

over valleys, supported on thousands of arches, or tunnelled for miles through the solid rock, while the greatest scientific skill was required to give the supply a proper grade.

"There was a great deal of talk about that wonderful triumph of genius, bringing the water of Loch Katrine to Glasgow, but the quantity of water delivered to every inhabitant of Rome was ten times the water supplied to London. An abundant supply of water was a special characteristic of an ancient city. We often read of the inhabitants of a besieged city suffering from hunger, but rarely, if ever, from thirst. And there was no overcrowding. Nineveh contained 600,000 inhabitants, but the population of London was, for its area, five times as dense as that of Nineveh. The ancients did not allow the dead to be buried within the walls of their cities—a practice only beginning to be abolished with us. In point of cleanliness, also, they were more careful than we are. He read the other day of some people taking cholera from washing the clothes of persons who had died from that malady. According to the Mosaic law these clothes should have been buried. Moses would not allow the people to live in houses that were unhealthy, but it was no use turning the people out and allowing the house to stand; he knew people would live in it if it remained, and so he said:—'Down with every stick and stone of it'

"In the matter of sewerage, the Romans were superior to us. The city was built on arches for the purpose of complete sewerage, and there yet remains a sewer in Rome so wide that a cart loaded with hay might pass through it. Excellent and well contrived drains have been discovered in Nineveh and other towns. The refuse of the cities was burned in the open plains. The hand-loom of thirty thousand years ago produced cloth of as fine a quality, in point of texture, colour and style, as we can produce; and the Hindoos, and some of the Africans, knew the process of manufacturing iron and steel, which led them to look with contempt, and to reject as rotten, the specimens of those metals which we sent them. In all these points the past compared favourably with the present.

"No doubt the present had its achievements. It has the printing-press and railroads, telegraphs and extensive manufactories. He believed that its superiority consisted more in the greater power of production, and in the wider diffusion of wealth and knowledge than obtained in the past, rather than in the intrinsic excellence, or beauty, or brilliancy, or depth of what it did or achieved."

HEAVY PETROLEUM OIL.

In the distillation of crude petroleum oil, the first product that comes over is a very volatile and inflammable spirit, which is usually rejected as being too dangerous to store; the next product is paraffine oil, and it is to the admixture of this oil with the light inflammable spirit that most of the explosions of paraffine oil are to be attributed, and this seems to arise from the manufacturers wishing to obtain the greatest yield possible of the saleable oil, or in the distiller inadvertently raising the heat before all the volatile spirit has passed over. When this is carefully attended to there is but little danger of any explosion with paraffine oil. The resi-

duum is composed of scales of paraffine and what is called heavy oil. The paraffine being extracted, there remains the heavy oil. As yet but little use has been found for this heavy oil, for it cannot be burned in lamps on account of the imperfect combustion of the excess of carbon it contains. From the crude oil 60 per cent. of paraffine oil is obtained, 4 per cent. of paraffine, and 16 per cent. of heavy oil, and there is 20 per cent. of waste. At present this 16 per cent. of heavy oil cannot be considered as anything but waste, as there is as yet no sale for it. But great efforts are being made to utilize this heavy oil. We believe that Mr. Lavender, at the petroleum works, Belvedere, is exerting his ingenuity to turn it to account: he is making it into what he calls grease, to be used as a lubricant. Of course that is only a name, as this heavy petroleum cannot be made into veritable grease. We suspect it is simply a kind of saponified emulsion of petroleum, made by a strong solution of alkali, and, if the price that it is to be sold at can be taken as a guide, that alkali is caustic soda. We do not say that this is that gentleman's process, but merely say that in this way it may be done, by first dissolving a little gum resin in the petroleum; it would then unite with caustic alkalies and caustic lime and form the emulsion above referred to. Such an emulsion at any rate would make an excellent lubricant, much superior to any crude grease, as all grease becomes rancid and then contains what are called the fatty acids, which attack metals, and are apt to do much damage to machinery; whereas this lubricant being alkaline will not oxidize, and, in case any matters should get into the petroleum that will acidify, the alkali will neutralize that acidity.

A strong solution of caustic soda itself is an excellent lubricant, and is being extensively used instead of soft soap and water for planing, boring, and turning metals. Doubtless this lubricant, if so made, will take the place of the caustic soda when mixed with a little of the heavy petroleum, and it will be quite as cheap and not so hurtful to the hands and clothes of the workmen. For different kinds of machinery it can be thinned in this way to the proper consistency. For railway carriages the thick emulsion would be about the proper consistency. For this lubricant it is reasonable to expect advantages that cannot be derived from ordinary grease or oil, namely, that of preventing heating in a great measure. It being somewhat of a volatile nature, any tendency to heating would be counteracted by the volatilization of the lubricant, and this in a lubricant is an inestimable property. As a lubricant, perhaps the most of the heavy petroleum may be used; still that is not the most profitable use to which to apply it. Its proper use is as a light and heat giving material. We think that we could suggest a way of using it, at least as fuel. Let it be first ascertained the amount of hydrogen required to unite with it to turn the whole into carburetted hydrogen gas, that will thoroughly consume without leaving any solid residue. Then heat the oil in contact with hydrogen, and the two would unite and pass off through the jets in the furnace as a highly calorific gas. The apparatus could be so arranged that a store of gas could be retained to commence with, and when in action it would not only generate its own hydrogen but distil over the