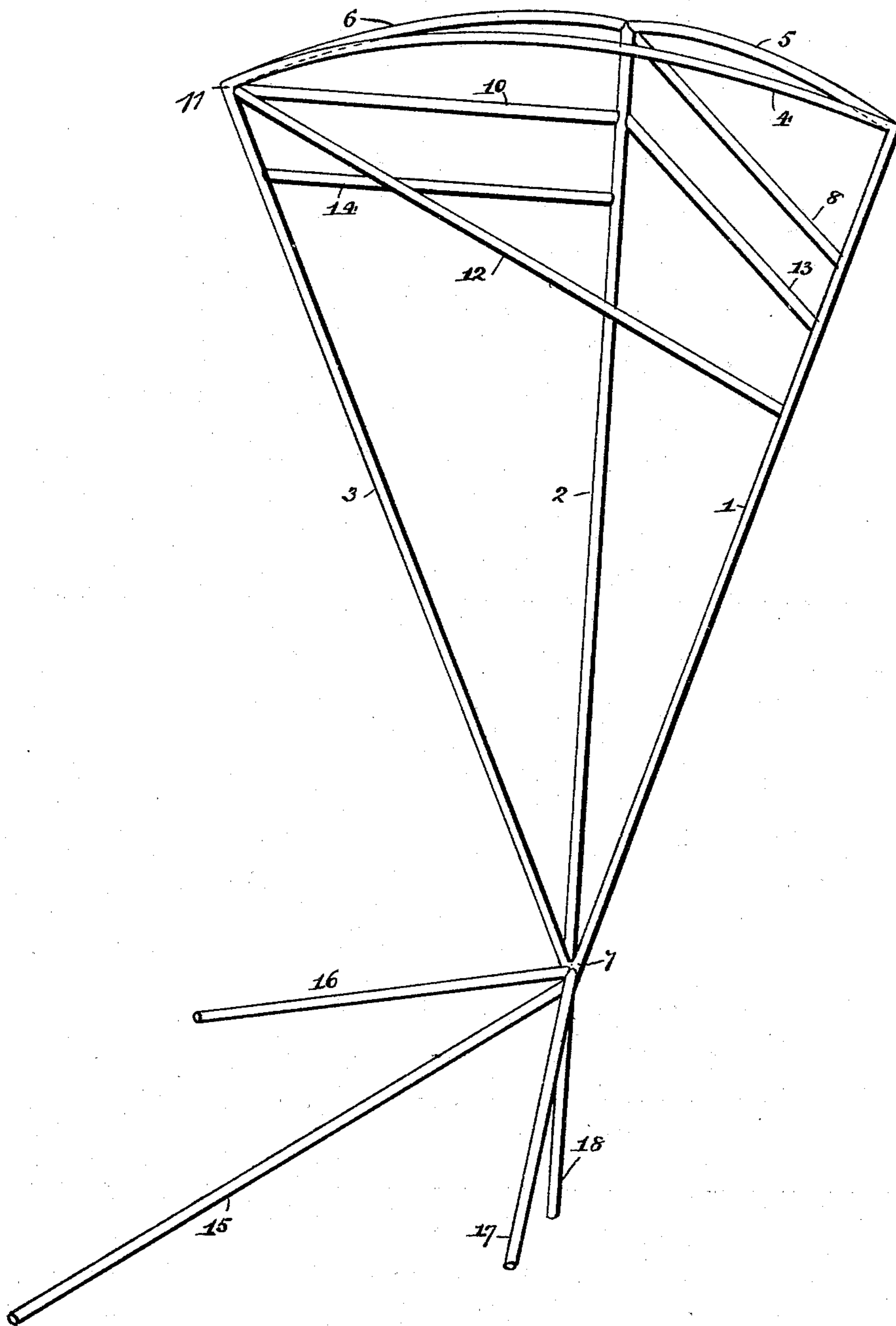


(No Model.)

A. MACFARLANE.  
EDUCATIONAL APPLIANCE.

No. 505,667.

Patented Sept. 26, 1893.



WITNESSES:

*H. Walker*  
*C. Sedgwick*

INVENTOR

*A. Macfarlane*

BY

*Munn & Co*

ATTORNEYS.

# UNITED STATES PATENT OFFICE.

ALEXANDER MACFARLANE, OF AUSTIN, TEXAS.

## EDUCATIONAL APPLIANCE.

SPECIFICATION forming part of Letters Patent No. 505,667, dated September 26, 1893.

Application filed April 7, 1893. Serial No. 469,429. (No model.)

*To all whom it may concern:*

Be it known that I, ALEXANDER MACFARLANE, of Austin, in the county of Travis and State of Texas, have invented new and useful Improvements in Educational Appliances, of which the following is a full, clear, and exact description.

The invention relates to educational appliances, and its object is to provide certain new and useful improvements for teaching mathematical mechanics and physics, in such a manner as to readily demonstrate and exhibit those principles of mechanics and physics involving directed quantities in space.

The invention consists in the particular construction and arrangement of parts, as hereinafter fully described and pointed out in the claim.

Reference is to be had to the accompanying drawing forming a part of this specification, in which the figure is a perspective view of the improvement arranged to demonstrate the cosine and sine of the sum of two angles having different axes.

As illustrated in the drawing the connected rods 1, 2, 3, 4, 5 and 6 represent a spherical triangle with 7 as the center of the sphere, and 4, 5 and 6 the sides. The sides 5 and 6 are the two angles having different axes, and the side 4 is their geometrical sum.

The rod 8 is at right angles to the rod 1 and extends to the junction of rods 5, 2, and 6. The rod 10 extends likewise at right angles from the rod 2 to the intersection 11 of the rods 3, 4 and 6. The rod 12 is at right angles to the rod 1 and terminates at the intersection 11. The rods 8, 10 and 12 represent the sines of their corresponding sides.

A rod 13 is arranged parallel to the rod 8 and joins the rod 2 at the intersection of the rod 2 with the rod 10, and represents the sine of the side 5 multiplied by the cosine of the side 6.

A rod 14 extends from rod 3 to rod 2 and parallel with rod 10, to represent the sine of the side 6 multiplied by the cosine of the side 5.

From the center 7 extend the rods 15, 16 and 17. The rod 15 has the direction of the axis of the plane of 4, and is equal in length to 12; it represents the axial sine of the side 4. The rod 16 has the direction of the axis of the plane of 5, and is equal in length to 13; it represents the axial sine of the side 5 multiplied by the cosine of the side 6. The

rod 17 has the direction of the axis of the plane of the side 6 and is equal in length to 14; it represents the axial sine of the side 6 multiplied by the cosine of the side 5.

The rod 2 has an extension 18 beyond the center, to represent the opposite of the axial sine of the angle between 16 and 17 multiplied by the sine of 5 and the sine of 6.

The rod 15 is equal in magnitude and direction to the diagonal of the parallelopiped formed by the rods 16, 17 and 18. This demonstrates that the axial sine of the side 4 is obtained by compounding the axial sine of the side 5 multiplied by the cosine of 6, the axial sine of the side 6 multiplied by the cosine of 5, and the opposite of the axial sine of the angle between the axes of the planes of 5 and 6 multiplied by the sine of 5 and the sine of 6. The axial sine so obtained is not only equal to 12, but it gives the axis of the plane of 4.

The several rods are differently colored to readily distinguish the same and the quantities they represent.

By arranging the several rods as described the teacher is enabled to readily demonstrate the proper relations of the parts represented by the rods, thus greatly facilitating the study of mechanics and physics.

It is understood that in order to demonstrate the various problems and propositions, different models are necessary, composed, however, of colored rods representing the individual quantities in space.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

A device for teaching mathematical mechanics and physics, consisting of the rods 1, 2, 3, 4, 5, and 6 secured together to form a spherical triangle, the parallel rods 8 and 13 extending from rod 1 to rod 2, the rod 8 being secured to rod 2 at its junction with rod 5, the rod 12 extending from rod 1 to the junctions of the rods 3, 4 and 6, the parallel rods 10 and 14 extending from the rod 2 opposite the rod 13 to the rod 3 and secured thereto at its junction with rods 4 and 6, and the rods 15, 16, 17 and 18 extending from the center 7 of the triangle, substantially as herein shown and described.

ALEXANDER MACFARLANE.

Witnesses:

GEORGE PIERCE,  
GEORGE KATCHUM.