

DESCRIPTION OF THE NUNNERY COLLIERY, SHEFFIELD.

This colliery is a typical instance of a coal mine having an excellent position for the purposes of trade, but great natural disadvantages. These being :—

- (1) A straggling coal-field.
- (2) A large quantity of water which comes by levels to the bottom of the shafts, and a small quantity which is very difficult to deal with in the dip workings.
- (3) Numerous faults which militate against the economical production of coal.

The colliery, as regards the Silkstone Seam, is practically exhausted within 2,000 yards of the shaft; but there is a large coal-field adjacent for which the present plant is available, and another large coal-field for which a new winning will have to be made.

The following are some of the chief features of the colliery :—

1.—With the conditions already mentioned, and with water in every working place to the dip, and with workings in some cases two miles from the shaft, an output of 20,000 tons per fortnight has been reached during the past few months.

2.—The Silkstone winding engine is a double 30-inch cylinder engine, with 5-foot stroke, working an 18-foot drum. The Parkgate winding engine has two 24-inch cylinders, and 4-foot stroke, working a drum of two diameters, viz., 16 feet 6 inches and 10 feet 6 inches. Both engines are under the same roof and are fitted with steam and foot brakes. A special appliance for signalling in the winding-engine house indicates to the eye of the engineman how many raps have taken place.

3.—The shaft guides consist of steel rails, which are twice the cost of ropes in the first instance, the only advantage of them being that the cages can be brought about one inch closer together. The wear and tear of cages is reduced by providing spiral springs at the bottom of the shaft, on which the cages drop, the usual shock being entirely prevented.

4.—The tubs are fitted with the Elliott lubricator, one application of oil to each per month being sufficient in ordinary working.

5.—The haulage in the Silkstone Seam is carried out by a head-rope 3,700 yards in length, which works an incline in-bye, bringing 42 tubs up a gradient of 1 in 7 at the steepest part to a point a mile from the shaft, whence they are brought by a main and tail-rope engine to the pit bottom.

Both engines are worked without spur gear, and the single rope engine is condensing and is fitted up with special clutch gear. Both engines have two 24-inch cylinders, and are erected on the surface, the ropes going down the shaft in pipes.

6.—An endless rope, 6,300 yards long, is used in the Parkgate Seam for working the haulage. In the East Parkgate district, another endless rope, 3,200 yards in length, is used for the combined purpose of hauling and pumping. Three pumps are worked by means of this rope; the pumps are double-acting plunger pumps, geared to 5-foot driving pulleys, fixed horizontally, round which the rope works. The pumps are capable of pumping 50 gallons per minute each.

7.—Another endless rope is used upon the surface for the purpose of carrying the Parkgate Coal to the main heapstead, and carrying stones, etc., to the dirt heap. This rope is 900 yards in length, and is worked by two pulleys having five and four grooves respectively.

On the dirt tip incline, a screw clip is being used, and is made of wrought iron, the weakest part being the "loop" which is constructed so as to give way when the tub gets off the road. The jaw which grips the rope is about five inches in length and is tightened by a screw. It is capable of hauling ten tubs and can work on steep gradients and round curves.

On the other incline an automatic detaching clip is used. This was designed with a view of having the tubs automatically detached from the rope, which is gripped by two jaws, jointed at the top, where the clip is attached to the draw bar of the tub. An arm stands out on each side from the cap or hoop. These arms strike against a sloping surface at the point of detachment and by raising the cap set the tub at liberty. The raising of the cap forces the jaws apart and liberates the rope. This clip has worked very well with single 10 cwt. tubs upon a gradient of about 1 in 7.

8.—The character of the underground works and the faults which have had to be overcome are shown by the size of the spoil heap, which is estimated to contain about 500,000 tons of stone, most of it being burnt.

9.—The pumping at the colliery is very heavy, power being provided for raising 6,000 gallons per minute. A large Cornish beam engine with 86-inch cylinder and 10-foot stroke, is kept constantly at work. To either end of a plated beam are attached the pump spears, working 18-inch and 16-inch sets to the Silkstone Seam at a depth of 220 yards, and pumping up 110 yards to the Parkgate Seam, to which there are two 26-inch sets at a depth of 110 yards, these two being equal to 2,000 gallons per minute.

There are three duplicate horizontal, direct-acting, compound pumping engines underground. They are fitted with 15-inch rams, and are each capable of pumping 1,000 gallons per minute. One pumps from the Silkstone to the Parkgate Seam, and the other two from the Parkgate to the surface.

10.—Seven steel boilers, 30 feet long by 7 feet diameter, were erected in 1884, and are all fitted with the Proctor mechanical stoker, which enables a very inferior class of coal to be used for firing. There is also fitted to this range of boilers an economizer, through which water is sent into the boilers at a temperature of from 280 degs. Fahr. to 310 degs. Fahr.

An Arnold boiler has lately been erected, 30 feet long by 8 feet diameter. The main feature of this is that in place of Galloway cross tubes, a longitudinal tube is fixed, running from near the back end to a point about 4 feet behind the bridge, and the flues themselves are in barrel-shaped sections, welded, by means of which thinner plates can be used, and no rivets are exposed to the fire.

A Carroll water purifier is fixed to the Arnold boiler. The feed-water is admitted through a flat pipe having two passages. The water passes first through the lower half, and then through the upper half into the boiler. The deposit and residue from the water settles in this pipe, and is blown off at intervals.

11.—Ventilation is produced by a 30-feet Guibal fan, which has been working about twenty years. A new engine to drive it was started in 1890. This is a compound engine fitted to work with fourteen ropes. Six are found to be sufficient to do the work at present. Two appliances of interest are in use in the fan-engine house, the first being a mode of ventilating the house by taking a pipe from the roof into the fan chamber, and the second is a mode of utilizing the ordinary steam gauge for the purpose of continuously indicating the speed of the fan.

12.—The dry separation plant at the surface consists of three sets of jiggling screens, which separate the coal into three sizes, and four large travelling belts on which the dirt is picked out from the coal. By the means provided, the coal is mechanically divided into twelve different sorts, and the plant is capable of dealing with 150 tons of coal per hour. A special plan is in operation for disposing of the dirt picked out from the coal, by dropping it down below the rails.

13.—The coal is washed by an ordinary trough machine, and the washed coal is taken a distance of 900 yards by water, and is received into large hoppers close to the coke ovens. A small locomotive is used for filling the coke ovens with despatch, and has been at work about fourteen years.

14.—The electric plant at the colliery consists of an Immisch dynamo and motor, the current being transmitted through a cable to the motor fixed at a distance of 3,500 yards from the dynamo.

The dynamo is compound wound, and gives at 880 revolutions, 520 volts and 22 ampères. It is driven by the fan engine, the speed being obtained by means of a counter-shaft with pulleys, driving two leather-link belts. The power required to drive the dynamo at full load is 22 horse-power.

The large driving shaft is geared to the engine shaft by a spiral form of friction clutch, and 37 revolutions per minute of the engine give a speed of 880 revolutions of the dynamo.

There are two $7/16$ bitumen insulated cables leading from the dynamo to the motor, which is rated at 16 horse-power when absorbing 525 volts and 25 ampères.

Power from the underground motor is transmitted by means of a leather-link belt on to a counter-shaft, which has spur gearing of $5\frac{1}{2}$ to 1 on to the pump shaft.

The pump is a three-throw ram pump, and is delivering 50 gallons of water per

minute through 2,000 yards of 4 inch pipes with a head of 385 feet, this being equal to six horse-power in the water, neglecting friction in the pipes.

The cables are taken down the shaft in pipes, and are fixed to the props in the pit with wooden clamps; they are quite slack, to enable them to give way in case of a fall of roof.

15.—A Cockson fan is at work at the Woodthorpe pit, and is driven direct by a Willans & Robinson engine, running 280 revolutions per minute.

A Robinson coal-washing machine has been in successful operation at this colliery for a number of years.
