northern hemisphere. The second, as well as the first, of these roots appears to represent stable conditions, and thus a depression revolving with high speed in a clockwise direction in the northern hemisphere is dynamically possible. In practice evidently such a condition could not get started on a large scale, as the rotation of the earth would inevitably cause the turning movement to commence in the normal direction. On a small scale, however, eddies round corners of houses or precipitous headlands might evidently be set up with revolution in either direction. It appears from the above that such rotation once started may, under favourable conditions, persist and develop into a dust whirl or tornado, with revolution either clockwise or counter-clockwise according to the direction of the initial impulse. One cannot impress too strongly on all observers of such phenomena the importance of noting in which direction the rotation is taking place.

J. S. DINES.

66 Sydney Street, S.W.3, December 5.

Fuel Economisers.

WITH regard to the fuel economiser designed by Prof. C. V. Boys, and described in NATURE of November 28 (p. 249), I may mention that I have lately been making experiments in the same direction. In the arrangement tested by me the economiser consisted of a large rectangular metal box fixed over the upper part of the grate. The products from the fire were led by a horizontal flue above the fire into the lower part of the box, in which they ascended and heated it, after which they were drawn back to the chimney by a flue over the one by which they entered. The result was a considerable increase in the efficiency of the fire, but on removing the box to make some check readings under ordinary conditions it was found that the arrangement was impracticable. The flues were so coated with soot that it was evident that the box would require to be too frequently taken out for cleaning to make it worth adopting; and I fear Prof. Boys's arrangement will be liable to the same disadvantage. I should, however, mention that the coal used by me was not good, and was very smoky.

With regard to the objectionable appearance of these economisers, I may state that their appearance can be improved by painting them with suitable colours, as it is not necessary to use black. All paints—with the exception of aluminium—with which I am acquainted radiate equally well for heat of wavelengths given out at the temperatures employed. White, or any colour, is as good as black for the purpose. The same remarks apply to colours with which hot-water radiators may be painted. The colour which harmonises best with their surroundings may be used without reducing their efficiency.

A great deal of the heat lost in the ordinary loosely fitted-in fire-grate might be saved if the fitting in was modified in the following way:—The bottom of the chimney is closed by a large sheet of metal, so as to make the fireplace-opening into a closed chamber; the grate is drawn forward two or three inches to allow of free circulation of air into and out of this chamber at the back of the grate, while the fire is provided with a chimney passing through the sheet of metal forming the roof of the chamber. By this arrangement the air heated by the hot back of the grate, which now goes up the chimney, would be sent into the room. In new grates it might be advisable to increase the amount of heat communicated to the grate by the fire, and also to increase the back surface of the grate by projections, flanges, etc. Great as the heat losses are in room-fires, it is admitted by all that

it is our kitchen-ranges which are the great coal consumers and where improvement is most urgently called for.

JOHN AITKEN.

Ardenlea, Falkirk, November 30.

THE trouble of cleaning referred to by Dr. Aitken has not in practice been found more than a minor inconvenience, and provision to make this easy is incorporated in the design. I agree with Dr. Aitken that, considering the radiating power alone, there is nothing in the colour, but it is desirable to employ an "enamel" stoved on so as not to smell if the temperature is raised, and I do not know that this can be done equally well with colour. While saving of fuel is most important and urgent at the present time, equable distribution of heat about a room has also its advantages, and it remains to be seen if this result brought about by my device will not itself more than compensate hereafter for the presence of the unobtrusive, if somewhat plain, heat interchangers—or "heavenly twins" as they were called by the first to benefit by their presence.

C. V. BOYS.

A Mistaken Butterfly.

IN NATURE of September 5 last an Australian correspondent notes the attraction of the blue knob of a hatpin for a butterfly. When playing golf in Gulmarg (Kashmir) this summer I was frequently put off by a large butterfly settling on the ball just as I was making a stroke. I make a point of keeping my ball white and clean, and the butterflies evidently mistook it for a white flower.

S. ROBSON.

Prince of Wales College, Jammu,
October 27.

CHEMICAL CORRELATION IN THE GROWTH OF PLANTS.

WHEN the apical shoot of a fir tree is broken off or injured, it is a familiar fact that one of the lateral branches below changes its direction of growth in order to take the place of the original apical shoot. The change of direction is accompanied by greater vigour of growth. These phenomena attracted the attention of Errera,¹ who suggested, as the reason why the lateral shoots do not tend to grow vertically while the apical shoot is intact, the possibility that the latter might produce inhibitory substances of a chemical nature which travel downwards to the other parts of the tree. Direct evidence was not then available, but the hypothesis has since received confirmation from certain experiments by Dr. Jacques Loeb, who appears to have been unaware of Errera's suggestion.

Although the phenomena are of general occurrence, Dr. Loeb found the tropical plant, *Bryophyllum calycinum*, an appropriate one for the purpose of investigation. The stem carries a series of buds, each in the axil of a leaf, while the leaves themselves are also provided with buds in notches around their edges. Under ordinary conditions all these buds are dormant. But they can be made to grow by various procedures. The common experiment of taking a willow shoot, cutting off the leaves and suspending it horizontally in moist

¹ Brit. Ass. Reports, 1904, p. 814. "Conflits de préséance et excitations inhibitoires chez les végétaux," Bull. soc. roy. botan. Belgique, vol. xlii., 1904; reprinted in "Œuvres Physiol. Gén.," p. 101. (Bruxelles, 1910.)