

cult task. The directions that come with such sets tell in detail how to do it, and generally the only tool required is a screw driver. Mostly, such changes will have to be made after the frequency

shift takes place, otherwise you could not set the buttons accurately. And while you are waiting to make the change, you can tune with the dial.

Science News Letter, March 22, 1941

ASTRONOMY

Astronomers' 1942 Almanac Has Material From Abroad

Information About Saturn Furnished by Germany; France Contributed Data on Jupiter's Satellites

DESPITE the war, foreign governments are still collaborating with the United States in producing the astronomer's bible, *The American Ephemeris and Nautical Almanac*, published each year by the U. S. Naval Observatory, part of the Navy Department.

The *Ephemeris* gives detailed tables of the positions of the sun, moon, planets and bright stars, information about eclipses, lists of observatories and other information that is essential to the astronomer. The volume for 1942 has just been released, so students of the heavens can now, if they wish, make plans for the coming year.

Director of the Nautical Almanac Office is Dr. W. J. Eckert, formerly of Columbia University, who assumed this post last year following the retirement of the former head, Dr. James Robertson.

Writing in the preface to the 1942 volume, Capt. J. F. Hellweg, U.S.N. (retired), superintendent of the Naval Observatory, states that the tables showing the positions of Saturn's rings, and the times when his moons are best seen, were furnished by the *Berliner Jahrbuch*, the corresponding publication of Germany.

The office of the similar French work, the *Connaissance des Temps*, furnished the tables of Jupiter's satellites. From the British *Nautical Almanac* office came tables of the positions of the sun, moon and planets. As in the volume for 1941, however, the name of the Spanish *Almanaque Nautico* is missing. For 1940 they furnished star positions.

Cooperation of the U. S. *Nautical Almanac* with foreign offices was authorized by Congress in the 1912 Naval Appropriation bill. This eliminated much needless duplication of work in the various countries. This act provided,

however, that the work on the *Ephemeris* be so conducted that, in emergency, all the tables needed for the navigation of American ships, both naval and commercial, could be prepared without any foreign assistance. This principle has been carefully followed ever since.

Only two eclipses of the sun are scheduled for 1942, the *Ephemeris* indicates. One is on March 16-17, visible near the South Pole, the other on Sept. 10, near the North Pole. There will be three eclipses of the moon, two partial, and one total, on Aug. 26. This will be seen throughout North America. Also, on a number of occasions during the year, the moon will "eclipse," or occult, the bright star Aldebaran.

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MILITARY SCIENCE

Inventions to Widen Arcs Of Fire from Machine Guns

TWO inventions, designed to give machine gunners in warplanes better all-around fire command, have just been granted patents by the U. S. Patent Office.

The first, covered by patent 2,233,642, is the design of John C. Sanders of Seattle. It provides for mounting three machine guns in a vertical zone around the fuselage of a plane. One of the guns is placed directly on the bottom, the other two on the sides near the top, so that the whole circle of the fuselage cross-section is divided equally between them. They can thus be trained so that at least one gun, and sometimes two, has fire command over any enemy approaching from above, beneath, or from either side.

Fore-and-aft command through at least a hemisphere is obtained by mounting each gun in a streamlined "blister" or



GRINDING

Once the correct reference face has been established by X-ray, the crystal, held securely at the base of the adjustable cylinder, is ground to the correct angle on a manually operated grinding spindle.

bulge. The guns lie along the long axis of these bulges when not in use, thereby minimizing the air drag due to projecting barrels and from the more abruptly jutting type of gun turrets now in use.

Each of the three guns may be served by an individual gunner, or, in smaller planes, one gunner may shift from one piece to the other, to meet changes in enemy position. With this system of mounting, the inventor claims, the entire plane is surrounded in a protecting sheath of overlapping fire fields.

Rights in the patent are assigned to the Boeing Aircraft Company.

The other invention, covered by patent 2,233,918, is a design for a nose turret for twin-engine bombers, devised by Howard M. Fey of Portland, Ore. It consists of a sphere made of safety glass or other transparent material, motor-driven to rotate from nearly straight-down to back of straight-up, and through slightly more than a half-circle from side to side.

Within this sphere sits the gunner, his hands and feet on a set of controls like those of a typical airplane. Regardless of what the pilot in his cockpit