— 0.4259687 = 25« + 6253 + 15625.y.

— 0.9330519 = 50» + 2500g + 125000∙y.

— 10.5180799 = 75« + .5625,8 + 4∙21875∙y. From these three equations we can readily obtain the

three values wanted of », S, and y, and which we find to be = — 0.01537419550 *β =* — 0.00006742735 y = + 0.00000003381

and hence the whole equation

Log. 30.∕. = log. 30. + *» n ∣ β nt + γ n3*

is now determined in English inches for the centigrade thermometer ; and in order to compare it with the French observations, it is only necessary to remember that 30. in. = 0∙7679 French metres, and to transform it thus : Log. F» = log. 0“ .76199 — 0.00112919957 — 0.01537278757.„N.

— 0.00006731995N’ + 0.00000003374Ns and in the common table of logarithms

Fn = 0m∙76.10 AN + BNt + cκ< or,

Log. Fn = T∙880820I + AN + BNs + CN3 which are almost identical with Laplace’s formula (C), the degrees being reckoned positively from 100° cent. downwards, and negatively upwards.

In degrees Fahrenheit and English inches, the formula in this shape becomes—

Log. Fz = 1.4771213T 0.00854121972/

— 0.00002081091∕a + 0.00000000580∕<.D.

These formulæ are far from representing the results of late experiments at high temperatures, although, within the limits of one atmosphere, they accord pretty closely with Dr Dalton’s early observations.

40. In the first volume of the new series of the *Philo­sophical Magazine,* Mr Ivory has given a formula constructed to represent empirically the experiments of Dr Ure. It is—

Log.^ = .0087466<000015178t,+000000024825f E.

The application of this formula is laborious. It is of exactly tne same nature with that of Laplace and Biot, and only represents the observations of Dr Ure within their narrow limits ; extended to higher temperatures, it seems to deviate considerably from the truth, as may be seen from our table (Art. 57∙)

41. Schmidt and Soldner, reviewing Dr Dalton’s experiments, have each constructed a formula to represent them :

Schmidt’s is—F = il∙363 + ∙0θilt F.

Soldner’s formula is—

r = Ix¾30.13—~~ι952~~~~j~~~~a~~~~⅞~~~~12,~~~~>~~ G.

42. In the *Edinburgh Journal Of Science* for 1829, Mr Tregaskis has given a theorem, which furnishes a rough approximation to experiment. It is this : that 1/5 of the temperature above 32°, added to vapour, will double its elasticity.

43. M. Roche, Professor of Mathematics at Toulon, sent to the Academy of Sciences, in 1828, a memoir on this subject, in which he proposes a formula, deduced from general principles. This formula is—

F=’“ +,0π⅛5i ,∙∙∙∙h∙

This formula agrees closely with the French experiments.

44. Dr Thomas Young invented a species of formula entirely new. Abandoning altogether the formula in which one of the variables is involved as an exponent, and abandoning altogether the views from which formulæ of this kind had been derived, he assumed an expression which is apparently perfectly arbitrary, and which has been adapted empirically to the experiments of Dr Dalton. It is this :

F = (1 + 0.0029.1)7 1.

*t* being reckoned above 212 Fahr, and F being the force in inches of mercury. Hence we get inversely ;

,\_F)l

.0029

For very small changes of temperature, Dr Young’s formula becomes

t = 1.642e

*e* being the corresponding slight variation of pressure from 30 inches, which corresponds, within three-thousandth parts, with the mean between Deluc’s correction 1.598, and Shuckburg's 1.70, or 1.645*e*.

Notwithstanding the simplicity of the form of this expression, and the facilities which it presents for ready calculation, it is impossible to adopt it, as it deviates widely and rapidly from the results of observation when extended to high temperatures. Induced, however, by the simplicity of the expression, and not a little influenced, it may be, by the high authority of a name that will ever be distinguished among the most distinguished of those who have contributed immortal truths to the treasures of physical science, the example of Dr Young has drawn after it many followers. Southern, Creighton, Coriolis, Tredgold, Arago, and Dulong, have successively attempted to modify the formula of Young, so as to twist it into some measure of conformity with observed phenomena—we shall see with how little success.

45. Mr Creighton adopted a similar formula to repre sent Ure’s experiments, only changing the constant expon ent from 7 to 6 ; so that, making F the force of steam in inches of mercury—0.09, and the temperature of Fahrenheit (85° = *t*, we have

F=f√V K.

∖168.878∕

Log. F = (Log. *t —*—2.22679)«

46. Mr Southern represented his experiments by the formula

p\_(£+5L3)^\_ + Oii L.

87344.000000.

Or,

Log. (1.1 F) = 5.13 Log. (Z+51.3)10.94123

And,

Log. (f+5l3)L°g (F + O∙1)+I⅛94123

5.13

47. Mr Tredgold simply reinstated Creighton’s expo nent, altering the coefficient to bring it nearer to those experiments with which he was acquainted when his work was written ; but it is inaccurate at high temperatures, and like that of Creighton.

κw «·

48. To adapt the formula to more recent experiments, M. Coriolis (in his work *Du Calcul de l'Effet des Ma­chines,* 4to, 1829) changed the exponent to 5.355, making it in French measures,

p∕l+0DI878A3∙^

∖, 2.878 *I*

reckoning from 0° cent. in atmospheres of 0.76 metres of mercury.

49. The French Academy of Sciences have finally reduced the index to 5. ; finding that number represent their experiments at high temperatures, they adopted the following expression :

F = (l + 0.7l53f)s O.

to give the elasticity in atmospheres of 0.76 metres, the temperature being in centesimal degrees, of course FI ι

*t = 3* ~~t~~

0.7153

50. In conclusion, the committee of the Franklin Insti