

molecule agrees with its symmetrical structure, and the zero moment for propane is consistent with the absence of moment in the higher members of the series and shows that any polarity in the C-C bonds, electrical dissymmetry caused by repulsion in the molecule or difference in electronegative character between the hydrogens on the primary and secondary carbons, is too small to measure. The small moments found for toluene and propylene are of the same magnitude as those which might arise from inductive effects in the molecules.

**Efficiency of Power Stations.** In a paper on "Power Station Efficiency" read to the Institution of Electrical Engineers on March 23, Mr. W. S. Burge discussed the processes involved in the generation of electricity from coal and examined the effects produced by 'releasing' the heat at various temperatures. The main factors connected with the efficiency are four. The first shows how it varies with the steam pressure and the vacuum conditions. The second shows whether the maximum efficiencies of the various components forming the plant all occur at the same time or not, and the last two the effects of regenerative feed heating and superheating. The

influence of the present physical limitations of the properties of metals, owing to the high temperatures used in practice, has also to be considered. The advances in the design of turbo-alternators in recent years have been so rapid that machines are now made which run at 3,000 revolutions per minute and have a capacity greater than 100,000 horse power. In the United States, it has been proved that when powdered coal is used, automatic control is more desirable than employing workmen. In one very large installation there, it is the habit of the 'watch' engineer to visit his boiler house only twice during an eight hour shift, although there is no one else in the boiler house. Mr. Burge considers that with no extension of steam conditions beyond about 650 lb. pressure per sq. in. and a temperature of 850° F., there is still wide scope for progress by making the plant item efficiencies have their values more nearly at the same time and thus improving the operating conditions. In his opinion, there is little scope for efficiency gain by using higher steam pressures and temperatures. Concentrated effort based on pressures of about 650 lb. pressure per square inch will produce the quickest and the best returns on the capital expended.

### Astronomical Topics

**Canals on Mars.** An article by H. Boyd Brydon on this subject has recently appeared (*J. Roy. Ast. Soc. Canada*, Feb. 1933). It is in the main a discussion of E. M. Antoniadi's recent volume on Mars, and gives reasons for differing from his conclusion that all the narrow straight markings on the planet are an illusion.

The article quotes the following sentence from G. W. Ritchey describing certain observing sites (including Flagstaff): "The conditions of atmospheric definition and transparency are at least as much superior to those at Mt. Wilson as the latter are to the average conditions at the important observatories of northern Europe and the United States. The overwhelming impressiveness, the incredible tranquillity of the night sky seen at these very high semi-desert sites are beyond all description and imagination."

It is noted that the equivalent focus of the camera used at Flagstaff for Martian photography is 180 ft. Statements are quoted from Dr. Slipher that the photographs confirm the drawings as to the existence of a network of dark linear markings, sensibly uniform and continuous along their length; the photographs include a few double canals, but these are exceedingly difficult objects.

It is pointed out that M. Antoniadi lays undue stress on the fact that some drawings of the canals do not conform strictly to the laws of perspective.

**Origin of the Solar System.** A note in the *Astronomical Topics* in *NATURE* of November 5, 1932, gave some account of articles by A. C. Gifford on the above subject that appeared in *Scientia* last year. The note suggested that in giving the views of Sir James Jeans as to the age of the planetary system, thousands of millions of years should be substituted for the value millions of millions, stated in his articles. Mr. Gifford now quotes a passage from Sir James Jeans's earlier writings which certainly does suggest

that he then assigned a more remote epoch for the stellar appulse than a few thousands of millions of years ago. Since that passage was written, much work has been done by cosmogonists in endeavouring to determine the age of the earth and the other planets. Their work is based on both astronomical and geological considerations, notably on a study of uranium and the products of its disintegration. The results are summarised by Dr. Harold Jeffreys in his book "The Earth"; the maximum estimate is about twelve thousand million years, the minimum one about a tenth of this. It is evident that Sir James Jeans now accepts these estimates; his article on Cosmogony in the "Encyclopædia Britannica", 14th edition (1929), vol. 6, p. 492, concludes as follows: "Our sun is a member of a colony of some thousands of millions of stars, the galactic stellar system. We do not know much about the number or arrangement of stars in the outlying parts of this system, but only in the dense central regions are stars at all likely to pass close enough to one another to produce planets. And here calculation shows that under present conditions planetary systems are only likely to be produced at the rate of about one in 6,000 million years. Thus our solar system with its age of only a few thousand million years is very possibly the youngest planetary system in the whole colony. Our terrestrial civilization, with only some 6,000 years of existence behind it, is almost certainly the youngest civilization."

**Annuaire of the Observatory of the University of Belgrade for 1933.** This *Annuaire* is a useful volume for all observatories engaged in meridian work. It gives apparent positions, at ten-day intervals throughout the year, of 240 fundamental stars for which ephemerides are not given in any other publication. There are also tables giving true sidereal time and the reduction from true to mean; the short period terms in the nutation are given for every day. There is also a list of new minor planets.