

for they include the carboniferous limestones; in the upper part they consist mainly of sandstones, shales, fireclays and coal seams. The lower section, or marine type, consists of Millstone Grit, flagstones, sandstones, and shales, with thin seams of coal and bands containing marine fossils. Thickness, 400-1,000 feet to 5,500 feet in Lancashire. Carboniferous Limestone, consisting of massive marine limestones and shales. Thickness in South Wales 500 feet, increasing northwards to more than 4,000 feet in Derbyshire and to about 6,000 feet in Lancashire, but diminishing northwards again into Scotland. The base of the carboniferous limestone series passes down conformably into the Upper Old Red Sandstone. The Upper Section or Lagoon type contains the Coal Measures, with red and grey sandstones, clays, and thin limestone, resting upon a great thickness of white, grey and yellow sandstones, clays, shales, and fireclays, with numerous workable coal seams. Thickness in South Wales, 12,000 feet; South Lancashire, 8,000 feet; Central Scotland, 3,000. The total thickness of the carboniferous rocks reaches sometimes to 20,000 feet.

The strata overlying the carboniferous are the Permian from the Russian Province of Perm, where they are well developed. They consist of the upper red sandstones, clays and gypsum, 50 to 100 feet thick in the East of England, but swelling out west of the Pennine Chain to 600 feet thick. Magnesian Limestone—a mass of dolomite ranging to 600 feet in thickness, and the chief repository of the Permian fossils. Marlstone, a hard brown shale with occasional limestone bands. Lower red and variegated sandstones with conglomerates. This division attains to 3,000 feet thick in Cumberland, but is hardly represented in the East of England. The sandstones of the Permian system are usually bright brick-red in colour, owing to the presence of earthy peroxide of iron, which serves to cement the particles of sand together, and for this reason is generally unfossiliferous. In Britain the Permian rests unconformably on the carboniferous system.

The strata underlying the carboniferous system are the Devonian, named by Sedgwick and Murchison after the county of Devon where they studied its details. It occurs in two distinct types, which bring before us the records of two very different conditions in the geography of these regions during the period when the rocks composing the system were being deposited. The ordinary type which is called Devonian represents the tracts that were covered by the sea, and has preserved the remains of many forms of the marine life of the period.

The less frequent type is characterised by thick accumulations of sandstones, flagstones, and conglomerates that were laid down in lakes

and inland seas. This type is known by the name of Old Red Sandstone.

As the science of geology is a vast subject, and one that requires years of study to acquire an elementary knowledge of, it is impossible to give other than a brief outline of the subject.

CO-OPERATION AND MINES.

The President of the North of England Institute of Mining and Mechanical Engineers, in his address at the recent annual meeting, said it would be interesting and useful to consider the direction they were likely to travel in the future. One or another of two paths they would, he believed, follow, the one leading to Socialism—the ownership and exploitation of the mines by the State—and the other towards co-operation—the ownership and exploitation of the mines by the workmen engaged in them. The first, he believed, would lead to disaster, the latter, to the advantage of capital and labor alike, and, through them, to the country generally. He believed that the object the Socialist thought could be obtained through the State could be obtained more satisfactorily by co-operation. The working man, however, had hardly reached the stage in social evolution that would enable him to conduct successfully colliery enterprises. He was ignorant of the elements of political economy as applied to coal-mining, commerce, and business generally. It was evident that there was a very prevalent belief amongst the miners as a body that, to quote one of their leaders, a county councillor, "In future wages should not be ruled by prices, but prices by wages." Until miners realised that that was impossible it would be hopeless for them to undertake to run a colliery of their own. Besides being better versed in political economy and commerce, the miners must learn to put more confidence in their leaders, before they could hope to manage a colliery successfully. He did not believe that a co-operative colliery could not tide over a few years of bad trade. From a careful examination of the results of trading during bad years he found that the receipts would be sufficient to pay a so-called living wage, and so long as the men got that, they could wait for the prosperous years, for high wages, and for interest upon their capital. Moreover, after a few years, a reserve fund would have been set aside sufficient to pay good wages and interest on capital during the bad years. A difficulty that was sometimes mentioned in connection with co-operative collieries was the want of capital amongst working miners. That, if it existed, was, in his opinion, due to the want of a little self-denial on the part of young men. Young men should postpone marriage until 27 or 28 years of age, instead of marrying soon after they came of age. Moreover, it would