minutes past eight it increased from 16 to 43 lbs. in the short space of two or three minutes; the barometer, being at its minimum, suddenly rose about three-hundredths of an inch, and during the heaviest part of the storm it continued to rise at the rate of about one-tenth of an inch an hour. The oscillations in the mercurial column, as will be seen by the diagram, were large and frequent during the storm, one of the most remarkable being immediately after 10^h A.M. and nearly coincident with two of the heaviest gusts of wind; the depression in this case amounted to between four and five hundredths of an inch, the rise following the fall so quickly that the clock moved the recording-cylinder only through just sufficient space to cause a double line to be traced by the pencil.

III. "On the Criterion of Resolubility in Integral Numbers of the Indeterminate Equation

$$f=ax^2+a'x'^2+a''x''^2+2bx'x''+2b'xx''+2b''x'x=0."$$

By H. J. Stephen Smith, M.A., F.R.S., Savilian Professor of Geometry in the University of Oxford. Received January 20, 1864.

It is sufficient to consider the case in which f is an indefinite form of a determinant different from zero. We may also suppose that f is primitive, *i. e.* that the six numbers a, a', a'', b, b', b'' do not admit of any common divisor. We represent by Ω the greatest common divisor of the minors of the matrix of f, by $\Delta\Omega^2$ the determinant of f, and by ΩF the contravariant of f, *i. e.* the form

$$(b^2-a'a'')x^2+\ldots\ldots;$$

$\Omega\Delta^2$ will then be the determinant of F, and Δf its contravariant. By $\overline{\Omega}$, $\overline{\Delta}$, and $\overline{\Omega\Delta}$ we denote the quotients obtained by dividing Ω, Δ, and $\Omega\Delta$ by the greatest squares contained in them respectively; ω is any uneven prime dividing $\overline{\Omega}$, but not $\overline{\Delta}$; δ is any uneven prime dividing $\overline{\Delta}$, but not $\overline{\Omega}$; and θ is any uneven prime dividing both $\overline{\Omega}$ and $\overline{\Delta}$, and consequently not dividing $\overline{\Omega\Delta}$. We may then enunciate the theorem—

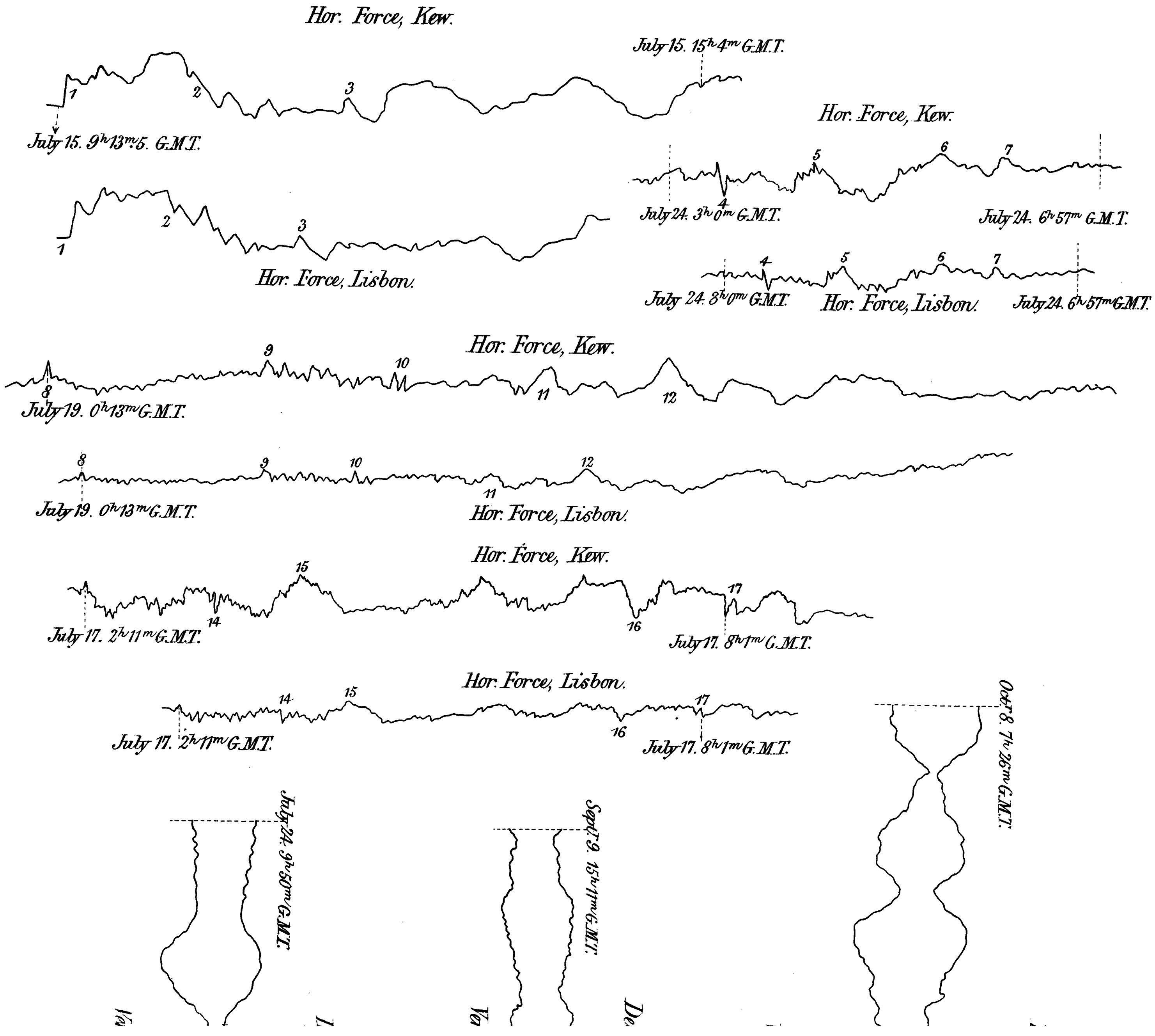
"The equation $f=0$ will or will not be resoluble in integral numbers different from zero according as the equations included in the formulæ

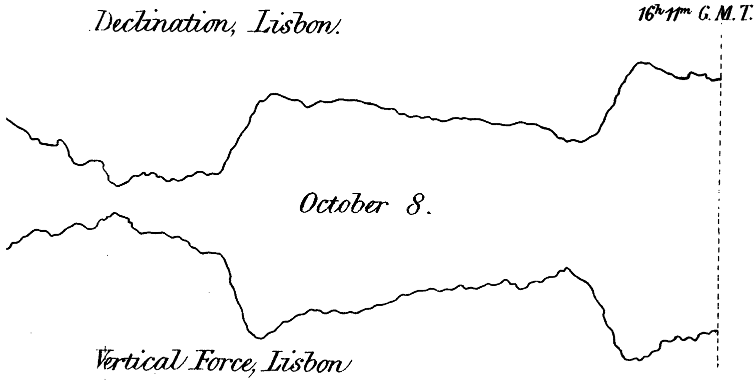
$$\left(\frac{\overline{\Omega}}{\delta}\right)=\left(\frac{F}{\delta}\right), \qquad \left(\frac{\overline{\Delta}}{\omega}\right)=\left(\frac{f}{\omega}\right), \qquad \left(\frac{-\overline{\Omega\Delta}}{\theta}\right)=\left(\frac{f}{\theta}\right)\left(\frac{F}{\theta}\right)$$

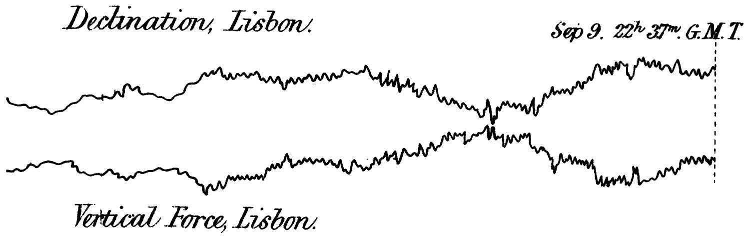
are or are not satisfied."

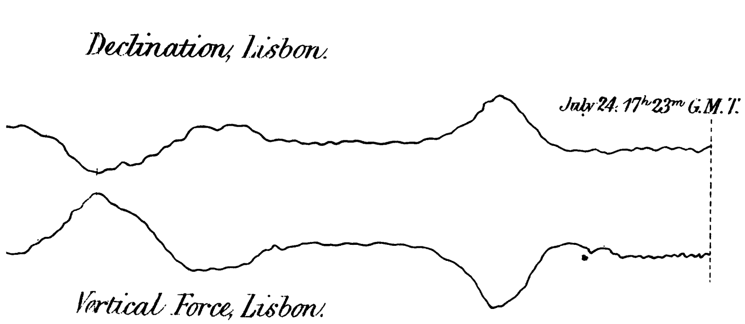
The symbols $\left(\frac{\overline{\Omega}}{\delta}\right)$, $\left(\frac{\overline{\Delta}}{\omega}\right)$, and $\left(\frac{-\overline{\Omega\Delta}}{\theta}\right)$ are the quadratic symbols of Legendre; the symbols $\left(\frac{F}{\delta}\right)$, $\left(\frac{F}{\theta}\right)$, $\left(\frac{f}{\omega}\right)$, $\left(\frac{f}{\theta}\right)$ are generic characters of f (see the Memoir of Eisenstein, "Neue Theoreme der höheren Arithmetik," in his 'Mathematische Abhandlungen,' p. 185, or in Crelle's Journal, vol. xxxv. p. 125).

The theorem includes those of Legendre and Gauss on the resolubility


Hor. Force, Kew.
July 15. 9h 13m·5. G.M.T.
July 15. 15h 4m G.M.T.
Hor. Force, Lisbon.
Hor. Force, Kew.
July 24. 3h 0m G.M.T.
July 24. 6h 57m G.M.T.
July 24. 3h 0m G.M.T.
Hor. Force, Lisbon.
July 24. 6h 57m G.M.T.
Hor. Force, Kew.
July 19. 0h 13m G.M.T.
July 19. 0h 13m G.M.T.
Hor. Force, Lisbon.
Hor. Force, Kew.
July 17. 2h 11m G.M.T.
July 17. 8h 1m G.M.T.
Hor. Force, Lisbon.
July 17. 2h 11m G.M.T.
July 17. 8h 1m G.M.T.
July 24. 9h 50m G.M.T.
Sept. 9. 15h 11m G.M.T.
Oct. 8. 7h 26m G.M.T.







J. Basire, lith.

of equations of the form $ax^2+a'x'^2+a''x''^2=0$ (Legendre, Théorie des Nombres, vol. i. p. 47; Gauss, Disq. Arith. arts. 294, 295, & 298). It is equally applicable whether the coefficients and indeterminates of f are real integers, or complex integers of the type $p+qi$.

It will be observed that if f, f', f'' . . . are forms contained in the same genus, the equations $f=0, f'=0, f''=0$, &c. are either all resoluble or all irresoluble.

IV. "Results of a Comparison of certain traces produced simultaneously by the Self-recording Magnetographs at Kew and at Lisbon; especially of those which record the Magnetic Disturbance of July 15, 1863." By Senhor Capello, of the Lisbon Observatory, and Balfour Stewart, M.A., F.R.S. Received January 14, 1864.

The National Portuguese Observatory established at Lisbon in connexion with the Polytechnic School, and under the direction of Senhor da Silveira, has not been slow to recognize the advantage to magnetical science to be derived from the acquisition of self-recording magnetographs. Accordingly that institution being well supported by the Portuguese Government, despatched Senhor Capello, their principal observer (one of the writers of this communication), with instructions to procure in Great Britain a set of self-recording magnetographs after the pattern of those in use at the Kew Observatory of the British Association.

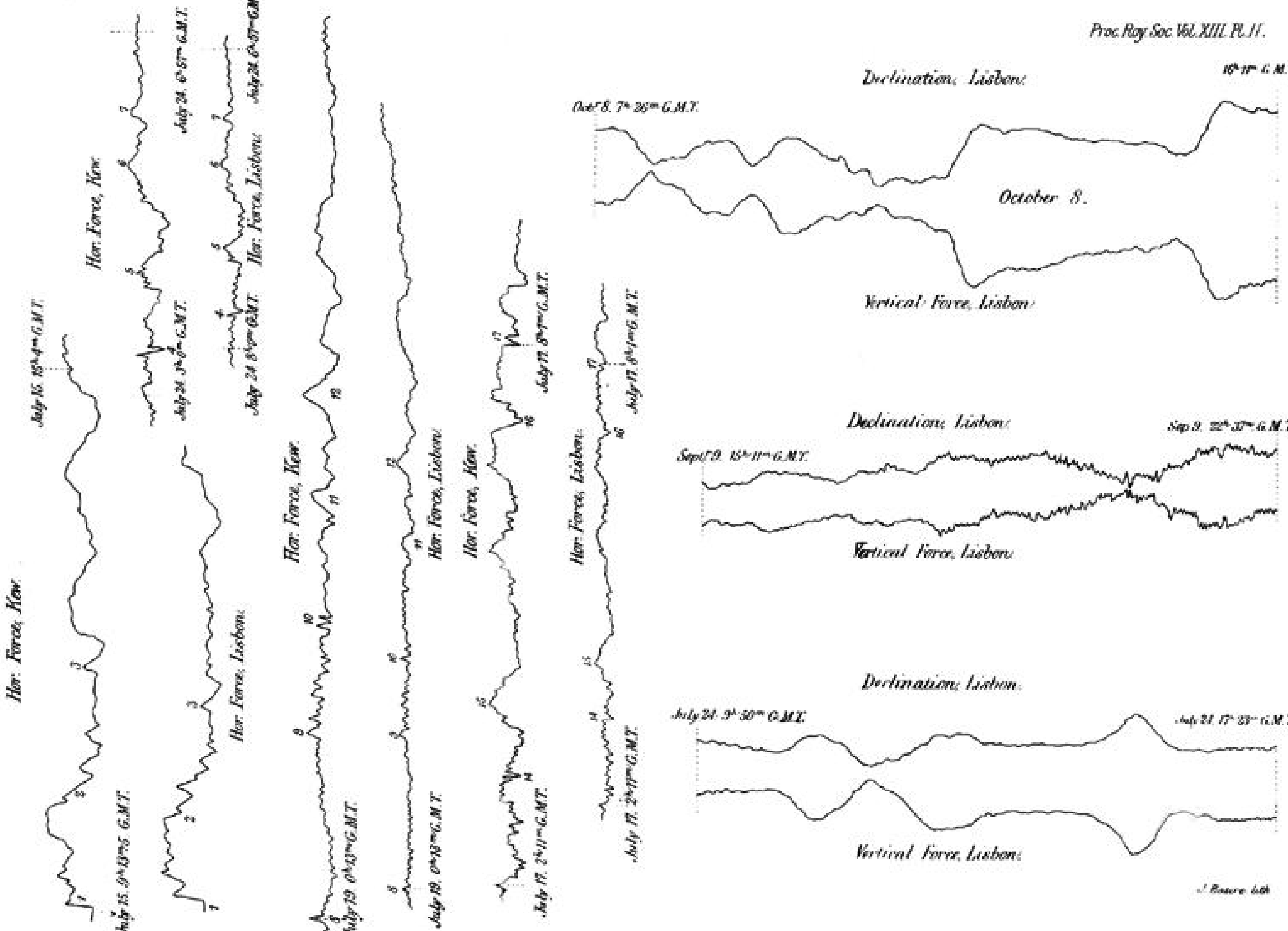
These instruments were made by Adie of London, and when completed were sent to Kew for inspection and verification, and Senhor Capello resided there for some time in order to become acquainted with the photographic processes. The instruments were then taken to Lisbon, where they arrived about the beginning of last year, and they were forthwith mounted at the Observatory, and were in regular operation by the beginning of July last.

It had been agreed by the writers of this paper that the simultaneous magnetic records of the two observatories at Kew and Lisbon should occasionally be compared together, and the opportunity for such a comparison soon presented itself in an interesting disturbance which commenced on the 15th of July last. The curves were accordingly compared together, and the results are embodied in the present communication.

We shall in the first place compare the Kew curves by themselves, secondly the Lisbon curves in the same manner, and lastly the curves of the two Observatories together.

Comparison of Kew Curves.

The disturbance, as shown by the Kew curves, commenced on July 15th, at $9^{h}\ 13^{m}\!\cdot\!5$ G.M.T., at which moment the horizontal-force curve recorded an abrupt augmentation of force. The vertical component of the earth's magnetic force was simultaneously augmented, but to a smaller extent; while only a very small movement was visible in the declination curve.



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