xxxiii., of *The Astrophysical Journal*. Feeling dissatisfied with the Crova alcohol actinometer obtained in 1902, Mr. Abbot conceived the idea of constructing a new form of pyrheliometer. This consists of a double walled, large test-tube blackened within, with a stream of water circulating between the double walls and absorbing the heat collected inside the chamber. The sun's rays shine into this chamber through a measured orifice, and the heat collected by the water is measured by a system of platinum wires forming a resistance thermometer.

Test experiments with electrically heated coils, in which the heat could be measured with great accuracy, have shown that the water system collects all the heat introduced within 1 per cent., and that the solar heat can be collected and measured to within 0·2 per cent. Thus the scale of the solar-constant observations of the Astrophysical Observatory is reduced to the absolute scale of calories (15° C.) per square centimetre per minute within a probable error of 0·2 per cent., an accuracy hitherto not attained.

DOUBLE-STAR OBSERVATIONS. Circular No. 6 of the Transvaal Observatory contains a list of about 350 double stars discovered with the 9-inch Grubb refractor of the observatory during 1910. Mr. Innes directs attention to the common statement that the southern heavens offer a practically unexplored field to the would-be double-star discoverer, and shows that this is by no means the case. The circular also contains a list of double stars discovered by Mr. Ward at Wanganui, New Zealand. The list contained observations of 212 stars, but has been revised, and in some cases the observations confirmed, by Mr. Innes.

Nos. 4486 and 4488 of the *Astronomische Nachrichten* also contain series of double-star measures, the former by Herr J. Voûte at the Leyden Observatory, the second a longer list of micrometer measures by Prof. H. E. Lau at Copenhagen.

MICROMETRICAL MEASUREMENTS OF NEBULÆ.—A useful catalogue of nebulæ lying south of the equator is published as No. 17 of the Publications of the Cincinnati Observatory. In the preface Prof. Porter explains that when the 16-inch Clark refractor was ready for work at the end of 1904 it was decided to observe those nebulæ of Dreyer's N.G.C. which have southern declinations, and the work has been carried on since. There was no idea of discovering new objects, but seventeen were found, of which nine appear certainly to be novæ. The catalogue includes the positions of 669 objects, with the micrometrical measures of them and of the companion stars.

THE MOTION OF CERTAIN STARS IN SPACE.—As an extract from the *Bulletin Astronomique*, we have received a paper in which Prof. Stroobant discusses the question of the sun being a member of a group of stars having a common motion through space. In the result, he finds a fairly strong indication that the sun does belong to such a system, which also comprises the stars α Cassiopeiæ, β Persei, α Persei, α Scorpionis, γ Cygni, and ε and α Pegasi.

## *THE COMPOSITION OF THE GASES CAUSED BY BLASTING IN MINES.*[1]

THE report before us was drawn up for the Government of Western Australia by Mr. E. A. Mann, the Chief Inspector of Explosives. The importance of investigations on the subject of the composition of gases caused by blasting in mines cannot be overestimated, since, hand in hand with the safety in actual use of blasting explosives, there is the possibility of accidents arising from the products of the explosion accumulating in badly ventilated headings. This risk has been recognised by several Governments, and investigations instituted. In the present case a most valuable and suggestive report is the outcome.

Nitroglycerine is the only largely employed explosive which contains more than sufficient oxygen for its complete combustion, and on firing should therefore yield only carbon dioxide, nitrogen, water vapour, and an excess of oxygen. The explosives investigated were mainly nitroglycerin explosives: blasting gelatin (nitroglycerin with approximately 10 per cent. soluble nitrocellulose), gelatin dynamite, and gelignite, both of which contain wood meal and potassium nitrate. Generally speaking, the former contains a slight deficiency of oxygen, whilst the latter two an excess.

The gases produced on firing under actual working conditions were collected by Mr. Mann, who wore for the purpose a Fleuss oxygen apparatus. In all 131 entries were made into the dangerous gases, and analysis invariably showed that carbon monoxide, which is so highly poisonous, was produced, together with small quantities of oxides of nitrogen, dangerous by reason of their physiological activity.

An important ratio obtained is that between $CO : CO_2$, which is a fair measure of the relative dangers of gas-poisoning with the different explosives. The highest is found with blasting gelatin (1 : 6·5), a general average for all the explosives being about 1 : 13. It is well known that pressure on firing exercises an enormous difference in the distribution of oxygen to form carbon dioxide or monoxide, high pressures increasing the $CO_2$, and this has an important bearing in practice. If the explosives mentioned are fired in a bomb, the maximum oxidation results, since maximum pressure is attained. In a rock, the greater the resistance, either from its character or the position of the charge, the lower should be the ratio $CO : CO_2$. The ideal condition would be where the rock only gives just when the maximum pressure is reached; but this is a condition impossible to realise in practice, so that holes are invariably overcharged, *i.e.* the rock is blown out before oxidation has been completed, hence the production of carbon monoxide.

Two very important points are brought out, first, the influence of the paper wrapper of the cartridge, which gives a deficiency of oxygen on the whole charge. Comparative tests with and without wrappers show that in the case of gelignite the ratio $CO : CO_2$ has been reduced from 1 : 16 to 1 : 51, and in the case of blasting gelatin from 1·95 to 1 : 52. Secondly, the influence of the physical condition of the powder; where the most intimate mixture of the ingredients is obtained, there is every chance of oxidation proceeding more rapidly to the maximum actually obtainable before rupture of the rock. Some excellent coloured plates of the microstructure of many of the explosives under polarised light emphasise the frequent heterogeneity of their structure.

The effect of fuse firing as compared with electric firing is carefully considered, and everything is greatly in favour of the electrically fired charge, fuses being responsible for much deleterious gas.

[1] Report on investigations into the Composition of the Gases caused by Blasting in Mines, by E. A. Mann, Chief Inspector of Explosives for Western Australia. (Perth: by authority: Fred. Wm. Simpson, Government printer.)

## *DRAINAGE AND MALARIA.*

IN India, the sanitary expert adviser of the complacent type must either "bend or break" under the weight of official opinion (held as strongly by the youngest Under-Secretary as the veteran Financial Member) that the Sanitary Department must be classed financially as "unproductive," and must therefore be, in its representations involving expense, tactfully unobtrusive. Hence, possibly, the unconscious evolution of the policy of "quinine prophylaxis," which would relieve the Government of India from applications for loans and "free grants" for radical anti-malarial measures, such as drainage works, requiring the sinking of capital, and would throw upon the inhabitants of malarious areas (who are notoriously impecunious as a sequence of disability to labour) the onus of purchasing an expensive drug—through an indefinite number of years.

In connection with the letter in NATURE of February 9 by Dr. Bentley—one of the small circle of supporters of this policy—and the reply thereto by Dr. Malcolm Watson, there is now available a record[1] of facts at issue, which will enable those interested in a question of much import-

[1] "The Prevention of Malaria in the Federated Malay States." By Dr. Malcolm Watson, with a preface by Prof. Ronald Ross, C.B., F.R.S. Pp. 139. (Liverpool: School of Tropical Medicine, 1911). Price 7s. 6d.