about 125 feet fm the fire when working on the brattice to get through.

FRANK YENKO, 22, THREE YEARS AT DELAGUA.

Went to work at 7 A. M. in #3 Rock Island. Went in through #3. About 2 P. M., heard explosion. It was very loud. Smoke followed, and prevented many from getting out. I went back and sat down with thirteen or fourteen other men in the cross-cut. Jap was among the number. We stayed there untul about 11 o'clock Wednesday morning, and came out through No. 2.

JOHN BONAQUISTO, 26 YEARS,
ONE YEAR AT DELAGUA, DRIVER 2nd WEST.

I was driving in the 2nd West. Went to work about 7 o'clock and had my lunch about 10 feet back of the haulage door about noon with Joe Valdez, driver in 1st West. We went back to work about 12:35 and made three trips. On the third trip out, there was smoke at the parting. I left the mule and went through the door to the main entry and went back to see where the fire was, about 200 feet on the main entry. I met the motorman (Bennett) at the door coming out. Bennett proceeded a short distance, stopped and came back. I stayed at the door until his return. I told him we had better get out. He said there was nothing there that could hurt us. He sent his nipper (Red) back to tell the pit boss, Evans, at the 10th East. Bennett stayed, but I started out of the mine. At about the 2nd East, I met William Evans and the pumper Smith. I told them there was a fire, or big light, at the second door. They continued in. I returned with them to the haulage door. Presently I turned round and Lewis and Evans were there. Lewis took hold

of the door and quickly shut it. Evans said, "The 1st West is gone, and we had better get out." I started to run and met Read about 300 or 400 feet from the slope. I told him there was a big fire, and he had better get out. I met another man about the 3rd North, and 3 or 4 men just inside the mouth.

JOHN R. JENNINGS, 28, IN DELAGUA SIX MONTHS.
OUTSIDE FOREMAN.

My brother called my attention to smoke at the fan. I was standing at the switch on the north end of the tipple. I ran to the office and informed Mr. Lewis. Lewis started from the office with myself and others. The crowd had gathered around the fan. I assisted in laying hose from the Jap plug, and then went to the mouth of the mine. Garich came out. He said he couldn't see for smoke further in the entry. Lewis was at the fan, I am sure. I told Lewis at the mouth of the mine what Garich said. There was a motor at the entrance and three cars. I was putting hose in the third car. I did not actually see anybody enter the mine. After the explosion, I ran over the bank. From that time on, I was a good deal dazed. The motor must have come out of the mine three or four minutes ahead of Garich. Three barrels of water had been filled at the mouth of the slope. There were five barrels in all. I am not clear as to my movements after the explosion.

STATEMENT OF JOHN HARVEY READ, 33 YEARS OLD, ASST. ELECTRICIAN, TWO YEARS AT DELAGUA.

About 1:30 o'clock, I was standing at the end of #3 trestle. I saw a light colored smoke coming out of the fan house. I ran over to, and went into the fan house. I asked Woods, the fan tender, what was the matter with so much smoke. He said he hadn't noticed it. We went inside the first door, and closed it. I opened the second door and could just see the electric lights about 10 feet away. I lit my lantern and the carpenter called "Slim" came in and he and I went through the second door. I went to the face of the air course, about 30 feet. The smoke was wood smoke and not very bad. I turned out the lights and got down on my knees. Could see smoke coming out of the mine. I stayed only a minute or two. It didn't occur to me that there was anything seriously wrong. I turned on the lights and came out. Charles Young, son of the Master Mechanic, Swank, the electrician, and several others had collected. I told them the fire was in the mine. My recollection is that Swank told me to go and tell William Evans that the fire was in the mine. I

ran with my lantern to the mouth of the mine. Before leaving the fan, I saw the Superintendent running up the bank to the mouth of the mine. When I reached the mouth, the Superintendent had gone in. I could see his light as he ran in about the 3rd North. There were several men at the mouth of the mine. I walked in after Lewis. There was no smoke. Near the mouth, I met a Slav driver coming out. He said nothing. I continued down the slope; between the 3rd and 4th North, I stopped a moment to pick up my pliers, which had fallen from my pocket. I turned into the 4th North, and went as far as the run around for the motor about 300 feet. There I met an Italian driver, Joe _____, who drove in the 1st and 2nd West. He said, "Big fire in mine, come on everybody get out." He was running. I said I knew that there was a fire, and that was where I was going. There was no smoke at this point. I went on to about 100 feet past the 1st West. I heard the motor coming, pushing empties in front. Bennett was the motor-man. I got to one side and flagged him. He stopped and said that Lewis told him to go out and get all the hose he could; that they could not get near enough to the fire to throw on water with buckets. Bennett told me

to get on and go out with him. I did so. The empties were left on the parting. At the switch, Frank Smith, pumper, came past and said, "Hurry up and get that hose." He started out of the mine; where he went I do not know. Half way between the 3rd and 4th North, we met Till Woodward and two others. I yelled to them that we wanted all the hose in camp. I heard no response. Just west of the 3rd North, we were flagged by Kilpatrick. When he learned the facts, he got on the motor and came back. We then ran to the mouth of No. 3 on the cab end. There we found James Young, Swank and others. I repeated Lewis' orders about hose, jumped off the motor and ran to the electric shop for a piece of hose. On the way, I met Dave Bell and Jerry Davis about 100 feet from the mouth. Was in the shop two minutes and started back with hose. About 150 feet from mouth, I saw a flash like a small explosion of powder. I turned partially around when a plank 2 x 10 and 4 or 5 feet long struck me on the right shoulder and hip, and knocked me down. I was somewhat excited, but remember the explosion sounded like a small blast of giant. I got up and ran abound behind the electric shop fearing a second explosion, and fell down with the hose. I stayed there until the air cleared,

and things quit falling, and then started back to the mouth of the mine on a course north of a straight line. I met Gillen on the way. He asked me for something to wrap up his head. I went with him back to the electric shop and tied his head up. Then I thought of Jimmy Bennett and went down to the mouth. I found him and Bert Jennings and Martin, the bartender, all dead. I was a good deal dazed, and walked back to the shop and had a talk with my wife and then mingled in the crowd which had collected around the office. Shortly afterward I thought of the fan at No. 1. Went there and found it in good condition.

JOHN JARICH, 22, AT DELAGUA TWO YEARS.
MAT JARICH WITH HIM.

Went to work at about 7 A. M. near the face of main slope. Anton Sarson and Matt Jardas were also there, about 1000 feet of North. About 2 o'clock, my brother and I were about 200 feet west from the 4th North door and switching a car. We smelled smoke. I took my brother by the arm and we started out to report a fire. It did not occur to me to be anything serious, and I did not notify Sarson and Jardas. At the hoist, we found Smith, who was preparing to pull out our car. I said "Frank, the mine is on fire somewhere in the 4th North." Smith looked up and said, "John, lets get out and report the fire." We three ran and walked toward the mouth. About 300 feet from the mouth, we met Evans; a little way behind him was the electrician Till Woodward, and still behind him came Lewis. Smith turned around and went back with Lewis. Almost immediately after reaching the mouth, the motor came out, and immediately after that, the explosion occurred. I saw Young at the mouth of the mine handling hose, but looked up a moment and he had gone. I suppose he went into the mine.

STATEMENT OF PAUL E. SMUTZLER, 27 YEARS OLD.
IN DELAGUA SINCE APRIL.

Was working in room #6 in the 4th West with Frank Leveck? Had lunch about noon in room. Cars had been coming slowly, and we had considered quitting for election. After lunch, I went to find the drivers, and found the two colored men sitting by the cars on the empty track at the parting, about 30 feet outside the cross-cut. They had had their lunch. Ever since I have been here, the drivers have been in the habit of eating their lunch at the door. They told me they would give us a car immediately. I went back and found Frank at the switch in our room. He had his coat on and had picked up our dinner buckets and my coat. I told him we would soon have a car, and we we went back to work. We loaded a car and dropped it 150 or 200 feet down. Then Frank wanted to quit, but he went into #5 room and asked Sampson for another car. The driver said he could have it about 3:30. We then decided to quit, and had put on our coats and started when Sampson met us at our switch without his mule, and told us there was a fire and asked if we had any water in our buckets.

We deliberately walked to the 4th north, when I suggested that if there was a fire there which could be put out with a bucket full of water, probably it could be smothered with a little dirt. We then ran to the door between the 3rd and 4th west, opened it, and looked through. The fire was raging and puffing on both sides of the 4th North, roaring and puffing all the time. We tried to pass through it but were compelled to turn back. I tried to kick down a stopping into the air course, and told Frank to get an axe. Before doing so, I met Smith, the driver, at the door and told him he needn't try to get through there, it was too hot. Presently Frank returned with an axe, and the four of us, Sampson having returned, tried to pass the fire. We were compelled to retreat, but Sampson and Smith went back and tried to get through. That was the last we saw of them. I then suggested that we try to break through into the air course. Frank was too much excited to be of any use, and so were the other two men who had come up from the 4th West. We cut through a brattice and got into the air course, assuring the others that the air was good. They then came through after me. Before breaking through, we went north to a water

hole but concluded not to try it. After breaking through into the air course, we turned in the direction of the fire, but soon encountered smoke and concluded to make it for #2 North through the air course. At about the 10th east, we met Evans, the pit boss and the nipper. We told them of the fire and urged the nipper to stay, but he and Evans went on. We proceeded in the northerly direction and found our way out into #2 mine. On the way, we met and warned a number of men, but for the most part, they paid no attention to us, saying that they were not afraid.

REPORT OF DELAGUA MINE EXPLOSION

November 8, 1910.

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The Delagua Mine Explosion occurred about 2 o'clock in the afternoon of November 8, 1910, and resulted in the death of 79 men.

HISTORY AND OWNERSHIP:

The Delagua Mine was opened up in 1902 by the Victor Fuel Company, which was later consolidated with the American Fuel Company and is now known as the Victor American Fuel Company. The general offices of the company are on the third floor of the Ernest & Cranner Building in Denver, Colorado, and the company operates a number of mines in Colorado and New Mexico.

The officers of the company are:

J. C. Osgood, Chairman,
Board of Directors, New York City.
J. W. Bowen, President, Denver, Colorado.
W. J. Murray, Vice Pres.,
and Gen. Mgr., " " .
S. I. Heyer, Secretary, " " .
J. W. Gove, Attorney, " " .

In the month previous to the explosion (Oct. 7, this company had a disastrous fire which burned the tipple, power house, boiler house, repair shops, and washing and storage bins. This fire was supposed to have been of incendiary origin, but the cause was never known.

OUTPUT:

Prior to the fire the mines were producing upwards of 3,000 tons per day, although at the time of the explosion they were working on a temporary tipple and had brought the production up to about 1,000 tons. Coal was extracted from five openings known as Mines Nos. 1, 2, 3, 4 and 5,- Nos. 1, 2 and 3 being connected and Nos. 4 and 5 on the opposite side of the gulch.

LOCATION AND GEOLOGY:

The mine is situated in the town of Delagua, at the terminus of the Colorado & Southeastern R. R. about 15 miles north from Trinidad, Colorado. This railroad (C. & S. E. R. R.) is six miles long and connects with the C. & S. Ry. at Ludlow, and with the D. & R. G. R. R. at Barnes Junction. It is owned by the Victor American Fuel Company and is used only to haul their coal to the connecting lines.

The seam worked is the fourth workable seam above the Trinidad sandstone, and is known as the Delagua seam. It lies practically flat and varies in thickness between 5-1/2 and 6-1/2 feet, averaging about 6 feet, and covers a slate parting about the middle of the seam, varying thickness from one to six inches. The vein is not seriously disturbed by faults. The immediate roof consists of slate below the cap rock (sandstone) varying in thickness

from 6 inches to 20 feet, and in parts of the mine is very treacherous and requires a good deal of timbering.

The vein out-crops around the hill-side and has a rather shallow cover varying from 150 feet to 200 feet. The coal is bituminous coking variety, but after operating the coke ovens for sometime with fairly satisfactory results it was found that the character of the coke became unsatisfactory, so the coke ovens were closed down; and have not been operated for some years. The coal near the crop made a very satisfactory coke, but coking was discontinued in 1909 because it was found the character of the coal changed as the mine went deeper, and the coke produced was not satisfactory - broken in small pieces from two inches to three inches in diameter - and the steaming quality of the coal was such that it was found more profitable to sell as steam coal than to coke.

Three samples of coal were taken from the faces of entries and rooms leading to the districts affected by the explosion only, and a composite sample made from these three; also road dust samples which are given herewith and numbered as follows:

DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

CHEMICAL LABORATORY REPORT

Test No. _____ Lab. No. II439 F

Sample of Road dust Can No. 20530

From State of Colorado Investigation Mine Accidents

County Las Animas Section G.S.Rice

Town Delagua Collector J.C.Roberts

Mine Delagua Operator Victor American Fuel Co.

Bed of coal Delagua Location in mine 4 th,north main haulage road 95' inbye first east

Method of sampling Not Given Gross weight, _____ lb. Net weight, _____ lb.

Air-dry loss I.40 Date of sampling II/I6/I0 Date of analysis I/I9/II

		Coal (Air dried)	Coal (As received)	Coal (Moisture free)	Percentages referred to coal (Moisture and ash free)
Proximate Analysis	Moisture	I/25	2.63		
	Volatile matter	30.40	29.97	30.78	44.36
	Fixed carbon	38.I2	37.59	38.6I	55.64
	Ash	30.23	29.8I	30.6I	
		I00.00	I00.00	I00.00	I00.00
Ultimate Analysis	Hydrogen				
	Carbon				
	Nitrogen				
	Oxygen				
	Sulphur	0.75	0.74	0.76	I.I0
	Ash				
Calorific value determined	Calories				
	British thermal units				
Calorific value calculated from ultimate analysis	Calories				
	British thermal units				

Date, I/7/II (Signed) A.C.Fieldner, *Chemist.*

6—206 6—2303

DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Test No. _____ CHEMICAL LABORATORY REPORT Lab. No. II438 F

Sample of Coal (dust) Can No. 20365

From State of Colorado Investigation Mine Accidents

County Las Animas Section G.S.Rice

Town Delagua Collector J.C.Roberts

Mine Delagua Operator Victor American Fuel Co.

Bed of coal Delagua Location in mine Empty slant haul from main slope to 3,rd. north 3c'from 3 rdnorth

Method of sampling Not Given Gross weight, _____ lb. Net weight, _____ lb.

Air-dry loss I.30 Date of sampling I1/I6/I0 Date of analysis I/30/II

		Coal (Air dried)	Coal (As received)	Coal (Moisture free)	Percentages referred to coal (Moisture and ash free)
Proximate Analysis	Moisture	0.43	2.7I		
	Volatile matter	27.87	27.5I	28.28	43.37
	Fixed carbon	36.39	36.92	36.92	56.63
	Ash	34.3I	33.86	34.80	
		I00.00	I00.00	I00.00	I00/00
Ultimate Analysis	Hydrogen				
	Carbon				
	Nitrogen				
	Oxygen				
	Sulphur	0.82	0.8I	0.83	I.27
	Ash				
Calorific value determined	Calories				
	British thermal units				
Calorific value calculated from ultimate analysis	Calories				
	British thermal units				

Date, Feb 24 th.I9I1 (Signed) A.C.Fieldner, *Chemist.*

6—206 6—2303

DEPARTMENT C THE INTERIOR
BUREAU OF MINES

Test No. _____ CHEMICAL LABORATORY REPORT Lab. No. II434 F

Sample of Coal (road dust) Can No. 20426

From State of Colorado Investigation Mine Accident

County Las Animas Section G.S.Rice

Town Delagua Collector J.C.Roberts

Mine Delagua Operator Victor American Fuel Co.

Bed of coal Delagua Location in mine Third north main haulage road between 7 &8 east

Method of sampling Not Given Gross weight, _____ lb. Net weight, _____ lb.

Air-dry loss I.I0 Date of sampling II/I8/I0 Date of analysis I/I8/II

		Coal (Air dried)	Coal (As received)	Coal (Moisture free)	Percentages referred to coal (Moisture and ash free)
Proximate Analysis	Moisture	I.33	2.42		
	Volatile matter	27.6I	27.3I	27.99	42.47
	Fixed carbon	37.42	37.00	37.9I	57.53
	Ash	33.64	33.27	34.I0	
		I00.00	I00.00	I00.00	I00.00
Ultimate Analysis	Hydrogen				
	Carbon				
	Nitrogen				
	Oxygen				
	Sulphur	0/64	0.63	0.65	0.99
	Ash				
Calorific value determined	Calories				
	British thermal units				
Calorific value calculated from ultimate analysis	Calories				
	British thermal units				

Date, Feb. 7 th. I9II (Signed) A.C.Fieldner, *Chemist.*

6—206 6—2303

DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Test No. .....

CHEMICAL LABORATORY REPORT

Lab. No. II443 F

Sample of Coal — Composite of II435 II436 II437

From State of Colorado — Investigation Mine Accidents

County ~~Delagua~~ Las Animas — Section G.S.Rice

Town Delagua — Collector J.C.Roberts

Mine Delagua — Operator Victor American Fuel Co.

Bed of coal Delagua — Location in mine .....

Method of sampling ..... — Gross weight, ... lb. Net weight, ... lb.

Air-dry loss 2.10 — Date of sampling ..... — Date of analysis 1/17/11

		Coal (Air dried)	Coal (As received)	Coal (Moisture free)	Percentages referred to coal (Moisture and ash free)
Proximate Analysis	Moisture	1.24	3.31		
	Volatile matter	35.08	34.34	35.51	39.75
	Fixed carbon	53.14	52.03	53.82	60.25
	Ash	10.54	10.32	10.67	
		100.00	100.00	100.00	100.00
Ultimate Analysis	Hydrogen	4.96	5.09	4.88	5.46
	Carbon	73.11	71.57	74.02	82.86
	Nitrogen	1.41	1.38	1.43	1.60
	Oxygen	9.42	11.09	8.43	9.44
	Sulphur	0.56	0.55	0.57	0.64
	Ash	10.54	10.32	10.67	
		100.00	100.00	100.00	100.00
Calorific value determined	Calories	7215	7063	7305	8177
	British thermal units	12987	12713	13149	14719
Calorific value calculated from ultimate analysis	Calories		7050		
	British thermal units		12726		

Date, Feb.10,1911 — (Signed) A.C.Fieldner, *Chemist.*

6—206 6—2303

DEPARTMENT (THE INTERIOR
BUREAU OF MINES

Test No. _____ CHEMICAL LABORATORY REPORT Lab. No. 11437

Sample of Coal Can No. 20510

From State of Colorado Investigation Mine Accident

County Las Animas Section G.S.Rice

Town Delagua Collector J.C.Roberts

Mine Delagua Operator Victor American Fuel Co.

Bed of coal Delagua Location in mine Room 5,3 rd, west off 4th, north

Method of sampling Usual Gross weight, 50 lb. Net weight, _____ lb.

Air-dry loss 2.10 Date of sampling 12/7/10 Date of analysis 1/19/11

		Coal (Air dried)	Coal (As received)	Coal (Moisture free)	Percentages referred to coal (Moisture and ash free)
Proximate Analysis	Moisture	1.06	3.14		
	Volatile matter	34.09	33.37	34.45	39.57
	Fixed carbon	52.05	50.96	52.61	60.43
	Ash	12.80	12.53	12.94	
		100.00	100.00	100.00	100.00
Ultimate Analysis	Hydrogen				
	Carbon				
	Nitrogen				
	Oxygen				
	Sulphur	0.51	0.50	0.52	0.60
	Ash				
Calorific value determined	Calories				
	British thermal units				
Calorific value calculated from ultimate analysis	Calories				
	British thermal units				

Date, Feb.1 1911 (Signed) A.C.Fieldner, *Chemist.*

6—206 6—2303

DEPARTMENT C THE INTERIOR
BUREAU OF MINES

Test No. _____ CHEMICAL LABORATORY REPORT Lab. No. II436

Sample of _____ Can No. 20454

From State of Coal Investigation Mine Accidents

County Las Animas Section G.S.Rice

Town Delagua Collector J.C.Roberts

Mine Delagua Operator Victor American Fuel Co.

Bed of coal Delagua Location in mine Face off entry I8 East off 4 th. North

Method of sampling Usual Gross weight, 50 lb. Net weight, _____ lb.

Air-dry loss 2.30 Date of sampling I2/7/I0 Date of analysis I/I8/II

		Coal (Air dried)	Coal (As received)	Coal (Moisture free)	Percentages referred to coal (Moisture and ash free)
Proximate Analysis	Moisture	I.26	3.53		
	Volatile matter	35.04	34.23	35.48	39.67
	Fixed carbon	53.27	52.05	53.96	60.33
	Ash	I0.43	I0.I9	I0.56	
		I00.00	I00.00	I00.00	I00.00
Ultimate Analysis	Hydrogen				
	Carbon				
	Nitrogen				
	Oxygen				
	Sulphur	0.48	0.47	0.49	0.55
	Ash				
Calorific value determined	Calories				
	British thermal units				
Calorific value calculated from ultimate analysis	Calories				
	British thermal units				

Date, Feb.4 th. I9II (Signed) A.C.Fieldner, *Chemist.*

6—206 6—2303

DEPARTMENT C THE INTERIOR
BUREAU OF MINES

Test No. .....

CHEMICAL LABORATORY REPORT

Lab. No. 11435

Sample of Coal

Can No. 20515

From State of Colorado

Investigation Mine Accident

County Las Animas

Section G.S.Rice

Town Delagua

Collector J.C.Roberts

Mine Delagua

Operator Victor American Fuel Co.

Bed of coal Delagua

Location in mine (Face, room 1, 24 th. (east off 3 rd. north

Method of sampling Usual

Gross weight, 50 lb. Net weight, ... lb.

Air-dry loss 1.90 Date of sampling 12/7/10 Date of analysis 1/18/11

		Coal (Air dried)	Coal (As received)	Coal (Moisture free)	Percentages referred to coal (Moisture and ash free)
Proximate Analysis	Moisture	1.31	3.19		
	Volatile matter	35.68	35.00	36.16	39.68
	Fixed carbon	54.25	53.22	54.97	60.32
	Ash	8.76	8.59	8.87	
		100.00	100.00	100.00	100.00
Ultimate Analysis	Hydrogen				
	Carbon				
	Nitrogen				
	Oxygen				
	Sulphur	0.58	0.57	0.59	0.65
	Ash				
Calorific value determined	Calories				
	British thermal units				
Calorific value calculated from ultimate analysis	Calories				
	British thermal units				

Date, Feb. 4 th 1911

(Signed) A.C.Fieldner, *Chemist.*

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6—2303

OUTSIDE EQUIPMENT:

At the time of the explosion, the outside equipment consisted of a temporary wooden tipple, 90 coke ovens built in 1903, and 90 ovens built in 1906 but never lighted, transformers, motor-generator sets, blacksmith shop and offices. The company was buying power from the Trinidad Electric Company until they could rebuild their power-plant.

DEVELOPMENT:

The mine is worked on the ordinary double entry system, room and pillar, and rooms are turned off both main and back entries. Mine No. 3 is the one in which the explosion occurred; and, therefore, the one with which this report will deal, although it is connected with No. 2 mine. The entrance known as the main slope is driven in 2600 feet connecting with 3rd, 4th and 5th north entries which constitute the No. 3 mine. The 3rd north is in 8,150, the 4th north 7,000 and the 5th north 600 feet. This entry isbeing driven from three points as shown by map to connect with the Rock Island; and when completed will constitute the main haulage road from the Rock Island. The name (Rock Island) is given to this portion of the mine because the land is leased from the Rock Island R. R. This entry starts at 4600 feet from the main slope off the 4th north and runs in a north-westerly course and intersects the 5th south which is being run to

connect with the 5th north from the main slope.

In the third north the pillars have been pulled and the rooms cased up to 22 east, and in the fourth north up to the 12th east, and the workings on these two entries are inbye this point or approximately 6,000 feet and 5,000 feet inbye the main slope, with the exception of the west entries off the 4th north, where the rooms are being driven and worked.

This is all clearly shown by the two maps which are attached and become part of this report, the one showing all the workings of the Delagua mine and the other showing only the districts affected by the explosion.

All entries are ten feet by six feet and are approximately 600 feet apart.

HAULAGE:

The haulage in this mine (No. 3) consists of mules gathering to partings at various parts of the mine and electric motors (250 volt) hauling cars to the main slope, and rope haul from main slope to tipple. Wooden cars of about two ton capacity were used to haul coal.

LIGHTING:

On main haulage ways lighting was by electricity (250 volts) and open lights, using miners' white oil, were used entirely throughout the mine; which means that matches were allowed;and men were allowed to smoke in the mine.

I am informed that no explosive gas had ever been encountered in the mine.

VENTILATION:

The ventilation is induced by a 15 foot cappel fan, and at the time of the explosion, was drawing in 55,000 - 60,000 cubic feet of air per minute. The fan was working as a suction fan and was located at the entrance to the back-air course paralleling the main slope. The course of the air was in the main slope to the 3rd north where a split occurred at the over-cast when part of the air was deflected up the 3rd north to the end, back to the back entry to back entry of main slope and to fan, the balance going down the slope to the 4th north where a door in the main slope forced all the rest of air down the 4th north to the Rock Island entry, where the air again split, part going up the Rock Island entry and the rest to the face of the 4th north and back by the back air course to the main back entry and thence to the fan.

HISTORY OF THE EXPLOSION; connection of the Bureau of Mines with same:

Mine Safety car No. 2 arrived in Denver, Colorado, on October 5, 1910, and remained there until Tuesday, October 8, when at the urgent request of Dr. V. C. Alderson of the State School of Mines, the car was taken to Golden for demonstration purposes before the students of the school. The

car left Golden at 4:00 P. M. for Denver, the intention being to leave at noon on the 9th for Trinidad. On arriving at Denver on the street car I discovered by the papers that an explosion had occurred in the Delagua mine and it was reported that 200 men had been killed. I immediately got in communication with Mr. W. J. Murray, General Manager of the Victor American Fuel Company, and arranged with the officials of the C. & S. R. R. to carry our car to Peublo on their train leaving Denver at 7:45 P. M. On arriving at Peublo, Mr. Murray had arranged for a special train to take our car and his (containing officials of his company) to Delagua where we arrived at 5:30 A. M. November 9.

The story of the fire and the explosion following as told by various witnesses is as follows:

As the details are given in the attached evidence also forming a part of this report, I will only briefly sketch the matter. At about 1 o'clock P. M. November 8, a fire occurred on the inbye side of a door in the second cross-cut outbye the 3rd west about 200 feet. All the officials went into the mine to fight the fire, which by the time they arrived at the scene was raging fiercely. The motor was sent out to the mouth to get hose, and before they could get back the explosion occurred. This door was not used but there was a breach on either side, and the drivers

and others were accustomed to congregate there at noon and eat their dinners.

At about 2 o'clock the explosion occurred.

RESCUE WORK:

W. F. Murray, Superintendent of Cass mine and James Cameron, Superintendent of Hastings mine were among the first to arrive on the scene after the explosion, and immediately took charge of the work of rescue and restoring the air. The fan was not injured but the top of the fan house was blown off, so that the fan was useless, and one of the first things that was done was to knock out the stopping connecting No. 2 mine with No. 3 mine, close up the mouth of No. 2 drift and this restored the ventilation, pulling the air through No. 1 fan. The blown out brattices were restored by the helmet men.

At 6:30 the Colorado Fuel & Iron Company car arrived on the scene with more helmets and volunteers, and regular rescue parties were formed and a rescue station established at the 4th north about 150 inbye the second west; and from this point the rescue operations and fire fighting were conducted.

After the fire was completely extinguished by means of the helmets, the work of rescue and exploring was started. The exploring party with helmets went up the 4th west to the fifth north back entry and discovered four men who had gone back and bratticed themselves off near the face

out and placed in the C. F. & I. rescue car and was worked on by three doctors using the pulmotor and other restoratives until 6:30 A. M. when he died. The doctors said he died of CO poisoning, although no tests were made to determine this fact. It is supposed that Evans in his eagerness wandered away and got lost, or the CO began to affect him and he lost his head.

There are several lessons to be learned from this sad occurrence: 1st, that organization and thorough discipline are absolutely essential in all rescue work (up to this time there had been an utter lack of organization); 2nd, that a rescue man should never give up his helmet to another man; and 3rd, that a man should never wander off alone in a strange mine. Evans should either have stayed where he was in comparatively good air or should have taken his chances of getting out as the other fellow did. 4th, that it is very essential that a careful check should be kept of every man entering and coming out of the mine. This was not done prior to this time.

Safety car No. 2 arrived at 5:30 A. M. on Wednesday morning, and a search party under John D. Jones, State Mine Inspector, accompanied by eight helmet men, with Tweeddale and Harvey of the Government car as members of the party, entered the main air course of No. 3, stating that they would come out by No. 2 mine, and after waiting a reasonable time for them to come out I became somewhat alarmed, and organized

a party to go in No. 2 and see if anything had happened to them. After penetrating about 4500 feet I discovered a light and heard a man yell for help, and sent one of the men back for assistance and the rest of us went forward to the assistance. It proved to be a party which had gone in at No. 3 and were coming out at No. 2. They proved to be in a very bad way and had it not been for the timely discovery they would have probably gone down and had lost their lives. They were brought out to the air and the pulmotor applied to them and they soon recovered. One man had entirely lost the use of his legs and had to be carried out. The party led by Jones came out at No. 3 (the way they had entered) without having encountered any misfortune.

On the morning of the 9th at eleven o'clock fourteen men who had been working in the Rock Island came out through No. 2. They were in pretty bad shape, but came through all right. Search parties were then regularly organized and the whole mine was explored, and by the 9th it was fully determined that all the men remaining in the mine were dead. In the meantime the work of recovering the dead continued, and it was not until the 17th that the last body was recovered owing to the fact that several bodies were burried under falls which had to be cleaned up.

LOCATION OF THE DEAD:

Twenty-nine bodies in the last cross-cut between 1st

and 2nd west. These men could have saved themselves if they had only used their heads and bratticed themselves off as did the four men in the 4th west. They were found huddled like sheep lying on top of each other.

Two men in 1st west between five and six.
" " " 4th north back entry 150 feet inbye second west.
One man " 4th north opposite room No. 1.
" " " " " about 50 feet outbye room No.1.
" " " cross-cut off main slope 4th north and slant haul.
" " " main slope opposite 4th north.
Five men " " " near mouth, badly burned and under caves.
Three " " 3rd north near main slope.
" " " " " about 50 feet inbye 5th east.
Five " " 4th " back entry (air course) about 250 feet inbye 4th west.
Twenty-one men in fourth north (main) entry about 100 feet outbye 7th east.
One man in 4th north main entry about 200 feet inbye tenth east.
Three men killed on the outside at pit-mouth by flying rock and timbers.
One man, Willis Evans, the rescue man found in room four off the 4th west.

Total 79 men.

As near as can be ascertained there were 118 men in the mine at the time of the explosion, 28 of whom came out through No. 2, four were rescued by the helmet men alive and fourteen came out the following day. Fortunately a large proportion of the men came out at noon to vote (it being election day) and did not get back to work, or the death roll would have been much larger.

Investigation was started on November 14. The explosion came out the main slope with terrific force, blowing timbers hundreds of feet, and the steel casing of the motor

which was standing near the mouth, was blown off and carried 600 feet away, cutting a hole in the blacksmith shop, which was built of sheet-iron. The main slope was caved for 300 feet so that it was not possible to get through. The overcast at 3rd North was blown out, and the cross-cut leading to the back air-course at this point has double doors and brattices (wooden) and used as a tool-house, was blown into the air-course.

A heavy door on the main slope between 4th North Main and Back Entries was utterly destroyed, and pieces found 20, 85 and 145 feet down the slope. The hinges, which were made of heavy strip iron, were bent double and found 85 feet inbye point where the door was originally located. Coke was found on inbye side of timbers. All indications point to the force coming out of the 4th North and going both up and down the slope.

Outbye the 4th North all timbers were blown outbye and slight coke was found on outbye side of timbers.

3rd North. All timbers are blown inbye and heavy falls from the 1st East to 4th East and slight falls from this point to 8th East, and brattices all blown into back air-course. From 6th East to the beginning of the heavy falls, the entry was excessively dry and dusty, the dust in places being fully 4 inches deep. The rails were entirely covered, but beyond

that point (inbye 6th East) the entry was very wet, and this I think accounts for the fact that the explosion did not propagate further into the working places.

Coke was found on inbye sides of Caps and props, up to 1st East where heavy falls begin. This was found to be the case in the main entry as well as in the slant-hauls. A door on the 3rd North 10 feet inbye loaded slant-haul was blown inbye 50 feet.

Fourth North. Slant-haul - loaded track. Begining at about 10 feet from Main Slope heavy cave 25 feet long. At this point leading into Main Slope there were three sets of timber about 4½ feet apart. The middle set was knocked out and the other two were intact. There was no sign of fire here however. 50 feet inbye this face was a loaded trip consisting of 21 cars, the 6th, 7th, and 8th cars were covered with rock. Just inbye this cave a set of timbers standing intact showed decided coke on all sides but heavier on the inbye side. The motor "run round" showed decided coke on all timbers and roof and ribs. The coking seemed to be stronger on the inbye side of the timbers.

The "empty track" showed the force going out, timbers were blown outbye, and heavy coke was found on outbye side of timber. There seemed to be a swirl at the intersection of the loaded track and the motor run-around as all indications point

to the force coming out the empty and loaded tracks and in the motor run-round.

The Rock Tunnel serves as a back air course to the main slope. 10 feet in were two gob walls and a heavy board stopping. These were blown into the tunnel with terrific force, some of the boards being blown 75 feet into the rock tunnel. From this point into the cross-cut at which the fire occurred there were no signs of force or heat. The timbers were all intact. They showed heavy scouring on inbye side and heavy dust on outbye, but no coke. There was a small cave at the slant leading to 1st East. Between the 2nd and 3rd East all timbers are standing intact with no signs of coke. Heavy scouring action was noted on inbye sides of timbers and heavy dust on outbye side.

The fire occurred in the cross-cut about midway between the 2nd and 3rd East and burned the coal from the ribs and roof 100 feet outbye and 80 feet inbye the cross-cut in the back entry. This door was 5'6" by 6'6" and part of the frame is still standing. The roof caved early at this point due to the heat and burning out of the timbers. The first signs of force were noted at the pump-cross-cut about 150 feet inbye 4th East. These falls were continuous with a maximum thickness of about 3 feet. At 5th and 6th East fall was very

heavy. The timbers all down appeared to have been blown outbye, but these might have been influenced by the fall of rock. From 6th East to pump cross-cut (250 feet outbye 7th East) there were no falls, and seemed to be very little disturbance.

At 6th East some timbers are still standing and show very heavy dust on inbye side of timbers and very little on outbye, but there is no sign of coking. At pump cross-cut heavy caves started and continued to 9th East. From this point to the inbye end of the 10th East parting there were no caves. We then encountered heavy caves until the 4th cross-cut inbye the Rock Island entries, where all signs of violence ceased. From 4th East to the Rock Island entries all the stoppings were blown into the back entry, and all along the back entry there were signs of force and heat with frequent occurrences of caves, sometimes on inbye and sometimes on outbyse side of timbers. As the timbers were not disturbed, it was impossible to predict which direction the force took. There were signs of force in both directions. It is certain, however, that the force came into the back entry through the cross-cut from the main entry, as all brattices were blown into the back entry.

The West entries were not disturbed, nor was the back entry between the West entries, except in the immediate

this dust mixed with air directly into and over the fire, which, prior to this time, was known to have been burning with terrific violence.

Respectfully submitted.

J. C. Roberts,

Mining Engineer.

DATA SHEET FOR MINE MAP REPOSITORY

QUESTIONS	COLUMNS	ANSWERS
Map Number	1 - 6	
Card Number	7 - 8	10
State Code	10 - 11	02
County Code	12 - 14	271
Mine Name	15 - 46	DALHQIN MINE
Mine ID (H & S)	47 - 56	X
Mine Type	57	1
Company Reference (card)	58 - 59	50
Modifier	60	X
Mine ID (B. of Mines)	61 - 65	X
UTM	66 - 80	
Card Number	7 - 8	60
Reel Number	10 - 14	
Frame Number	15 - 18	
Number of Scenes	19 - 21	
Date of Filming	22 - 27	
Document Classification	28	0
Distribution Limitation	29	6
Declassification Schedule	30	0
River Basin Code	31 - 34	
Land Survey	35 - 52	X
Army Map Number	53 - 60	N/A
Quadrangle Name	61 - 76	
Date of Document	77 - 80	1900

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DATA SHEET CONTINUED

QUESTIONS	COLUMNS	ANSWERS
Card Number	7 - 8	61
Commodity Code	10 - 17	
Mine or Company ID	18 - 20	X
Card Number	7 - 8	63
Bed Code	10 - 12	X
Mine Reference (card)	13 - 14	X
Card Number	7 - 8	65
Reference Document	10 - 23	H S
Mine or Co. Reference (card)	24 - 25	X
Modifier	26	X
Card Number	7 - 8	50
Company 1	10 - 41	VICTOR AMERICAN FUEL CO.
Company 2	42 - 73	X
Card Number	7 - 8	70
Narrative	10 - 80	

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Data Complete [illegible] Data Punched _____ Posted to Base Map _____

15619

Report on the Delagua Mine Explosion Nov. 8, 1910.

Delagua, Colorado

by

J. C. Roberts, Mining Engineer.

Denver, Col. Nov. 17, 1911.

Report of Delagua Mine (1)
Explosion - November 8th 1910.

The Delagua Mine Explosion occurred about 2 o'clock in the afternoon of Nov. 8th 1910, & resulted in the death of 79 men.

History & Ownership.

The Delagua Mine was opened up in 1902 by The Victor-Fuel Co., which was later consolidated with the American Fuel Co., & is now known as the Victor-American Fuel Co.

The General offices of the Company are in the 3rd floor of the Ernest & Cranmer Building in Denver, Colo., & the Company operates a number of Mines in Colo & New Mexico.

The officers of the Co. are

J. C. Osgood Chairman Board of Directors New York
Geo. Bowen Prest Denver, Colo.
W. J. Murray V.Pr. & Gen'l Mgr " "
N. D. Hagen Secy " "
J. W. Gove Atty " "

Just month previous to the explosion (Oct 7) the Company had a disastrous fire which burned the tipple, power house, Boiler House, Repair Shops, Washing & storage bins. This fire was supposed to have been of incendiary origin, but the cause was

now known. ~~Prior~~

Output

Prior to this fire the mines were producing upwards of 3000 tons per day although at the time of the explosion they were working on a temporary tipple & had brought the production up to about 1000 tons.

Coal was extracted from 5 opening known as mines #1, 2, 3, 4 & 5., Nos 1, 2 & 3 being connected & Nos 3 & 4 on the opposite side of the Gulch.

Location & Geology.

The mine is situated in the town of Delagua at the terminous of the Colorado & Southern R.R., about 15 miles north from Trinidad Colo. This R.R. (C&S.E.R.R.) is 6 miles long & connects with the C&S. Ry at Ludlow & with the D&R.G. R.R. at Barnes Junction. This owned by the Victor-American Fuel Co., is used only to haul their coal & the connection thereon

The seam worked is the 4th workable seam above the Trinidad sandstone, is known as the Delagua seam. It varies in thickness between 5½' & 6½', averaging about 6 feet, & carries a slate parting about the middle of the seam varying in thickness from 1 to 6 inches ~~in thickness~~. The vein is irregular & not seriously disturbed by faults ~~& folds~~

The immediate roof consists of shale below the caprock (Sandstone) varying in thickness from 6" to 20', & in parts of the mine is very treacherous & requires a good deal of timbering.

The vein outcrops around the hillside & has a rather shallow cover varying from 150 to 200 feet. The coal is a bituminous coking variety, but after operating the coke ovens for some time with fairly satisfactory results, it was found that the character of the coal became unsatisfactory so the coke ovens were closed down & have not been operated for some years.

The coal near the crop made very satisfactory coke ~~but as the mine progressed in work the character of the coal changed~~ *(under page 3 1/2 here) ~~& coke was abandoned.~~

~~The analyses herewith represent a composite of 3 samples taken from Face of Room 5 3rd West off 4th North, Face of entry~~

Three samples of coal were taken from the faces of entries & rooms leading to the districts affected by the explosion only, & a composite sample made from these three, also wood dust samples which are given herewith & numbered as follows: ~~showing the location of each~~

~~40 coke ovens built in 1903.~~
~~40 " " built in 1906, ~~[illegible]~~ lighting.~~

* ~~The~~ Coke coking was discontinued in 1909 because it was found that the character of the coal changed as the mining went deeper, the coke produced was not satisfactory - broke into small pieces from 2" to 3" in diameter & the steaming quality of the coal was such that it was found more profitable to sell as steam coal than to coke.

#11435. Face Room I. 24th East off 3rd North
Prox. Analysis (here).

11436. Face Entry 18 East off 4th North.
Prox Analysis (here)

11437 Room 5, 3rd West off 4th North
~~Prox~~ Analysis (here)

11443F. Composite sample made up of
Equal Parts of 11435, 6 & 7.
Prox & Ultimate Analysis (Here)

11434F. Road Dust. 3rd North Main haulage
road between 7th & 8th East.
Prox Analysis (here).

11438F. Empty Stone Haul from Main Slope to
3rd North 30' from 3rd North.
Prox Analysis (here)

11439F. 4th North Main Haulage road 95'
in by 1st East.
Prox. Analysis Here

Outside Equipment.

At the time of the explosion, the outside equipment consisted of a temporary wooden tipple, 90 coke ovens built in 1903; & 90 ovens built in 1906, but ~~were~~ were lighted, ~~for reasons already stated~~, transformers, motor-generator set, blacksmith shop & office. The company was buying power from the Pittsburgh Electric Co., until they could rebuild their power plant.

~~System of working.~~-

Development.-

The mine is worked on the ordinary double entry system, Room & Pillar, & room are turned off both main & back ~~headings~~ entries. Mine #3. is the one in which the explosion occurred & therefore the one with which this report will deal, although it is connected with no 2 mine. The entrance known as the main slope is driven in 1600 ft connecting with 3rd & 4th & 5th North Entries which constitute the #3 mine the 3rd North is in 8150 feet, the 4th North 7000 feet & the 5th North, 600 feet. This entry is being driven from 3 points as shown by map to connect with the Rock Island, & when completed will constitute the main haulage road from the Rock Island.

The name "Rock Island" is given to the portion of the mine, because the land is leased from the R.I.R.R. - This entry starts at 4600 feet from the main slope off the 4th North & runs in a North westerly course & intersects the 5th South which is being run to connect with the 5th North from the Main Slope.

Both 3rd North the Pillars have been mined out rooms cut up to 2½ East & in the 4th North up to the 12th East, & the workings within 100 metres are inbye of this point or approximately 6000 & 5000 feet inbye the main slope, with the exception of the west entries off the 4th North where rooms are being driven & worked.

This is all clearly shown by the two maps which are attached & become part of this report, the one showing all the workings of the Delagua mine & the other showing only the district affected by the explosion.

All entries are 10' x 6' & are approximately 600' apart.

Ventilation.

The ventilation is induced by a 15 foot Capel fan & at the time of the explosion was drawing in 55,000 - 60,000 Cu feet of air per minute. The fan was a suction fan, & was ~~the Main Slope~~ located at the entrance to the back air course paralleling the Main Slope.

The course of the air was in the Main Slope to the third (3rd) North, where a split occurred at the Omega, where part of the air was deflected up the 3rd North to the end, back the back entry to back slope of Main slope & fan, the balance going down the Slope to the 4th North, where a door in the Main Slope forced all the rest of the air down the 4th North to the ~~face~~ Rockdale entry, where the air again split, part going up the R.D. entry & the rest to the face of the 4th North & back by the back air course to the main back entry & thence to the fan.

Haulage.

The Haulage in this mine (#3) consists of mules gathering to partings at various parts of the mine. Electric motors, 250 volt, hauling cars to the main slope & Rope haul from Main Slope to tipple. Wooden cars of about 2 ton capacity were used to haul coal.

Lighting. In main haulageways was by electricity (250 volts), & open lights, using mines white oil, were used entirely throughout the mine, which means that matches were allowed & men were allowed to smoke in the mine.

I am informed that no ~~gas~~ explosive gas had ever been encountered in the mine.

* 14½ insert here

History of the Explosion. The Connection of the Bureau of Mines with Same.

Mine Rescue Car #2 arrived in Denver, Colo. on Oct 5th 1910 & remained there until ~~Friday Oct 8th~~ Oct 8th, when at the urgent request of Dr. V. Calderon of the State School of Mines, the car was taken to Golden for demonstration purposes before the students of the School. The car left Golden at 4 P.M. for Denver, the intention being to leave at noon on the 9th for Trinidad.

On arriving at Denver on the 8th, I discovered by the papers that an explosion had occurred

in the Delagua Mine fire was reported that 200 men had been killed.

Immediately got in communication with Mr. W. J. Murray Jr. of the Victor American Fuel Co., & arranged with the officials of the C.&S. R.R. to carry our car to Pueblo on this train leaving Denver at 7.45 P.M. On arriving at Pueblo, Mr. Murray had arranged for a special train to take our car & his (containing officials of his Co.) to Delagua, which we arrived at 5.30 A.M. Nov. 9th

The story of the fire ~~with its~~ & the explosion following as told by various witnesses is as follows: As the details are given in the attached evidence also forming part of this report I will only briefly sketch the matter:-

At about 1 o'clock on the afternoon of Nov. 8th, a fire ~~was reported down in the mine outside the Mouth~~ occurred on the inboye side of a door in the 2nd Cross Cut out by the 3rd West about 200 feet.

Both local officials went into the mine to fight the fire, which by the time they arrived at the seam, was raging fiercely. The motor was put out to the mouth to

to get loose & before they could get back the explosion occurred.
This door was not used, but there was a bench on either side & the drivers & others were accustomed to congregate there at noon time & at this time.
At about 2 o'clock the explosion occurred.

Rescue Work.

~~Fanning & Sets Men.~~

Wm Murray & Supt Chas Minn & Jas Cameron Supt Hastings Mine were among the 1st arrival on the scene after the explosion & immediately took charge of the work of rescue & restoring the air. The fan was not injured but the top of the fan house was blown off, so that the fan was useless, so that one of the 1st things that was done was to run a cross cut the stopping connecting #2 mine with #3 mine, clear up the mouth of #2 Diff & thus restore the ventilation pulling the air through #1 fan. The blown out brattices were restored by the Helmet men.
At 6.30 the O.F. & Cos arrived on the scene with mor helmets & volunteers & regular rescue parties were formed, & a rescue station established at the 4th North about 150' inbye the 2nd West, & from this point the rescue operations & the fire fighting were conducted.

After the fire was completely extinguished by means of the Helmets ~~& extinguishers~~ the work of rescue & exploring was started. The exploring party with helmets went up the 4th west to the 5th north back entry & discovered 4 men who had gone back & battened themselves off near the face & stayed there. These men had torn down a curtain in the last cross cut, thus shutting the air & preventing the after damp reaching them & remained there in safety until help came to their relief.

Willis Evans, an engineer in the employ of the C.F. & I.Co. & another member of the rescue crew took off their helmets & put them on two of the rescued men who seemed very much exhausted. This happened in the third 3rd west. Evans & the other man were told to stay where they were, as the air seemed to be good at that point, & the men with the helmets would come back after them. The other man followed the helmet crew out & reached safety but Evans stayed. I am told there was considerable difficulty in getting men to put on the helmets & that fully an hour elapsed before the party went back

in search of Evans. One reason for the delay was that some men said that Evans was out, & they went out to find him, & failing to do so, a party was organized & went in search of him. He was not when the party expected to find him but had wandered off & after about an hour's search, he was found in room 4 off the 4th West. He was down & the first thing the rescue party did on reaching him was to administer artificial respiration in the bad air. They stated that they made him vomit. He was then brought out to the relief station in the 4th North where the Doctors worked on him for some time & then he was brought out & placed in the C.F. & S. Rescue Car & was worked on by three Doctors using the Pulmotor with restoratives until 6.30 a.m. when he died. The Doctors said that he died of CO. poisoning although no tests were made to determine this fact.

It is supposed that Evans in his carelessness, wandered away & got lost with the CO. began to affect him & he lost his head.

first discussed lessons to be learned from this sad occurrence. 1st that organization & thorough discipline are absolutely essential in all rescue work (up to this time there had been an utter lack of organization); 2nd that a rescue man should never give up his helmet to another man; & third that a man should never wander off alone in a strange mine. Evans should either have stayed where he was, in comparatively good air or should have taken his chances of getting out as the other fellow did. 4th that it is ~~this sad occurrence cost a damper over the~~ very essential that a careful check should be kept of every man entering & coming out of the mine. This was not done prior to this time.

Rescue Co #2 arrived at 6:30 Am on Wednesday morning, & a search party ~~headed by~~ led by John D. Jones, State Mine Inspector, ~~entered~~ accompanied by 8 helmet men, with Woodall & Harry of the Govt Co ~~forming~~ as members of the party, entered the main air course of #3, stating that they would come out by #2 mine. After waiting a reasonable time for them to come out, I became somewhat alarmed & organized a party to go in #2 & see if anything had happened to them.

after penetrating about 4500 feet, I discovered a light & heard a man ~~call~~ for help, & sent one of the men back for assistance & the rest of us went forward ~~to~~ to the assistance. It proved to be a party which had gone in at #3 & were coming out of #2. They proved to be in a very bad way & had it not been for the timely discovery, they would probably have gone down & have lost their lives. They were brought out to the air & the Pulmotor applied to them & they soon recovered.

One man had entirely lost the use of his legs & had to be ~~helped~~ carried out.

The party led by Jones came out at #3 (the way they had entered), without having encountered any misfortune.

On the morning of the 9th at 11 o'clock 14 men who had been working in the Roadsland came out through #2. They were in pretty bad shape, but came through all right.

Search parties were then regularly organized & the whole mine was explored & by the 9th ~~all~~ it was fully determined that all the men remaining in the mine ~~had~~

were dead. During the meantime the work of removing the dead continued, it was not until the 17th that the last body was recovered, owing to the fact that several bodies were buried under falls which had to be cleaned up.

Location of the dead.

29 Bodies in the cross cut below 1st & 2nd West. These men could have saved themselves if they had only used their heads & battened themselves off. as did the 4 men in the 4th West. They were found huddled in a chute, lying on top of each other.

2 Men in 1st West below Rooms 5 & 6.
2 " " 4th North Entry 150' inby 2nd West.
1 Man " " " opposite Room 1.
1 " " " about 50 ft out by room 1.
1 " " cross cut off Main Slope 4th North & Haul haul.
1 " " Main Slope opposite 4th North.
1 " " " " Near mouth, badly burned & under cars.
5 " " 3rd North near Main Slope.
3 " " 3rd " about 50' out by 5 East.
3 " " 4th North Back entry (air course) about 250' inby 4th East.
5 " " 4th " (Main) " about 100' out by 7th East.
21. " " 4th " " " " 200' inby 4th East.
1 " " 4th " " " " outside air pit mouth by flying rock & timber.
3 Men killed outside air pit mouth by flying rock & timber.
1. Man Willis Evans the rescue man found in room 6 off the 4th West.

79.

As near as can be ascertained there were 118 men in the mine at the time of the explosion 28 of whom came out through no 2, 4 were rescued by the helmet men alive & 14 came out the following day. Fortunately a large proportion of the men came out at noon to rest (it being election day) & did not get back to work ~~until~~ the death roll would have been much larger.

Investigation was started on November 14th

The explosion came out the main slope with terrific force blowing timbers hundreds of feet, & the steel casing of the motor which was standing near the mouth was blown off & carried 600 feet away & cutting a hole in the blacksmith shop, which was built of steel door. The main slope was cover for 300' south it was not possible to get through.

The door cost at 3rd north was blown out, ~~but there was very little signs of force between 3rd & 4th north. The door between the~~ & cross cut leading to the back air course at this point ~~two~~ double doors & brattices (wooden) used as a tool house, was blown into the air course.

A heavy door on the main slope ~~just in by~~ between 4th north Main & Back entries was utterly destroyed, & pieces found 20', 85' & 145' down the slope. Six hinges which were made of heavy strap iron were bent double & found 85' inby point where door was originally located. Coal was found on inby side of timbers. All indications point to the force coming out of the 4th north & going both up & down the slope.

Outby the 4th north all timbers were blown out by & slight coal was found on outby side of timbers.

3rd North. All timbers are blown inbye & heavy falls from the ~~main slope~~ 1st East to 4th East & slight falls from this point to 8th East & brattices all blown into back air course. From 6th East to the beginning of the heavy falls, the entry was excessively dry & dusty, the dust in places being fully 4 inches deep. - The rails were entirely covered, but beyond that point (inbye 6th E.) the ~~roadway~~ entry was very wet, & this seems accounts for the fact that the explosion did not propagate further into the working places.

Coke was found on inbye sides of lags & props, up to 1st East where heavy falls begin. This was found to be the case in the main entry as well as in the slant haulds.

A door on the 3rd North 10' inbye loaded slant haul was blown inbye 50'.

Fourth North. Slant haul - Loaded track ~~2d Cross~~ Beginning at about 10' from Main Slope heavy cave 25' long. At this point leading into main slope 3 sets of timber about 1½ feet apart. The middle set was knocked out & the other two were intact. There was no sign of fire here however.

50 feet inbye this fall was alooded this consisting of 21 cars, the 6th, 7th & 8th cars were covered with rock. Just inbye this cave a set of timbers standing intact showed decided coke on one sides, but heavier on the inbye side.

The Motor "run round" showed decided

Coal on all timbers & roof & ribs. The coking seemed to be strongest on the inbye side of the timbers.
The "Empty track" showed the force going out - timbers were blown outbye & heavy coal was found on outbye side of timbers.
This seemed to be a swirl at the intersection of the loaded track & the motor run round as all indications point to the force coming out the empty & loaded tracks & in the motor run round.
~~At the intersection of the Rock Tunnel with the 4 Foot~~
~~The mouth of the "Rock Tunnel" was got back tight for 30', a heavy board stopping. This got was blown into the tunnel~~
~~The mouth of the Rock Tunnel~~
The Rock Tunnel, ~~which~~ serves as a back air course to the main slope. 10' in were two robbed walls & a heavy board stoppings. These were blown into the tunnel with terrific force some of the boards being blown 75' into the Rock Tunnel.
From this point in to the cross cut at which the fire occurred there were no signs of force or heat - the timbers were all intact. They showed heavy scouring on inbye side & heavy dust on outbye

but no coal. There was a small cave at the drift leading to 1st East.
Between the 2nd + 3rd east all timbers on standing intact, with no signs of coal. Heavy scouring action was noted on inby side of timbers + heavy dust on outby side.
The fire occurred in the crosscut about midway between the 2nd + 3rd East + burned the coal from the ribs + roof 100' outby + 80' inby the cross cut in the back entry. The door was 5'-6" x 6'-6", + part of the frame is still standing. The roof caved early at this point due to the heat + burning out of the timbers.
The first signs of fire were noted at the pump cross cut about 150' inby 4th East. The falls were continuous, ~~all the~~ though with a maximum thickness of about 3'. At 5 + 6th East falls were very heavy. The timbers all down appeared to have been blown outbye, but this might have been influenced by the fall of rock.
From 6th East to pump cross cut (750' outbye 7th East) there were no falls + seemed to be very little disturbance.
At 6th East some timbers are still standing + show very heavy ~~soot~~ dust ~~is very heavy~~ on inby side of timbers very little on outbye but there is no sign of coal.

At Pump Cross cut heavy cave starts continued to 9th East.
From this point on to the inbye end of the 10th East Parting there were no caves ~~until~~ but they encountered heavy caves ~~to the~~ until the 4th Cross cut in by the R.I. Rockland entries, when all signs of violence ceased. From 4th East to the Rock Island entries, all the stoppings were blown into the back entry & all along the back entry there were signs of fire, here with frequent accounts of coal, sometimes on inbye & sometimes on outbye side of timbers. As the timbers were not disturbed, it was impossible to judge which direction the force took. There were signs of fire in both directions. It is certain however that the force came into the back entry through the cross cut from the main entry, & all brattices were blown into the back entry.
The west entries were not disturbed nor was the back entry between the west entries except in the immediate vicinity of the fire, even there, no indications of violence or force resulting from the explosion were in evidence.

The area of the explosion zone was relatively small considering the size of the mine, one of the chief reasons being that the work cutters had been very thorough work (by sprinkling) with Sunday preceding the explosion.

~~*The~~ ~~Various theories have been advanced as to the cause of the explosion, saving just account of the same written by Mr Geo Dee in Mine Minutes is attached herewith & forms part of the report.~~

It extended ~~from~~ on the 4th North from the 13th east south of the North Branch from the R.R. to 5th East. to the main slope, on the 3rd North from the 8th East to the main slope, south main slope from the 4th North to the mouth. The back entry leading to the face showed very little evidence of fire the stopping having been blown into the back entry from the main slope.

The direction of the wave of propagation seemed to be as follows: On the 4th North all evidence seemed to show the force coming out of (in the direction of the main slope) from the 5th East rushes from this point to the a point between 13th & 14th East, where all signs of fire disappeared. These facts are with

confusing owing both fact that no evidence can be found indicating any reason why the explosion could have started on the 4th North between 5th & 6th East, although the line of fire seemed to divide themselves at this point. All stopping between 4th N. Main & 4th N. Cross cuts were blown into the back entry showing that the force came from the main into the back entry.

The force came out the 4th North to the main slope & divided at this junction, the bulk of the force going out the main slope where it was propagated & helped by the accumulation of dust, while the reflex blew down the door on the main slope & a portion of the force went out the back air course to the fan. The back air course & the main slope below the door, at 4th North were very wet & had very little dust ~~caused the explosion~~ ~~first place because there was nothing for the flame to feed upon~~, consequently there was very little damage done.

The main slope above the door, & the 3rd North up to the 6th East being very dry & dusty permitted a propagation of the flame & explosion up to & into the 3rd North, the bulk of the violence going out at the mouth of the main slope.

Many has been several theories advanced as to the cause of the explosion, ~~but the only tenable theory~~ several of which are given in Mr Duck's article in Mines & Minerals of Jan. but the only theory which seems to me at all tenable is the following which is deduced from the facts at hand:—

A fire was known to be in a cross cut on the left side of a door in a cross cut between the 4th North & Main & Back entries, an electric motor, a few minutes before the explosion occurred was known to have rushed out from this point to the pit mouth with terrific speed which stirred up the dust, the air currents carrying this dust into the mine. As soon as the door burned through the air was short circuited carrying this dust mixed with air directly into over the fire, which prior to this time was known to have been burning with terrific violence.

Respt Submitted.

J. Roberts

R E P O R T

on the

DELAGUA MINE EXPLOSION

November 8, 1910.

DELAGUA, COLORADO.

by

J. C. ROBERTS, Mining Engineer.

Denver, Col., November 17, 1911.

REPORT ON THE DELAGUA EXPLOSION,

which occurred November 8, 1910,

resulting in the death of 79 persons.

The Delagua mines are situated near the bottom of a canyon whose undulating sides rise irregularly to heights varying from 300 to 400 feet from the base, about six miles west of the Ludlow station of the Colorado and Southern Railroad, and about twenty miles north of the town of Trinidad, in Las Animas county. They are owned and operated by the Victor-American Fuel Company, whose own railroad, of six miles extent, the Colorado and Southwestern, connects the plant with the main line of the Colorado and Southern Railroad. The mine consists of five independent openings, viz.; Four drifts and one slope, two on the south side and three on the north side of the canyon. The plant was originally equipped with a tipple trestle 400 feet in length, extending from one side of the canyon to the other on a level plane with the main openings, and was fitted with two of the most up-to-date tipples and modern appliances known to science, to receive the large output as it was brought from the mine. On the night of October 5 this entire trestle, tipples, the adjoining coal washeries and power plant were totally destroyed by fire, which was reported to be of an incendiary origin. Hence, at the time of the explosion, the product was handled over a temporarily constructed old-fashioned single tipple on the north side, which curtailed the output to less than one-half of its usual daily capacity. Due to the fact that there were no tipple connections, the two mines

on the south side did not resume operations, and consequently a part of the men from the south side workings were transferred to mine No. 3, increasing the force, and thereby the death rate was larger than it would have been if Nos. 1 and 2 mines had been working.

The Delagua coal bed is a member of the upper of the three series of veins characterizing the Raton field, and it varies from 5½ to 7 feet in thickness. The coal is bituminous in character and of the coking variety.

Analysis of the coal.

Fixed Carbon	Volatile Matter	Moisture	Ash
53.25	36.17	1.89	8.69

The mine where the explosion occurred is known as No. 3. It is opened by a slope entering upon the outcrop of the coal and driven on the dip of the vein. Practically all the workings of the mine are embraced within the territory tributary to the third and fourth north entries. These two entries, with their parallel air courses, branch off the slope at distances of 700 and 1,400 feet, respectively, from the entrance, and have reached a distance of 8,500 and 7,100 feet northward, in the order given. The cross-entries, or those from which the rooms are turned, are driven eastward in pairs from 400 to 800 feet apart, and are continued until the workings of the fourth north connects with the air course of the third. In this same manner the cross-entries of the third unite with the second north, and it was thus that those men from the inner workings of the fourth north, who were located beyond the destructive limits of the force of the explosion, escaped through

mine No. 2, a separate opening to which the second north entry belongs. The entire workings of the mine are conducted exclusively under the double entry, room and pillar system. The live workings of the mine at the time of the explosion were confined within the areas inward, from the twentieth cross entry in the third, and from the thirteenth east cross-entry in the fourth north and the three pairs of west entries off the latter. From these points outward all of the east entries and their tributary rooms had been worked out andabandoned.

The ventilation was created by a 14-foot Capell exhaust fan, passing 96,960 cubic feet per minute. Part of the air current entered along the slope and was divided about equally into two splits - one for the third, and the other along the fourth north. The other portion of the air entered through mine No. 2, and from there traveled into the third, and there joined the other currents near the face of the workings, from whence all returned in one volume through the main air course of the fourth, ventilating the west workings on its outward passage into the fan. The main haulage was done by electric locomotives; 250 volts were used all through.

It was about 2:00 oclock in the afternoon, when Superintedent Lewis, who was at the time standing on the tipple trestle, noticed volumes of smoke issuing from the fan house, which is situated at the mouth of the air course, about 300 feet west to the entrance of the slope. Immediately after his discovery, he entered the mine through the main slope for the purpose of locating the point where the smoke came from. While proceeding along the fourth north entry, at a

point about 1200 feet from the slope, he found that the door and ribs in a diagonal cross-cut through the pillar between the main entry and air course were on fire. The flames had already gained such headway that Lewis thought it was useless to try to extinguish the fire without water power. He then instructed a motorman, who happened to be coming out at the time, to disconnect his motorfrom the trip of cars and continue to the surface with all possible speed and notify William Kilpatrick, outside foreman, and James Young, master mechanic, to bring into the mine all the hose that was available. Lewis' intention was to attach sufficient hose to the pump's column pipe on the slope to reach the seat of the fire. This was the last seen of Lewis alive. The motorman delivered his message, and Young and Kilpatrick entered the mine with some of the ordered equipments, without losing any time, and when they were some distance down the slope the explosion occurred, killing the two men and all others who were within the bounds of its life-destroying force.

Lewis' body was found on the slope a short distance below where Young and Kilpatrick had fallen. Lewis evidently, after instructing the motorman, followed, with the intention, it is believed, to assist the men to bring in the hose and also, probably, to slow the fan and thus reduce the air fuel for the flames. It was about 2:30 p.m., or half an hour after the smoke was first discovered at the fan house, that the explosion occurred. The cross-cut where the fire started, and which was the point of origin of the explosion, was once intended for a haulage way, and this was why the door had been placed there. Directly opposite the cross-cut, on the main

air course, is a double parting 200 feet long, to accommodate the cars hauled by mules from the first and second, third and fourth west entries. These two pairs of west entries are turned at nearly right angles off the main return air course, and had been driven to distances of 1,000 and 1,200 feet, respectively, with rooms branching north and south off both pairs. The first and second west are located 400 feet outside of where the fire started, and on the main return between the two entries was a door to turn the air into the second and out the first; consequently, the smoke fumes from the fire were carried directly upon the thirty-three men that worked in this particular district and killed them. Three of this group of men were found on the main air course, between the seat of the fire and the entrance into the second west. They were lying on the floor, with faces downward, and were more or less burned. Three others were located at intervals of twenty-five and thirty feet apart in the first west, immediately inside of the entrance. The other twenty-seven men were found in two groups of eighteen and nine each, near the bottom of the first west, and at the end of the last cross-cut between the two entries. They were lying side by side, excepting the three near the center of the largest group, who were leaning upon one another. None of the bodies showed the slightest indication of burns or injuries from any heat or force. These victims had congregated at this point in an effort to escape the fumes as far as possible, and when the atmosphere became so heavily contaminated from the gases of the fire as to be no longer breathable, they died from suffocation, which no doubt occurred long before the explosion. The other six men from this district re-

ferred to above also died from suffocation while trying to escape through the smoke.

The third and fourth west entries are situated about 100 feet inside of where the fire started, and, therefore, the smoke could not reach the men in this district as long as the ventilation system was intact, as they were situated in advance of the fire in the air circuit. However, after the collapsing of the door in the burning cross-cut, and in this way the air becoming short-circuited, more or less, of the fire fumes would naturally penetrate the third and fourth west. At the lower extreme end of the fourth west, a pair of entries had been turned to the north, known as the "fifth north", and were in about 300 feet. The four miners employed in these two entries were rescued alive, about 9:30 p.m. on the same day of the explosion, by the helmet corps, consisting of Willis Evans, Bert Lloyd, J. Walker and Al Thompson, which entered a few hours after the explosion, and before the fire was completely subdued. The face of the fifth north entry was in about 25 feet beyond the last cross-cut. The four men rescued had put a canvas across the entry a few feet beyond the last cross-cut as a barricade against the deadly fumes, which were gradually advancing towards them from the fire, thus to keep the amount of air there was beyond the canvas uncontaminated as long as possible. Of all the canvases put up to conduct the air currents underground, none were more hermetically fitted than this one. The bottom was covered with fine slack from one side to the other, and all sides and top were perfectly tight. During their incarceration they made several visits, one at a time, back along the fourth west entry, as far as they could

safely go, to determine the atmospheric condition, and each time found that the smoke was too thick to venture an attempt to escape through it. One of the party had made more visits to this entry than the others, and was found to be much weaker than his three companions when discovered. The joy and enthusiasm of the entombed men upon the arrival of the rescuers is beyond description. From the face of the fifth north to the nearest point on the main entry, outside of the fire, where fresh air was then circulating, and where a force of rescuers without helmets were waiting, is about 1,350 feet. Before starting out with the rescued, Willis Evans took off his helmet and placed it on the weakest of the four men rescued. After walking back some distance, he (Evans) told his three comrades that he would not proceed, but remain and search a few of the rooms of the fourth west, and for them, after safely delivering the rescued men, to return for him. A longer time than Evans anticipated elapsed before the party returned. A fresh helmet corps, consisting of Bert Manley, John Harrison and H. Sanderson, started out, and when they found Evans, he was fast asleep by the side of the roadway in room 4. He was immediately removed and carried outside, but he never recovered consciousness, and died in a few hours after. Willis Evans was an employee of the Colorado Fuel and Iron Company's engineering corps, and was a volunteer aid at the Delagua catastrophe. He was 25 years of age, and a graduate of the Colorado School of Mines. He bore an excellent character, and was of a noble, generous disposition. He was exceedingly bright and physically strong. At the Starkville explosion, which occurred thirty days previous to the one now under consideration, he was one of the most heroic of the rescuers.

The Starting of the Fire.

How the fire, which was the initiatory cause of the explosion, started, no one knows positively. But, from the statement made to me by Frank Levick, I am much inclined to the belief that it was accidently started by the lamp of one of the two colored drivers, James Sampson and L. Smith, of the fourth west. Frank Levick and his partner, P. E. Smutzler, were working in room No. 6, off the fourth west. About 12:50 in the afternoon, Smutzler went back to look for cars, and when he arrived at the double parting, he found the two drivers eating lunch in the cross-cut. After being informed that the cars would soon be coming, he returned to his room. About 1:30 o'clock, one of the drivers rushed into the room of Levick and Smutzler and asked if they had any water left in their buckets, and stated that the cross-cut at the double parting was on fire. Both Levick and Smutzler went back to investigate matters, and they found that the fire was spreading rapidly towards the main air course, and the double parting, the usual way out, was impassable from heat and smoke. They then secured an axe and cut their way through a cross-cut inside of the fire into the main entry. They proceeded inward along the fourth north, through the sixteenth cross-entry into the third north, and from there into the second north, and while on their outward course through the second, the explosion occurred. They felt its concussion, but it was very slight. The said two colored drivers, and all the miners of the third and fourth west, excepting the two above described, and the four rescued, were killed along the fourth north entry and air course while traveling inward in their efforts to reach No. 2 outlet.

The mine was worked with naked lights exclusively. It is

possible that after eating their lunch, one of the said drivers changed the wick in his lamp before leaving the cross-cut, and in disposing of the old wick, he probably threw it carelessly amongst some easily inflammable material lying close to the door or one of the ribs, and thus starting the fire. It is known from Frank Levick's statement that it was upon the driver's return from his first trip after lunch that he discovered the fire. It must have gained with great rapidity, as by the time of the explosion it had reached, as was indicated by the coked ribs, 125 feet south and about 40 feet north along both sides of the double parting, besides the twenty feet it had to travel through the cross-cut. From the time P. E. Smutzler, Levick's partner, visited the two drivers, at 12:50 o'clock, until the explosion occurred, one hour and forty minutes had elapsed. If the fire started in the door, it appears to me that it would have been burned through and collapsed long before the explosion. The collapsing of the door was the most propitious moment for the explosion during the period of the fire. While the door was intact, the supply of air inside, this being the return for the air current, was more or less impregnated with carbonic acid gas, and thus rendered unable to form a complete combustion. The result was that large volumes of carbon monoxide (CO) was formed, which is highly explosive when properly mixed with air. I am of the opinion that the fire started in the timber or coal some distance inside of the door, and when it reached and destroyed the door, the entire current of fresh air from the main entry passed into the immense body of carbon monoxide gas and formed an explosive mixture, and the explosion quickly ensued. The destructive force of the explosion

was confined to parts as follows: The full length of the slope from the fourth north out. The first 1,500 feet of the third north, from the mouth of the fourth north to a point half way between the twelfth and thirteenth cross-entries, a distance of 5,000 feet. I found but very little dust cokings along any of the parts traversed by the force. But the fact that some of the men who were standing outside, about 100 feet from and in line of the slope, were burned, and that such violent force extended into the fourth and third, distances of 1,000, 1,500 and 3,800 feet, respectively, from the nearest body of the said explosive mixture, strongly indicates that dust took part in augmenting and propagating the explosion.

During the time of my investigation, on November 9 and 10, I could not determine the hygrostatic condition of the slope, as its roof had fallen to a height varying from two inches to six feet, covering the floor the entire length of 1,400 feet. Parts of the third north were dry and parts wet, with light accumulations of dust at widely interspersed points on the upper side of the roadway. The fourth north was dry, but free from dust accumulations. The force of the explosion did not invade even one of the entries where the miners were working. They were all moist and free from dust. I was accompanied through the mine by Deputy Inspectors James Dalrymple and Frank N. Oberding. During our examination of even the most advanced workings, and this before the air current was fully restored, we failed to find the slightest trace of fire-damp.

Mr. William Lewis, superintendent of the Delagua mine, who was a victim of the explosion, was a competent and thoroughly posted coal mining man; he was a good student, and was both practically and theoretically a first-class coal miner. He was deputy state coal mine inspector in this State for a short time, and resigned to accept a better position. In the performance of his official duties, his chief aim was to first protect and safeguard life and property. He was respected and admired by all who knew him, and his death is keenly regretted by his numerous friends.

Magazine Articles

THE DELAGUA, COLO., EXPLOSION

Written for Mines and Minerals, by George F. Duck

The most disastrous accident in the history of Colorado coal mining, one in which 79 lives were lost, took place at the No. 3 mine of the Victor American Fuel Co., at Delagua (pronounced Del'-ah-wah), Las Animas County, Colo., about 2 P. M., Tuesday, November 8, 1910. About 1:30 to 1:40 P. M., a fire was reported at the abandoned door *a*, Fig. 1, some half-mile underground on the 4th north entry, and while preparations were being made to extinguish it the mine "let go."

An Account of the Conditions Existing at the Mine before and after the Explosion

Delagua is the terminus of a coal road 6 miles in length, running west from Ludlow on the Colorado & Southern Railway. Ludlow is 15 miles north of Trinidad, 82 miles south of Pueblo, and has an elevation of 6,295 feet above sea level. Delagua is about 20 miles north of the Starkville Mine, which exploded with the loss of 56 lives on October 8.

The seam worked, known as the Delagua, is in the upper part of the Laramie formation of the Cretaceous. It averages rather more than 6 feet in thickness with a persistent slate or bone parting near the middle from 1 inch to 6 inches thick.

The coal outcrops around the hillsides and has an average cover of 150 to 200 feet. The roof is poor and requires the use of much timber. The regular draw slate is not generally present but rather a soapstone, from 6 inches to 15 feet thick, full of slips which cause it to fall in irregular shaped pieces of no great size and with sharp edges. The coal is friable and will not bear stocking for any length of time. The composition is, essentially, 36 per cent. volatile matter, 8 per cent. ash, 2 per cent. moisture, and 54 per cent. fixed carbon. The sulphur is below 1 per cent., and when washed to remove fragments of the parting the coal makes a very satisfactory coke for furnace use.

It is stated that gob fires, blown-out shots and firedamp are unknown.

The surface plant, destroyed by fire on October 7, consisted of a wooden tipple of 2,500 to 3,000 tons daily capacity, a 600-ton washery, 600-ton storage slack bin, power plant, boiler houses, repair shops, etc. There are 160 standard beehive ovens in block. Five mines fed to this tipple, No. 3 producing about 1,250 to 1,500 tons daily. Since the fire, however, the production of No. 3 has been about 750 tons. Delagua is known as the largest single coal producer in the state.

The system of working is the ordinary double-entry with rooms turned off both the main heading and air-course, or back heading as here known. There are four parallel headings, known as the 1st, 2d, 3d, and 4th north, respectively, driven on a course of 6° 45′ W, which were opened in the order given. No. 1 mine (not shown on the map) is 1,300 feet east of the No. 2 mine. It has its own fan and is independent of the other mines, but is connected with No. 2 at several points inside.

The No. 2 mine is 1,000 feet east of No. 3 mine and is also independent but is connected with No. 1 and No. 3 inside. Its fan is not in use, ventilation being secured through No. 3. The heading proper is 8,000 feet long.

The 3d and 4th north entries and their branches constitute No. 3 mine, the scene of the accident. They are driven from a slope *b* at present 2,600 feet long.

The 3d north entries, which leave the slope 675 feet inside, are 8,150 feet long, are advancing and have no rooms until those on the last pair of cross-entries are reached.

The 4th north entries are 650 feet west of the 3d, are 7,050 feet long to the face which is stopped in a fault or pinch. No rooms are working on these headings until near their end.

The main slope is not now advancing as the roof is being shot to bring the track to grade.

The 5th north entries start from the end of the slope and are working, headings being driven back to meet them from the 3d west and Rock Island, as shown in Fig. 1.

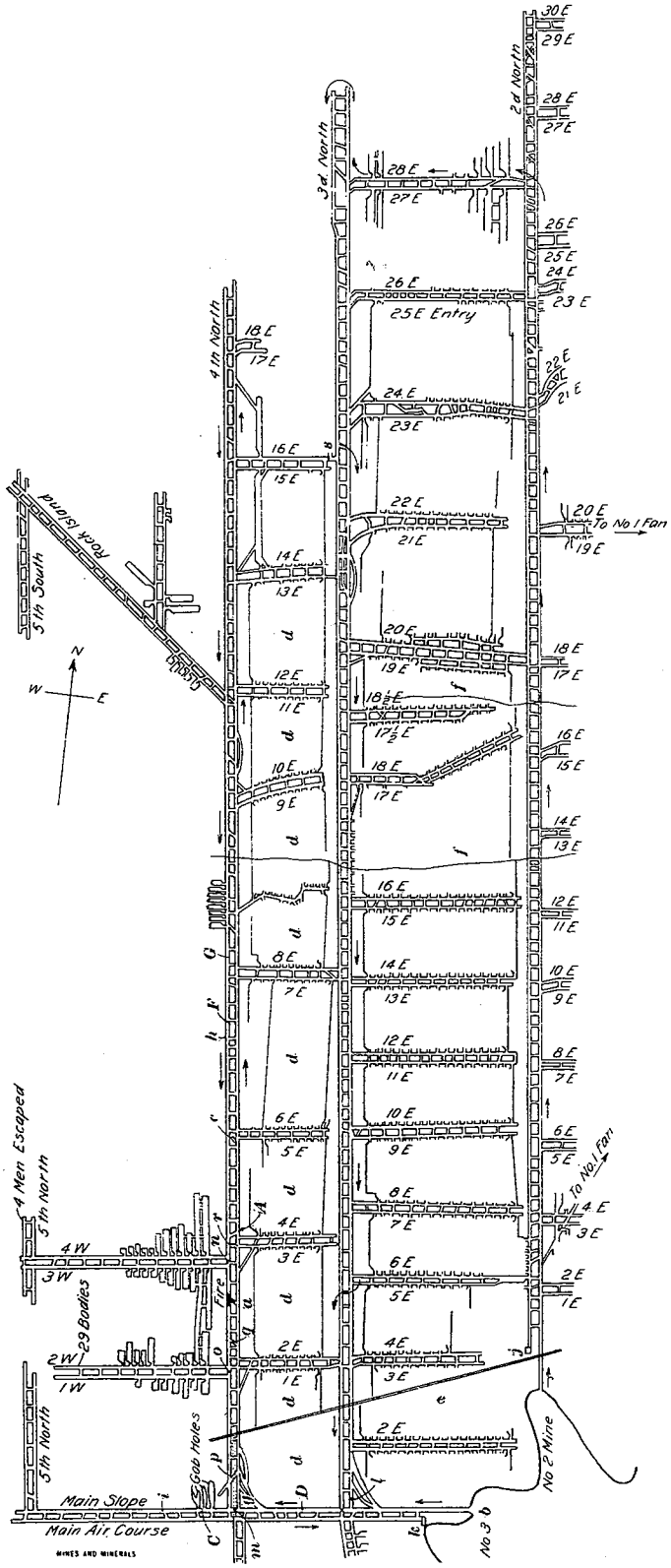


FIG. 1

A = slate forced into inby side of cap.
n = door blown outby.
C = slate forced into outby side of cap.
D = slate forced into inby side of cap.
l = door blown inby.
F = slate forced into outby side of cap.
G = slate forced into outby side of cap.

The bulk of the coal from the 4th north section comes from the rooms driven from the 1st, 2d, 3d, and 4th west entries,

COAL MINING NOTES

The Pemberton Coal and Coke Co., of Affinity, W. Va., found it cheaper to install the alternating-current generator and the motor-generator set for converting the alternating into direct current for use at the company's mine 2 miles distant from Affinity, than to install a larger direct-current machine, and transmit the direct current to the other mine. The additional apparatus bought represents a smaller investment than that which would be incurred in maintaining the losses in transmitting the direct current to the mine 2 miles away.

The Avondale Colliery, historical from the fact that it compelled the first mine law to be enacted in the United States, is now being drowned out by an inrush of water, presumably coming from some cave. The Delaware, Lackawanna & Western Railroad are owners of the mine.

The long expected commission to revise the coal mining laws of the state of Colorado was appointed on November 14 by Governor John F. Shafroth. The membership consists of Dr. Victor C. Alderson, President of the State School of Mines; Prof. J. B. Ekeley, of the Colorado State University; R. D. George, State Geologist; and James Dalrymple, the newly-appointed chief mine inspector. Colorado has some very effective mining laws upon its statute books but they have not been enforced in the past, largely from lack of power on the part of the inspector so to do. It is the intention of the board to hold a series of public meetings at which all interested will have a chance to be heard, to be followed by visits of inspection to the various coal-mining centers of the state. After these public hearings and visits of inspection, during which the particular needs of Colorado are expected to be brought out. the codes of the older states will be studied and the results thus obtained embodied in a set of new laws which will be submitted to the next session of the legislature for its consideration. The attention of the commission is called to the fact that the chief difficulty to be overcome in Colorado coal-mining practice is that of handling dust in the prevailing dry climate. When the dust question is satisfactorily settled, practically all others will take care of themselves.

It is with sincere regret that MINES AND MINERALS has to announce the resignation of John D. Jones from the position of chief mine inspector of the state of Colorado, a place which he has filled with distinguished success since his appointment by Governor Peabody on February 6, 1903. While Mr. Jones' resignation was tendered during September, it was not publicly announced until the time of the Delagua accident when he was leading one of the exploring parties, and became effective on November 21. Mr. Jones leaves the service of the state to become General Manager of the Oakdale Fuel Co., at La Veta, Colo., a position which he will fill with the same signal success as he did that of chief inspector of mines. What is most to be admired about Mr. Jones, aside from his being a self-made man of the best type, is the fact that with him it was always "come on" and not "go in." MINES AND MINERALS joins all his many friends in wishing him a long and successful career in his new undertaking.

In a report prepared at the request of Governor Shafroth, Mr. John D. Jones, the retiring chief mine inspector, recommends that the state be divided into five instead of three districts as heretofore, and that each district should have its particular deputy inspector, all in charge of a chief, with headquarters at Denver. Mr. Jones' recommendation that the salaries of the chief be fixed at $5,000 and the deputies at $3,000 per year, with proper allowance for expense, seems a wise one.

Governor John F. Shafroth has appointed James Dalrymple as chief mine inspector of Colorado. Mr. Dalrymple is well known to the mining fraternity of the state and since leaving Irwin, Pa., 25 years ago, has filled responsible positions in and around mines on the Western Slope. He has appointed Harry Douthwaite, of Colorado Springs, as deputy mine inspector, to fill the position made vacant by his own promotion.

On November 22, what promised to be a greater tragedy than any that has yet overtaken the coal-mining industry in Colorado was averted through the coolness of David Griffiths, superintendent of the Bear Gulch or Fremont Mine of the Colorado Fuel and Iron Co., 2½ miles southeast of Florence, Colo. A fire broke out in the underground mule stables about 4 P. M., while Mr. Griffiths was at the surface. With a hastily-organized force he entered the mine and sent warning to each working place. The men were gathered at a point where the air was clear, and in squads of 10 and 12 were made to hold their breath long enough to pass through the smoke and reach the cage. All but two of the 173 men in the mine were brought up in this way and these lost their lives by refusing to stay with the party beyond the smoke zone.

Both the Colorado Fuel and Iron Co.'s rescue car and that of the Bureau of Mines were on the scene about 2 o'clock in the morning of the day after but their services were not required except to recover the bodies of the two dead. The value of telephones to mines was again clearly brought out in this case, where the engineer in charge of the pumping station, being in constant communication with the outside, was able to remain at his post until the last minute.

The experience of the past, that with the approach of winter explosions in coal mines increase in number, is borne out by the reports for November. On Saturday, November 5, 15 men were killed by what the evidence at hand shows to have been a dust explosion at the Lawson Mine, Black Diamond, Wash.; on Tuesday, 79 died from a dust explosion started by an underground fire at Delagua, Colo.; and on Monday, the 28th, 13 more were killed by what is said to have been the ignition of a pocket of gas at the Jumbo Mine, 20 miles from Antlers, Okla. On November 25, 11 miners were entombed in mine No. 3 of the Providence Mining Co., Providence, Ky. This makes a total of 118 for the month, to which total Colorado contributed 79.

Since the first of the year, 210 have died in Colorado, either from explosions directly attributable to dust or which were increased in intensity by this agent. Colorado coal mines are naturally not more dusty than those of other states, but the extreme dryness of the air causes the entering current to absorb the natural and acquired moisture of a mine more rapidly than elsewhere and points to the fact that more watering than heretofore done is necessary. This and the complete removal of all accumulated underground track refuse will almost entirely prevent a repetition of such accidents as have occurred recently.

Referring to the rescue work at the Providence, Ky., disaster, Chief Inspector of Mines Chas. J. Norwood states that the work was in charge of Thomas O. Long, inspector for the district. He first repaired the damaged fan by the use of canvas, and restored the air circulation. He then led the first party that entered the mine, using an oxygen helmet furnished from the United States Mine Rescue Station at Linton, Ind., as his new helmet just received from the manufacturer had not yet been adjusted. Assistant Inspector Jones, of the Central City district, was also present with his oxygen helmet and assisted in the work. In addition to the Kentucky inspectors, Barr and Jones, and volunteers from nearby, there arrived, quickly after the disaster, the car from the United States Mine Rescue Station, at Linton, Ind., in charge of Mr. R. Y. Williams, and accompanied by his assistants, A. A. Samms and John B. Shepherd, who with apparatus and advice furnished valuable aid.

Engineer Antonio Llambias de Olivar, the representative of the boring company subsidized by the government of Uruguay, informs the Minister of Industries, Labor and Public Instruction, that in the middle of August, in the fourth boring which the company is making in the Department of Cerro Largo, a bed of coal was found at a depth of 124 meters, more than a meter thick and of quality superior to that met in the boring of November, 1909, at a depth of 140 meters.

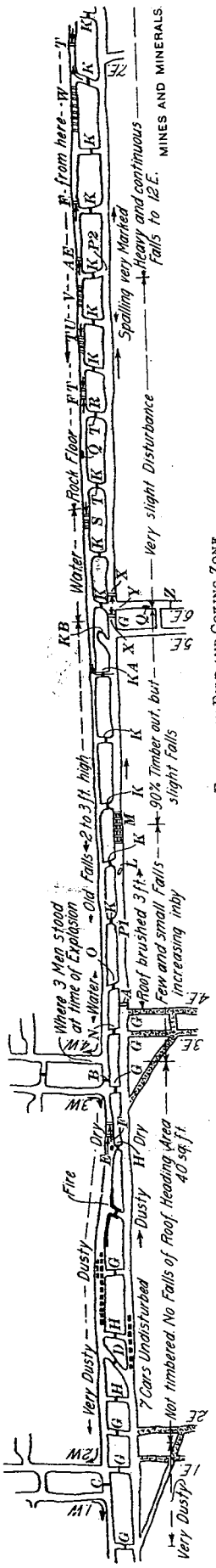


FIG. 2. ENLARGED SECTION OF ENTRIES AT FIRE AND COKING ZONE

A, slate forced into cap; *B*, door blown outby; *C*, curtain, unharmed; *D*, first west haulage door, slightly bulged into back heading; *E*, heavy coke on outby side; *F*, light coke on outby side; *G*, gobbed snut, not damaged; *H*, Bulged in toward back heading but not broken; *K*, entirely destroyed, blown into back heading; *L*, timber fallen outby; *M*, undisturbed timbering; *N*, brattice through which men escaped; *O*, upper ½ apparently out before fire; *P1*, electric pump not harmed but rheostat blown into back heading; *Q*, coke on rib 40 feet inby; *R*, the only stopping blown into haulage road; *P2*, electric pump blown 3 feet and rheostat 20 feet, very violent action here; *S*, three caps with center posts. Heavy coke on inby side of all members; *T*, coke on inby side; *U*, four sets caps, very heavy coke inby, some little outby; *V*, six caps unharmed; *W*, nine sets timber unharmed; *KA*, used as tool house by men working in 5th west; *KB*, fifth west started since November 1st on night turn; *X*, very heavy dust; *Y*, gob thrown into entry; fall, heavy spalling opposite mouth; curved arrows show direction of throw of heavy materials; small arrows show place of deposit of coke, slate or other materials; *Z*, Brattice blown inby; ‖ caps in place.

respectively. The 5th west was started at *c* opposite the mouth of the 5th east on November 1 and is worked nights.

The Rock Island entry, or more generally the Rock Island, is shown as starting 4,650 feet from the slope on the 4th north return air-course. Its name is derived from the fact that it is advancing into coal leased from the C. R. I. & P. R. R.

In Fig. 1 large areas marked *d* are caved, and although the pillars have not been drawn, the roadways and rooms are filled with falls of roof. It is said to be possible to walk or crawl over these old falls from the slope to the extremity of the workings. In this part of Colorado the dikes *e* and faults *f* as shown on the map, commonly give off marsh gas brought up from lower seams, so that it is by no means impossible that at intervals, at least, some little firedamp is present in these abandoned workings.

The coal is undercut by the miner who also drills, charges, and tamps the hole, and after affixing a flag or marker, leaves the actual firing to the company's shot firers. While the introduction of "permissible" explosives is meeting with marked success among the more progressive men, the mine is largely a "black-powder mine." One-quarter of a keg of powder is allowed in one place at one time.

After being gathered to the various partings by mules the coal is hauled to the main slope by Jeffrey motors operated under 250 volts pressure, and up the slope by a rope. The coal from the main slope below the 4th north is hoisted to the latter by an electric hoist at *g* in the cross-cut.

Some little water is met in the return air-courses which are to the dip of the haulage entries. This is handled by two small electrically driven pumps at *h* on the 4th north and a larger one at *i* on the slope.

As stated above, although connected with No. 2, No. 1 mine, the first pair of north entries, has its own fan. Also, No. 2 fan, at *j*, is not in use and has not been for some time.

The fan ventilating both No. 2 and No. 3 mines is that placed at *k*, the end of the return airway of No. 3. It is a Capel fan, 15 feet in diameter, driven by a motor on an independent circuit. At the time of the explosion 55,000 to 60,000 cubic feet of air a minute was circulating through the two pairs of entries.

The air is drawn in through No. 2 mine, passes up the 2d north its entire length, thence over to the 3d north entry of No. 3 mine, down it to near the main slope where it passes into the air course, across the slope in an overcast to the main return and out it to the fan. Thus, the 2d north is the intake and the 3d north the return for one split, the air traveling a total distance of 18,000 feet. Doors *l* are placed on the 3d north to separate it from the 4th north and also from the main slope.

The air for the 4th north comes in the main slope and is prevented from going down the same by a door *m* on the slope. It is thus drawn into the entry, to its face, back along the return to the 4th west cross-entries up which it is forced by a door *n*, a canvas curtain *o* forcing it up the 2d west, thence to the main air-course by way of the Rock Tunnel *p*, traveling a distance of 21,000 feet. The Rock Tunnel is shown in dotted lines between the 4th north entries. It is driven in rock and was intended for an overcast but the bridging at the slope has not been completed.

Sufficient air for the four men working in the 5th north entries off the slope is thrown down by a regulator placed in the 4th north return between the slope and its air-course.

The Rock Island is ventilated by diffusion only, a comparatively few men being employed there.

Both the intake and return airways vary from 35 square feet to 100 square feet or more in area but average by several measurements about 50 square feet. This change in cross-section has the effect of rapidly increasing or decreasing the velocity of the air and had a marked influence upon the currents generated by the explosion.

Fig. 2 gives the details of the ventilation of the west entries.

The explosion at Delagua No. 3, whatever its origin, was unquestionably produced by coal dust, as at Starkville. Firedamp undoubtedly did not figure in it at all, and it was not caused, independently of the coal dust, by the direct ignition of the hydrocarbons distilled from the burning coal. That the condition of the mine prior to the explosion may be understood certain definitions are permissible.

For the sake of clearness, a mine is defined as very dusty when the track and roadways are covered to the depth of at least an inch with fine, almost impalpable dust, most of which will float on water; as dusty, when the particles of dust are larger than in the above case, not so thickly deposited and when but a comparatively small percentage can be blown from the hand or will float; as dry, when the coal is in pieces up to ¼ inch in size with no evidence of moisture to the touch. The very dusty conditions are usually met at partings where the coal is churned into powder by the constant passage of men, mules, and motors; the dusty conditions along some well-traveled entry; and the dry, in rooms which have been advancing for some months. A dry mine is not quite safe, a dusty one is dangerous, and a very dusty one, highly so.

On the other side, a damp mine may be considered as one where the material in the roadways has no tendency to blow away when disturbed by the feet of men or mules and leaves a distinct impression of moisture to the touch; a wet mine, a one where the road cleanings may be moulded into balls by the hand, and where occasional patches of water are encountered and a watery mine, as one where the track is deep in mud o

where standing water over an inch in depth is encountered generally throughout the workings. The damp mine is safe, and a watery one cannot explode. These definitions are not absolute and are modified by other conditions. Thus, a section of the mine marked as dry may be in a rock tunnel and hence absolutely safe.

According to the foregoing definitions the conditions in Delagua No. 3 mine as determined by observations made 36 hours after the accident were essentially as follows: All return air-courses were "safe," coming under the terms of damp and wet, and, in many cases, even watery. Standing water is frequently met in the air-courses which mostly have a rock floor from falls of roof.

No. 2 mine was not visited at the time of the accident, but was classified 10 days after the explosion as dry to dusty. The 3d north entry, from its face to the 8th east cross-entries, should be defined as damp to wet, having been so freely watered on Sunday that haulage was difficult on Monday. It was impossible to determine the exact conditions owing to the falls, but it is reasonable to suppose that this entry became dryer as it approached the slope where it was more constantly traveled.

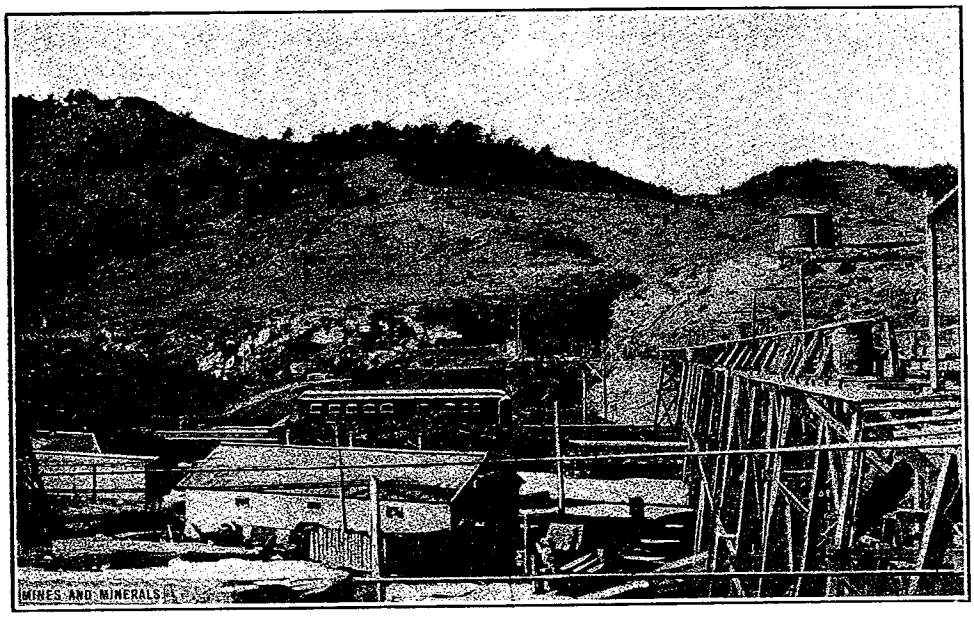


FIG. 3. DELAGUA NO. 3 MINE, SHOWING U. S. RESCUE MINE CAR, TEMPORARY TIPPLE, AND WATER TANK TO RIGHT OF DRIFT MOUTH

The 4th north entries, also watered on Sunday prior to the explosion, were dryer than the 3d north, and should be classified as damp to dry; that is to say, they were essentially safe. The Rock Island was damp and the two pairs of west cross-entries off the 4th north entries were the same. The partings on both the entries at the main slope, the 7th east and 10th east partings on the 4th north, some partings on the 3d north and the parting near the fire *a* on the return of the 4th north between the 2d and 3d west were dusty. In general, so far as the roadways were concerned the mine was safe.

The season has been an exceptionally dry one in Colorado. The Trinidad office of the Weather Bureau reports rain as follows: For August, .42 inch; September, .45 inch; October, 1.41 inches, and November, none. The October rain fell on the 16th, 18th, 19th, and 20th of the month, and except for a trace, less than .01 inch on the 26th, there was no rainfall for 19 days before the accident.

L. H. Dangerfield, local forecaster, in charge of the Weather Bureau at Pueblo, about 80 miles north of Delagua, and the nearest station thereto, has kindly supplied the observations for several days prior to the accident. As they are of considerable interest, the figures for 4 days are given.

Day	Temperature			Relative Humidity		Barometer		
	6 A. M.	Noon	6 P. M.	6 A. M.	6 P. M.	6 A. M.	Noon	6. P. M
5	36	48	48	80	41	25.48	25.46	25.42
6	23	69	61	82	10	25.42	25.31	25.30
7	30	67	58	34	17	25.31	25.23	25.20
8	54	70	65	13	6	25.13	25.08	25.02

Mr. Dangerfield gives as the mean of a 21-year period the following averages for November: Temperature, 43.9 degrees; barometer, 25.31 inches; and relative humidity for 6 A. M., 62.9 per cent., and for 6 P. M., 41.0 per cent., a daily mean of 52 per cent. It will be noted that prior to the explosion from 6 P. M. Sunday, the temperature was slowly rising and the barometer and relative humidity rapidly falling. The high temperature, which is about the annual mean of the place, while favorable to preserving the moisture in the mine was more than offset by the abnormally low humidity. The air was practically dry and greedily absorbed every drop of available moisture.

The accident at Delagua must be studied from the two propositions, that of the explosion, which happened about 2 P. M., and that of the fire which certainly was burning as early as 1:15 P. M.

Had some one not been careless, there would have been no fire; had the mine not been dusty, there would possibly have been no explosion. The two hypotheses, while undoubtedly connected, could have happened independently.

The fire occurred inside a disused door in a cross-cut between the 4th north entries. This door is 230 feet from the 1st west door *q* and 330 feet from the 2d east entry.

The door was built of ordinary 1-inch plank, had an area of about 30 square feet, and was placed about 20 feet in from the haulage road and 12 feet from the return, where the parting for the west entries was made. It was the custom of the drivers to eat their dinners on some benches just inside the cross-cut, and not infrequently other company hands used the opposite or the haulage side for the same purpose. There was probably the usual mine refuse in the place, chips, pieces of board, paper, and fat from dinner buckets and the like. This door was entirely destroyed by the fire, except the two side posts, and before the fire zone was cleaned up, from measurements made, it was seen that the fire burned 100 feet south and 80 feet north from this point on the return airway. The fire did not quite reach the haulway. It is evident that the fire started on the return airway side of this abandoned door. The effect of the fire was almost entirely on the rib nearest the main entry, which in places was burned and coked to a depth of 6 inches.

The time when the fire started and how it started, since no electric wires were near the door and the first observers of the trouble are dead, will probably never be solved, although there are a few fairly-well established times and a few apparent facts bearing upon its origin.

It is stated that Jos. Boyd, a fire boss of experience, and a competent man, passed the place at 12:05 and noticed nothing out of the way. The fire was undoubtedly not started at that time.

At 12:50 a miner from the 4th west went to the parting to inquire if more cars would be given after dinner, it being election day and the mine not running full. He found the two colored drivers, Sampson and another, eating their dinner, not at the usual place, but leaning against the cars 30 feet from the cross-cut and on the heading. If the drivers had fired the place at an earlier hour and supposed they had put it out they did not mention the fact to the miner. In any event, shortly before 1 o'clock, the miner, an intelligent Austrian, who subsequently saved himself and numerous others through his coolness, noticed nothing wrong. At this time, any previously started fire was by those possibly implicated supposed to be out. The miner returned to his place in room 6 on the 4th west and "in a few minutes" received a car which he and his buddy loaded and dropped down 150 to 200 feet. After talking over the possibility of more cars, one of them hunted up the driver on his heading, Sampson, and being advised that he would have none until 3:30 P. M. returned to his place and with his partner, gathered up their tools, clothing, and buckets, and prepared to go home. At the switch to their room they met the driver who asked if they had water in their buckets as there was a fire at the "old door."

All this took time and it was probably fully half an hour from when the miner left the parting where he inquired for cars to when, satisfied that no more would be received within a reasonable time, the two decided to go home and were then advised as to the existence of the fire. What happened in this 30 or 35 minutes is merely conjecture. The men on the 4th west cross-entries being on the intake side did not notice the smoke and of those on the 1st and 2d west cross-entries, where the smoke traveled, all but one, an Italian driver, are dead. The 3d and 4th west entry drivers were also killed.

The 2d west driver says he started to work at 12:35 (which appears a little early) and on the third trip out noticed smoke, etc. If he made four trips an hour, his mule would be handling over 80 tons a day, which is not bad work for the distance covered. This would make it about 1:20 when he noticed the smoke on the airway. It must be remembered that the men first referred to were inside the fire and each party knew nothing of the other's movements. Why none of the men on the 1st and 2d west entries when first noticing smoke, and it must have gone to their places in a very few minutes, did not attempt to escape, is as much of a problem as why the driver, Sampson, did not get water from the "water hole," but 80 feet away in the 4th west return, or why he did not notify the pit boss, Llewellyn Evans, who, in making his rounds by way of the 3d north, had supposedly reached the 10th east parting on the 4th north, 3,000 feet inside the fire.

The two miners inside the fire zone, after being notified, went in that direction and opening the door, noticed the "smoke rolling over and over and 'swishing' back and forth." After trying to get through under the smoke they returned to their places, notified the men in the 4th and 5th rooms, gathered up their outfits and with axes came back to the entry. They again looked through the door and found the fire was growing dull red and that the agitation of the smoke was more violent than at first. They again failed to get past under the smoke and after deciding not to try the return, proceeded to cut and scrape a hole through a brattice *r* just inside the 4th west door. As but one man could work at a time, they estimated that this would require 4 or 5 minutes. After relighting with difficulty the lights which, with the exception of an acetylene lamp, had all gone out, they crawled through the brattice and noticed the smoke within 10 feet of them on the main heading.

After trying to pass the fire on the haulage road side they turned into the mine and near the 10th east cross-entries met the pit boss and the nipper on their way toward the fire. Going further, they picked up the drivers from the Rock Island and warned many others, most of whom treated the matter with indifference, crossed over to the 3d north by way of the 16th east cross-entry, went out it to the 26th or 27th east cross-entry and to the 2d north entry and had just turned out of it for the No. 2 opening, when they felt a slight jar of the air which they afterward learned must have been caused by the explosion. As they were afraid of an explosion while on the 4th north, they probably ran as far as the 10th east, but from there in they walked in a more leisurely fashion. It is 2,750 feet to the 10th east from where they broke through the brattice and 4,000 feet by the usual route from there to the 2d north Making all allowances for running and for stopping to talk to men on the way, it must have been about 1:40 P. M. when they met the pit boss at the 10th east, about 1:35 when they broke through the brattice, about 1:30 when they started to do so, and 1:20 to 1:25 when they were notified of the fire by Sampson and after which they gathered up their companions, etc.

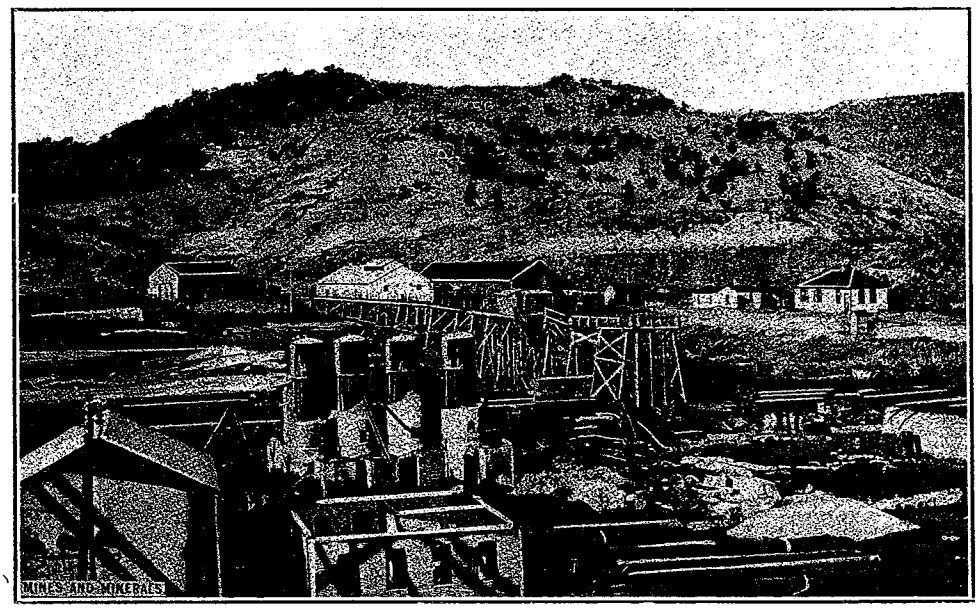


FIG. 4. DELAGUA NO. 3 MINE FROM HILLSIDE OPPOSITE FIG. 3, SHOWS TEMPORARY TIPPLE FROM NO. 2 MINE. WHITE BUILDING IS BLACKSMITH SHOP. NO. 2 OPENING IS TO LEFT OF BLACKSMITH SHOP

On the return beyond the fire zone the time figures out fairly well. The 3d west driver, mentioned before, at an estimated time of 1:20 P. M. met the motor man, Bennett, at the 1st west door *q*. After some examination of the fire and a trip on the part of Bennett, it was decided to send the nipper, "Red," in to the 10th east to notify the pit boss. He must have been sent prior to 1:35 P. M. as by that time the miners on the inside could not get through the smoke on the haulage road, and also these miners met him and Evans at the 10th east parting about 1:40 P. M. It must then have been about 1:30 when Bennett, sent the boy back to inform the pit boss, whom he must have just left at the parting mentioned.

Outside the mine, at about 1:30 P. M. the smoke was noticed coming in thin clouds from the fan which was supposedly on fire. Thirty thousand feet of air a minute through an airway with a cross-section of about 50 square feet was traveling from the

fire to the fan a distance of 3,900 feet. This requires 6½ minutes for the air to reach the fan and establishes the time at 1:23 P. M. when the fire was noticeable. This agrees with the figures obtained inside.

William Lewis, the superintendent, and his assistant, W. J. Evans, were in the office about 1:35 P. M. when notified of a supposed fire at the fan. After hastily investigating this and finding the fire to be inside and after making arrangements for a party to get water in barrels and for others to follow them, Lewis and Evans, started in "on the run." On the way they met the slope pumper, Smith, who reported a fire in the 4th north, "somewhere." Smith went back with them. It was some time after 1:40 P. M., perhaps nearer 1:45 P. M., that they reached the fire. On opening the 1st west door *q*, Evans remarked, "the 1st west is gone, we had better get out." Lewis, seeing that the fire could not be reached with buckets, sent the motorman out with his empty locomotive for hose. This must have been about 1:45 or a little later, for the motorman had time to drop his trip, set his switches, to stop twice on the way out, the distance being about 2,750 feet, and to help 3 to 5 minutes on the outside after his arrival there, before the mine "let go."

It seems more than a coincidence that the time, figured from such diverse starting points, both backwards and forwards, should agree so closely. It may be considered as settled that at any time between 1:20 and 1:25 P. M. the fire was beyond control and that as late as 1 o'clock it had either not started, or having started was supposedly out.

After sending the motorman out, Lewis, who had supposedly been joined by several other of the officials, waited at the fire until something happened, perhaps the fall of the old door, to convince them that they were in immediate danger and that nothing further could be done. It may have been as late as 1:50 when the party hurriedly left the fire. Some believing they would be safer from the impending explosion turned into the 3d north, but Mr. Lewis in company with several others continued out the slope and were overtaken by the blast about 400 feet from the mouth where they were as badly crushed and burned as were their companions in the side heading. Some comment has been made as to why the men were not warned in time to escape and the answer is obvious; no one knew of the fire until too late. Being on the outlet and near the fan it was not noticed by the only official inside until his attention was called to it by a boy, the nipper, "Red," who probably told him, "Bennett says there is a fire at the door and you had better come." Evans had only a child's statement for the fact and lost his life in the endeavor to get through. Lewis knew nothing definite of the fire until within 17 minutes of the explosion, when it is possible that those on the 1st and 2d west were already dead, and the others could not be reached through the fire. No one was killed on the 3d north entries except the officials mentioned as Lewis' companions, and three men who were asphyxiated in attempting to get through. It seems probable that, instead of attempting to escape, Lewis sent his companions through the 3d north in an effort to warn the men of the fire, while he and the others continued on out the slope to hurry up the hose, fire extinguishers, and other needed apparatus? This is the more charitable and, from the known courage of all the dead, the more probable view.

The explosion took place, as nearly as can be determined, at 1:57 P. M., and this time has been taken as correct in our estimates of the fire. The relative time alone is of importance.

A few seconds before the explosion an extremely dense cloud of heavy black smoke came out the fan, almost immediately turning to a light gray only to be followed by the shock. This was severe but not accompanied by any great noise. The fan was not damaged except by the blowing off of the roof and continued in motion until the current was turned off. This want of damage to the fan is undoubtedly due to the sudden increase in area of the return from about 50 to nearly 200 square feet near the mouth so that the gases had a chance to expand, to the roof being light and offering little resistance, and to the further fact that the airway being damp and having a rock floor afforded nothing for the explosive energy to feed upon.

At the drift mouth the blast came with great violence, the fall of the timbers and roof completely blocking the entrance. The casing of Bennett's motor was torn off and blown 350 or 400 feet and he and two others were killed by the flying stones and three others more or less injured.

In the mine the damage was confined to the blowing down of the timbers and consequent falls of roof on the main slope from the 3d north entries to daylight, on the 3d north from the 2d to 4th east cross-entries, with smaller and decreasing falls out to the 7th east, and on the 4th north entries from about the 7th east to the 12th east cross-entries. None of the air-courses were harmed, but with one exception, the air stops were all blown from the haulage roads into the return airways. Little or no damage was done to the slope below the 3d north entries, none at all to any of the four west entries or to the Rock Island, and the force was so slight at the ends of the 3d and 4th north, that many men continued at work until the rescue parties entering through No. 2 mine warned them of the accident.

Twenty-nine dead were found on the 2d west cross-entry at the last cross-cut and four more between that point and the fire on the 1st west entry. All these were asphyxiated, possibly by smoke prior to the explosion. Two were found on the slope at the 4th north; five on the slope between the 3d north and daylight; six on the 3d north not far from the slope; three on the 4th north back return not far from the fire; and others at various partings on the 4th north. Of the 135 miners and 22 company hands who entered the mine on the morning of the eighth, 88 either escaped after the explosion, between the time of the fire and the explosion, or had left before the fire started. The death list came to 79, of whom one was a visitor at the drift mouth, two who went inside out of curiosity, and Willis Evans, in charge of the C. F. & I. rescue car, who lost his life in bringing out 4 men imprisoned on the 4th west by the afterdamp. Thus, of the employes of No. 3 mine, 75 were killed, and as 6 of these can hardly be classed as company hands, 69 of the 157 going into the mine that morning are dead.

The evidence afforded by deposits of coke as to the direction taken by the explosion is conflicting and at best only confirmatory. The best evidence is afforded by the throw of heavy materials.

On the main slope several pieces of slate were found driven into the dip side of a cap about half-way between the 4th and 3d north entries and it is known from this that from the 4th north the explosion moved outwards to the mine mouth. Just below the 4th north, the door *g* across the slope was shattered and a piece found 195 feet down the slope. Also a short distance inside from this door slate was found forced into the pitch side of caps. Therefore, on the slope section, the force went both ways from the 4th north. On the 3d north, the door *l* across the entry was broken and blown 30 or more feet inwards. A timber further in was found blown inwards. Hence the explosion went into the 3d north from the slope.

At the mouth of the 4th north entry, a piece of timber has scarred the lower rib, while flying outward. At the Rock Tunnel, the gob was forced outwards from the haulage road. Just inside the 4th east cross-entry, a piece of slate was forced into the dip side of a cap. One hundred and twenty feet further in a heavy timber was plainly thrown outwards. From the 6th to the 10th east cross-entries, 45 posts are standing with their heads inwards and 22 with heads outwards along the left rib, and along the right rib 29 have the heads pointing outwards and 9 inwards. At the 7th east parting, 3 cars of a 7-car trip are off the track and "bumpered" in such a way that the force of the explosion must have been inward.

On the 3d north entry air-course no evidences of direction were apparent, but from the slope to the 12th east cross-entry,

all the brattices that were not gobbed shut, and even some that were, are forced from the haulway into the return airway.

The main slope air-course was not injured from the 4th north except that the brattices were blown in.

The 4th north entry air-course, however, does show marked evidences of direction. The door between the 3d and 4th west cross-entry was blown 30 feet toward the fire, and plastered with mud which could only have come from the water hole 80 feet farther inside. On this same air-course and 550 feet in the 6th east cross-entry, slate is found forced into the outby side of a cap. Slate is also found in the same position in another cap 450 feet farther in. As to brattices, all from the 4th west entry to some little distance beyond the Rock Island, with one exception, are blown in from the haulway to the air-course.

Starting somewhere on the 4th north main entry within a space of 610 feet from, and probably near, the 5th east cross-entry, the explosion traveled in two directions. That going north gathered up the dust at the 7th east cross-entry parting, probably resulting in a second explosion, and a third took place at the 10th east cross-entry parting. Meeting the wet and new section of the mine at the 12th east cross-entry the explosion stopped for want of material. Entering the air-course at about the 5th east cross-entry the explosion also traveled north, forcing slate into the caps as noted, but doing no great harm as this heading is wet to watery and has generally a rock floor due to falls of roof.

From its origin, the explosion passed south to the slope, on its way forcing slate into a cap piece, blowing the brattices into the air-course as far as the fire, beyond which point none were destroyed and only a few bulged into the return. Passing the Rock Tunnel the explosive force threw several carloads of material into it. Coming to the network of dusty sidings at the slope, there was another explosion, but having room for expansion it did little harm. At this point the force divided, one arm turned down the slope, destroying the door, but was stopped at the "gob hole" by the water and by a large amount of rock dust on the floor. The other arm turned up the slope, forcing slate into the caps on the pitch side, but again, owing to the large cross-section, did little damage until it met the 3d north siding, where, meeting fresh supplies of dust, the final explosion occurred. The force extended but a short distance into the 3d north entry owing to the heading being wet. It was this last explosion, the one at the 3d north that did the most damage to the mine.

On the 4th north entry return air-course, the force entering near the 5th east cross-entry passed over the rock floor and water and knocked down the door between the 3d and 4th west. Why this branch did not explode in the presence of so much dust just outside the fire is a mystery, as deposits of coke are found between this door and the fire, indicating intense heat action.

These different points of probable explosion are clearly indicated, not only by the known condition of the mine at each place, but also by the presence of coke on caps and ribs. Coke is found in large quantities on the 3d and 4th north sidings and opposite the 7th east parting in the return. It is also found in the 6th east entry above an old fall 40 feet in from the 4th north. It is found on the return between the 3d west door and the fire in one place. All the places where the coke is found were either very dusty or near places that were. No coke was found near the 10th east cross-entry, probably because it was not looked for and it may possibly be found if careful examination is made.

While there were undoubtedly a series of explosions, the time interval between them was but a minute fraction of a second, so that to observers the action appeared instantaneous.

Several theories have been advanced as to the cause of the explosion and its place.

The first supposes that it was caused by the ignition of the heavy hydrocarbon gases, resulting from the burning of the coal in insufficient air and that it was done by the lamps of one of the two men whose bodies were found on the slope at the at the 4th north on opposite sides of the door. In any case, the man outside could not have lighted it, as a heavy door was between him and the return, and had it been ignited by the man inside, the door would have been blown out and not down the slope. For every reason this theory is untenable. ✓

Another theory suggests that the gases at the fire, meeting sufficient fresh air when the burning door fell, combined with the increased supply of oxygen with explosive violence. It may be admitted that such a *minor* explosion is possible and that it may have been the cause or starting point of a dust or other wave of disturbance, but that it, and it alone, without extraneous aid was the cause of the loss of life and wrecking the mine, is impossible. Aside from the fact that we have no knowledge to prove that the coal was not burning to CO_2 direct, the explosion, the actual detonation, did not and could not have taken place at the fire or near it. ✓

Explosive energy radiates in all directions from its point of origin along lines of least resistance. A study of the map proves that what little energy is encountered near the fire is all toward it and not away from it as it would be the case had the explosion taken place there. On the west, none of the headings are disturbed in the slightest degree. Even such light objects as cigarette papers are where left by the owners. On the north, the door at the third and fourth west entries is blown in toward the fire, but above all, three men standing 10 feet inside the mouth of the fourth west entry 240 feet from the fire, were merely knocked down by the concussion, and a companion 200 feet further up the fourth west entry was not jarred. On the east, the brattices were bulged in toward the return, but not broken, and on the slope side of the fire were not even harmed. On the south, the canvas curtain between the second and first west cross-entries was unharmed. The point of explosion must plainly be looked for elsewhere.

All indications point to the fourth north not very far from the mouth of the fifth and sixth east cross-entries as being the point of the initial, but by no means the most violent, of the series of explosions which occurred. Just beyond this point the energy is proven to have gone inward and just before it outward. The brattices beyond the old falls 90 feet up the fifth and sixth east entries are shattered to pieces and blown inward, and intense heat is proven at this point by a small deposit of coke on the rib of the sixth east 40 feet in, as well as by the spalling action on the roof opposite the mouth of the fifth east. No coke is found in the air-course immediately opposite this point, but it begins a few feet farther in and is found in numerous places to a point beyond the seventh east cross-entry. Perhaps there was but one explosion at this point and not two, as the writer supposes, but indications point to one at the fifth east and another at the seventh east parting.

Because of lack of damage at the fire, it was first thought that it and the explosion were entirely independent. It seemed possible that a short-circuiting of the trolley wires brought about by a fall might have ignited the dust and that the fall, if not otherwise caused, might have been produced by the jar to the air caused by the sucking in of the door at the fire, the journey of the current being suddenly changed from one of 20,000 feet to less than 4,000. It also seemed possible that some stranger to the mine might have climbed into the 6th east entry with a naked light and ignited standing gas brought in there from the dikes mentioned. Another view was that the night shift working the newly started 5th west entries had left a full supply of powder behind, which was carelessly ignited by some passerby. Any one or all of these causes could have ignited the dust and except the second, independently of the fire. But a thorough investigation into the gas question immediately after the accident, the accounting for all of the missing, and want of knowledge as to any powder being present, compel the abandonment of this view for one advocated, in part at least, by

some of those on the scene shortly after the explosion. It is freely admitted that there are weak points, largely ones of time, in the argument, but in want of definite knowledge it is given for what the reader may think it worth and the objections frankly stated. This is an attempt to connect a fire on the return with an explosion which took place 1,000 feet beyond it on the intake. The difficulties are obvious. This view supposes that the danger became imminent when the motorman left at top speed for outside, which we have shown was 10 to 12 minutes before the explosion. The hurrying motor stirred up vast clouds of dust at the slope parting 1,000 feet outwards from the fire. As the evidence shows that the fan was slowed down shortly before the explosion, the air was probably not traveling with its normal velocity of 600 feet per minute. Assuming 300 feet, it would require 3 to 4 minutes for the bulk of the dust to go up the 4th past the fire. By this time the door had burned partly through and the air was beginning to short-circuit. What dust passed through the openings was burned inside and the quantity of entering dust constantly increasing, it began to "backfire" into the haulage road. Perhaps it was this backfiring that convinced the party at the fire that danger was imminent.

The door, disintegrating more and more rapidly by reason of fire on both sides, finally burned down and the sudden short-circuiting of the entire air-current of this section of the mine threw still larger volumes of dust into the fire from the roadways, and possibly by suction from the gob holes and cross-cuts, thus producing more intense inflammation. While this was going on, the major portion of the dust was continuing up the 4th north, growing warmer and warmer until it finally began to distill gases. The falling of the door and the short-circuiting of the air caused increased volumes of dust to go out the 4th north, the air already having a tendency to go in. The gases were distilled more and more rapidly until when the 5th east was reached the action was so intense as to cause an explosion. Traveling inward the gases met fresh volumes of dust at the 7th east and 10th east partings and exploded, but stopped at the 12th east cross-entry for want of fuel. Going outward from the 5th east cross-entry the gases traveled with intense velocity through the rifle-like section of the entry, in some places of but 35-feet area, until, encountering the dust at the slope partings, another explosion occurred, but did little damage by reason of the very large cross-section of the mine at this point. The explosion did not travel down the slope, as it was wet, and did little damage between the 4th and 3d north because of the large area. At the 3d north sidings, where there were large volumes of dust, the final and largest explosion occurred. Going in along this entry, its cross-section diminishing rapidly, the place was completely wrecked, but for no great distance, the force being stopped in that direction by the watering received the Sunday before.

This view likens the affair to the ignition of a train of powder, the fire being the match and the points of explosion being occupied in this case by dusty places in the roadway.

The chief difficulty in accepting this view is finding an explanation why the explosion did not start as soon as the motor stirred up the dust on its way out. Part of the time may be accounted for by showing that it took several minutes for the dust to reach the fire, but there seems to be no explanation other than that already offered to account for the 5 minutes that presumably elapsed between the time Mr. Lewis and his party left the fire and the explosion. It would greatly simplify matters if it could be shown that the actual determining cause of the dust ignition was at the 5th east cross-entry.

The explosion killed all those in immediate authority, and while some little confusion naturally resulted, it was but 20 to 30 minutes until ventilation was restored in the mine. This was accomplished by placing a canvas brattice across the mouth of No. 2 mine, opening the doors between it and Nos. 1, 3, and 4, and covering the roof of the No. 3 fan. As soon as this was done a helmet party was able to enter with brattice cloth and close up the destroyed brattices along the main slope as well as to install a regulator below the 3d north entry. This forced the air up both the 3d and 4th north entries through No. 2 and out the No. 1 fan, which was speeded to its full capacity. By 6 P. M. the first rescue station was established at the upper cross-cut next to the 4th north entry on the slope, and by 6:30 P. M. the second was established at the fire which had been so dampened by extinguishers that it could be walked over.

About 6:30 P. M. the rescue car of the C. F. & I. Co., with a hastily gathered force, arrived and their trained helmet men went in. About 7, this party, noticing a light in the 5th north entry off 4th west cross-entry found four men behind a canvas brattice at the end of that entry, which they had built to keep out the firedamp, and it was by giving up his helmet to one of these men who was partly overcome, that Willis Evans, in charge of the C. F. & I. car, lost his life. Being left behind he was overlooked in the confusion, and when found was in practically a state of coma and died about 6:30 the next morning, despite the most vigorous efforts to resuscitate him. When the fire was quenched it was but a short time until the dead were reached and the bodies began to be brought out. The mine was thoroughly explored by Thursday noon and all but one of the dead definitely located. About 10:30 A. M. Wednesday 15 men came out of the 2d north mine opening who had been marooned on the Rock Island since the explosion and who had kept sufficient air in circulation by moving their jackets fan-fashion to sustain life. About 5 A. M. the morning after the explosion, the United States rescue car which had been at Golden, arrived, and rendered important aid with helmets and pulmoters. The work of restoring ventilation, by reason of there being a second fan, was simple and the rescue and recovery work after the air was restored proceeded with great rapidity.

In conclusion, while this was undoubtedly a dust explosion, the connection between it and the fire is not quite plain by reason of the length of time from the origin of the probable impelling cause to that of the explosion.

The writer wishes to thank all the many officials of the Victor American Fuel Co. for unfailing courtesy; Jos. Boyd, the fire boss, for kindly accompanying him through the mine on many trips and for his patience in answering many questions. His thanks are especially due to J. C. Roberts, enginer in charge of United States mine rescue car No. 2; to Thos. W. Tweedale, car foreman; and to Thos. C. Harvey, first-aid miner, for many kindnesses, and for their kindly suggestions and criticisms.

TARIFF ON BRECCIA

In paragraph 112 of the existing tariff law breccia wholly or partly manufactured is put in the same class and subject to the same rate of duty as marble, onyx, and alabaster. In paragraph 111, which covers marble and onyx in blocks, rough or squared, there is no specific provision for breccia, but being expressly excepted from the provision covering building stones not dressed, hewn, or polished, subject only to 10 cents per cubic foot in paragraph 114, it would seem that Congress intended to put it in the same class with marble, especially since it is under paragraph 111, classed with and subject to the same rate of duty as marble manufactured.

There is ample evidence to show that breccia is similar in texture and uses to marble. It is crystalline and is used extensively in the form of columns, mantels, wainscoting, and general interior decoration. This is merely another perversion of geological terms by lawyers; breccia is a rock composed of angular pieces, and may be quartz breccia which has no resemblance to marble and could not be used as marble. The rock under consideration was probably "breccia marble," somewhat similar to Taconic marble.

Newspaper Accounts

47 Dead In Mine Horror

Rescuers Stagger From the Entrances Almost Overcome by Gases.

EXPLOSION POWERFUL

Watch Found Torn From Victim's Pocket and Hurled Hundreds of Feet.

[*By Associated Press to The Dispatch.*]

DELAGUA, Col., Nov. 9.—The bodies of 35 men were today found in the north entry, where yesterday's explosion in mine No. 3 of the Victor American Fuel Company originated.

They are being brought out slowly over the debris, but are not yet identified.

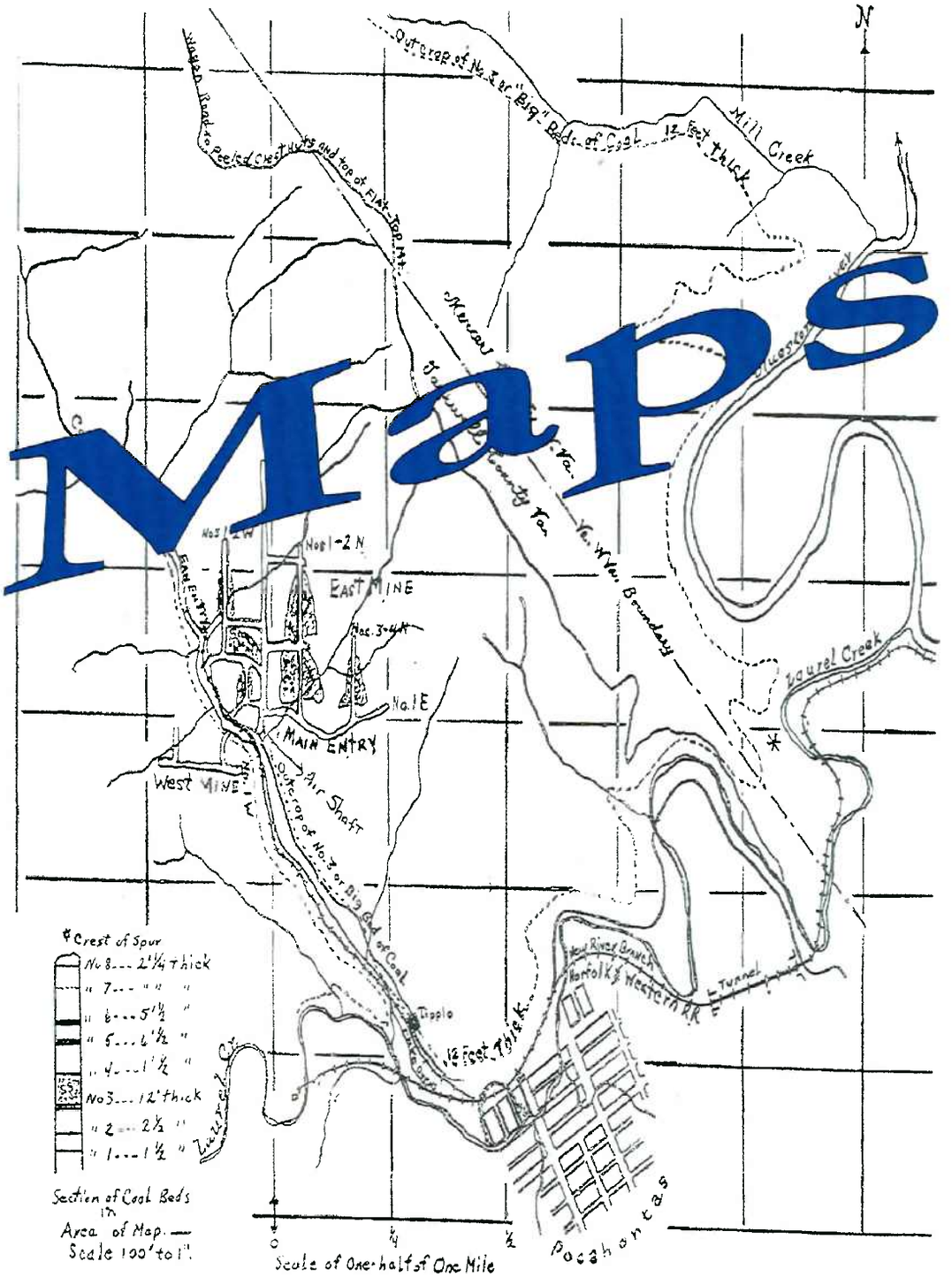
These 35 bodies bring the total dead to 47. Three bodies have been brought out Rescuers who entered the fourth entry early today went through a portion of the mine, coming out of No. 2 mine. Many were overcome by gas and were carried to the surface by their companions.

Election day cost one man his life and saved the life of another. M. Martin, who was killed at the entrance of the mine by flying rocks, was loafing around the mine because the saloon, where he was a bartender, was closed for election.

Domenico Chaves, who works in the fourth North entry, stayed away from work yesterday to vote. One of the first signs of the explosion found by the rescue party was the battered remnant of a silver watch. The force of the explosion had torn it from the owner's pocket. It was found hundreds of feet from a body.

Not a man of the 14 rescued through mine No. 2 dropped his dinner bucket. Although the party were too weak to stand alone, each one had his bucket gripped tightly in his hand. Some did not even let go to shake hands with friends.

Maps


N
Outcrop of No. 3 or "Big" Beds of Coal 12 Feet Thick
Mill Creek
Road to Peeled Crest Hills and top of Flat Top Mt.
Mercer
Tazewell County Va.
Va. W. Va. Boundary
Gladeston
Laurel Creek
No. 1-2 W
No. 1-2 N
EAST MINE
Fan Entry
No. 3-4 N
No. 1 E
MAIN ENTRY
West Mine
Air Shaft
Outcrop of No. 3 or Big Bed of Coal
Tipple
12 Feet Thick
Lawrence Cr.
New River Branch
Norfolk & Western RR
Tunnel
Pocahontas
Crest of Spur
No 8 --- 2¼' thick
" 7 --- " " "
" 6 --- 5½ "
" 5 --- 6½ "
" 4 --- 1½ "
No 3 --- 12' thick
" 2 --- 2½ "
" 1 --- 1½ "
Section of Coal Beds
Area of Map. —
Scale 100' to 1".
0 ¼ ½
Scale of One-half of One Mile

Map

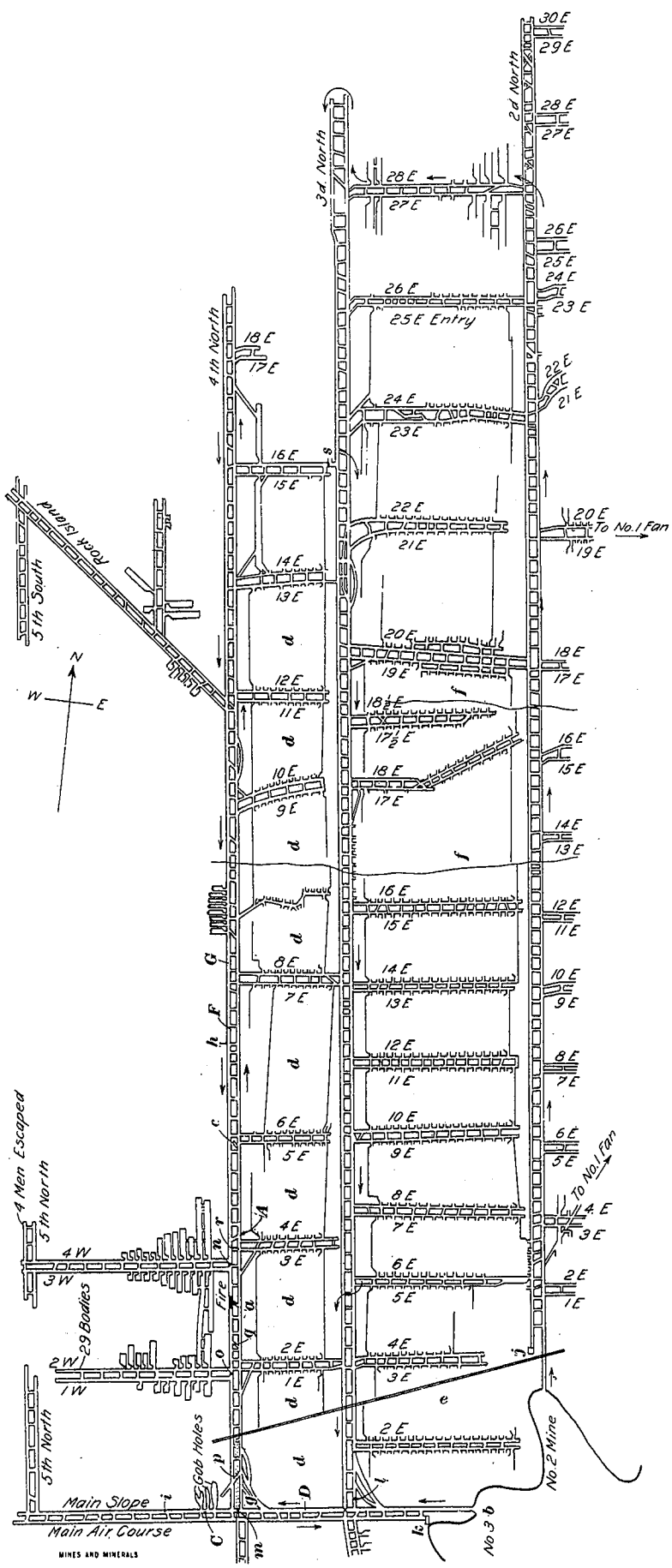


FIG. 1

A = slate forced into inby side of cap.
n = door blown outby.
C = slate forced into outby side of cap.
D = slate forced into inby side of cap.
l = door blown inby.
F = slate forced into outby side of cap.
G = slate forced into outby side of cap.

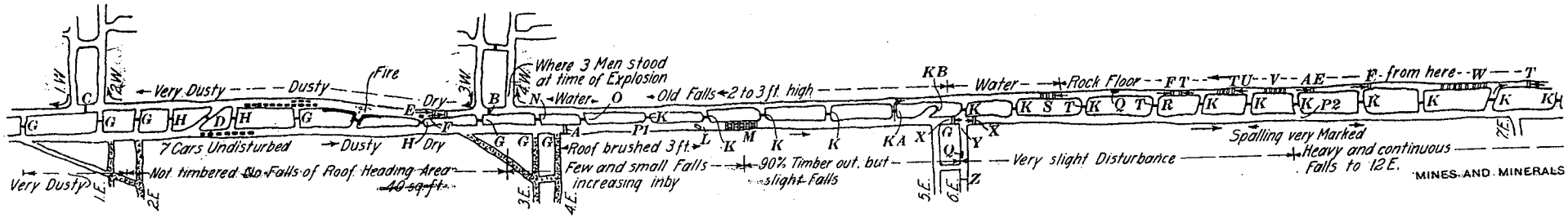


FIG. 2. ENLARGED SECTION OF ENTRIES AT FIRE AND COKING ZONE

A, slate forced into cap; *B*, door blown outby; *C*, curtain, unharmed; *D*, first west haulage door, slightly bulged into back heading; *E*, heavy coke on outby side; *F*, light coke on outby side; *G*, gobbed snut, not damaged; *H*, Bulged in toward back heading but not broken; *K*, entirely destroyed, blown into back heading; *L*, timber fallen outby; *M*, undisturbed timbering; *N*, brattice through which men escaped; *O*, upper ½ apparently out before fire; *P1*, electric pump not harmed but rheostat blown into back heading; *Q*, coke on rib 40 feet inby; *R*, the only stopping blown into haulage road; *P2*, electric pump blown 3 feet and rheostat 20 feet, very violent action here; *S*, three caps with center posts. Heavy coke on inby side of all members; *T*, coke on inby side; *U*, four sets caps, very heavy coke inby, some little outby; *V*, six caps unharmed; *W*, nine sets timber unharmed; *KA*, used as tool house by men working in 5th west; *KB*, fifth west started since November 1st on night turn; *X*, very heavy dust; *Y*, gob thr[illegible] into entry, fall, heavy spalling opposite mouth; curved arrows show direction of throw of heavy materials; small arrows show place of deposit of coke, slate or other materials; *Z*, Brattice blown inby; ‖ ‖ caps in place.

Maps

Not

Scanned