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SELECTED QUESTIONS AND ANSWERS.

HAULAGE.

Q.—What is your experience in underground haulage? State briefly under what circumstances you would apply the endless and tail rope systems.

A.—The successful working of a colliery depends to a very large extent upon the adoption of the most efficient and economical hauling arrangements.

The systems of haulage in which I have had experience are the following:

1. Direct haulage, or main rope haulage.
2. Main and tail rope haulage.
3. Endless rope haulage.
4. Haulage by horses, by self-acting inclines, and by endless rope inclines.

I will give a description of the methods of haulage as stated in Number 4.

Horses are generally employed in bringing the coal from the face to the collecting station or pass-bye at the in-bye end of the haulage plane, or to the top of a self-acting incline; that is to say when the roads are comparatively level.

Self-acting inclines are used when the coal is to be conveyed from a higher to a lower level, and the road is of an uniform gradient, and not less than about 1 in 18.

The following is a usual arrangement of a self-acting incline. The rope extends from the bottom to the top of the incline, and is coiled from 2 to 4 or 5 times round a drum fixed at the top. The full tubs are attached to the rope at the top, the empty tubs at the bottom, and the full tubs gravitate to the bottom and haul up the empty tubs. The speed is controlled by means of a brake on the drum. The tubs are attached to each end of the rope in sets or journeys of from 2 to 30 or more tubs. When the seam is steep this system can be adopted to convey the tubs from the face to a lower bed. In the endless rope self-acting incline a double line of rails is required the full length of the incline, one for empties, the other for the full tubs. The rope is passed a few times round a pulley at the top, and the speed is controlled by means of a brake. A return wheel is fixed at the bottom of the incline, and the slack rope is taken up by means of a tension balance arrangement, also fixed at the bottom of the incline. Both full and empty tubs are attached to the rope at certain distances apart, and when the supply of tubs, either full or empty, falls short, the rope must be stopped.

The direct, or main rope system of haulage can be employed when the inclination of the road is in-bye, or against the load. The inclination must be great enough to enable the empty tubs to gravitate in-bye, and haul behind them the rope from the drum of the hauling engine. Branch roads cannot very easily be worked with this system of haulage, and the main advantage is that a single tramway only is required. Of course, double

tramways are laid at each end for pass-byes, and if a double road can be kept, and a large output is required, two drums can be used, and the full set be hauled out while the empty set is running in-bye. With a single road one rope, the length of the plane, is attached to the drum of the hauling engine. The full set is drawn up the plane and the rope detached from the full set, and then attached to the back end of the empty tubs. The drum of the engine is thrown out of gear, and the empty set is gently lowered on to the rope. The set then gravitates to the bottom of the plane, and the speed is regulated by a brake on the drum.

Main and tail rope haulage can be applied where a single roadway only can be maintained, and where the roadways are slightly curved or undulating; but it will give better results where the road is of uniform gradient and straight. Of course this can be said of all systems of haulage.

The engines for driving the ropes can either be fixed at the surface, or be placed underground. Two drums are required, one for the main rope the other for the tail rope. These drums are connected to the engine by suitable shafting and spur gearing, are worked independently of each other, and can be thrown in and out of gear by clutch gearing. The tail rope is twice the length of the plane, and the main rope is the same length as the plane. As the tail rope has not such heavy work to perform a smaller rope can be adopted. The tail rope is carried either along the side or near the roof on pulleys, and it passes round a return wheel at the in-bye end of the plane. It is attached to the in-bye end of the full set of trams, and the main rope is coupled to the front of the set. When the full set has arrived at the shaft the tail rope is detached from the back of the full set, and is then attached to the first tub of the empty train while the main rope is coupled to the back, or last tub of the train. The main rope drum is thrown out of gear and the tail rope drum only worked from the engine. Brakes are fitted to each drum, so that when the set is running the brake can be lightly applied to the drum of the trailing rope to keep the couplings tight at all points of the journey. The number of tubs in a train varies from 20 to 100, and the speed from 6 to 12 miles per hour. Branch roads may be worked, and each branch must have its own, and a double length of tail rope. When the full set is at the shaft, shackles, fitted to both ropes, are opposite each branch road. These are uncoupled, and the two out-bye ends of the main tail rope connected to the two ends of branch tail rope. The empty set is then taken into the branch road and the full set taken to the shaft. The ropes can then be changed back again, or another branch can change and so receive the empty set. Another method of working a branch road is to change the ropes when the set is in-bye.

Endless rope haulage may be applied to almost any