

This account is written by someone to whom the dynamical problem is a reality and no theoretical abstraction: he employs throughout the gravitation measure of force, and to an engineer there is no ambiguity in his use of the words pound and ton sometimes in the sense of mass or weight and sometimes in the sense of force.

Prof. A. B. W. Kennedy, in his "Mechanics of Machinery," pp. vii. and 222, has called attention to the same ambiguity of language, and points out that the word pound is used in two senses (three senses when pound-sterling is to be distinguished), which he proposes to distinguish as weight-pound and force-pound; not, observe, mass-pound and weight-pound as the mathematician would have us call them.

An article in the current number of *Wiedemann's Annalen*, No. 6, 1887, by A. Oberbeck, "Ueber die Bezeichnung der absoluten Maass-systeme," shows that a similar controversy on dynamical terminology is now going on in Germany.

The mathematical definition that "the weight of a body is the force with which the earth attracts the body" must disappear and be replaced by "the attraction of the earth on a pound, a ton, or a kilogramme, is called the force of a pound, a ton, or a kilogramme;" these are gravitational units of force, derived originally from statical considerations, but used in practice for dynamical problems also; but inasmuch as the magnitude of these units depends on the local value of g , they are unsuitable for astronomical or electrical purposes, and are now replaced in such cases by the absolute units of force, the poundals, dynes, &c.

The defect of modern dynamical teaching is the unreality of its applications; it is too much the "dynamics of a particle." Were the student accustomed to examples taken from the magnificent problems presented by the latest industrial developments, he would become accustomed to the use of gravitational and absolute units of force, and recognize their respective advantages.

A. G. GREENHILL.

Woolwich, May 30.

Upper Cloud Movements in the Equatorial Regions of the Atlantic.

RECENT communications to your paper have given the motion of the upper clouds from the eastward in the equatorial regions of the Atlantic. My observations (the result of having passed through these regions sixteen times in sailing-ships) give the motion of the upper clouds from the westward; and the motion of the intermediate cloud layers, consisting of the high low-level stratiform clouds (cirro-cumulus and such like), from a point somewhat to the north of east on the north side of the equator. Intermediate clouds are rare in the equatorial regions south of the Line. The high low-level clouds are constantly being confounded with the true high clouds.

There is another source of error in noting upper cloud movements; little attention has been paid to a movement of propagation. So marked is this at times, that they are propagated over the sky quicker than they are moving, this movement being frequently at right angles to the direction of motion.

DAVID WILSON-BARKER.

The Shadow of Adam's Peak.

THE shadow of Adam's Peak, to which Mr. Abbay refers in his letter to *NATURE*, vol. xxxvi. p. 152, is certainly not the kind of shadow that I witnessed, but that which is only seen in the clearest weather and without the intervention of mist. This is mentioned in one of the last paragraphs of my paper.

Nevertheless, I cannot think that mirage has anything to do with that shadow. When the Observatory was first established on Pike's Peak, the observers used to see the shadow of the mountain rising against the sky on the far distant horizon. At first they thought this very curious, but soon found that the appearance was always there in very fine weather.

Further observation showed conclusively that the appearance was simply the ordinary earth shadow of sunrise projected so clearly against the sky, that an irregularity such as a sharp peak could be distinguished on the edge of the generally circular shadow.

I do not think that mirage has anything to do with this antiprecipular shadow, but no doubt there are abundant thermometric observations in America for anyone who wishes to investigate the subject further.

RALPH ABERCROMBY.

21 Chapel Street, London, June 17

Temperature and Pressure.

I HAVE to thank Mr. S. A. Hill for replying to my letter, and it is most interesting to know that the same connexion between temperature and pressure exists in India as in Jamaica (*NATURE*, vol. xxxv. pp. 437, 606).

No doubt, as Mr. Hill observes, different localities will have different values of the coefficients λ and μ in the equation—

$$\delta T = \lambda \delta P + \mu (\delta P)^2;$$

indeed, we must expect very different values; but still, by putting $\delta P = 0$ in the equation for *minimum* temperatures, each locality should give the same limiting temperature, which we may regard as the temperature of space.

It is of course to such concordance that we must look for the determination of the temperature of space, so defined, rather than to extreme care in the taking of observations in any one particular part of the world.

With reference to Mr. Hill's remarks about extrapolation, it is hardly necessary for me to point out that astronomical refraction is caused by the whole terrestrial atmosphere, and that some law between temperature and pressure must be adopted before refraction-tables can be constructed; Mr. W. H. M. Christie, the Astronomer-Royal, has, in the *Memoirs R.A.S.*, vol. xlv. p. 177, recently pointed out how errors may arise from this source.

Indeed, errors must arise from this source. In Jamaica the values of λ and μ are not the same for mean and minimum temperatures, or, roughly speaking, for day and night; neither is it to be expected that they will be the same anywhere else. But enough has been said to indicate the importance of the problem, and the steps which should be taken for its solution.

Jamaica, June 6.

MAXWELL HALL.

British Association Sectional Procedure.

IN reference to Prof. Thompson's letter (June 16, p. 151), will you allow me to say that in 1884 I went from the meeting of the Association of American Microscopists at Rochester, N.Y., to that of the British Association at Montreal. At the former the proceedings commenced daily at 9 a.m., closing about noon, and another short session was held in the afternoon. The middle of the day was thus left at liberty for Committee work, sight-seeing, or rest, and the greater amount of work got through in the day as compared with the usual plan at our Association was very striking.

ALFRED W. BENNETT.

6 Park Village East, Regent's Park, June 18.

Mirage.

THIS afternoon, shortly after 4.30 p.m., my attention was drawn to an extraordinary and wonderfully perfect "mirage." My house, situated almost on the extreme point of Hartlepool, near the Heugh Lighthouse, overlooks with a south aspect the Hartlepool or Tees Bay, Redcar, Saltburn, and in clear weather a beautiful high coast-line stretching from Saltburn to Staithes. When first seen, all the houses of Redcar, some seven miles distant, and lying almost at sea-level, were enormously elongated to at least six or seven times their ordinary height, and looked like high square towers with intensified colouring. I could not however determine (with the aid of an opera glass) whether the phenomenon was a simple elongation or whether the upper part of the "mirage" was an inverted image of the houses. I am inclined to think that the lower two-thirds was an elongation of the buildings, while the upper third was an inverted image.

During the height of the mirage a dark misty stratum of air, bounded by a distinct upper margin parallel with the horizon, and decreasing in density towards it, stretched from the western end of Redcar through an arc of almost 90° seawards. I estimated the height of this stratum at 35' to 36' of arc. After some 10 minutes the "mirage" gradually dwindled over Redcar, but remained distinctly visible for a short time longer over Saltburn, the coast-line, and out to sea. At Saltburn, about 11½ miles distant, some of the buildings were duplicated, a white house being visible as two spots widely separated. The normal coast-line south of Saltburn was obscured by the haze, but a beautifully clear "mirage" of it was visible, taking as its horizon the upper margin of the misty air stratum, the horizon being thus bodily raised through some 36' of arc. Out at sea in an almost easterly direction a smoking steamer was faintly visible with an inverted