RADIO

Radio Stations' Moving Day Is Coming on March 29

After 3 A.M. on That Date, Most of Your Favorite Stations Will Have New Dial Setting; Push-Buttons Off

See Front Cover

SATURDAY, March 29, will be "moving day" for the country's radio broadcasters.

After 3:00 a. m., on that date, most of your favorite stations will come in at a different dial setting from the one they have had for many years.

If you have a set tuned by push-buttons, they will no longer work properly.

For the radio station engineers, it will mean a good deal of work, and a complete change of at least one small but important part.

The result of all this, however, will be greatly improved reception throughthe nation, especially in rural areas.

Through the Federal Communications Commission, the U. S. government carefully polices the ether. From several monitoring stations in different parts of the nation, they watch all the broadcasters, to make sure that they stay in the band to which they are assigned.

On this account, the stations have taken careful pains to stay where they should be. But beginning on the 29th, almost all will have to make a change. Only those with present frequencies below 740 kilocycles will be unaffected. In most instances, the shifts will be slight, generally a little higher. In a few, however, the jump will be half way around the dial. A station at 1090 kilocycles, as an example, will go to 1310. On the other hand, one at 760 changes only to 770.

A small crystal of quartz, about as big as a lump of sugar, provides the control of frequency at the transmitter. Such a crystal, carefully selected, precisely cut to size, can be made to vibrate so that it yields exact electrical vibrations of any desired frequency. Such a circuit is used to run some of the most accurate clocks.

But the frequency determines the dimensions of the crystal, and that means that each of the 700 stations which will change must get a new one. It might be imagined that some swaps could be effected. A station now on 1190 kilocycles, that has to move to 1210, might send its crystal to one at 1160, which is changing to 1190. This, unfortunately, is not practicable. The stations are in widely scattered parts of the country. On Friday evening, March 28, they will still be at the old position, with the old crystal still in use. But that evening, you may be sure, they will all have the new equipment ready to change over by the throw of a switch.

The reason for all this trouble is to improve reception, and as a gesture of good will to our southern neighbors, in Central and South America. Present broadcasting assignments were made in 1928. Then there were no big stations south of the border, so small ones in Latin America could operate freely on the same channels as U. S. stations. Now they have big ones. Most powerful station in the western hemisphere is in Mexico City. Its power is 350 kilowatts, seven times the 50 kilowatts maximum allowed in the United States.

Some of these stations continued to operate on the same frequency as the U. S. stations, but their higher power interfered with them, except within fifty miles or less of the transmitter. Others tried to slide in between two American stations, but this was even worse. Already as close as practicable for them to be, with channel separations of 10 kilocycles, this meant that two U. S. broadcasters were affected.

To remedy this, an international conference was held in Havana in 1937 and new assignments were harmoniously worked out. Now Canada will have six exclusive channels, Mexico six, Cuba one, and the United States more than 40. In addition, certain channels are shared, where distances between stations are enough to prevent interference.

Changing push-button sets to operate on the new frequencies, is not a diffi-

PRELIMINARY TEST

A crystal of Brazilian quartz, weighing about six pounds, is given a preliminary examination under an arc-lamp by a worker of the General Electric Co. Many defects are thus detected. Perfect sections are ground and the crystals used to control the nation's radio transmitters. Not only broadcasters, but also Army and Navy stations, vital link in national defense, use a great many of them.

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.

Science News Letter, March 22, 1941

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 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.

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.

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