

Course in Gas Engineering

This Course consists of a series of practical talks on the theory and practice of the gas, gasoline and oil engines. 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.

The matter of rating, power delivered, etc., was gone into quite thoroughly in previous lessons, and we wish now to look at some of the characteristics of the internal combustion engine, which have a direct bearing, not so much on the manufacturers' rating, but upon the load under which the user operates his engine. It is a well known fact that most of the engines purchased at the present time are too small for the work they are expected to do. Whenever a man purchases an engine, he does so with some particular purpose in view, that is, he desires the engine to operate some particular machine, and with that end in view the proper size engine is purchased. Soon, however, the advantages and adaptability of this type of power become manifest and other uses are found for the engine. Oftentimes it is desirable to operate several machines at the same time, making an overload for the engine. While it will be shown that it is not economical to operate a large engine under a small load, yet the fuel consumption is greatly increased at an overload, besides the wear and tear on the engine is much greater in proportion to the load.

Since the most common type of engine for farm use, and in fact for all sizes up to 60 or 75 h.p. is the single cylinder hit-and-miss engine, we shall consider this type in this discussion. When engines of any particular size are mentioned, the rating is not necessarily that given the engine by the manufacturer, but is that determined in the manner shown later. As before mentioned, manufacturers' ratings are listed with lit-

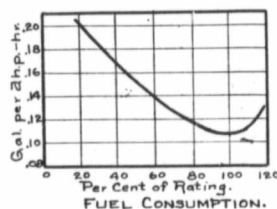


Fig. 1.

tle regard to the proper working capacity of the engine. The proper rating of an engine or other prime mover of any kind should be such that if a person desired say 60 h.p. and purchased an engine rated at 60 h.p. the engine would operate at this load under the most economical fuel consumption, or in other words at its greatest efficiency. For the larger sizes of engine, of course, such tests are made that the manufacturer knows what fuel consumption he can guarantee for a certain power delivered, and at what

load he can recommend his engine to be the most economical. Small engines do not have the same care bestowed upon them, and it is up to the purchaser to a large extent to judge this for himself.

Taking up the subject of fuel consumption, this will be represented by the graphical method as shown by the curve in Fig. 1. Distances measured vertically up to the curve represent gallons of fuel for developed horse power. The horizontal distances are usually laid off in horse-power, but since we are not discussing any particular size, the horizontal distances will be designated as percentages of the rating. 100 per cent. will then be the proper rating for any size engine under discussion.



Fig. 2.

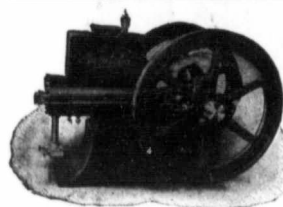
It will be noticed that the curve starts at the left quite high, that is at a small load, the fuel consumption is great, and as the power delivered by the engine is increased, the curve gradually falls until, at a certain point, the minimum fuel consumption is reached. Beyond the minimum point, the curve rises quite rapidly, showing that the fuel consumption increases in a greater proportion than the power delivered. The proper rating for the engine is the power delivered when the fuel consumption is at its minimum, and this point we will call 100 per cent. of rating.

We wish now to look into the reason for the fall and rise of this fuel consumption curve, and for which there is a definite reason.

In an engine rated at 100 developed h. p. we shall assume, as an example, that it requires 10 h. p. to operate the mechanism of the engine when running idle. This power is expended in turning the shaft, overcoming the friction of the piston in the cylinder, opening the valves against the spring tension, sucking in the mixture of gas and air, forcing out the exhaust gases, etc. The amount of power required to operate the engine is practically constant, though slightly greater as the speed of the engine is increased. Now, there is a certain fuel consumption for operating the engine idly, that is when the developed h. p. is zero. Now if a load of 15 h. p. be thrown upon the engine, the fuel necessary will correspond to 25 h. p. or nearly twice that corresponding to the power deliv-

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