and we, therefore, hail with pleasure every improvement which, like the present, promises to render more available the vast mineral wealth with which Great Britain has been so liberally gifted by nature, and which requires so great an amount not only of actual labour, but of energy and talent, for its continued and beneficial extraction.

Mining Journal.

On the Composition of Bitumens. By M. BOUSINGAULT.

The bitumens which are so abundantly spread over the face of the globe, and whose uses are every day becoming more varied and extensive, have hitherto been little examined. If we except the labours of M. de Saussure upon the naphtha of Amiano, we are nearly in complete ignorance concerning the intimate nature of these bituminous compounds.

It is to this insufficiency of the data supplied by chemistry that we must attribute the confusion into which most mineralogists have fallen in their attempts to classify the different bitumens. A systematic place can easily be assigned to naphtha, idrialine, and mellilite or honey-stone, but when we come to petroleum we get involved in difficulties; this substance usually met with in a liquid state, now becomes viscid, and successively presents all possible degrees of consistence, till we arrive at asphaltum, which is solid and brittle. We are generally led to admit that the bitumens owe their fluidity to naphtha; but the results of the present investigation show that there is no ground for this supposition. The attention of the author was first directed to the viscid bitumen of the *Département du Bas-Rhin*. After describing the method in which the bituminous sand is treated, he gives a rapid sketch of the locality of bitumens; and shows that the immense masses of mineral pitch which are found on the banks of the River Magdalena, at Payta, upon the coast of Peru, have a geological position precisely similar to that in which we find bituminous impregnated sands in Europe; that is to say, in formations which we must refer to the supercretaceous group. The only contradictory fact opposed to this conclusion is that recorded by M. de Humboldt, when he states, that at La Punta d'Araya, in the Gulf of Cariaco, he saw petroleum issuing from mica-slate.

The bitumen of Bechelbronn is viscid, of a very deep brown colour. The uses to which it is applied have procured for it the name of mineral grease.

Heated to 120° , this bitumen does not yield any product; but, on distilling it with water, an oily principle is procured, which is volatile, of a pale yellow colour, in which analysis shows there is nothing else than carbon and hydrogen. As this carburetted hydrogen appears to constitute the principal liquid of bitumens, the author designates it by the appellation *Petroline*.

Petroline boils at 280° of the mercurial thermometer; its odour is that of bitumen; at 21° its weight is 0.891, even at a cold of 12° it does not lose its fluidity; alcohol dissolves it in small quantity, and it is much more soluble in ether. It contains carbon 0.885, hydrogen 0.115, and is consequently isomeric with the essential oils of turpentine, lemon, and copaiba.

By using the methods employed by M. Dumas, it is found that the density of the vapour of petroline is equal to 9.415, whilst calculation indicates 9.533. This is precisely double the weight of the vapour of the essence of

turpentine. If we admit that four volumes of vapour constitute an atom of petroline, its atomic composition will be as follows:—

Carbon 80 atoms,	3060.8
Hydrogen, 64 atoms,	400.0

3460.8

Independent of the petroline, there exists in the bitumen a black solid substance, which is absolutely insoluble in alcohol, and soluble in ether. M. Boussingault names this product *Asphaltine*, because it forms the base of that species of mineral which mineralogists describe under the name of asphaltum.

Asphaltine may be procured by subjecting bitumen purified by ether to the continued action of a temperature of 240° or 250°. Asphaltine is solid, very black and brilliant, its fracture conchoidal; at a temperature of 300° it becomes soft and elastic, and is decomposed before the blowpipe. It contains Carbon, 0.753; Hydrogen, 0.099; Oxygen, 0.148, a composition which is represented by the formulary $C^{80}.H^{64}.O^6$, which indicates that asphaltine is the result of the oxidation of petroline.

The bitumen of Bechelbronn, purified by ether, seems to be nothing more than a mixture of petroline and asphaltine. It contains Carbon, 0.870; Hydrogen, 0.112; Oxygen, 0.018.

On the whole, then, it would appear that glutinous bitumens are mixtures, probably in all proportions, of two substances, which we can isolate, and which have each a definite composition. One of these principles is solid and fixed, and in its nature approaches to asphalt; the other liquid, oily, and volatile, resembles petroleum in some of its properties. Hence we may readily conceive how the consistence of bitumens varies in a way we may call indefinite; its degree of fluidity being regulated by the relative proportion of the mixture of its ingredients.

The analogy which exists between the asphaltine and the asphaltum of mineralogists, led me, says the author, to inquire if this analogy is maintained in their composition; I have submitted the asphaltum of Coxitambo (Peru.) which may be considered as the type of the species, to analyses. This asphaltum has a fracture which is eminently conchoidal, with a high degree of lustre. The weight is 1.68; it is decomposed before the blowpipe, and when burned leaves 0.0016 residuum. It contains Carbon, 0.750; Hydrogen, 0.095; Oxygen, 0.155.

Edin. New Philos. Jour.

Watch Statistics.

Mr. Dent, (Arnold and Dent,) in his illustrations at a lecture on the construction of watches and chronometers, given by him at the Royal Institution on the 7th ult., laid before the meeting the dissection of a detached lever watch (compensation-balance,) every part was separated and displayed, but grouped in one of six larger divisions to which it belonged.

Each part had been previously examined, and its distinct constituent pieces counted by the lecturer; the surprising result of this enumeration was exhibited in a table, of which we lay a copy before our readers. In addition, will be found the number of kinds of artificers concerned in the operations necessary for the construction of a good watch. When to these are added the amount of previous operations which the materials constituting each piece must undergo, before it comes into the hand of the watch-artificer, a glimpse may be obtained of the extensive and numerous changes of form