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SECURING PIT BOTTOMS.

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When the shaft has been sunk and the actual opening of the seam has to be commenced, there is no more important consideration than that of arranging and securing the pit bottom. All the output of the mine must necessarily be handled there and so long as the mine continues to produce coal the bottom and the roads leading to it must be kept in the best possible condition. The bottom ought to be arranged in such a way that the greatest possible output ever expected to be obtained can be dealt with easily and with economy. Any mistake in this respect will remain as an eyesore, and to cripple the output during the whole lifetime of the mine. The arrangements made for handling the coal will depend entirely on local conditions, the method of haulage, and the system of working the coal. It is not intended to deal with such arrangements here, but rather to deal with the methods of making the bottom and adjacent roadways secure. If this is not done in good style at first there will always be costly repair work to be done to keep the roads and bottom good. Better to make a good permanent job of it at first than to have continual outlay and a crippled output afterwards. It is absolutely necessary in the first place to have a large, strong pillar left round the shaft bottom in order to prevent movement and crushing as much as possible. This will help to keep the bottom roads good by taking much of the weight. No matter how strong the roof and coal may be there should always be supports of a strong permanent kind used around the bottom. It has been known for collieries to work for a number of years without any other supports than the coal pillars left around the shaft, but this was only under extra hard rock and with hard strong coal. In most cases of this kind it was afterwards discovered that this method of doing business was penny wise and pounds foolish. In one instance the roof was very hard strong sand stone and the pit porch was not supported in any way whatever. This remained in this state for a number of years, but one day a tremendous fall of rock laid the mine idle for several days and cost a large sum for cleaning up and repairs. The pit porch was afterwards secured in a permanent manner—a case of shutting the barn door after the horse has got out. The same amount of money, or perhaps considerably less, expended in the first opening up would have prevented the loss and expense due to the fall of rock.

Many methods of securing the pit bottoms and bottom roadways are in actual practice to day, all of these claiming more or less advantages with regard to cost, strength, permanency, and ease of adoption. In some cases heavy timber bars or thick props are used. These are cheap in the first outlay, but do not last very long, and are not strong, therefore they are not often used.

Heavy timber bars are also sometimes used on side walls of brick, freestone, or concrete, but this is not often done as the timber has the same disadvantages as mentioned above.

In many cases steel girders or steel props are employed and give good results, as they are very strong and will last a long time. They are costly at first, and rather hard to handle, and are liable to slip out, but they are in every respect superior to timber. There are those who claim that girders of steel are not so good as they are said to be, but often this is due to faulty setting and not due to any defects in the girders themselves. Girders set in such a way that they are subjected to side pressure on their ends will never give good results. The ends of the girders should be kept clear of the sides of the roadway or else blocks of wood should be inserted so as to serve as cushions.

Girders are often used on side walls of brick, stone, or concrete, and when so used often give good results. Concrete is often used owing to it being cheaper than brickwork, but it is questionable whether it is cheaper after all. In cases where there is great pressure and movement concrete does not make so good a showing after all, owing to it cracking and breaking. In one case where part of the road was secured with brickwork and part with concrete the concrete gave out while the brickwork was not effected. The brickwork had wood blocks built into it to make it more elastic, so that it settled gradually without breaking. The best method of permanently securing a pit bottom is to put in a good brick arch, and if properly built it will last longer than the mine will. The circular arch and the elliptical arch are rarely met with in mines owing to their being so costly and hard to build, although there is no doubt about them being the two strongest forms. The form most adopted is the horse shoe arch which will resist great top pressure and partial side pressure. There should always be a few courses of wood blocks built into the arch. These blocks are cut to same size as the bricks and are built in every fifth or sixth course. This allows the arch to settle a little when the weight comes on and thus prevents it from being crushed in. All timber should be removed from behind the walling and the space should be filled in with some soft material such as sand, ashes or small stones. This equalizes the pressure all round and acts as a cushion. In some cases the space behind has been filled in by running concrete, but the results behind have been anything but good. The concrete would not yield under the pressure and the result was a broken arch.

When arches are built there is no danger of stones slipping out between the supports as often happens in the case of girders or timbers. Of course a good lagging will prevent this in any case, but if an arch is put in there is no necessity for lagging. In cases where the measures are highly inclined, as is often the case in