Power from the Sun.

WITH reference to Mr. A. S. E. Ackermann's letter in NATURE of January 15, in which he states that, in putting the possible efficiency of obtaining power from the sun with the heat engine at less than 2 per cent., I have used too low a figure, I may point out that, whereas Mr. Ackermann's figure of 4·32 per cent. was a maximum obtained presumably under specially favourable conditions, and as I understand in Egypt, in suggesting a figure of less than 2 per cent. I was referring to what could be expected "in this latitude and in this climate"—that is to say, in England, and also as an average during the hours of daylight throughout the whole year.

For the purpose of my argument, and in comparison with the very much higher efficiencies that are theoretically possible if the radiation can be directly utilised without first turning it to heat, with the consequent avoidance of the second law of thermodynamics, I do not think that the difference between 2 and 4 per cent. is of much importance; but, even so, I should be surprised to learn that Mr. Ackermann would expect to obtain an efficiency of even 2 per cent. anywhere in England throughout the year.

A. A. CAMPBELL SWINTON.

66 Victoria Street, S.W.1, January 17.

Sedimentation of Blood Corpuscles.

I HAVE noticed lately that if oxalated or defibrinated blood is put to stand in narrow tubes, the corpuscles sediment a good deal faster if the tube is inclined than when it is vertical. Thus with tubes about 2·7 mm. internal diameter there were, after 20 hours, 4, 23, 35, and 42 per cent. of clear serum with tubes inclined at 0°, 22½°, 45°, and 67½° respectively. In another rough experiment with tubes of different diameters, all filled to a height of 40 mm. with diluted blood, after 5 hours there were the following proportions of clear serum:—

mm. diam.	Vertical Per cent.	11¼° Per cent.	22½° Per cent.	33¾° Per cent.
2·7	6	20	29	51
8	5	10	15	21
14	4	5	9	12

The phenomenon seems to depend on the *vertical* height of the columns of blood, and it occurs to me that the slight Brownian movement of the lower corpuscles may interfere with the sedimentation of those above. But I should be glad if someone would tell me the explanation: the phenomenon is perhaps well known in some other form. A. E. BOYCOTT.

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The Einstein Theory and Spectral Displacement.

ONE of the "crucial phenomena" in connection with the Einstein theory is the displacement of the spectral lines towards the red when the emitting atom is in a position where the gravitational potential is large.

In the case of the sun this displacement is so small that its existence is a matter of doubt. But the amount of the displacement varies as the mass of the sun or star concerned, divided by its radius, and in the case of giant stars, such as Canopus, Arcturus, or Antares, should give a result corresponding to a recession of many hundreds, if not thousands, of kilometres per second, whereas, in fact, these stars show no abnormal radial velocities.

It may be pointed out that the effect varies as the product of the area and density, factors as to which the magnitude and spectrum of a star enable astronomers to make a fair approximation, at any rate as to minimum values.

These facts must, of course, have been considered by the supporters of the theory, and I think that an explanation would be interesting and useful.

H. FLETCHER MOULTON.

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MR. FLETCHER MOULTON is quite correct in stating that the shift of the spectral lines varies as mass/radius, but his expectation of spectral shifts measured by hundreds or thousands of kilometres per second does not appear to be justified. All the evidence available, deduced from visual binaries, Algol variables, and spectroscopic binaries, points to the conclusion that the masses of the stars vary between much narrower limits than their brightness. We have no clear evidence of any star having a mass so great as forty times that of the sun; moreover, the most massive stars known to us are apparently in a much more diffused state than the sun, so that the ratio of spectral shifts is much less than that of masses.

We cannot use individual stars to test the Einstein effect, for we do not know the radial motion independently of the spectroscope, as we do in the case of the sun. All that we can do is to take the mean of a large number of spectra and see whether there is a systematic shift towards the red; such a shift does exist, and the difficulty is rather that it is too large than too small to ascribe wholly to the Einstein effect. Thus Campbell ("Stellar Motions," p. 199) says: "Of Type II. stars (that is, F5 to M), 371 have positive velocities and 352 negative. Of Type I. stars (that is, O to F4), 215 have positive velocities and 122 negative." Subdividing further, he gives the following mean velocities of recession in km. per second: B to B9, 4·93; A, 0·18; A2 to F8, 0·60; G to M, 0·91. Dr. de Sitter, taking the average mass and density of a B star as 10 and 1/10 respectively, finds 1·4 for the Einstein effect, about one-third of the observed quantity.

We do not know the character of the atmospheric circulation in the stars; this, as well as pressure effects, may well have some influence on the mean results. Taking the stars as a whole, it must be admitted that their verdict, though by no means conclusive, is, so far as it goes, in favour of Einstein.

ANDREW C. D. CROMMELIN.

Use of a Prismatic Binocular for Viewing Near Objects.

A FEW years ago, with a view to the observation of close objects out of doors, I procured some glass adapter lenses for use on the object glass of the half of a prism binocular (×12) which I carried about with me. Finding, however, that this method involved the use of several glass adapters, and that with it I had to know the exact distance of my objective, I prevailed on an optician—after lengthy argument, he deeming the experiment impracticable—to remove the eyepiece and refit it for use with a long screw thread. The result was most satisfactory; by this device I can draw out the eyepiece and adjust it to the proper distance for any observation down to four feet off. This device is also very useful for indoor work, such as observation on the occupants of an aquarium.

The device may be useful to other observers, who will find that the necessary alteration can be easily made. D. WILSON BARKER.

Flimwell.