THE APPLICATION OF CHEMISTRY TO THE MILITARY ART.

At the weekly meeting of the Polytechnic Association of the American Institute, on Thursday evening, Jan. 23d, the chairman announced that the appointed subject for discussion was the application of chemistry to the military art, and called upon Professor Seely to open the debate.

Prof. Seely—There seems to be a general misapprehension in the public mind in regard to what chemistry can do in the way of killing people. We see in the papers, or hear in conversation, the statement that if it were not for our humanity we could easily suffocate an army with noxious vapors, or sprinkle them with destructive acids, or burn them up with liquid fires. All of these notions are quite absurd. We employ the most destructive agencies with which we are acquainted. The greatest service that chemistry has ever done for the military art was the invention of gunpowder. It has more destructive power than any other substance known. Compare it, for instance, with some of the acids the use of which in war has been suggested. If we throw sulphuric acid upon a person it will injure him. If a drop gets in the eye it will put the eye out. But it will not do as much damage as a shot of the same weight striking the eye. I would rather have ten grains of sulphuric acid thrown in my face than a shot weighing one grain. All this too is apart from the practical difficulty of throwing a liquid to any distance. The art of war is the most perfect of all arts. It has received far more encouragement from governments than any other, and the intelligence of all nations for thousands of years has been directed to its improvement. To provide for its various exigencies the latest developments of science are called into requisition. Explosive shells, charged with the most suitable materials known, have been carefully and thoroughly tested, and are now stored in great numbers in our arsenals. We have heard some talk about filling shells with "liquid fire," as it is called—a solution of phosphorus in bisulphide of carbon. It was said last week that this substance has been objected to from the fact that it produces sores which are difficult to heal. It is not the aim in battle to afflict the enemy with incurable diseases, but to disable him immediately. It is just as well to wound him, or to take him prisoner, as to kill him. When phosphorus is dissolved in any volatile liquid like the bisulphide of carbon, if the solution is spread out in a thin sheet, as soon as the solvent evaporates, the phosphorus, exposing a large surface to the atmosphere, absorbs oxygen so rapidly that it becomes heated to the moderate temperature (about 120°) at which it takes fire. But phosphorus in burning gives out very little heat, and will seldom set anything else on fire. Last week Dr. Van Der Weyde very kindly showed us the common and striking experiment of dipping a piece of paper into the phosphorus solution and holding it in the air. You remember that as the solvent dried away the phosphorus took fire; and you also remember that the paper was not burned. You know that upon the ends of friction matches there is a little phosphorus, and below this a little sulphur. Now, the sulphur in burning produces sulphurous acid, which is an exceedingly poisonous compound, and it would be very desirable to avoid using the sulphur. But the phosphorus will not set the stick on fire. Sulphur burns more easily than wood; the phosphorus will set the sulphur on fire, and then the sulphur will kindle the stick. I would rather have a six-inch shell, filled with melted cast-iron, to set a ship on fire with than a hogshead of a solution of phosphorus in the bisulphide of carbon.

At this moment Dr. Van Der Weyde came in from his lecture and remarked:—I was told in the hall that it had been stated here that the substance which I exhibited last week would not burn anything.

The Chairman—Will Prof. Seely please repeat his statement.

Prof. Seely—Dr. Van Der Weyde understands the matter perfectly, and if he were going to give an account of it, it would be the same that I have given. I said that phosphorus generates very little heat in burning, and will set fire only to very combustible substances.

Dr. Van Der Weyde—I got a drop of the liquid on my thumb and there is a bad burn that it made.

Prof. Seely—Yes; but it did not set it on fire.

SURFACE CONDENSERS FOR STEAM ENGINES.

Number V.

In diagram No. 10 we have views of the peculiar double condenser tubes of James M. Miller, formerly of New York, whose condenser was illustrated on page 17, Vol. VIII. (old series) Scientific American. The other figure representing Howden & Morton's bent tubes will be easily understood. Miller's condenser consists of a series of tubes, each double. The outer one is of comparatively large diameter, with a conical tube fixed to the inside, the smaller end being closed, and extending nearly to the mouth of the outer tube. The steam is admitted between the plates into the tubes, the water circulates around their outer surfaces.

Fig. 10.

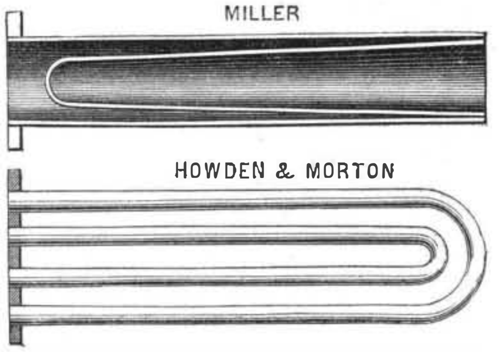
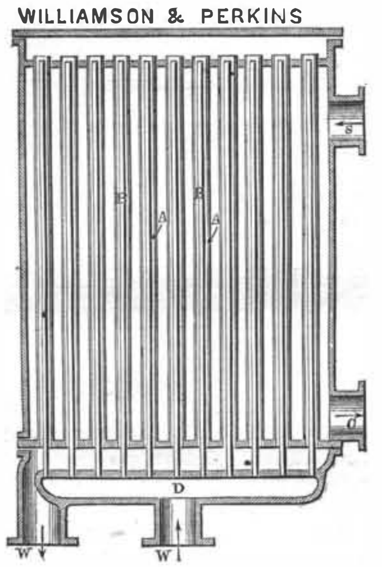


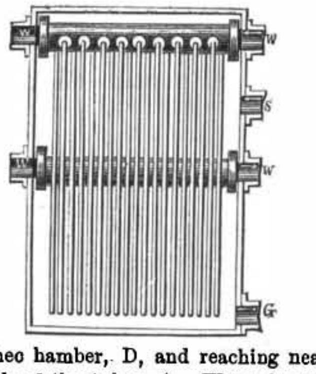
Fig. 11 represents the condenser of Messrs. Williamson & Perkins.

Fig. 11.



The exhaust steam from the boiler is admitted by the branch, S′, into a cast-iron box, containing a number of tubes, A, closed at their ends, and firmly fixed into a tube plate at the lower end, being allowed to expand and contract through holes in the upper plate, which serves to keep the tubes in place. Inside these tubes are others of smaller diameter, B, open at both ends, the lower ends being firmly fixed in the diaphragm of the chamber, D, and reaching nearly to the closed ends of the tubes, A. Water is admitted by the branch, W, through the chamber, D, into the tubes, B, and, passing through their upper ends, returns through the annular space between the two tubes, thus cooling the outer tubes and condensing the steam, the condensation water from which is removed by the air pump through the branch, C′, and is returned to the boiler.

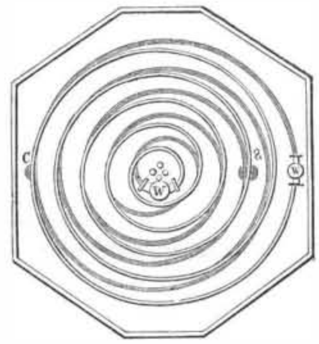
Fig. 12.



By an arrangement not shown in the diagram (should any leakage take place) a valve attached to the inlet branch, W, being partially closed, the circulating pump attached to the outlet branch, W′, acts under such circumstances as an air pump, and causes a partial vacuum on both sides of the tubes, thus preventing the access of condensing water to the condenser. This condenser has been used with considerable success by Dr. Williamson, and possesses many advantages; first, by the condensation water having all to pass through the annular space between the tubes, must necessarily (the same quantity being used) pass much more rapidly over the surfaces than when the water fills the whole of the tubes, and thus present a large surface of water, and, at the same time, by its rapid motion, diminish the quantity of scale or sediment on the tubes. The tubes are also free to expand and contract unequally by being fixed at one end only. On the other hand, it would be very inaccessible for cleaning, and, from the double number of tubes, expensive.

The next figures, 12, 13, represent a plan patented by Messrs. Randolph and Elder, and consists of a number of alternately right and left spiral tubes, attached at one end to the top pipe, W, and inclosed in an iron case, into which the exhaust steam is admitted through the branch, S′, and the condensation water withdrawn through the branch, C′, the condensing water being made to pass through the spiral tubes.

Fig. 13.



This condenser would, undoubtedly, expose a large condensing surface, and would not be affected by any unequal expansion and contraction of the tubes, but it would be expensive and difficult to manufacture, and inaccessible for cleaning.

Uses for Light Rock Oil.

Chemists who have investigated the subject of petroleum products agree that benzole is not to be found among them; and that the substance called *benzole* which is obtained from petroleum is a light eupion oil ranging in specific gravity from 650° to 750°. It is now used to some extent as a vehicle for quick-drying paints. It is very volatile and evaporates rapidly when exposed to a gentle heat. As it does not contain water, it is superior to common alcohol as a solvent for several resins that are employed in making varnishes.

Those light oils have been used successfully in several cases of rheumatic and neuralgic affections. The best method of applying it for this purpose is to saturate a piece of cloth or paper, and bind it to the part affected by several thicknesses of cloth, to prevent too rapid evaporation, and continue the application as long as the patient can bear it. A short time after its application a pricking, burning sensation will be experienced, which should be borne as long as possible, and the application then removed. The pricking soon subsides, and the application, if necessary, should be again repeated. No vesication or eruption will be caused by its application; only a slight redness of the skin, which soon disappears.

Extent of the Gulf Stream.—The Swedish government last year sent a scientific expedition to Spitzbergen. It has just returned to Troruss, whence it started, after having accomplished its mission very satisfactorily, in spite of the rigor of the weather. The old maps have been corrected; fresh ports have been discovered and numerous experiments made, which have thrown fresh light on meteorology and natural history. It has been ascertained that animal and vegetable life exists in the sea at a depth of 2,500 yards, and that the great current of the Atlantic Ocean, known by the name of the Gulf Stream, reaches as far as the coast of Spitzbergen, pieces of broken wood, bottles, &c., having been found there.