

FIG. 4.

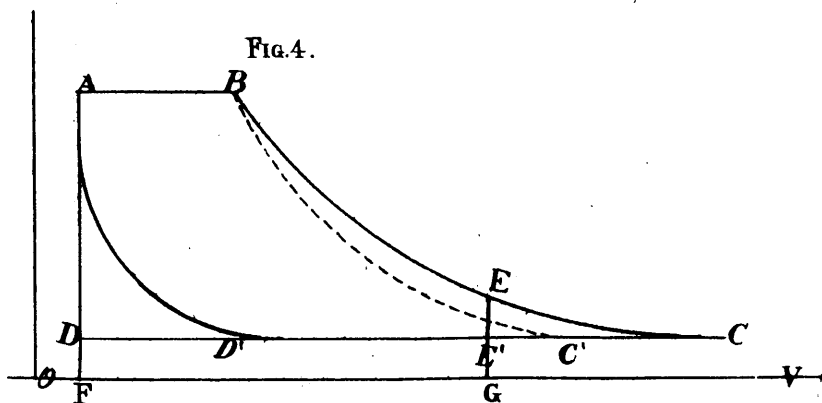


FIG. 6.

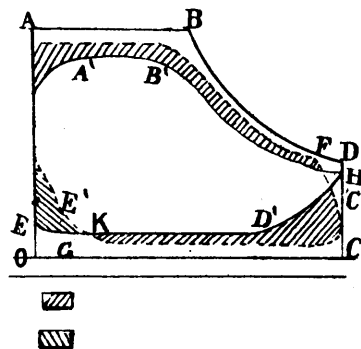


FIG. 5.

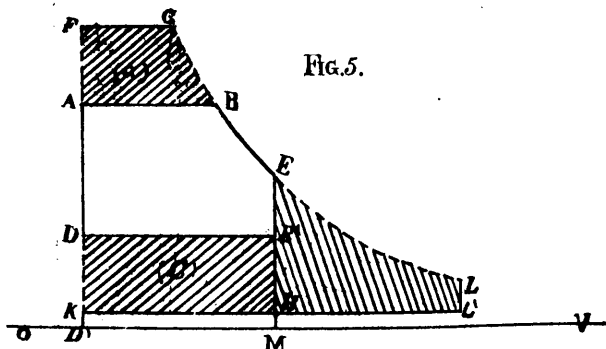
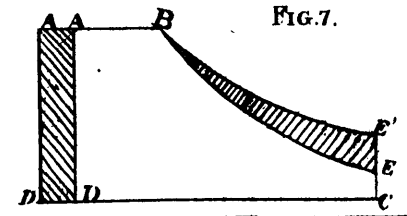


FIG. 7.



The above diagram, or cycle, differs from that of a molecule of water. A molecule taken from the condenser at the pressure defined by B is forced along D A into the boiler, evaporates along A B, and expands along D C to the pressure in the condenser. The molecule is then liquefied under this pressure along C D. In a Carnot's cycle A D and B E are replaced by the two adiabatics A D' and B C'.

Advantages of condensation, high pressure, and a high rate of expansion. Fig. 5.

Let O V be the datum line.

Let A B E E' D be the diagram of a non-condensing engine.

E' M is the atmospheric pressure.

The effect of adding a condenser to the engine is to change the exhaust pressure from E' M to H M, so that there is a gain of work proportional to the area D E' H K, without a theoretically greater expenditure of steam. The degree to which condensation can be carried is sometimes limited by the difficulty of procuring cold water and also by the weight and volume of the necessary apparatus.

The effect of using steam at a high pressure is to change the pressure at admission from D' A to D' F.

There is consequently a gain of work represented by the area A F G B, G B being a prolongation of the expansion curve B E, and it is evident that the expenditure of steam is the same as before. The employment of high pressures is limited by practical considerations as to the size or strength of the engine. The advantage of a high pressure is more especially felt in the case of non-condensing engines.

Theoretically the expansion gives a net gain of work without any further consumption of steam, and it would seem expedient to prolong the expansion indefinitely. A first limit, however, is fixed at the point at which the pressure of the steam falls below that of the condenser. Again, as the expansion increases so also does the stroke and therefore the size of the engine. Hence, from a constructive point of view, expansion is only practicable within certain limits. Indeed, the advantages arising from exceedingly high rates of expansion are comparatively so small that many engineers prefer a low rate, and even to wire-draw the steam.

The gain of work by prolonging the expansion to n is proportional to the area E L L' H.

Loss of head. The ports open gradually and therefore all the angles of the diagram will be rounded.