fan to remove gas from shelters could really be effectual only after first dealing with the area round the shelter. That is one reason for the relative decline in the fortunes of the Ayrton fan. I say *relative*, as large numbers of such fans were issued even during the winter of 1917–18, and, for all I can remember, still later. Other reasons were the natural and rooted objections of the regimental officer and soldier respectively to be responsible for, or to load himself with, stores of (to him) problematical value, and the growing favour shown to the alternative fire method. (It was said, perhaps not without malice, that Ayrton fans were often used for clearing shelters from gas—by fire!)

However that may be, there was no demand by troops for the fans towards the end of the war; on the contrary, we were besought to withdraw them. I know this myself from many personal interviews with regimental officers and from reports furnished by Gas *personnel* of every type of unit and formation. There were, of course, up to the end of the war gas casualties caused by men sleeping in shelters which might have been successfully cleared of gas either by the fan or by fire. They were, however, owing to the particular properties of "mustard gas," a small proportion of the whole; and fatigue and ignorance and the exigencies of the battle were their causes.

I must, therefore, characterise as quite unfounded the view that much suffering and loss of life could have been avoided by increasing the provision of Mrs. Ayrton's fan. Regimental and Gas Services *personnel* were both far too anxious to reduce gas casualties in every way practicable. It was ultimately the fighting soldier who decided, after weighing all the facts of the situation, that the fan, useful in sound and well-established trenches, was scarcely "worth while" during the advances and retirements of 1917–18 or in the mud and pill-boxes of the Ypres salient—this apart from the question of "mustard gas." Mrs. Ayrton is very obviously sincere, but, like another distinguished civilian who has recently written on camouflage, is not quite *au fait* with the realities of the battlefield. Exaggerated attacks of this nature on the War Office are liable to defeat their own ends, and also to neutralise the efforts of others who are trying to ensure the application of scientific methods to military problems in a more systematic manner than has been the case in the past.

A. J. ALLMAND.
(Late Chemical Adviser to Fourth and to Second Army Headquarters.)
King's College, W.C.2, June 7.

Attainment of High Levels in the Atmosphere.

I MUST confess that I am very sceptical as to a sounding balloon having reached 37,000 metres or a pilot balloon 39,000 metres, as mentioned in NATURE for June 3, p. 437, although such heights would be possible if sufficiently large balloons were employed.

A sounding balloon as commonly used is a small india-rubber balloon expanded by hydrogen to about twice its natural diameter, and then securely tied up. The rubber stretches as the balloon ascends, until finally it can stretch no further and the balloon bursts. Under the supposition that the pressure and temperature of the gas inside are the same as those of the air outside, and under average conditions of temperature for Europe, the following rules hold: The starting diameter is doubled at a little more than 16 km., trebled at a little more than 24 km., and quadrupled at 30 km. Since the starting diameter is about double the natural diameter, this means that at 30 km. the rubber has stretched eightfold linearly and its thickness been reduced sixty-fourfold. I do not think any rubber that will stand this treatment can be found.

On the other hand, a precise calculation of a great height is in practice impossible. We can only measure the pressure, and when the air pressure is greatly reduced a very small error in the pressure makes a large error in the height.

For a pilot balloon, if the balloon is near the zenith and the base line for the theodolites a long one, there is not so much risk of error; but if, as is usually the case, the balloon has drifted a long way, particularly if it has drifted in the direction towards which the base line points, then a small error in the setting of the theodolites or in reading the angles will make a great error in the height.

It is desirable that when the recorded height has reached an abnormal value the computer should give full details and state his reasons for believing it to be genuine, otherwise one is apt to think some mistake has crept in.

W. H. DINES.
Benson, Wallingford, Berks, June 4.

Central Wireless Station for Astronomy.

IN the "Astronomical Column" of NATURE of May 27 it is stated that "Prof. Kobold, editor of *Astr. Nachrichten*, and director of the Central-stelle, delegated the latter work to Prof. Strömgren, Copenhagen, during the war, but has now resumed it, and announces in *Astr. Nach.*, 5044, that arrangements have been made for the distribution of astronomical information by wireless telegraphy from the Nauen station."

It will be remembered that, in pursuance of resolutions adopted by the International Scientific Academies at London and Paris in 1918, there was established at an international conference held at Brussels in July, 1919, among other Commissions, a Commission of Astronomical Telegrams, with a central bureau at the Royal Observatory of Belgium (Uccle), to replace Kiel, for the purpose of receiving, centralising, and dispatching information concerning astronomical discoveries, observations, and calculations, either by telegram or post, to the various institutions or private persons subscribing to it.

Surely with such an organisation in full working order this Commission should undertake the dispatch by wireless of astronomical information of great urgency, such as the appearance of a new star, etc., if such information is going to be distributed by wireless at all!

Practically every observatory in Western Europe now takes in the time and weather signals from the Eiffel Tower, and any news of an astronomical nature could be easily transmitted to that station from the central bureau at Uccle (or Brussels) and re-transmitted from the Eiffel Tower at, say, 10.00h. and 16.00h., the standard times of transmission of the time and weather signals.

Before the war the Central Bureau of Astronomical Telegrams was located at Kiel, but this organisation has *ceased to exist* from an international point of view. There seems no object, therefore, in reviving it at Nauen (near Berlin) purely for the sake of this wireless astronomical information, when this mode of dispatch can be as easily adopted in Western Europe for this purpose.

Prof. Kobold seems not only to ignore the existence of the new International Central Bureau in Belgium, but also assumes that the war has made "no difference."

WILLIAM J. S. LOCKYER.
Hill Observatory, Sidmouth, S. Devon,
May 28.