barn, as the storage of hay and grain depends upon cubical content, alone, and silos should always be circular, no matter where built. Cows, when lying down, are decidedly wedge-shaped, requiring much less space in front than behind. The objection may be raised, with round barns large enough for two rows of cows, that the row headed out does not use the space as economically as in the rectangular form, because a cow needs more width at the rear of the platform than at the manger. Where there are two rows of cows, the inner row is usually headed out, and as only about one-third of the cows are in this row, this loss of space is counterbalanced by the large number of cows in the outer circle using the space more economically than they do in the rectangular barn.

Box stalls cannot be as conveniently arranged, but in a one-row barn, gates hung on the outside and swung around to the manger, form stalls for cows at freshening time, and in a barn with two rows, box stalls can be arranged in the inner circle.

HOW THE ROUND BARN AT THE UNIVERSITY WAS BUILT

The barn is located on the side of a hill, sloping gently to the south and east. With this location, it was an advantage to excavate 5 feet deep on the northwest and run out to the surface of the ground on the southeast.

[Illustration: FIG. 13. SHOWING TEMPORARY BRACING TO HOLD STUDS IN PLACE WHILE SHIP LAP CEILING IS NAILED ON.]

The footing for the foundation is 18 inches wide. A ten-inch brick wall was carried up nine feet above the stable floor. This wall contains a 2-inch air space to prevent moisture from condensing on the inner wall and making the barn damp. This is an important point, as barns with a solid stone or brick wall are very objectionable on account of dampness. It has been proven by two years' use that this difficulty is entirely obviated by the air space in the wall.

The foundation for the manger and feed alley is built up 2 feet above the stable floor. The foundation for the silo extends 4 feet below the stable floor and is continued 9 inches above the floor in the feed alley. This silo wall, together with the foundation under the manger, forms the foundation for the center supports of the barn. Fig. 12 shows the foundation completed.

The silo, which is the Gurler type, was then started and carried up with the barn. It was built by placing 2 × 4 studs around the circle, one foot on centers, and ceiling inside with 1/2 × 6-inch lumber. This 1/2-inch lumber was obtained by re-sawing 1 × 6 yellow pine fencing. Common lath were then put on horizontally in the regular way inside, without furring out, and plastered with rich cement plaster.

The sill of the barn is 6 × 6, made up of 1 × 6s, and built on top of the wall. Building it up in this manner makes a stronger sill than can be obtained in any other way, as it forms a continuous hoop around the barn.

[Illustration: FIG. 14. SHOWING HEIGHT AND CONSTRUCTION OF SILO, SIDING COMPLETED, AND FOUR MAIN RAFTERS IN PLACE.]

The joists are 2 × 12s notched 6 inches to fit the sill, so that the outer ends rest on both the sill and the brick wall. The outer span of joists is 14 feet and the inner ends of these joists rest on a similar sill built of 1 × 6s on top of the 4 × 4 supports at the stanchions. The inner span of joists, between the stanchions and the silo, is 8 feet, the outer end resting on the sill over the stanchions, and the inner end on a 1-1/2 × 6-inch band, made up of three 1/2 × 6-inch pieces, running around the outside of the silo. These joists are placed 2-1/2 feet apart at the outside of the barn, and half as many joists are used in the inner span, making the joists at the silo one foot apart. The number of