

to increase their speed away from the cage a further downpitch of 4.21% is adopted from *F* to *A*. This pitch gives to the empty car a velocity that is specially required for two reasons.

1st. To move the car quickly from the cage, and 2d, to run the car to a sufficient elevation above the back switch *B* to make it clear before it is switched down onto the empty track. Thus it is seen that a continuous fall is provided from the knuckle on the full track at *K*, down to and through the cage and on to *A* where it ceases; the velocity acquired, however, is now sufficient to carry the car by its momentum up the grade beyond the switch *B* until it stops, after which it moves back on the downgrade through the back switch at *B* upon the empty track. The cars are oiled on the descending grade and then run to a point about 200 feet in front of the shaft where the trips are made up and sent into the mine. The profile in Fig. 1 contains the grades and elevations and can be studied with interest.

In a mine the width of the shaft landing is made as small as possible consistent with furnishing sufficient room for work to be done with a minimum of danger, as otherwise the cost of securing the roof and sides is greatly increased. Where the full track is to be situated at a higher elevation than the empty one, a strong and substantial retaining wall is built to support the upper

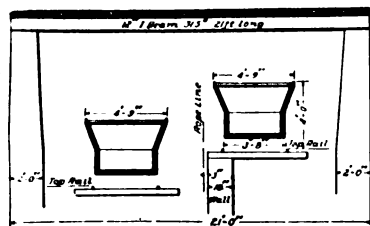


FIG. 3.

track and to make it secure without increasing very much the width of the landing. This wall in the Davidson works is 18 inches wide and one of the rails of the full track lies on it, as shown in Fig. 2. The landing under notice is supported with 12-inch I beams, above which 3" oak lagging is placed. The use of steel girders is not yet extensive in the mines of the United States, and such use of them

is, therefore, interesting. Girders of different sizes and weights are used, the sizes and weights ranging from 10 inches in depth and 25 pounds per foot of length, to 15 inches in depth and 42 pounds per foot of length. The prevailing sizes and weights are 12 inches in depth and 31.5 pounds per foot of length. The hauling arrangements are made for main and tail rope. The engine is located in the heading *E* shown in the plan in Fig. 1. The main rope passes out of the heading under the full track and then, after passing around a sheave, runs along the side of the retaining wall to the bull or return wheel near the shaft. The object of placing the bull wheel so near the shaft is to allow the full trip to be hauled over the knuckle and brought within 30 feet of the shaft, when the rope is cut off.

An inspection of the plan in Fig. 1 shows the curved, empty track at one side of the shaft, and a semi-circular manway around the opposite side of the shaft. This manway is a wise provision for the safety of the miners coming to and leaving the hoist, as they are safer on the empty than on the full track, and besides, it keeps them out of the way of the loaders. For the safety of the miners passing along the empty track behind the shaft, manholes are provided, as seen at *G G* in the plan in Fig. 1.

Liquid Air for Blasting.

The most interesting application of liquid air which has hitherto been tried on a commercial scale, is to make an explosive by mixing it with carbon. So said Professor Ewing in a paper read before the London Society of Arts on March 2. When liquid air, enriched by the evaporation of a large part of its nitrogen, is mixed with powdered charcoal, it forms an explosive comparable in power to dynamite, and which, like dynamite, can be made to go off violently by using a detonator. To make the explosive, the liquid, containing about 40 or 50 per cent. of oxygen, is poured on fragments of wood charcoal, two to four cubic millimeters in size. These are kept from scattering under the ebullition of the liquid by mixing them into a sort of sponge with about one-third of their weight of cotton wool. The liquid which remains is, of course, richer in oxygen than that which is originally applied, and when the mixture is allowed to stand long, all the liquid evaporates and the explosive power disappears. It must, therefore, be mixed at or near the place where it is to be used. But the cotton wadding, impregnated with coarse charcoal powder, can take up more than enough of the liquid to supply oxygen for its complete combustion, and when put quickly into thick insulating cases of paper, it retains its full explosive power for five or ten minutes. After an interval, which ranges from fifteen to thirty minutes, according to the size of the cartridge, all explosive power is lost. Experiments were made with this explosive on the parade ground at Munich, and a practical test on a large

scale has gone on for some months in a coal mine at Pensburg, not far from Munich, and are claimed to have given very satisfactory results. The chief advantage of the explosive is its cheapness, the cost being simply that of the power used in liquefying the air. Even the fact that after a short time the mixture ceases to be capable of exploding may be urged as a recommendation in one respect, for if a detonator hangs fire there is no danger of the charge going off accidentally some time after the explosion is due; nor is there any danger of its being purloined or used for criminal purposes. It is questionable, however, if such an unstable explosive can ever be found either convenient or economical, except, perhaps, in large quarries where a large amount of blasting is to be done at one place.

The Accident at Kaska-William Colliery.

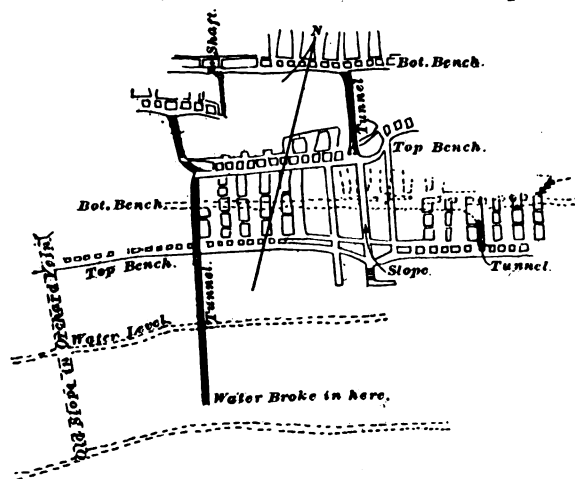
Written for MINES AND MINERALS by L. C. Morganroth, Lansford, Pa.

The Kaska-William colliery owned by the Lehigh Coal and Navigation Co. and leased by the Dodson Coal Co. is situated on a branch of the P. & R. R. R., seven miles northeast of Pottsville, Pa.

It is worked from a shaft 504 feet deep and sunk to the bottom bench of the Mammoth seam; 460 feet to the east of the shaft a tunnel has been driven southward cutting the upper bench of the Mammoth. At a distance of 230 feet from this tunnel and on the same line as the tunnel, a slope has been sunk on the vein for about 400 feet, and from this slope about one-half of the output of the colliery is at present obtained. At a point 420 feet to the west of the top of the slope a tunnel was being driven southward from the upper bench of the mammoth to the Primrose and Orchard veins, and in this the accident occurred. The only maps of the Primrose and Orchard veins available were those of the State Geological Survey, and according to those the Orchard vein only had been worked, while the lowest indicated workings were 300 feet above the level of the tunnel. The mine inspector was informed of the weekly progress of the work and as both he and the operators placed confidence in the above maps there was no thought of danger until the Orchard vein should be approached.

On May 27th the tunnel had reached a point *X*, in the figure, and while the day shift was loading the loose rock brought down by the round fired the previous night, the water broke in. The mine foreman had left the place only about half an hour before, after a careful examination of the tunnel and after having had a bore hole drilled six feet into the face and finding it dry.

The four men in the tunnel and two who were down the slope were drowned, but had the accident occurred upon a work-



PLAN OF KASKA-WILLIAM COLLIERY.

ing day, the 130 usually employed down the slope would have had no possible means of escape, as all other outlets, including the slope, were in the direct course of the water.

The barrier gave way with a report like an explosion of fire-damp, and immediately one of the fire bosses who was in the mine and the mine foreman started to investigate, but a second report and the rushing of the water warned them of what had happened and they then ran for the shaft bottom. As the water could not escape down the slope fast enough it backed up to the shaft and it nearly took the men off their feet before they could be hoisted. The imprisoned water had a head of 420 feet and under this enormous pressure it took everything before it. As there are over two miles of gangways connected with the slope it will take some time to pump out the mine and tell the extent of the damage.

The officials of the mine seem to have been taking every precaution, but this accident again illustrates the necessity for the keeping of accurate mine maps from the time a colliery is opened up.