## ORBIT OF THE SPECTROSCOPIC BINARY X AURIG.E

The second hypothesis may be presented as follows:--

Let A and B (fig. 2) be two stars or the two nuclei of a binary, and let the gases be condensed about these. It is known that calcium occurs at very high levels in the sun, and let us suppose that the equidensity layers in the calcium vapour about the two stars are nearly spheres. The calcium cloud will rotate about the common centre of gravity of the two stars in the same period as they revolve about each other. If A is the primary star and only one set of lines is observed on the plate, we need concern ourselves only with the light from A. The light from the photosphere gives the continuous spectrum, and as it passes through the cooler gases, hydrogen, helium and calcium, has lines from these elements absorbed. The absorption of the calcium takes place where the element is very rare, which accounts for the narrow character exhibited by these lines. The absorption of helium and hydrogen must be supposed to take place at a much lower level. Assume that it is permissible to speak of effective levels at which this absorption occurs, at a height D for the hydrogen and helium and at a height F for the calcium. At the time when the primary is moving toward us with the greatest velocity, the points at which the calcium absorption is taking place are rotating then as always about the point C and so are moving nearly across the line of sight. Moreover, the different points are all moving at about the same rate toward the observer, thus maintaining the narrow character of the lines. The points at which the hydrogen and helium absorption occurs, exhibit a wide range in velocity and give the wide character of the lines and the high range if the inclination is nearly zero. If the inclination is nearer to ninety degrees, the hydrogen and helium lines would be sharper and give a smaller range. This fits the case of 12 Lacertæ and X Aurigæ. There are doubtless other factors not understood which may contribute to the width of the lines observed in other cases. If the calcium cloud were extensive enough the calcium lines would remain nearly stationary, at least the amplitude would be small enough to be masked by errors of measurement. As the cloud condensed, the amplitude observed in the H and K lines would increase, the exact range depending on the degree of condensation of the calcium.

27