

Some of the advantages of petroleum for steaming purposes are that it gives twice as much heat as an equal weight of coal, that it requires less storage space and that it is entirely free from ash; but it has some rather serious disadvantages such as the difficulty of burning it without much smoke and tarry deposits, the danger attending its use, and its costing three or four times as much as coal. The heavier and thicker flowing varieties give the best results in heat engines, and for a time Baku petroleum was used in the locomotives of one of the railways in the south of Russia.

In metallurgical operations it is far superior to coal, as in the bending of armor plates, etc., the operator being enabled to heat the metal in a much shorter time, and to concentrate the heat on any desired portion of the plate. When hydrogen gas burns it gives an intensely hot flame, and as petroleum is a mixture of hydrocarbon containing a large percentage of hydrogen, it is easy to see why it gives a much more hotter flame than coal or charcoal.

#### Refining by Distillation.

Being a mixture of many liquid hydrocarbons, each with its own particular boiling point, the petroleum is placed in a large iron boiler or "still" to keep the air away from it when it is heated. The hydrocarbons with the lowest boiling points are vaporized first and the vapors condensed by passing through water-cooled pipes. Then the temperature is raised somewhat, the next portion of vapor condensed, and the fraction-

al distillation proceeds until a thick, tarry substances remains at the bottom of the still. Some of the liquids obtained in this way are known as cymogene, rhigolene, gasoline, naphtha, benzine, maltha, kerosene, and vaseline, whilst the residue in the stills contain solid paraffins, coal tars, bitumens, asphaltum, etc. It must be distinctly understood that the above mentioned substances are not pure chemical individuals. The names are commercial names, each of which applies to a complex mixture of hydrocarbons.

Kerosene, or the so-called "coal oil," is really a mixture of some five or six liquid hydrocarbons, and to be fit for use in lamps should be entirely free from the more volatile gasoline, benzine, etc., as they form explosive mixtures with air, just as marsh gas does. The legal "flashing point," or temperature at which kerosene takes fire, is about 112 degrees Fahrenheit for most places in the United States. In other words, no part of the mixture should vaporize below this, as a mixture of air and hydrocarbon vapors explodes upon the approach of flame.

#### Standard Oil Company's Exhibit.

Most of the east North American petroleum have a paraffin base and they are light illuminating oils; whereas the greater proportion of the western petroleum have an asphaltum base and are heavy oils adapted principally for fuel and lubricants, the light, illuminating element being much in the minority. At the Pan-American exposition the Standard Oil Company exhibited over 500 of the