

and decided to attempt an underground voyage. The *maitre-ponion* (or colliery foreman) showed us into a dressing-room, where we each took a complete miner's suit, clothing ourselves in a sort of heavy hemp-linen, and a very heavy, ugly leather hat, with a large rim, and stuffed with horse hair.

"Those hats are not after the Parisian fashion," said our guide, "but they protect you in case of stones or pieces of coal tumbling down."

"And against what weight can it guarantee us?"

"Well, a stone of forty pounds will not in the least injure—the hat. But sometimes, though not often, fragments of rock of half a ton fall down, and of course, in such cases, the hat is of no use."

It was now time to take our seats in the cage; our guide procured for each of us a seat in the shape of a bundle of straw. In this we were treated as distinguished visitors. The miners themselves know nothing of such luxuries. They sometimes go down sitting on the brim of a tub called in their language "a kibble." Each of us, with a safety lamp, sat down, rather close together; the bell rang, the engine whistled, and down we went. A strange sensation is felt in descending for the first time into the shaft. The light of day is cut off at once and replaced by darkness made more gloomy by the dim light of the lamps. Everything swims before our eyes, and we can hardly breathe; but little by little we get accustomed to the light of the lamps, and commence to distinguish faintly the surrounding objects. We examine the sides of the shaft; by turns we see masonry, woodwork, sometimes the bare rock, in other places iron bars screwed up, and maintaining heavy beams. Further on the walls are carefully cemented; generally water is seen leaking and dropping down, but not in large quantities. The different systems of constructing and keeping the shaft in good order depend upon the hardness of the rock, the nature of the ground, and the existence of underground water springs. Now and then we saw a large excavation, which looked like a huge "black-hole," and our guide told us that it was one of the landing places of the upper galleries.

It must be remarked that in a coal district there are different depths or *stories*. There are different layers of coal, called coal measures, say, at two hundred, three or four hundred yards deep, and so on. These layers or *strata* do not generally run quite horizontally. The thickness is generally between two and four feet, say an average of three feet; sometimes there are two layers close together, but this unfortunately is an exception to the general rule. In America, however, the layers of coal are generally much thicker, and in many places near the level of the ground. In that respect the new continent has a great advantage over the old one.

We took fourteen minutes to be lowered to a depth of 3,000 feet. There was a large excavation newly made to receive the water that was oozing in different places. Under each stratum that is worked out generally a *reservoir* is made, forming a security in case of small inundations. Then we went up again several hundred feet and landed at a colliery in full activity. At the landing place we found stables for several horses, and we felt rather surprised to find that faithful servant of man amid such surroundings. To take a horse into a mine, they tie its legs close to its body, wrap it in a leather sack made for that purpose, put it in a high cage, sitting erect, and so it goes down, keeping as stiff and stately as the president of a legislative council. There is also a place for putting tools,

babcocks, provisions and instruments, and for lighting and cleaning lamps. The landing place is the starting point of the different underground roads or galleries which lead to the working places, *shanties* or *cuttings*. These galleries run in every direction; in the interior of a coal mine there are squares, highways, small passages, and so on, in considerable numbers. Then we had to travel in a horizontal direction. A horse was harnessed to two small cars, we took our places, and had a brisk drive of about one mile through one of the main roads. The way of constructing the galleries depends, like that of the shaft, upon the nature of the stratum. Of course, all the cars run on small railway tracks, below as well as above the ground. Then we came to a *square*, and saw there arriving from different directions cars loaded with coal, which were dragged or pushed by women and boys, called in the mine "setters." Our horse was sent back with a load of six cars and returned to the landing place alone and without light, groping his way like a blind man. As we entered a new gallery, which was too low to give passage to a horse, it was replaced by two women, one pulling and one pushing our cars. The legend tells that King Sesostris had his carriage drawn by the kings he had conquered, and whose ears he had cut off as being superfluous ornaments, but that is not a bit worse than giving such work to the gentler sex. It is now, fortunately, forbidden by law.

We came at last to a place where we saw a gang of miners at work. It is a mournful, desolate spectacle. By the dim light of the lamps we saw a crowd of men handling their pickaxes, mattocks, shovels, and hammers, the noise of their tools and their sighs of fatigue being the only signs to be heard. The height varies between two and a-half and four feet, and in that narrow space they work in a painful position; some are kneeling, others are lying on their backs, or on their sides, and they work hard ten hours a day without being able to stand upright. They are covered with perspiration and coal-dust, and there they pass half their lives; it is a miserable existence indeed. Of course when the layers of coal vary from five to twenty feet in thickness, as is very often the case on the American continent, the mines are worked with far more facility, and the colliers, having their movements free, are in a much more favorable position.

(To be continued.)

CHARCOAL AND ITS BEARING ON THE UTILIZATION OF OUR FORESTS.

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(Continued from last month.)

THE MANUFACTURE OF COAL IN PITS OR MEILERS.

In Sweden the coal is very largely manufactured in pits, and this has been carried on on quite a large scale also in the United States. One advantage of the pit system is that farmers and others can do coal burning on their own lands and obtain the results of the labor, and at the same time the cost of transportation is naturally greatly lessened, as forty bushels of charcoal can be transported for considerably less than a cord of wood, of which it is an average equivalent. In general results throughout the United States, it would seem that the quantity of coal per cord obtained by pit burning has not been equal to the quantity obtained in the kilns. The general average seems to be about thirty-five bushels per cord from pit burning, as against about