outside cylinders, and I believe five feet driving-wheels; and that the number of miles run daily by the engines, is 1588, including nineteen extra miles each journey between Manchester and Warrington.

I was exceedingly desirous of riding on the new four-wheel outside cylinder engine, for the purpose of seeing whether this engine had the same shuffling, wriggling motion that three others of the kind had on which I had rode. So anxious was I on this account that one very cold day I went without my breakfast to keep an appointment made with me to put the engine on, but was for some reason disappointed; the engine, which I believe was not at all on the list to go out, having been put on at a very different hour.

[TO BE CONTINUED.]

Practical and Theoretical Mechanics and Chemistry.

Analysis of Well-water, Philadelphia. By JAS. C. BOOTH and M. H. BOYE.

Induced to undertake the examination of this water by Mr. Samuel Webb, of Philadelphia, we deemed it a matter of sufficient interest to extend our investigations farther than required, in order to ascertain with precision all its constituents, and therefore, we think that it may not be uninteresting to some of the readers of the Journal.

The well is in the yard of 158 West Callowhill street, and was made by first digging about twenty feet through the common superficial clays, and then several feet into the Gneiss rock in a partially decomposed state. Although water was obtained in the clay, it was yielded much more abundantly after penetrating the rock, so that the water from the latter is the prevailing character of the fluid in question.

A sediment sometimes appears in it, but at the time we obtained it, it was said to be unusually clear. It was this clear water which we subjected to analysis. It exhibits a slight acid reaction, and deposites by standing at first a red flocculent precipitate of hydrated peroxide of iron, and subsequently coats the vessel containing it with an adherent layer of an ochrey color, consisting chiefly of the above oxide of iron with the carbonates of lime and magnesia. The same sediment was obtained more abundantly by evaporating the water into a small bulk and subsequent filtration. The sediment and the concentrated liquid evaporated to dryness, were separately investigated.

The deposite consists in 100 parts of:

Silica,	-	-	-	-	27.75
Peroxide of Iron,	-	-	-	-	4.83
Carbonate of Lime,	-	-	-	-	45.15
“	Magnesia,	-	-	-	22.27
					<hr/>
					100.00

The concentrated liquid, evaporated to dryness, gave a residue of the following composition:

Silica,	-	-	-	-	10.91
Peroxide of Iron,	-	-	-	-	a trace
Carbonate of Lime,	-	-	-	-	4.09
“ Magnesia,	-	-	-	-	3.40
“ Soda,	-	-	-	-	34.65
Chloride of Sodium,	-	-	-	-	44.74
“ Potassium,	-	-	-	-	2.21
					<hr/> 100.00

The whole amount of solid matter in one gallon of the water was 6.22 grains, of which about eight-fifteenths, or a little more than one half, was deposited during evaporation. In this should be included a small amount of sulphuric acid, and a mere trace of organic matter which were neglected in the analysis.

Observations on Mosaic Work and Cameo-cutting. By CH. H. WILSON, Esq., *Architect, Edinburgh.*

The art of mosaic work has been known in Rome since the days of the republic. The severe rulers of that period forbade the introduction of foreign marbles, and the republican mosaics are all in black and white. Under the empire the art was greatly improved, and not merely by the introduction of marbles of various colours, but by the invention of artificial stones, termed by the Italians *smalti*, which can be made of every variety of tint.

This art was never entirely lost. On the introduction of pictures into Christian temples, they were first made of mosaic; remaining specimens of these are rude, but profoundly interesting in a historical point of view. When art was restored in Italy, mosaic also was improved, but it attained its greatest perfection in the last and present century. Roman mosaic, as now practised, may be described as being the production of pictures by connecting together numerous minute pieces of coloured marble or artificial stones; these are attached to a ground of copper by means of a strong cement of gum mastic, and other materials, and are afterwards ground and polished as a stone would be to a perfectly level surface; by this art not only are ornaments made on a small scale, but pictures of the largest size are copied. In former times the largest cupolas of churches, and not unfrequently the entire walls, were encrusted with mosaic. The most remarkable modern works are the copies which have been executed of some of the most important works of the great masters for the altars in St. Peter's. These are in every respect perfect imitations of the originals; and when the originals, in spite of every care, must change and perish, these mosaics will still convey to distant ages a perfect idea of the triumphs of art achieved in the fifteenth century. The government