Monitor, and a large number of volumes dealing with the South African war of 1899–1902. The catalogue also includes more than sixty oil paintings by James Baines, who had a wide experience of southern tropical Africa, and was with Livingstone on his Zambezi expedition. The only other known collections of Baines's pictures are in the possession of the Royal Geographical Society and the museum at Kew Gardens. The catalogue is exclusive of Mediterranean Africa and the Red Sea border.

OUR ASTRONOMICAL COLUMN.

SUN-SPOTS AND PRESSURE.—A paper dealing with pressure data has been received from Dr. Gilbert S. Walker, who is engaged on a comprehensive statistical investigation in world meteorology with the object of laying the foundation of a secure system of seasonal weather forecasting. The data are treated as in the case of rainfall and temperature in preceding papers. For pressure the Indian area is characterised by negative correlation coefficients, whilst in the western hemisphere and boreal regions the opposite sign prevails. A general tendency is observable for the pressure coefficients to be opposite in sign to those for rainfall, indicating that their variations are dominated by a common cause, and temperature would seem to have little influence on either. Humidity, especially in the upper air, appears to control the relationship between sun-spots and temperature (Mem. Indian Met. Dept., vol. xxi., part xii., No. vi.).

HARMONIC ANALYSIS OF THE MOTIONS OF THE HELIUM STARS.—The dynamics of our stellar system are engaging an increasing degree of attention, and although Alcyone, and, recently, Canopus have been the suggested super-suns, it is still a question of establishing the existence of the general orbital movement. Prof. von S. Oppenheim adopts the working hypothesis that such movement exists, and some results of his work in this field were recently noted in this column (October 21). In an earlier investigation Prof. Oppenheim employed harmonic analysis to answer cognate questions. This is now recalled because these investigations have lately been carried a stage further (*Astronomische Nachrichten,* 4822). Pursuing the analogy drawn from the swarm of minor planets, he observes that a precise parallelism probably exists if instead of dealing with the totality of the stars the movements of the galaxy-grouping helium stars (type B) are alone taken into account. Employing the methods of the earlier papers to deal with the Lick results for the radial velocities of 233 stars of this type, taking proper motions from the Boss Catalogue, and making an approximation in regard to parallax, he finally obtains as developments of expressions involving respectively proper motions and radial velocities two Fourier series the terms of which are in good agreement regarding an orbital position angle of the sun, a result considered to establish the reality of the original hypothesis (*i.e.* that the stars, including the sun, move in circular orbits about one ideal centre). The numerical results which may be specially mentioned concern the position of this centre. Taking $\Omega = 234° \ 40'$ as the ascending node of the plane of the sun's way, with inclination $i = 53°$, then the sun viewed from the centre of the system appears in R.A. 203° 55', declination $-34° \ 0'$. The corresponding apex of the solar motion is R.A. 266°, and declination $+34° \ 37'$.

THE ASTRONOMICAL AND ASTROPHYSICAL SOCIETY OF AMERICA.—We have received a copy of the second volume of the publications of this peripatetic society. The meetings reported range from the eleventh, 1910 —attended by a number of important English astronomers—to the fifteenth, 1913. Abstracts are given of the papers. A most important feature of the volume is an appendix devoted to Halley's comet. The special committee of the Astronomical Society made suggestions that led to Mr. Ferdinand Ellerman taking an expedition to Honolulu to secure a record of the appearances presented by the comet during the spring of 1910. Two cameras were employed, a 6-in. Brashear, f.l. 31·8 in., and a Bausch and Lomb Tessar lens of 57 mm. aperture, and 251 mm. f.l. The greatest length of tail photographed with the latter was 50° on May 14. The photographs obtained are described by Prof. E. E. Barnard, and no fewer than forty-seven are reproduced. The dates range from April 26–June 6. The Comet Committee also publish a very extensive index catalogue of photographs of the comet, giving date, time of exposure, optical constants, place, and an indication of the technical quality of the photograph.

PROBLEMS OF EFFICIENT METHODS OF DOMESTIC HEATING.

THE determination of the efficiencies of different methods of heating is a problem very difficult to solve on a purely scientific basis. It is, indeed, difficult to attach a precise meaning to the expression "efficiency" in connection with heating apparatus. The word as commonly understood in connection with devices for the utilisation of energy in any form means the ratio of the total amount of energy utilised to that consumed. In a heating apparatus it is difficult to say what fraction of the energy is to be regarded as "utilised." If we regard that heat only as utilised which is delivered into *the air* of a room, in one sense every apparatus which when suitably disposed delivers almost the whole of its heat into the air of a room may be regarded as having nearly the maximum possible efficiency—100 per cent. Such, for example, is the electric low-temperature stove (not taking into account the generating mechanism or boilers from which the heat is ultimately derived), or the oil stove, or the gas radiator, which deliver the products of combustion into the air of the room.

But heat is delivered into a room not only by convection currents of heated air, but also by the conversion of radiant energy into heat. The proportion of the radiant energy which may be converted into heat is essentially uncertain. It depends on the position of the radiant body relatively to the windows, walls, furniture, etc., and on other circumstances. If therefore the "efficiency" of the apparatus depends on such extraneous considerations, it is evidently out of place to use, in connection with this matter, such a word as "efficiency," which has a precisely defined significance. Alternatively we are debarred from regarding the air heat as the only "utilised" energy.

Functionally, a heating apparatus is one by which a certain amount of heat energy is passed through a room to the outer air. As a consequence of its passage, certain thermal and other conditions in the room are maintained. If the resistance interposed between the room and the outer air is relatively high, the same flow of heat will maintain a higher temperature than if the resistance is low. In the limit if the resistance were supposed infinitely great, the thermal conditions might be conceived to be maintained without any expenditure of heat whatever. It