curves and measuring their enclosed areas, the following scales have been chosen:

Fig. 1..... .....Scale 50 lbs. to the inch,
Fig. 2..... .... " 20 " " " "
Fig. 3..... .... " 5 " " " "

In each case, "*A. B. C. D.*" represents a theoretically perfect diagram, so far as free expansion is concerned, because expansion is carried to the line of return pressure, and compression fills the clearance space to initial pressure. It is hardly necessary to say that the curves here shown are Mariotte curves, and not Adiabatic, as the latter are seldom used and are considered an unnecessary refinement in this investigation. The successive curves in each diagram, which follow the curves "*B. C.*" represent later points of cut-off, and they are continued beyond the limits of piston travel until they intersect the line of return pressure. The areas of enclosed spaces are indicated by figures. Thus in Fig. 3, the area of the theoretically perfect diagram "*A. B. C. D.*" is 2.68 inches, and "*B. B_1. C_1. C. B.*" is .90 inches, etc.*

The next step is to determine the best point of cut-off for each cylinder. In this investigation each cylinder must be considered separately, and treated as though it was a single cylinder engine working between the limits of pressure indicated, and it may be asserted without fear of successful contradiction that if any cylinder of a compound engine is not realizing the highest economy obtainable from a single cylinder engine working between its limiting pressures, then the engine as a whole is falling short of its possibilities. It is also true that if because of cylinder condensation it is not economy to expand to the line of back pressure in a single cylinder engine, the same is true of every cylinder of a compound engine, it being only a question of the degree of free expansion permissible in each case.

To those who believe that there ought to be no "drop" in any of the cylinders of a compound engine except the low, the foregoing will seem rank heresy. They argue that if there is "drop" in the high cylinder there is free expansion waste, and by earlier cut-off in the low cylinder the receiver pressure may be raised until the drop in high cylinder disappears, thus elimi-

* For convenience of publication, the diagrams of Figs. 1, 2, and 3 have been reduced in size, and therefore, while the areas remain relatively the same, the figures given are the actual areas of the original diagrams.