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PETROLEUM IS NOT COAL OIL.

We observe that the practice is quite common of calling petroleum coal oil, but the appellation is not correct. The oil which is obtained by thedistillation of coal is not the same substance as petroleum.

One of the most wonderful facts in nature is the formation of so great a number of substances by the combination, in different proportions and in different ways, of the two elements, hydrogen and carbon.

By the dry distillation of wood a substance is obtained called methyl. It is a colorless gas with a slight odor somewhat resembling that of ether. The atom of this gas is found to be composed of two atoms of carbon, and three of hydrogen, $C_2 H_3$.

In alcohol there is another substance called ethyl, which is also a gas, though it may be reduced to the liquid form by a pressure of 2½ atmospheres. The ethyl atom is formed by the combination of four atoms of carbon with five of hydrogen, $C_4 H_5$.

There are other substances, formed by the combination of hydrogen and carbon, which if arranged in order form a series of wonderfully regular gradations:

1. Methyl $C_2 H_3$
2. Ethyl $C_4 H_5$
3. —— ——
4. Valyl $C_8 H_9$
5. Amyl $C_{10} H_{11}$

and so on, with several blanks yet to be discovered, up to melissyl $C_{60} H_{61}$

Methyl is a gas, ethyl is a gas which may be condensed to a liquid, valyl is a liquid which boils at 108° of the Centigrade thermometer, amyl is a liquid which boils at 155°, and finally melissyl is a solid obtained from beeswax, and only melts at 55°. Thus the simplest members of the group are the most volatile, and as the numbers of the atoms increase the substances become more solid. The specific gravity increases in the same way, and these two laws apply to all the series of the compounds of hydrogen and carbon which have been examined.

It will be observed that by adding $C_2 H_2$ to one member of this group we have the composition of the member next above in the series, and this curious law also applies to other groups of these compounds; but if the commencement is different, all of the substances in any two groups will be different. For instance, there is a series called the formyl group; the simplest substance in the series being a gas called formyl. This gas is composed of two atoms of carbon, and one of hydrogen, $C_2 H$, and by adding $C_2 H_2$ we have the several substances of this group.

Formyl $C_2 H$
Acetyl $C_4 H_3$
Propionyl $C_6 H_5$
Butyryl $C_8 H_7$
Valeryl $C_{10} H_9$

and so on, with only three breaks yet undiscovered, up to Cerotyl $C_{54} H_{53}$ Acetyl is the radical of vinegar, and butyryl of butter. In this group as in the methyl, the simplest substances are the lightest and the most volatile.

If coal is distilled at a high temperature as in making illuminating gas, one series of hydrocarbons is formed; if at a lower temperature, as in making oil, another series is formed. Of those formed in the manufacture of gas, a very full statement by Dr. Hoffman will be found on another page.

That petroleum consists of a mixture of hydrocarbons is well settled, and there is no doubt that these have a wide range in specific gravity and in volatility. But they have never all been separated, and severally examined. There is no doubt, however, that they are different from the coal-tar series. There is no benzole in petroleum, and hence the mauve dyes can not be made from it.

The investigation of the several hydrocarbons contained in coal oil offers a fine field for some of our ambitious chemists, and we wonder that they have neglected it so long.

PAINES'S SPRAY SUPERHEATED STEAM ENGINE.

A steam engine for which steam is generated on a very ingenious principle has been in operation for several days, and is now on exhibition at 21 Center street, this city. The patent has recently been taken through this office, and we will briefly state wherein the invention differs essentially from the ordinary steam engine. For the latter, as every body knows, a boiler is used containing a considerable quantity of water, to which the heat of the furnace is most directly applied, and from which the steam is generated. Such a boiler is a magazine of force, because it contains a far greater amount of steam and heated water than is required to supply the engine at each stroke. Herein consists the danger from explosions in common boilers. A hot-air engine has no magazine of force like a steam boiler. Its heater is supplied with the exact amount of air requisite for each stroke, hence its immunity from explosion. This new engine embraces a similar principle. It has a peculiarly constructed heater into which the exact quantity of water for each stroke is fed in the form of spray, then it flashes into steam and passes over an extended heated surface to the working cylinder.

The engine exhibited is single-acting, and of the following dimensions:—Its steam cylinder is 7 inches in diameter; the stroke of piston, 7 inches. It is situated upon a small tank 30 by 34 inches, which forms the bedplate and the heater of the feed water. The feed pump has a stroke of one-fourth of an inch, and the water is fed through a ¼-inch pipe. The steam heater, outwardly, resembles a vertical cylindrical stove. It is 13 inches in diameter and 30 inches in hight. There are 19 double tubes inside and the steam passes between these and is heated on two sides. The circular grate containing the fire is capable of being adjusted by a lever and set at any required distance from the bottom of the heater. We have examined this engine working with superheated steam at 50-pound pressure, and running at the rate of 87 strokes per minute. The steam exhausts into the tank upon which the engine stands, the feed-water, nearly at the boiling temperature, is conveyed into the heater in a fine shower through a small conical chamber on the top of the heater. A small quantity of superheated steam is contained in the heater and the feed water in the form of spray, is instantly converted by it into saturated steam. The pipe for supplying the cylinder with steam is situated nearly at the bottom of the heater, hence the saturated steam formed from the feed-water at the top of the heater has to pass in a current between the double tubes on its way to the cylinder, and it thus flows over a very extended heating surface and becomes superheated. A constant current of steam is maintained in this manner over the heated surfaces of the tubes. By such a heater and such arrangements of the parts of the engine, nearly all the heat is economized, and a perfectly safe steam engine is secured. If the feed pump were to cease working or the supply of water to become exhausted, the heater would become like an empty oven after a few strokes, and the engine would stop of itself. For pumping water, printing presses, sawing wood and various operations requiring a small moter from 1 to 10-horse power, this engine appears to be well adapted, as it is compact, safe and easily controlled. We shall soon be able to present to our readers an engraving of the invention, and in the meantime we shall examine more thoroughly into its economic qualities—an important point—which we shall then more fully discuss.

MAJOR General Sumner entered the army as a private, and rose through all ranks to the highest.

SALTS OF SILVER, PHOTOGRAPHY AND INDELIBLE INK.

The quality which salts of silver possess of becoming black by exposure to light lies at the very foundation of the photographic art. The chloride of silver is most sensitive to the action of light. It was discovered a long time ago by the old alchemists in their search after the "philosopher's stone," and was by them denominated "horn silver." It is formed from a solution of the nitrate of silver. The latter is made by dissolving metallic silver in aquafortis (nitric acid), then adding a solution of common salt to it. A white precipitate of chloride of silver is formed, which, when exposed to the light for a few moments, changes from white to violet color, and then to black. The blackening of this salt by the rays of light did not escape the attention of the old alchemists, and it led them to the opinion that light as well as heat was one of the great agents in the transmutation of metals. The action of light upon certain salts and substances, whereby they are decomposed and changed in appearance or color, constitute the chemistry of the photographic art. Other salts beside the chloride will also turn black if exposed to the light, provided they are in contact with organic bodies. The action of light upon different substances is not yet well understood. This agent facilitates (in some cases) the combination of certain elementary bodies, and in other cases it hastens the separation of combined elements. The blackening of silver salts by light is an instance of chemical decomposition. In the form of chloride of silver it is a white salt; when it becomes dark by exposure to light the black substance produced is simply metallic silver in a very finely subdivided state. A very simple experiment may be performed to establish this fact. Dip a slip of ivory into a solution of the nitrate of silver until it assumes a bright yellow color, then place it in a tumbler containing rain water and expose it to the direct light of the sun, and it will then gradually become black; but when dried and rubbed with an agate burnisher the ivory surface will become bright and resemble a slip of metallic silver.

Heat produces an effect upon the salts of silver analogous to light. M. Niepce de St. Victor heated a metallic plate by boiling it in water, he then placed the print of an engraving against it, and over that a sheet of paper prepared with the nitrate of silver and the chloride of gold, and he obtained a violet-blue impression on the paper of the dark parts of the engraving. If the paper is only prepared with the nitrate of silver the light parts of the engraving are reproduced in metallic luster.

Long before photography was known or practiced the nitrate of silver was employed to color the human hair, stain marble and mark linen, and it is still employed to a large extent for the first and last-named purposes. The best indelible marking ink is made with nitrate of silver, aqua ammonia, a small quantity of cream of tartar, sugar, gum arabic and the whole colored red with carmine. About one part of the nitrate of silver is dissolved in twelve parts of water, and ammonia poured in slowly until the solution appears free from precipitate. A very small quantity of gum arabic and sugar are required. This ink must be kept in a bottle screened from the rays of light. Although called indelible, this ink is easily removed with the cyanide of potassium, but it withstands the action of washing with soap and water.

Simple photographic paper, for copying pictures and various objects, may be made as follows:—Prepare a solution of nitrate of silver by dissolving an ounce of the nitrate in twelve of water, and adding aqua ammonia gradually until the solution becomes clear. Take a sheet of white paper, soak it in a solution of common salt and then dry it. After this stretch it on a clean board, apply the ammonia nitrate solution to its surface evenly with a sponge, and dry it in the dark.

To copy a print or a negative picture, it is placed with its face upon the sensitive paper, and a plate of glass is placed upon its back, and the whole exposed to sunlight through the glass. The picture gradually appears upon the prepared paper, first in a bluish tinge then black. When fully developed the paper is first washed in soft water, then the picture is fixed by washing in a solution of the sulphite of soda.

Hair is stained black with a solution of the nitrate of silver and ammonia; or what is better, a solution