THE *ANNALES DES MINES* ON THE PRESENT POSITION OF THE METALLURGY OF IRON IN ENGLAND.

Annales des Mines, ou Recueil de Mémoires sur l'Explortation des Mines, et sur les Sciences et les Arts qui s'y rapportent. Rédigées par les Ingéneurs des Mines, et publiées sous l'Autorisation du Ministre des Travaux Publics. Cinquième Serie. Tome XIX. 1861. Paris: Dunod, Quai des Augustins.

This famous periodical, by far the most renowned publication in the world connected with mining and metallurgy, has long been particularly celebrated for the descriptions which, from time to time, have appeared in its pages on the mines, mining appliances and machinery, and metallurgical processes of other countries. To a great degree this may be accounted for by the natural dearth of subjects available in a country so comparatively poor in mineral resources as France, particularly when compared with the supply of highly cultivated ability afforded by such a corps as the French *Ingéneurs des Mines*—a corps selected by competition from the choicest youth of France. But, to whatever cause it may be attributable, to the *Annales des Mines* is due the credit of being generally foremost in describing the mining and metallurgical processes in use in every part of Europe, being even not unfrequently beforehand with local engineers. In this country they have certainly managed to go ahead of Englishmen in describing many of our most important operations. Le Play was the first to give any complete description of our modes of copper-smelting, Combes was one of the earliest to teach Europe and our own engineers what extraordinary machines we possessed in the Cornish condensing engines, the details of whose duty had been previously laughed to scorn. Even in our own time, M. Moissenet has given by far the best, and indeed the only complete, description of the Cornish methods of tin dressing—a point of the greatest value at the present moment. The same author has also anticipated, by the few months, Dr. Percy's description of the Cornish methods of assaying in all essential particulars. We believe that at the present moment French engineers are examining the salt deposits of Cheshire; and to them we will also be probably indebted for the first comprehensive description of these little known but highly important sources of our national industry.

Consequently, in a periodical so celebrated for dealing successfully with the mining and metallurgical progress of other countries than its own, we naturally look with considerable interest on an elaborate paper contributed to it, by two eminent engineers especially commissioned by the French Minister of Public Works, on the present position of that great branch of industry upon which so much of our material prosperity and wealth depends.

The authors of the paper in question are Monsieur Gruner, Professor of Metallurgy at the Imperial School of Mines, Paris, and Monsieur Lan, occupying a similar position at the Mining School of Saint-Etienne. To enter into anything like a complete analysis of their elaborate memoir, which extends over two *livraisons* of the *Annales*, would exceed the space at our disposal; so, on the present occasion, we shall content ourselves by referring to a few topics of general interest, reserving a general analysis of the paper for another occasion. Coal, both in regard to cost and general fitness, being the basis of all iron industry, the paper commences with enquiries respecting that mineral.

Comparative Rents and Royalties payable on Coal in England and France.—In England the property in minerals belongs to the proprietors of the soil.* These they usually let or farm at certain royalties fixed at their

* We suppose that most of our readers are aware that in France, and generally on the continent, this is not the case. All mines are under the control of the State, which alone has the right of dealing with them, and fixes the royalties payable to itself and the owners of the soil—never exceeding 5 per cent on the net profits.

pleasure. These royalties, small originally, have gone on progressively increasing, and form at present one of the heaviest charges, particularly having regard to the prices of the coal. In the western part of the Dudley district, for instance, where competition is so keen, the royalties paid reach, in certain instances, to 2*s.* and 3*s.* per ton. The mean royalty paid in the Newcastle district is only about 6*d.* per ton; but, taking the whole of the great coal districts of England, we may assume a general average of from 6*d.* to 9*d.* per ton—or about 12 per cent. on the average selling price of say 5*s.* These are very much greater dues than are paid in France, where the royalty paid to the State has not, on an average, exceeded a limit of from 1*d.* to 1¾*d.* per ton. In some parts of France certainly these payments are as unequal as they are in England; and if in some parts of South Staffordshire 2*s.* or 3*s.* per ton is paid, the mines of Saint-Etienne paid, in 1858, about 8*d.* per ton to the proprietors of the soil, and 2¾*d.* per ton to the State, and some of the collieries of the department of *la Loire* as much as 5*d.* or 6*d.* to the State, and 9*d.* and 1*s.* to the proprietors of the soil—although, in considering this, it must be borne in mind that the selling price is precisely double in France.

But the measure of the greater burden borne by English colliery workers is not merely shown by the above figures, for experience shows that in England the royalties go on continually increasing, while in the department of *la Loire*, the heaviest burdened in France, they decrease with the depth to a certain limit. And besides the French *concessionnaires* are not merely tenants on a terminable lease, but absolute proprietors, subject to terms fixed by general laws, as long as they choose to continue the works. The system of terminable leases also leads to a grasping spirit of working and a consequent waste, a system which evidently leads to a discount of the Future to the profit of the Present: thus in Staffordshire half the coal has been sacrificed, and at least a quarter is still lost there as well as in Scotland.

On the other hand, if the mines of England are burdened with heavier rents than those of France, they are free from the troublesome interference of the State, and the endless formalities which are required by the French mineral laws, which can only be thoroughly appreciated by those who have been subject to them. As the authors of this memoir justly say:—"*Il est vrai que si l'Etat ne fait rien, au moins il ne gêne pas les travaux des compagnies, comme trop souvent cela arrive en France.*" The existence of large properties, too, facilitates the construction of the local railways, which in France are impracticable without the intervention of the State.

Comparative price and increasing production and consumption of Coal in England and France.—The great advantage which the iron industry of England possesses over that of France is the low price of coal, averaging about 5*s.* per ton, while in France it averages exactly double, or 10*s.* per ton. But the real difference is even still greater than is shown by these figures, for the English price applies to *large* or *screened* coal, while the French price applies to the average of the whole. The difference was not so great twenty-five or thirty years ago, or even eight or ten years ago; and everything tends to show that the difference of price in the two countries has now reached a maximum which may be expected to decrease.

The coal-fields of France, with the exception of those of the departments of the *Nord* and *la Vendée*, being situated in the centre of the country, were until recently inaccessible to distant consumers. Thanks to railways and canals this is now modified; but still the disadvantages of France must in this respect always be considerable. Yet, within the last twenty years the French colliery industry has developed itself comparatively more rapidly than in England: in that country the production and consumption have both trebled since 1830, while in France, within the same period, the

production has increased in the ratio of 1 to 4½, and the consumption in that of 1 to 5½. From 1831 to 1833 the total quantity of combustible mineral furnished annually only reached a mean of from 1,500,000 tons to 1,600,000 tons, and the consumption to 2,500,000 tons; while in 1859 the production of France had augmented to 7,500,000 tons, and the consumption to 13,500,000 tons. This result is encouraging; and if the French production has not kept pace with the consumption, it may be expected that the completion of canals, lines of railways, with the reduction of duties and tolls, will contribute more than any thing else to make up the deficiency.

On the nature of the various Coals.—This is a very valuable portion of the memoir, particularly as it gives the result of the experiments made at the French dock-yards on the various qualities of English and French coals. We may refer to this on another occasion.

The fifth chapter of the memoir brings us to the IRON ORES, and the consideration of the comparative cost and capabilities of those of England and France. The description of the English iron ores, their localities and modes of occurrence, statistics, and comparative capabilities, is very complete, but naturally presents no particular feature not before known to those acquainted with the subject. The authors class these ores into the five following divisions:—

1. Ores of the coal measures, including the argillaceous iron-stone and the black-band.
2. The red hæmatites (red ores) of Lancashire and Cumberland, worked in the carboniferous limestone.
3. The oolitic ores of Cleveland, and those of the secondary strata of Northampton, Buckingham, Oxford, &c.
4. The brown hæmatites and spathic ores found scattered in Cornwall, Devonshire, Somersetshire, and parts of Wales, Cumberland and Northumberland, generally in comparatively small quantities.
5. The ore found at Froghall, in North Staffordshire, in the millstone-grit, and which is found to pass, at points, into the ordinary clay iron-stones, and even black-bands.

Comparative price of English and French iron ores.—In this respect England is at as decided a disadvantage as France is in the case of coals. France is richer in iron ores than England, the greater part of the large iron-works of the former country incurring a much less cost per ton for the ores necessary to produce a ton of pig-iron than makers in the latter country. The authors here take exception to the figures given in Mr. Hunt's "Mineral Statistics" for 1858, as to the cost of iron ores, particularly those of the coal-measures: "*Nous croyons qu'il y a positivement erreur dans les chiffres officiels, ou que les prix mentionnés ne comprennent pas la redevance payée au propriétaire du sol.*" Passing over this point we shall conclude this abstract with the following observations of the authors on the comparative cost of the ores to the English and French iron makers:—

"If therefore in England, in one special district, as that of Cleveland, the cost of the ore per ton of pig-iron does not exceed from 14*s.* 6*d.* to 16*s.* 6*d.*, there are also works in France specially favoured, like those of *la Moselle*, where the cost of the ore per ton of pig-iron does not exceed 12*s.* 6*d.* But leaving out of the question this special case, it is undoubted that in England there is in general consumed, per ton of pig-iron, ores to the value of from 29*s.* to 33*s.* 6*d.*; while in France the value does not exceed from 21*s.* to 25*s.*; thus showing an advantage to the latter country, in the matter of ores, of about 8*s.* per ton of pig-iron, and from 2*s.* 6*d.* to 3*s.* 3*d.* per ton of ore.

"It is clear that the great advantage of the English maker is really in the low price of coal, and that in the matter of ores the advantage rests with France. In this respect France is in about the same position as Belgium; but like the English the Belgians have the advantage of cheaper coal."