LEIF ERIKSON OR COLUMBUS

By Prof. C. E. Sherman

WHICH one was the braver, Columbus or Leif Ericson? Leif believed the earth was flat! Think what that means and imagine being one of his crew. They feared being pulled over the western brink of the ocean, where the flat sea poured in one appalling Niagara downward into caverns measureless to man, on down beyond a sunless sea.

But one Old Nestor in the ship used logic on his mates. Said he, "There must be mountains on the other side, same as here in Norway, to hold the water in. Else this ocean had run dry, even when Thelma was a child." The crew sailed on.*

Do you know there are people who still believe the world is flat? Not at Ohio State, you say. But hold! You may still find remnants of Leif's idea on the campus. Try this on a friend. Ask him what a level surface is. Nine out of ten will tell you it is one that is perfectly flat. Yet water seeks its level, you know. That is, it makes a level surface when it comes to rest. Therefore, a level surface is anything but flat. We shall see how the old globe resents being called flat.

Leif's idea still affects surveying. The surveyor measures a farm and computes its area as if it were flat. He surveys a coal mine on the same theory. All the city subdivisions of old farms into lots and streets have been surveyed the same way, at least here in Columbus and at most other places.

But when these "flat" surveys are all pieced together, over a large area, all on the theory that the world's surface (its sea-level surface) is flat, trouble creeps in. They begin to fit together about as well as a flat board fits onto an orange. In other words, no one has yet told how to make a spherical surface lie flat without seams, crecks, gores, gussets or something of the like. Just so, when you have to make a survey of a state or of a county, or even of the area of a large city (like Columbus with its adjacent territory now embraced in Franklin County Sanitary District) you will have to step up to more accurate methods than just ordinary plane surveying.

This work requires great precision, and a bureau of our Government—the U. S. Coast and Geodetic Survey—has been doing such work for the nation and the states. Thus was furnished the basis for the State Topograpnic Survey which has just been completed. It takes into account the curvature of the earth. The whole Ohio survey is based on the transcontinental triangulation belt which crosses the state along the 39th parallel.

Any sophomore surveyor can tell the curvature of the earth by means of the wye level, but it takes a precise transit to show how the curvature affects horizontal measurements. For example, if you measure the three angles of an ordinary triangle with an ordinary transit, their sum should be 180 degrees. But if you measure the three angles of a very large triangle, covering an area as big as the city or county, their sum will equal more than 180°. It takes a precise transit to show this excess.

Such precise instruments are a part of the equipment in the newly established work under Prof. E. F. Coddington. The new "direction theodolite," just imported from Switzerland, reads angles directly to 2 or 3 seconds, and by the method of averages (or its development—Least Squares) it measures angles to a second or less. This is a very small angle on a 5-inch circle.

How about linear distances—those measured with a tape? An ordinary surveyor doesn't count the temperature. But in Professor Coddington's work, it not only is counted carefully, but he has metal tapes of special composition, that expand or contract 20 times less than steel if they get warm.

What has all this to do with the University Campus? Just the same thing it has to do with down-town property. Land has become valuable. To piece together old-time surveys, or even new surveys of the ordinary kind will not carefully enough apportion our high-priced land. Thus there is a gap of four feet in the old surveys of High Street property. Down town, this makes a tidy sum of $20,000 a foot. This is not so high as $50,000 at the center of Miami, or the much higher priced property in New York or Chicago.

So the thing to do is to spread a "triangulation net" over the city, for precise "horizontal control." This has been done, and the net is now being adjusted by Least Squares. One of the "stations" is right here on the campus—on the top of the tower of Hamilton Hall. One of the Stadium towers offered a good point, but it is not a good place to hold classes. Deeply absorbed in measuring angles with the delicate instrument, it is too easy for a fellow to fall off the stadium tower. What will be the result of all these "fine haired" measurements? Why, a set of monuments on the ground in and around the city which will make land lines fit. No more fudging one "plane" survey over another, indefinitely onward with accumulating discrepancy. Every factor will have been taken into account, and all adjusted until each measurement of line or angle fits all other similar measurements in the "net."

So it is with precise levels versus ordinary levels. With the precise level, which is a part of the equipment in Geodetic Engineering, a circuit of 13 miles has just been run, which closed upon itself within 6 thousandths of a foot. Even this very small discrepancy will be adjusted when other circuits of the "level net" are run. These circuits are run with rods faced with invar metal.

The details of precise surveying which produces the standards to which all other surveys in cities are adjusted, are mist interesting and form the subject of the fall term's work in Civil Engineering Course No. 608 under Professor Coddington. The winter term his class takes up the accurate adjustment of the field work in the fall. The whole subject is carried on in conjunction with the Geodetic survey of the city, now in progress under the direction of the R. H. Randall Company.

* See "The Alquoans," by General John Beatty.