The story goes that Byrd and Bumstead were having lunch at the Cosmos Club in Washington and Byrd was ruminating about how he couldn’t figure out how he was going to navigate during his North Pole flight. Bumstead asked Byrd why he didn’t consider using a sun compass. Byrd responded, “What’s a sun compass?” “I’ll make you one,” Bumstead said.

To make the compass, Bumstead mounted a watch above the face of a standard compass. Not the kind of standard two-handed watch that can be found on a wristband, but one with a single hand that completed a rotation every twenty-four hours. The hand of the watch was equipped with a pin that stuck straight up and cast a shadow. Once the watch was set to local time and inclined at an angle appropriate for the latitude, its hand would follow the motion of the sun, and Byrd could use the shadow to determine which direction was north. In essence, it worked like the opposite of an old-fashioned sundial—instead of using the shadow’s direction to determine the time, Byrd could use his knowledge of the time to figure out which way was north.

Bumstead took his prototype to the Pioneer Instrument Company of Brooklyn, NY, who manufactured the sun compasses for the Byrd expedition. This letter, from The Ohio State University Archives, Papers of Admiral Richard E. Byrd, and dated September 20, 1928, was written to the Pioneer Company from Albert Bumstead:

Dear Sirs, I have examined the five sun compasses made for Commander Byrd, and am forwarding them to him today. I note that the pointers are made of soft brass and that one end is very thin and weak, so that it may be bent by jarring. I have recommended that Commander Byrd order extra pointers, and if he does I hope you will make them stiffer. I noticed also that the ruled lines on one of the targets were off center so that the shadow lines would not be parallel to the hour circle indicated by the clock. I was able to redraw these lines in correct position. In one of the compasses there was a ½ degree error in the setting of the vertical arc, i.e. the arc read 90-1/2 degrees when the clock face was parallel to the base. This will have no appreciable effect, but it indicates careless workmanship. One of the cover glasses had rattled loose in shipment. I think a cement could be found that would hold these more securely. Your design of the vertical arc with one spoke instead of two is doubtless easier to make, but I am convinced the extra effort of making two spokes would be well worth while. The central clamp screw is very small and weak as compared with the strength of the rest of the instrument. I would recommend it be made 5/16” diameter and that a washer which cannot turn on the stud be placed between the clamp nut and the compass dial. I hope these suggestions will be of value to you and will help to make the sun compasses more practical and workmanlike. Yours truly, Albert H. Bumstead

Byrd successfully used Bumstead’s compass on the first flight over the South Pole in 1929. To show his appreciation, Byrd named a mountain in Antarctica Mount Bumstead, after the cartographer who had helped him find his way. And he returned a sun compass to Bumstead as a thank-you gift. When Bumstead received the compass it had a new inscription on it:

To Albert H. Bumstead For Getting Us There
From Richard E. Byrd, Jr.

Albert Hoit Bumstead (1875 – 1940) was a surveyor, explorer, cartographer and inventor. He graduated from the Worcester Academy in 1894, and then went on to the Worcester Polytechnic Institute (WPI) and studied civil engineering. He then worked as a surveyor for the U.S. Geological Survey for seven years. In 1912, he became the chief surveyor of Hiram Bingham’s expedition to Peru, where Machu Picchu was studied. Upon his return, Bumstead became the first head of the cartography department at the National Geographic Society. In addition to the sun compasses used by Admiral Byrd and others in polar explorations, Bumstead developed a method for making marble bas-reliefs from photographs using a dual vision device, and a photo-printing technique for printing mapping fonts in various sizes without losing clarity. In 1937 Bumstead presented his Equal-Area Polyconic Projection to the National Geographic Society.

Resources:
http://www.antarctic-circle.org/E02.htm
http://library.osu.edu/projects/conquering-the-ice/names.html