THE CHEMISTRY OF COAL.

Number V.

NAPHTHA.

Of all the substances which mingle together to form coal tar, the one most extensively known is naphtha. This is itself a mixture of hydrocarbons, of which the most abundant and valuable is benzole. Naphtha is formed of the most volatile of hydrocarbons in coal tar, and consequently is readily separated from others by distillation. If the coal tar is heated in a retort, the naphtha is evaporated, and when again condensed, is obtained in a separate state from the others.

Of the hydrocarbons which unite to constitute naphtha, three have been separated and examined. These are benzole, C_{12} H_6, toluol, C_{14} H_8 and cumol, C_{18} H_{12}. They are all light, volatile, inflammable oils, and, mixed together as naphtha, are coming into use for many purposes in the arts. Naphtha will dissolve india rubber and other gums, as well as resins and fats. Its power of dissolving resins adapts it for use in the preparation of varnishes, and its power of dissolving fats brings it into use as a detergent for cleaning cloth from spots of grease, wax, &c.

The most valuable component of naphtha is benzole, as it is from this that the new dies, Solferino, Magenta, &c., are made. The chemical changes involved in converting benzole into these dyes are few and simple, and we will explain them next week.

Local Anæsthesia.

The Paris Correspondent of the London *Lancet* says:—Dr. Fournier has addressed to the Academy of Sciences a paper on the subject of local anæsthesia, and details a new process for its production, which is called "chloracetization." His method for producing local insensibility to pain is that of exposing the part to be acted on to the fumes of a mixture of acetic acid and chloroform. "If," he says, "in a room, the temperature of which is upward of 63° Fah., the mouth of a thin glass bottle, half filled with a mixture composed of equal parts of pure crystallizable acid and chloroform, be exactly applied to a clean and healthy skin, not deprived of its epidermis, and if this phial be constantly maintained at the temperature of the hand, complete anæsthesia of the part included by the orifice of the bottle will be attained.' M. Fournier proposes to utilize this discovery for surgical purposes by directing the vapors of the chloro-acetic compound upon the parts to be rendered insensible to pain by means of a retort, the rest of the limb being protected by diachylon plaster from the benumbing action of the anodyne emanations; and suggests the employment of his method in those cases where general anæsthesia may be deemed admissible."

Actual Horse Power of High-Pressure Engines.

The actual power of an engine is ascertained by the indicator. The friction of a locomotive engine when unloaded is found by experiment to be about 1 lb. per square inch on the surface of the pistons, and the additional friction caused by any additional resistance is estimated at about .14 of that resistance; but it will be sufficiently near approximation to the power consumed by friction in high-pressure engines, if we make a deduction of a pound and a half from the pressure on that account. The Rule, therefore, for the actual horse power of a high-pressure engine will stand thus:—Square the diameter of the cylinder in inches, multiply by the pressure of the steam in the cylinder yer square inch less 1½ lbs., and by the speed of the piston in feet per minute, and divided by 42,017; the quotient is the actual horse power.—*Bourne.*

How to Play Billiards.

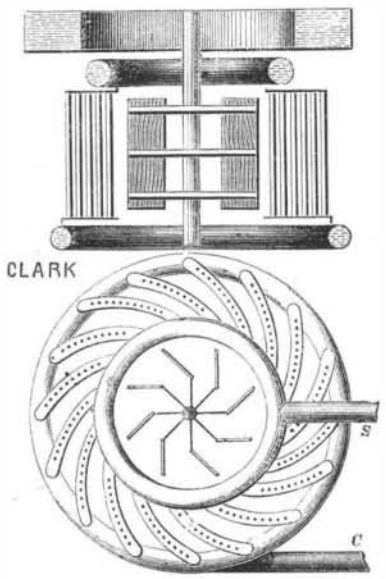
Michael Phelan, the celebrated billiard table manufacturer and billiard player, of this city, has just issued the fourth edition of his invaluable work on billiard playing, which should be in the hands of all amateurs and lovers of the game. The work contains clear and explicit instructions to the young player accompanied with numerous engravings to illustrate the effect of various strokes in ordinary playing, besides diagrams of fancy shots as made by such professional players as Phelan, Berger and others. It is neatly printed and copiously illustrated. Appleton & Co. are the publishers. Address Phelan & Collender, billiard table manufacturers, 63 Crosby street, New York city. Price, $1.

SURFACE CONDENSERS FOR STEAM ENGINES.

Number VIII.

On this principle, indeed, as long ago as 1822, previous to the experiments of Mr. Hall, Mr. Clark patented a very ingenious though somewhat complicated condenser, represented in Fig. 21. The steam is condensed in small tubes fixed into larger ones which radiate from a center, over which water, in the

Fig. 21.



form of a shower, is made to fall; the rapidity of the condensing water is accelerated by means of a fan placed in the center. I am not aware if this condenser was ever applied practically; but it would, no doubt, be a very efficient one, although, of course, subject to the same rapid deterioration from oxidation as others made on this principle.

Fig. 22.

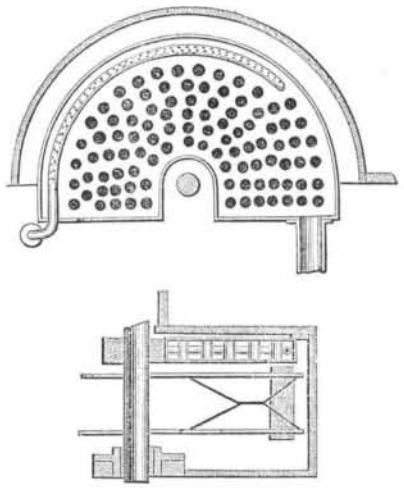
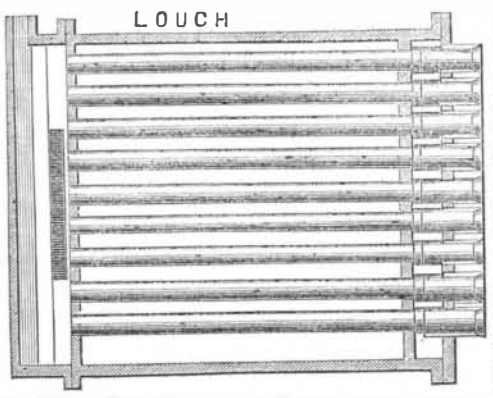


Fig. 22 represents Samuel & Nicholson's condenser, which is applicable to paddle-wheel engines. The steam is admitted through a perforated pipe, into a case provided with a number of tubes, the outer surface of which is kept wet by the water thrown up by

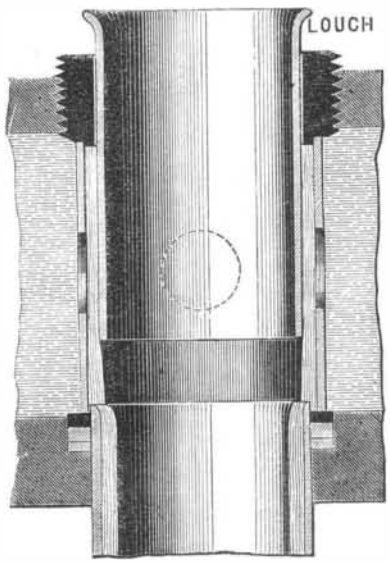
Fig. 23.



the paddles, thus dispensing with circulating pumps. This plan of condenser, without tubes, has been used to some extent in the British navy, for distilling water for the use of the vessels. As an engine condenser in its position is objectionable.

Figs. 23 and 24 represent Mr. Louth's condenser. It consists of a number of tubes, through which the condensing water is made to flow in a circular film, instead of being wholly filled. This film is produced by inserting into the upper end of the condensing tubes short pieces of tube, slightly smaller in diameter, thus leaving an annular space between the two, and making the water to flow in a hollow column. A current of air, forming a communication through an opening, A, with the boiler chimney is also made to pass through the tubes. Condensation on this principle is conducted partly by evaporation and partly by surface contact. Very little scale can form on the surface of this condenser. It is said by Mr. Louth to be more rapid in the condensing action than if the tubes were flowing full of water. These tubes can easily be cleaned, and they may be plugged when the engine is at work to repair a split tube. The screwed tube, Fig. 24, which passes through the cover gives the

Fig. 24.



necessary pressure to the packing. The steam is admitted to the outside of the tubes by one branch connection, and the condensation water is drawn off by the other branch. The condensing water obtains access to the tubes through perforations in the intermediate or packing tube, and is withdrawn from the lower portion of the condenser by the circulating pump.

Another class of surface condensers consists of those which employ cold air as the condensing agent instead of water. James Watt patented an air condenser for locomotives, but it was never put into practice.

Craddock's air condenser consists of a number of very small tubes, which are caused to revolve rapidly in the open atmosphere. A few of such condensers are in use in England, but they are said to be troublesome and expensive.

Perkins's air condenser consists of a large number of very small vertical tubes, partially open at the top, and the steam is admitted to the bottom and condensed by the cool air. This condenser is not used to form a vacuum, but simply to obtain the condensed steam as pure water to feed the boiler.

Another method of condensation consists in cooling the injection water of an ordinary condenser, to be used over again for the same purpose, thus allowing only fresh water to be used in the condenser and boiler. This has been effected by passing water through tubes contained in cases open to the sea. Such condensers are most applicable to steam vessels. The steamer *Vanderbilt* has been fitted with one of these. They were first proposed by Symington, one of the earliest steamboat inventors.