

tion of an official appointed by the lessors; but this course is cumbersome, requires constant attention, and is very likely to give rise to disputes. As, however, the mine has been worked for twenty years without any such appointment having been made, the clause cannot so far be said to have resulted in much good or harm. As will be seen by the plan, the workings in the main seam have been carried on over an area of about 21 acres on the west side of high-water mark, and over about 10 acres to the east. In addition to these there exists, at a depth of 217 feet in the shaft (see section on line QR plan), about $1\frac{1}{2}$ acres of working, mostly to the rise.

2. *Details of Bords and Pillars in Ordinary Working.*—André, on coal-mining, says (p. 309), "Experience gained under similar conditions is alone worthy of confidence, and, following this experience, will lead for the sake of safety, to excessive dimensions. Hence it has come to pass that minimum dimensions have been left altogether out of consideration, and another principle of working adopted. Whenever it is important that no surface disturbances should take place, the size of the pillars is calculated in the same way as that of the shaft pillars, the base of the calculation in this case being designed to give security by means of great surplus of strength." Again (p. 278), he says, "The dimensions of the shaft pillars are determined by four conditions, namely, the depth of the seam from surface; the angle of inclination of the beds; the strength of the coal; and the nature of the thill or floor. In no case can safety be obtained with pillars less than 35 yards square. These may, therefore, be considered to be minimum dimensions in the shallowest mines, when the other conditions are favourable, say, up to the depth of 150 yards. . . . These dimensions are given as sufficient on the assumption that the other conditions are favourable. But it is evident that those conditions may be such as to require an augmentation of the dimensions determined according to the depth alone. Thus, if the strata are highly inclined, the tendency of the pillars to yield is greater than when the strata are flat." From the Transactions of the North of England Institute of Engineers, Vol. viii., p. 87: The Brockwell seam at Woodfield was 7 feet thick, "the roof falling freely." Only 4 feet was worked first, leaving a band and the top coal. The depth from the surface was about 120 feet, and the chief peculiarity a soft bad roof. Originally the pillars were left 90 feet long and $22\frac{1}{2}$ feet at the headways; the bords were turned away $13\frac{1}{2}$ feet, and increasing to 18 feet or 21 feet at the centre, and diminishing again; that is, the pillars were $22\frac{1}{2}$ feet at the headings, and diminished to 14 feet or $17\frac{1}{2}$ feet. "In the foregoing plan the chief difficulty arose from the great width of the bords near the middle and consequent thickness of the pillars. In the present case, therefore, the bords are turned away 12 feet wide, and continued the same width throughout, the pillars being left 24 feet thick by 90 feet long."

From the same, Vol. ix., p. 18 in same, Notes on Old Workings at Dipton Colliery: Pillars 24 yards long by 2 yards to 3 yards wide; bords 4 yards, and walls 2 yards; that is, the pillars were 6 feet to 9 feet thick, and the bords 13 feet, "these being the only effective excavations, the pillars being abandoned, causing a loss of 33 per cent. of the coal, as well as endangering the entrance of the mine. Unless the seams of coal, the stratum above and below it, are of a very hard nature, and sufficiently thick to resist the pressure of the incumbent strata, no great extent of workings could be excavated on such a system."

Mr. George Fowler says, in South Wales, "the stalls are set sufficiently far apart to leave a pillar equal to twice their width between them. It is, however, very commonly the practice to leave much thinner pillar, and heaving and pucking bottoms are the consequence."

In Leicestershire, where the new red sandstone rested unconformably on the coal measures, we worked 18 feet, leaving 48 feet, in order to prevent the possibility of an influx of water from the red measures, which were a considerable distance above. Though there was no danger to life, the miners were fined if they exceeded the proper width.

Of course it would be easy to indefinitely multiply examples of this sort, but I merely wish to show that the Shag Point pillars are smaller than those ordinarily left, where the attendant circumstances do not threaten loss of life. In order to take the average of the Shag Point bords and pillars, as shown in plan, I drew a number of lines at chance, and took the average at the points where these ran, with the following results, viz., the average of 30 pillars (not counting main-road pillars) was 10.296 feet, or a little under $3\frac{1}{2}$ yards, and the average of 35 bords taken in the same way was 13.97 feet.

Tabulated as follows:—

Names of Colliery, &c.	Bords. Feet.	Pillars. Feet.	Proportion.	Remarks.
Woodfield	... $16\frac{1}{2}$	19.125	1,000 to 1,600	Unsatisfactory, pillars too small.
" (new system)	... 12	24	1,000 to 2,000	
Dipton	... 12	$7\frac{1}{2}$	1,000 to 625	Endangering the entrance.
South Wales		...	1,000 to 3,000	Less proportion causes floor to swell, &c.
Leicestershire	... 18	48	1,000 to 2,666	
Shag Point	... 13.97	10.296	1,000 to 729	

The proportion is shown much more clearly, but the method of averaging does not show the true aspect of the case. For instance, though several small pillars followed by a large one may bring up the average, yet it does not offer the requisite uniform support to the roof.

3. *Notes on Accidents by Irruption of Water.*—Although there are, unfortunately, many accounts of accidents from this cause, yet they are nearly all caused by too close proximity to old workings, in which water has accumulated, and few of them offer any analogy to the circumstances under consideration.

In the year 1827 the sea broke into a colliery off the coast of Cumberland, causing great loss of life.

On the 6th July, 1878, at the Kilkeevan Colliery, in Scotland, an irruption of water took place. This was from an old working, but as there was 25 or 30 feet of measures intervening the case is somewhat apposite.