the air in non-condensing engines, of which this article speaks. When the steam is exhausted, the pencil falls to B, on the atmospheric line. On the return stroke, as there is no pressure in the cylinder, the pencil follows the atmospheric line A B. This diagram represents the action of the steam and valves in one end of the cylinder during one complete revolution. A C is called the admission line, C D the steam line, D E the expansion line or curve, and E B the exhaust line.

Figures 2 and 3 are fac-similes of diagrams taken from a Brown engine in a neighboring town. The diagrams of Figure 3 were taken first, and they present one of the most extreme cases of bad valve adjustment, as may well be judged by comparing them with the diagrams in Figure 2, which were taken after the valves were correctly adjusted. It will be noticed that the general figure of the diagrams of Figure 2 is very similar to that of Figure 1, the great difference being that the corners are not as square as in Figure 1. This rounding is due to the gradual opening and closing of the valves and the speed of the engine. If the valves are correctly adjusted, the corner at C, Figure 1, will in most cases be square, for the reason that the admission valve is opened an instant before the piston reaches the end of its return stroke, and while the piston changes the direction of its motion, the pencil has time to reach C before the paper begins to move. This would also occur at the corners B and E if the exhaust did not take place until the end of the stroke was reached. But the steam is exhausted an instant before the end of the stroke, so that the steam may have time to get out of the cylinder before the return stroke is commenced. It will be noticed in Figures 2 and 3 that there is a line a little above the atmospheric line. Owing to the bends and length of the exhaust-pipe, there is in most cases a "back pressure" on the piston, which is the cause of the back pressure line above the atmospheric line. It will also be noticed that the corners of the diagrams of Figures 2 and 3, corresponding to the corner A of Figure 1, are more rounded than the other corners. This is caused by the exhaust valve closing before the end of the return stroke is reached, so that the steam remaining in the cylinder is compressed and increases in pressure, according to Mariotte's law. The pencil of the indicator then traces the compression curve. The steam is thus compressed for the reasons that it forms a cushion which receives the shocks due to the reversing of motion of the reciprocating parts, and also because the steam thus compressed, sometimes to boiler pressure, fills the steam passages, instead of making the direct steam do this before it can act on the piston. The expansion curves in Figure 2 meet the back pressure line at the end of the stroke, and it is the very best practice to so proportion the speed of the engine that this condition takes place. This can be done only with a constant