It is hardly necessary to state that the inlet lines on compressor cards must be below the atmospheric line (for low-pressure cylinders or interlocker line for high-pressure), even if mechanically opened inlet valves are employed, the friction in pipes, passages, and ports, and the changes of velocity, etc., ensuring some slight drop. If spring-loaded inlet valves are employed this drop below atmospheric pressure will be increased, and the proportion of work performed in drawing air into the cylinder will also rise. And yet how seldom is it that a card is seen on which the pressure at the end of the inlet stroke does not practically coincide with the atmospheric line; in fact, it is nothing unusual to see it shown on the top edge of the atmospheric line. It is frequently claimed that this is due to the admirable system of inlet valves employed on the compressor, and their excellent condition, the fact being ignored that if it needs an excess of pressure on the outside of the cylinder to overcome pipe friction and the resistance of valves, this excess of pressure must also be, to some degree, apparent at the end of the stroke, otherwise air will not flow into the cylinder. The real reason that the pressure rises at atmospheric (and sometimes above it) at the end of the inlet stroke, is that the air has become heated by passing over hot surfaces and by contact with cylinder walls and head, and piston, and the pressure has thereby been increased.

If the temperature of the air rises from 80 degrees Fahrenheit to 150 degrees Fahrenheit, 10.6 lbs. absolute pressure of air will (if the volume remains constant) be raised to 12 lbs. absolute; so that, assuming our 12 lbs. atmospheric pressure has been decreased at inlet to cylinder, by friction, etc., to 10.6 lbs., abs., a rise in temperature from 80 degrees Fahrenheit to 150 degrees Fahrenheit before compression commences would have brought the pressure back to atmospheric once more.

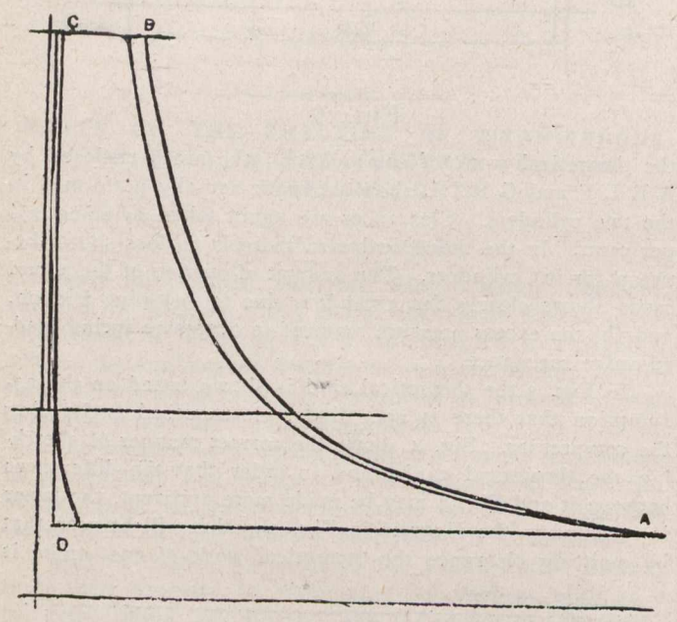

FIG. 4.

Starting, therefore, on the assumption that the air is at atmospheric temperature and pressure if a comparison is made with a theoretical curve, we have the result shown in Figs. 3 and 5, but if we agree that the air must be at a higher temperature than atmospheric, then our isothermal curve should commence below the atmospheric line, at such a point as would give us the equivalent pressure of the air contained in the cylinder had it been at atmospheric temperature. This also explains why it is often, and quite erroneously, assumed that air is compressed practically adiabatically in air compressors. A moment's consideration would assure anyone that adiabatic compression is in practice impossible, as there would be a continuous rise in the final temperature until a delivery temperature greatly in excess of that due to adiabatic compression from atmospheric temperature was reached; this is not so, therefore we have not adiabatic compression, though, because the final temperature is very close to the temperature which would be reached by compressing adiabatically from atmospheric pressure and temperature it appears, on casual consideration, to be approximately adiabatic compression. My point will be realized when I state that with adiabatic compression from 12 lbs. absolute and 84 degrees Fahrenheit temperature to 33.6 lbs. absolute, the final temperature would be 273 degrees Fahrenheit, whilst with an original temperature of 120 degrees Fahrenheit it would be 322 degrees Fahrenheit.

It may seem a small point whether the curve of compression is termed adiabatic or semi-adiabatic, but there is a serious side to the case.

Once it is realized that the cylinder jackets do far more than keep the clinder walls from reaching a temperature too high for efficient lubrication the circulating system will receive more attention, and there will be an immediate increase of efficiency in compressing air.

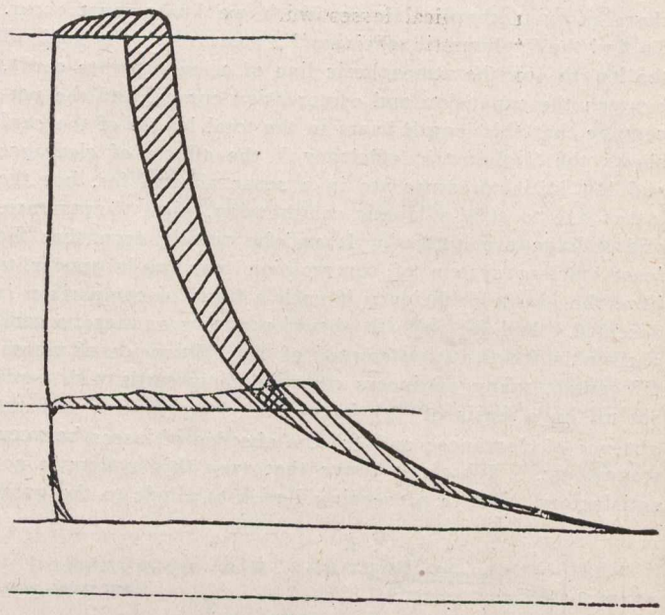

FIG. 5.

Personally I think that if it were considered possible to devote the attention to the inrivirual compressors on the mines which would be devoted to similar machines in big central stations there would be little or no room for central plants. By attention I mean the care in designing the plant,

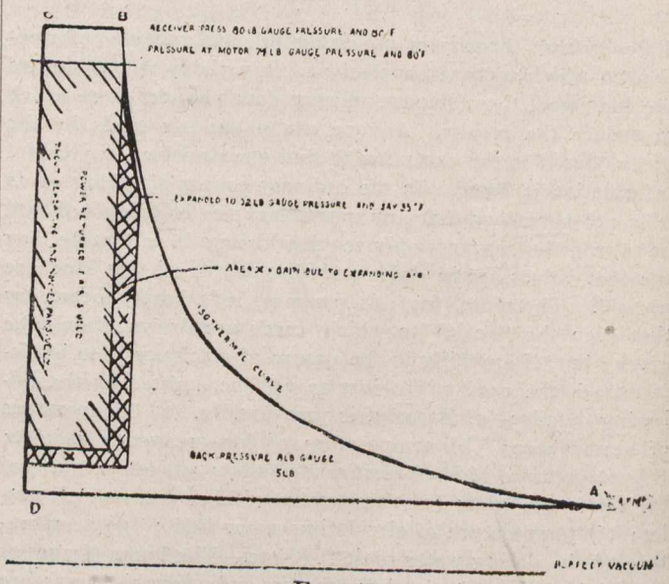

FIG 6

not the supervision of operation; this I do not call into question. One can quite realize that in central stations attention is devoted to every detail which will tend to promote efficiency, and why should this not be so in isolated plants?

I wish to point out an easy and comparatively accurate method of comparing the efficiency of various compressors, or types of compressors.