

P, being the total pressure of the steam in pounds per square inch, and V, its relative volume, compared with that of its constituent water.

These formulas may be adopted without considerable error, throughout the range generally required in such engines, viz., from about 5 lbs. to 65 lbs. per square inch.

Two tables are then given, showing the pressures and volumes, as calculated for every 5 lbs. pressure in this scale; they show a comparison of the results of the four formulas with each other, and the respective amount of deviation from truth in each.

The great error is,

	lbs.
By M. Navier's formula,	1.31 per square inch.
M. de Pambour's first ditto,	4.12 "
" " second ditto,	2.75 "
The new formula,	0.71 "
The mean error is,	
By M. Navier's formula,	0.245 per square inch.
M. de Pambour's first ditto,	1.42 "
" " second ditto,	0.35 "
The new formula,	0.0062 "

The tables also show:—

1st. That the new formula is nearer the truth than either of the others taken separately, in three-fourths of the scale.

2nd. That it is nearer than all three combined, in half the scale.

3rd. That the greatest error of the new formula, with regard to the pressures, is only about half as great as that of the most correct of the other three.

4th. That the mean error is only one-fortieth of either of the others, and only equal to about one-tenth of an ounce per square inch.

5th. That the errors in the volumes are much less numerous and important with the new formula than with either of the others.

It is also added, that the new expression is simpler in algebraical form than the others; it is more easily calculated, the constants are easier to remember, and that no alteration of the constants in the other formulas will make them coincide so nearly with the truth as the new one does.

Lond. Journ. Arts and Sciences.

### On Fermentation. By PROFESSOR BRANDE.

The communication, to which this title was given, afforded a general view of that important class of chemical phenomena, of which fermentation is a single example, viz., decompositions and combinations, brought about by causes independent of chemical affinity. Having exhibited striking experiments illustrative of chemical affinity, Mr. Brande called attention to the fact that none of that interchange of the elements of the combining substances, which takes place under the influence of this force, occurs in *catalytic*, or *contact-action*. The phenomena, resulting from catalysis, are of two kinds: 1st, when

the substance producing the effects is altogether passive. The agency of platinum on a mixture of hydrogen and oxygen gases, is a striking instance of this sort of catalytic action. Mr. Brande reminded the members of a communication made by Mr. Faraday, some years since, on this subject. Mr. Faraday then drew attention to the fact, that a clean disk of platinum, immersed in an atmosphere of oxygen and hydrogen gases, mixed in the proportion, by weight, of 8 and 1, caused chemical union, with more, or less, of heat and explosion. Here the acting substance undergoes no change. But, 2nd, in organic catalysis, the substance producing the effects undergoes changes in itself, but does not, as in the case of ordinary chemical affinity, form union with the substance on which it acts. Thus in the case of rennet coagulating milk, or yeast, inducing fermentation in wort, each of these substances interchanges its particles with those of the liquid into which it is immersed, as happens when a plate of iron is plunged into a solution of copper, but the effect is obtained by the motion of the particles of the decomposing body among themselves, creating a corresponding movement in the body subjected to its influence. The decomposing body must be organic, contain nitrogen, and in a state of decay. This is the case with yeast when placed in a vessel of wort. It undergoes a change, connected according to some naturalists, with the growth of a microscope plant, and by this change splits the sugar of the wort into carbonic acid and alcohol. Having noticed the effects of this force of catalysis, Mr. Brande adverted to two theories respecting its nature—the doctrine that the particles of the decomposing body can communicate their motion to an indefinite mass of matter, and the doctrine that each particle of the decomposing body must be, in its turn, presented to every particle of the substances to be acted upon. After pointing out the difficulties inseparable from both these theories, Mr. Brande noticed, apparently with approbation, the simpler doctrine, that, in these cases, the combining force travels from particle to particle, as happens when a train of gunpowder, or an ordinary fire, is lighted. Mr. Brande concluded by adverting to an economical method of brewing, practiced, we believe, with much success in the family of Sir Thomas Marrable. In this method, yeast, as well as the expensive apparatus of coolers, is dispensed with. The wort, after the malt is strained off, is boiled with the hops, and together with the hops deposited in a barrel placed upright, arrangement being made for the escape of the carbonic acid, and for the barrel being completely closed as soon as the fermentation should terminate.—*Trans. Roy. Inst.*

Lond. Athenæum.

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### *The Hygro-Barometer. By Mr. Ross.*

Mr. Ross explained his hygro-barometer, which has been so arranged that the height of the barometer column, and the depression of the dew point, may be registered from mere inspection, while these two elements are so combined, as to exhibit, in a popular manner, the real state of the weather. The instrument consists of a barometer