



SCHMIDT DOME—Tube of the 48-inch Schmidt telescope-camera is visible within the dome atop Palomar Mountain.

placed halfway between the mirror and correcting lens, must be bent back a little to give sharp images.

Although a number of ingenious suggestions have been made to improve the Schmidt telescope, those of Harvard's young Dr. Baker are considered the most promising. His advanced design will reduce the length of the telescope and also eliminate the need for curving the plate.

Dr. Baker suggests that a second mirror be inserted within the telescope system. Under the new set-up, light entering

through the correcting lens proceeds to the concave spherical mirror, is reflected back to a convex spherical mirror which reflects it to the film. The second mirror straightens out the light rays so that a sharp image is produced on a flat photographic plate or film.

A telescope of the modified Baker-Schmidt type, the first of its kind to be built, is now under construction. It will have a 32-inch correcting plate and 36-inch primary mirror. The second convex mirror is 17 inches in diameter.

ASTRONOMY

Giant World Telescopes

► THE MAJORITY of the world's most powerful telescopes are located in the United States. This list of the "giants" includes their size, when completed, where located, and by whom operated.

Outstanding among the reflecting (mirror) telescopes are:

200-inch, 1948, Palomar Mountain, Calif., California Institute of Technology and the Carnegie Institution of Washington.

120-inch-to-be, Mt. Hamilton, Calif., Lick Observatory of the University of California.

100-inch, 1917, Mt. Wilson, Calif., Mount Wilson Observatory of the Carnegie Institution of Washington.

82-inch, 1939, Mt. Locke, Tex., McDonald Observatory of the Universities of Texas and Chicago.

74-inch, 1948, Pretoria, South Africa, Radcliffe Observatory.

74-inch, 1933, Richmond Hill, Ontario, David Dunlap Observatory of the University of Toronto.

72-inch, 1919, Victoria, British Columbia, Dominion Astrophysical Observatory.

69-inch, 1932, Delaware, O., Perkins Observatory of Ohio Wesleyan University.

Large refracting (lens) telescopes include:

40-inch, 1897, Williams Bay, Wis., Yerkes Observatory of the Universities of Chicago and Texas.

36-inch, 1888, Mt. Hamilton, Calif., Lick Observatory of the University of California.

32.7-inch, 1889, Meudon, France, Observatory of Paris.

31.5-inch, 1899, 1916, Potsdam, Germany, Astrophysical Observatory.

30-inch, 1914, Pittsburgh, Allegheny Observatory of the University of Pittsburgh.

Idea for Telescopes First Used for Lamp

Astronomy's most promising "big baby" among telescopes, the Schmidt-type instrument, might have been born about 20 years earlier. A similar arrangement, in reverse, was applied to searchlights by an American inventor. But it had to be applied to photographing the sky later.

In 1910 the late Dr. Gustav A. Hermann Kellner was granted patent No. 969,785, which he assigned to the Bausch and Lomb Optical Company, on "A Projecting Lamp." Essentially a reverse-Schmidt, no claim was made that this same type of system could be used in photography.

Later in Germany the Schmidt telescope-camera was developed.

Science News Letter, August 14, 1948

Scheduled to be completed within another year, this telescope-camera will be located at Harvard's South African station. It is to be operated jointly by the Armagh Observatory of Northern Ireland, the Dunsink Observatory of Eire, and Harvard Observatory.

The center of our Milky Way system is located in the constellation of Sagittarius, the archer. These star clouds are favorably located for studies at observatories in the Southwest United States, in Mexico, and especially in South Africa. They pass directly overhead at Harvard's Boyden Station at Bloemfontein, South Africa, where two of the world's largest Schmidts soon will start exploring them.

Science News Letter, August 14, 1948

30-inch, 1886, Nice, France, Bischoffsheim Observatory of the University of Paris.

Outstanding among wide-angle Schmidt camera-telescopes are:

60-inch-to-be, Bloemfontein, South Africa, Harvard College Observatory.

(Continued on p. 108)

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SUFFERN, N. Y.

Do You Know?

Persons can obtain *calcium* from milk, kale, collards, yellow cheese, mustard greens and turnip greens.

Disturbing *noises* of all kinds, from barking dogs to train whistles and flying planes, are being muffled by law in many American cities.

The 18-8 designation for stainless *steel* followed the discovery that a proportion of 18% chromium and 8% nickel in the steel was ideal for a great variety of steel products.

Mine-water problems in the Pennsylvania hard-coal region are of long standing but are growing worse; the average anthracite mine now pumps out about 13 tons of water for every ton of coal removed in comparison with an 8-1 ratio 25 years ago.

Hair molecules are long chains of atoms strung together with cross links, a scientist explaining the so-called *permanent wave* stated; in the waving process the cross links are broken, the hair formed into suitable shape, and cross links re-established.

48-inch, 1948, Palomar Mountain, Calif., California Institute of Technology and the Carnegie Institution of Washington.

48-inch-to-be, Upsala, Sweden, University Observatory.

32-inch Baker-Schmidt, scheduled for 1950, Bloemfontein, South Africa, Armagh Observatory of Northern Ireland, Dunsink Observatory of Eire and Harvard Observatory.

26-inch, 1942, Tonanzintla, Mexico, Mexican National Observatory.

24-inch, 1941, Oak Ridge, Mass., Harvard College Observatory.

24-inch, 1941, Cleveland, Case Institute of Technology.

Complete list of existing large telescopes is found in the appendix of *Telescopes and Accessories* (Blakiston Co.) by George Z. Dimitroff and James G. Baker.

Science News Letter, August 14, 1948

AERONAUTICS-METEOROLOGY

Flying in Thunderstorms

➤ A STROKE OF LIGHTNING which hits an airplane flying through a thunderstorm usually does little physical damage to the plane itself but is rated as one of the greatest psychological hazards to the pilot.

The brilliant flash of the discharge, the smell of pungent ozone, the accompanying noise and concussion may frighten even the most experienced pilot, Maj. Gen. H. M. McClelland, U. S. Air Force, Commanding General of the Airways and Air Communications Services, declared. The general spoke as guest of Watson Davis, director of Science Service, on Adventures in Science, heard over stations of the Columbia Broadcasting System.

If the flash occurs at night and the pilot is temporarily blinded, he might find himself trying to fly instruments and seeing nothing but blurred gauges; in heavy turbulence that is not contemplated with any enthusiasm, he added.

The general summarized experiences and lessons learned in a recent Thunderstorm Project carried out in Florida and an Ohio-Indiana area as a joint undertaking by the Air Force, the Navy, U. S. Weather Bureau, National Advisory Committee for Aeronautics, with the Civil Aeronautics Administration and the Civil Aeronautics Board cooperating. The findings are of value to both military flying and civilian air transportation.

In these thunderstorm investigations, airplanes played an important part. Black Widow Night Fighters of the Air Force were used because of their rugged design. When an approaching storm was located by radar, a number of planes took off and entered the storm, stacked at 5,000-foot intervals from 5,000 to 25,000 feet in altitude.

They were equipped to record on film the data of special instruments for measuring the extent and speed of the great updrafts and downdrafts, in addition to the smaller-scale but violent turbulence and sharp accelerations encountered in the storms. They also carried instruments for measuring temperature and electrical field, and were equipped with radar.

During the thunderstorm seasons in Florida and Ohio 150 thunderstorm days were studied, and 1,363 airplane flights were made through them. During these 1,363 flights, planes were struck by lightning 21 times. No major damage was done to the aircraft. However, lightning strikes burned off radio antennas and static discharge wicks, drilled holes up to the size of a dime in wing tips, rudders and elevators.

In addition to the use of planes in the thunderstorm studies, swarms of balloons, a surface micronet and radar were used. All four components worked together as a coordinated team. The balloons gave additional details on thunderstorm structure and circulation. Some were followed by

radar, others were equipped with transmitters and were followed by radio direction finders. The micronet consisted of 55 ground stations, each equipped with many types of weather recording instruments. Radar followed planes and balloons in flight.

Science News Letter, August 14, 1948

INVENTION

Golfers Taught to Hold Heads Steady by New Device

➤ GOLFERS all know that not moving your head wrong has as much to do with the success of a stroke as moving the club's head right. But correction of that fatal tendency to raise your head, or to move it right or left, isn't easy unless you have some way of knowing which way you move it, and how much.

This is just what a new device, invented by A. M. Newman and R. V. Miller of Los Angeles, undertakes to do. The golfer first takes a correct stance, presumably under the direction of his "pro." Then a band is slipped around his head, and a cord led from this to a box of electrical gadgets before him on the ground.

When he makes his practice swing, flashing lights of three different colors—red, green and white—will tell in which direction his head moved. Buzzers are also rigged, to give mechanized Bronx cheers in three different tones, according to what he does wrong. If he does two wrong things at once, like raising his head and moving it to the right, he gets it double.

U. S. patent 2,445,839 has just been issued on the new mechanized golf instructor.

Science News Letter, August 14, 1948

Science Service Radio

LISTEN in to a discussion on research upon feelings and emotions on "Adventures in Science" over the Columbia Broadcasting System at 3:15 p. m. EDST Saturday, Aug. 21. Watson Davis, director of Science Service, will have as his guests Dr. Martin L. Reymert, director of The Mooseheart Laboratory for Child Research, Mooseheart, Ill., and Malcolm R. Giles, executive director of the Loyal Order of Moose. They will report current findings in the application of psychology to everyday life, giving a forecast of the Second International Symposium on Feelings and Emotions to be held in Mooseheart and Chicago, Oct. 28-30.

Science News Letter, August 14, 1948

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