

PROCEEDINGS  
OF THE  
GEOLOGICAL & POLYTECHNIC SOCIETY  
Of the West-Riding of Yorkshire,

AT THE FORTIETH MEETING, HELD IN THE GUILDHALL,  
DONCASTER, ON WEDNESDAY, AUG. 24TH, 1853.

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EDWARD SCHOFIELD, Esq., M.D., in the chair.

The following gentlemen were proposed as Members of  
the Society:—

WM. BECKETT, Esq., M.P., of Kirkstall Grange.

PETER FAIRBAIRN, Esq., of Woodsley House.

JOHN McLANDSBOROUGH, Esq., C.E., of Otley.

Rev. PRIPPS CHAMPNEYS, of Skellon, Doncaster.

The Chairman, after briefly addressing the Society, and  
announcing the subjects of the communications to be brought  
before the Meeting, called upon W. S. Ward, Esq., of  
Leeds, to read the first paper—

ON A NEW THERMOSTAT FOR REGULATING VENTILATION.

BY W. S. WARD, ESQ., LEEDS.

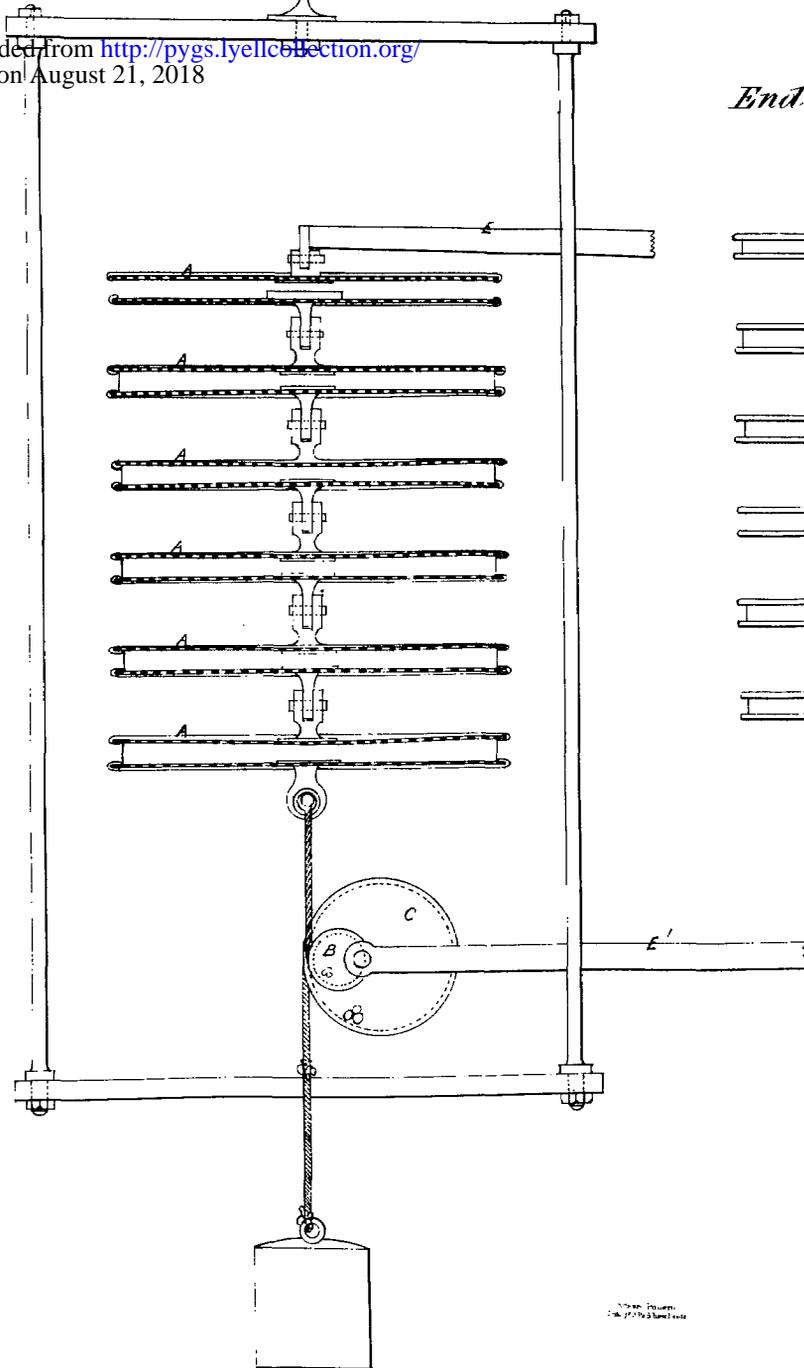
Mr. Ward said—Having been engaged in horticultural  
pursuits, he had found that it was desirable to have some  
instrument for regulating the ventilation and temperature of  
hothouses, without requiring the close attention of the gar-  
dener. He then described the invention which he calls a  
Thermostat, and which consists of metallic vessels, in which  
the vapour of a volatile liquid is used to give motive power for  
opening or shutting ventilators, or dampers, or regulating the

flow of hot or cold water, or similar applications for regulation of temperatures. The vapour of æther has been used for such purposes when confined in tubes by mercury, but in such apparatus the amount of power to be obtained is much limited by the weight and consequent expense of mercury required. He makes use of vessels of thin metal, of which the ends or sides being discs of metal, are so thin and flexible as to be changeably either convex or concave, and in which the vapour of sulphuric æther (or of suitable volatile liquid), along with a portion of such liquid, is enclosed; the discs or ends of such vessels acting as diaphragms, separating the vapour from the external atmosphere, will, at temperatures under the boiling point of the fluid employed, be pressed inwards by the atmosphere, but with a pressure varying according to the temperature. He therefore attaches a counterpoise of sufficient weight partially to counteract the pressure of the atmosphere, so that the differential pressure of the æthereal vapour above or below the degree at which the pressure is counterbalanced, gives motive power. And as the extent of motion from each of such moveable surfaces is very slight, he combines several of such vessels together, so as to have several moveable ends or discs; and as there is a peculiar action when a weight is employed to extend such discs, it is advisable to use a combination of two pulleys, placed eccentrically on the same axis, so that a descending weight may operate in a rapidly increasing ratio. Motion being thus produced, it is obvious that if the Thermostat be geared to the ventilators of hothouses or of buildings, and to pipes supplying hot or cold water, or to dampers of furnaces, and to numerous similar purposes, by a sufficient size and number of flexible surfaces, any reasonably required power and extent of motion may be obtained.

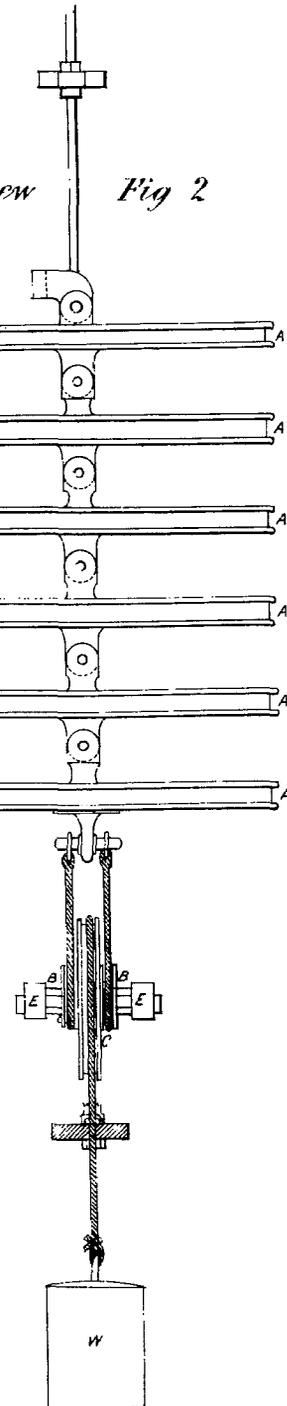
Mr. Ward then exhibited the apparatus, of which a drawing is annexed.

Side View Fig. 1.

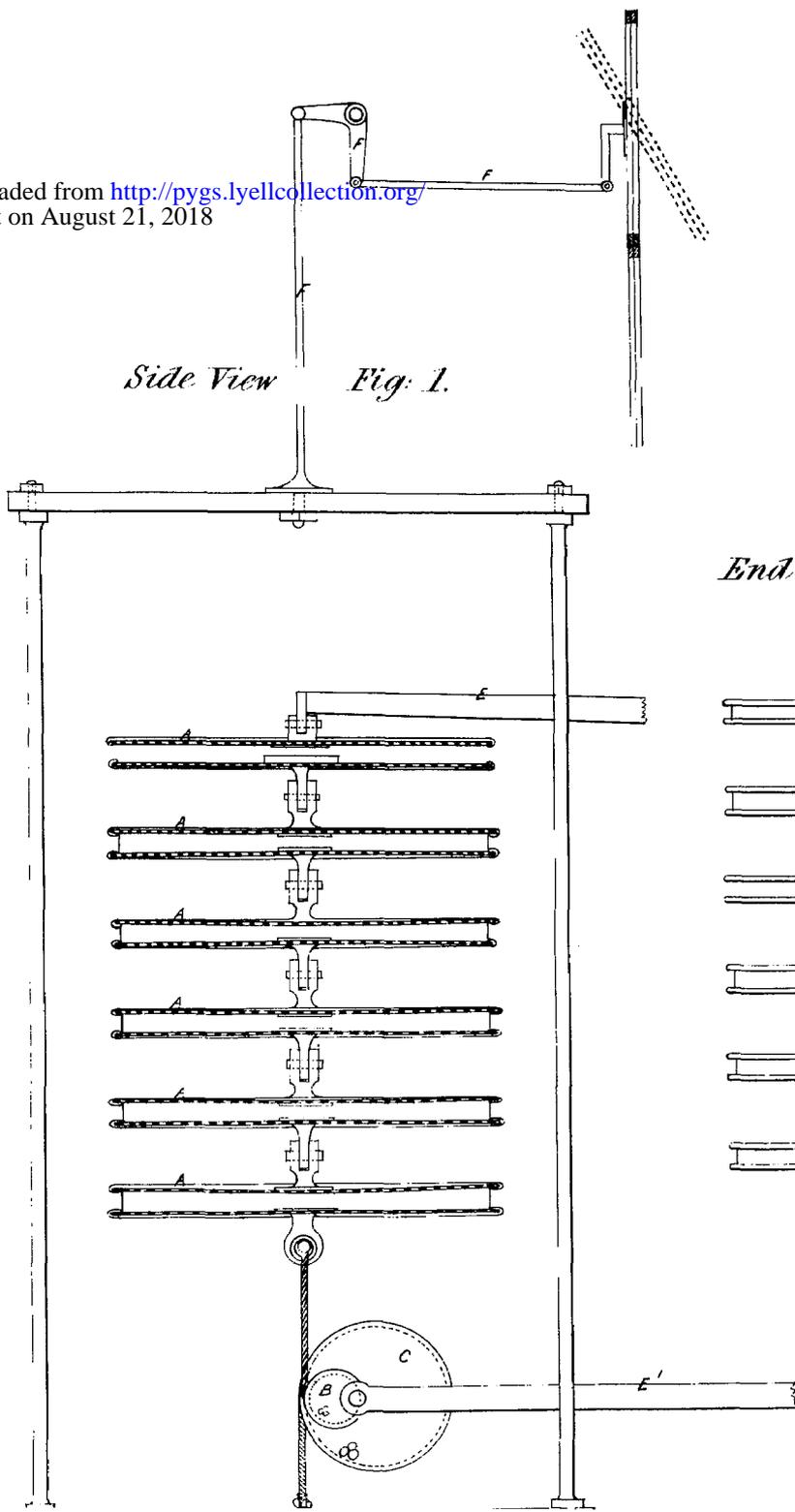
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End View Fig. 2.



*Side View Fig. 1.*



*End View Fig. 2.*

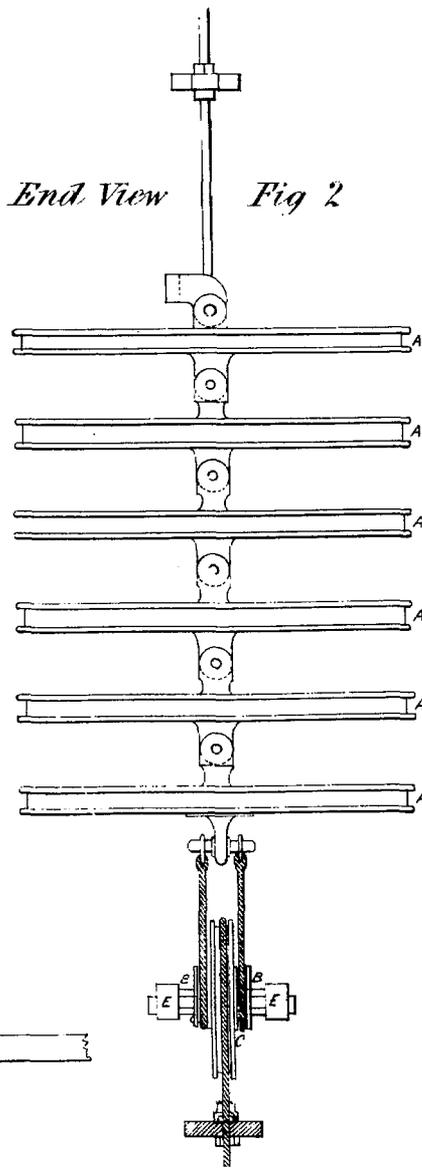


Figure 1 represents a section, and figure 2 a front view of an apparatus. The same letters indicate the like parts; A A A A A A represent a series of thin vessels, by preference of copper, tinned, in the form of very short cylinders having the ends slightly raised or dished. These vessels are independent of each other, being connected by socket joints and pins, are suspended from a frame, and have a weight attached through the medium of pulleys. Each of the vessels contains a portion of sulphuric æther, and after the æther has been boiled therein so as to expel the atmospheric air, the aperture is sealed with solder; such sealing is easily effected, if two apertures be made in any part of the apparatus, one about  $\frac{1}{8}$  of an inch in diameter, and the other about  $\frac{1}{16}$  of an inch, and the larger one first soldered, the soldering being effected just when the æther has ceased to boil. In such apparatus the boxes are about eight inches diameter, and six in number, so that twelve flexible surfaces are combined; the thickness of the copper is such that a square foot weighs about one pound. The weight may be varied from about five to fifty pounds, according to the temperature which the apparatus is intended to regulate. The proportions of the eccentric pulleys used are such, that when the weight is raised the tension upon the series of vessels is a little increased by leverage; but when the weight has descended so as to turn the pulley about half round, on account of the varying leverage, the tension on the series of vessels becomes about five times that amount, but this will require adjustment by trial with each apparatus. When properly adjusted, the weights should have equal tension on the vessels throughout the half turn of the pulleys, as in the fusee of a watch; and the eccentrics are made with slots, so that they may be adjusted on the axis.

Mr. Ward has found sulphuric æther the most suitable for temperatures ranging from  $40^{\circ}$  to  $90^{\circ}$  of

Fahrenheit's thermometer. Alcohol, with its vapour, for temperatures from about 90° to 180°. Water, with its vapour, for temperatures from about 180° to 212°; other fluids may, however, be used. When the Thermostat is fixed in such structures as hothouses, he prefers that it should be shaded from the direct rays of the sun. He also exhibited the following table of the tension of æther vapour at various temperatures, and of the pressure of the atmosphere in pounds, on each acting square inch of the apparatus:—

| Temperature. | Tension of vapour in inches of Mercury. | Pressure of Atmosphere on apparatus in lbs. |
|--------------|---|---|
| 34° .....    | 6.2 .....                               | 11.9  |
| 44° .....    | 8.14 .....                              | 10.93                                       |
| 54° .....    | 10.3 .....                              | 9.85  |
| 64° .....    | 13. ....                                | 8.5   |
| 74° .....    | 16.1 .....                              | 6.95  |
| 84° .....    | 20. ....                                | 5.  |
| 94° .....    | 24.7 .....                              | 2.65  |
| 104° .....   | 30. ....                                | 0.  |

Mr. Pearsall, of Leeds, said a few words on the subject, and referred to the vast importance of such an invention as that which had just been described, and especially to its introduction into hospitals, and for a variety of useful purposes. It was capable of very important results.

ON THE ORIGIN OF SLATY CLEAVAGE. BY H. C. SORBY, ESQ.

F.G.S., OF SHEFFIELD.

Before describing the theory I have propounded to account for what is called "slaty cleavage," it will probably be the best for me to explain briefly the nature of this structure and of the problem to be solved. Most stratified rocks can be split with more or less facility in the plane of their bedding, but in certain districts, greatly disturbed by elevatory forces, besides this line of weakness, there occurs another, only