Course in Gas Engineering

This Course will consist of a series of practical talks on the theory and practice of the gas, gasoline and oil engine. They will be simple, illustrated when necessary, and of such a nature that the gas engine owner may easily adapt them to his daily engine work.

LESSON XII.

D. O. Barrett.

The question for calculating the compression was shown to be which resolves to—

Formula (a) is the one which is most convenient to use by substituting all the values and solving. However, this is a somewhat lengthy process and involves the use of logarithms, with which the majority of people are not familiar. A much simpler form is (b). The quantity $(V+v)/v$, will be recognized as the "compression or volume ratio." In the same manner, 'p' divided by 'P' will be designated

AVERAGE PRESSURE RISE PRODUCED BY COMBUSTION. (Poole "The Gas Engine").

Compression Ratio $\frac{V+v}{v}$	Illum. Gas. B.T.U per Cu.Ft. 600	625	650	Gasoline.	Kerosene.
4.0	135	140	146	195	168
4.1	139	145	151	201	174
4.2	144	150	156	208	179
4.3	148	155	161	214	185
4.4	153	159	166	221	190
4.5	157	164	170	227	196
4.6	162	169	175	234	202
4.7	166	173	180	240	207
4.8	171	178	185	247	213
4.9	175	183	190	253	218
5.0	180	187	195	260	224

as the "pressure ratio,"or the ratio of the pressure at the end of the compression stroke to that at the end of the suction stroke. To facilitate the use of this formula the curve has been derived directly from it and, having the volume ration, the pressure ratio may be obtained from it in a few seconds, with no calculations whatever.

Distances measured vertically represent the volume ratios, while those measured horizontally represent the pressure ratios. Suppose the volume at the end of the suction stroke was four times that at the end of the compression stroke, then from the curve the pressure ratio will be 6.3 times the absolute pressure at the end of the suction stroke.

In order to demonstrate the practical use to which the curve may be put, let us take a concrete example:—On an engine having a bore of 9 in. and a stroke of 14 in. the compression was found to be 65 pounds gauge, suitable for gasoline. It is desired to increase the compression to 90 pounds gauge so that it may be economically operated on gas.

The engine has a mechanically operated admission value, and we shall asume an absolute pressure at the end of the suction stroke 13.5 pounds. The absolute compresion presure is 65 + 14.17, or 79.7 pounds. The pressure ratio, then, is 79.7 divided by 13.5, or 5.9. Turning to the table and locating 5.9 on the horizontal line we follow perpendicularly up to the curve and then draw a horizontal line to the left and we find that the volume ratio corresponding is 3.8. Repeating for the higher compression pressure we have: 90 + 14.7 divided by 13.5, 7.75 as the pressure ratio. From the curve again the corresponding volume ratio is found to be 4.7. The compression space must now be reduced in the engine until the existing volume ratio shall be raised from 3.8 to 4.7.

Now the volume of the cylinder swept by the piston is equal to the area of the 9 in. piston multiplied by the stroke 14 in., or 63.62 times 14 = 980.7 cubic inches. Then $v + 890.7$ divided by $v = 3.8$ or $3.8\,v - v = 2.8\,v = 890.7$; then $v = 890.7$ divided by 2.8 or 318 cubic inches. This gives the volume of the existing clearance space. In the same manner determine the volume of the clearance space corresponding to the desired compression. Here $v + 890.7$ divided by $v = 4.7$, or $4.7\,v - v = 3.7\,v = 890.7$; then $v = 241$ cubic inches. The space must then be reduced from 318 cubic inches to 241, or about one-fourth of the original volume, 77 cubic inches. The area of the piston is 63.6 square inches, so that the distance by which the