

On electro-magnetic clocks / Professor Brande.

Contributors

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Royal College of Surgeons of England

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Stereoscopes (on Brewster's principle) illustrating the Phænomena of Binocular Vision, as explained by Professor Wheatstone. [Exhibited by Mr. Claudet.]

Talbotypes from the Great Exhibition, by Mr. Henneman.

A Telescopic Camera Lucida and a Microscope with improved Mechanism, by Mr. C. Varley.

Specimens illustrating Claussen's Processes of Preparing Flax, Hemp, &c. [Exhibited by Dr. Ryan.]

Minerals. [Exhibited by Mr. Highley, jun.]

Model (in similar materials) of the Lion, Bull, and Column from Nineveh in British Museum. [Exhibited with permission of Dr. Layard.]

Carving on wood by Mr. W. G. Rogers.

WEEKLY EVENING MEETING,

25.

Friday, January 30.

W. R. HAMILTON, Esq., F.R.S. &c. Vice-President, in the Chair.

PROFESSOR BRANDE,

On *Electro-Magnetic Clocks.*

MR. BRANDE began by adverting to the various opinions which had been entertained in reference to the mutual relations of electricity and magnetism, previous to the grand discovery of Oersted in 1819. As soon as the influence of an electrical current upon a magnetic needle had been developed by the researches of that eminent philosopher, many most important applications of the fact almost of necessity suggested themselves, amongst which the wonders of the electric telegraph were to be included. Another result of Oersted's discovery was the *electro-magnet*; the power namely, of conferring by proper adjustments of an electric current any degree of magnetism upon a bar of soft iron: and inasmuch as these magnetic energies cease the moment that the electric current ceases, so we have it in our power to render any convenient form of soft iron, such as bars, or horse-shoes, powerful magnets at one moment, and at the next, entirely withdrawing all their powers; and this, simply by making and breaking the contacts upon which the flow of electricity from voltaic arrangement depends. In this way a horse-shoe magnet was made alternately to lift and drop a weight, to raise and depress a loaded lever, and to bend and release a spring. These effects were merely due to the attractive force of the electro-magnet upon holders and

bars of soft iron, with proper contrivances to prevent the interfering influence of the residuary magnetism which in such cases is more or less retained by the iron core of the coil. Another form of this application of electro-magnetism as a motive power consists in so arranging the electro-magnets that the poles may be alternately inverted, and so made to act upon adjacent permanent bar-magnets, both attractively and repulsively: these forms of the apparatus were also exhibited.

Mr. Brande then stated that upon examining Mr. Shepherd's electro-magnetic clocks at the Great Exhibition in Hyde Park, he had been especially struck by the excellent illustration which they afforded of the exclusive use of electro-magnetism as their moving power, its force being employed to give impulse to the pendulum, to propel the ordinary movement of the clock, and to effect the striking of the hour; no auxiliary weights or springs being in any case employed: and thinking the whole subject worthy the attention of the Members of the Royal Institution, had determined to bring it before them at one of their Friday Evening Meetings. He had therefore applied to Mr. Shepherd for such information and assistance as he required, and this had not only been cheerfully, but liberally given, Mr. Shepherd having furnished him with the pendulums, clocks, models, and diagrams, then before them, and with much useful information in reference to the whole subject.

Mr. Brande first explained the mechanism of the *pendulum*, which is so arranged as to make and break an electric circuit, and consequently to make and unmake a horse-shoe magnet at each vibration. Each time that the magnet is made it attracts its armature, which lifts certain levers: one of these is concerned in raising a weighted lever and causing it to be held up by a latch or detent; the magnet is then unmade in consequence of the pendulum breaking the circuit, and the armature is released, when the pendulum lifts the latch, and allows the weighted lever to fall, which, in falling, strikes the pendulum so as to give it an adequate impulse: then the circuit is again completed, the armature attracted, the levers moved, the weight raised, and held up by the detent; another vibration breaks the circuit and releases the armature; the pendulum then raises the detent, the weight falls, and in falling its arm strikes the pendulum, and gives it an impulse; and so on.

But the pendulum at each vibration not only makes and breaks the electric circuit of the battery which maintains its own action, but also, and simultaneously, that of a second battery, of which the duty is to make and unmake the electro-magnets belonging exclusively to the clock or clocks, which are upon this circuit. These electro-magnets act upon the extremes of one or more horizontal bar-magnets, so as alternately to attract and repel their opposed poles, and which carry upon their axis the pallets, by the alternating motion of which to the right and the left, the ratchet wheel is propelled onwards at

the rate of a tooth each second, and the axis of this ratchet wheel carries the pinion which moves the other wheels of the clock.

The circuit of the battery connected with the striking part of the clock is only completed once in an hour, and is connected with an electro-magnet so arranged, as by means of a proper lever to pull the ratchet wheel attached to the notched striking wheel one tooth forward every two seconds, and each tooth is accompanied by a blow on the electro-magnetic bell. The number of blows depends upon the notched wheel, the spaces on the circumference of which are adapted to the number to be struck, and when this is complete, a lever falls into the notch, and in so doing cuts off the electric current, which is not re-established through the striking electro-magnet, till the next hour, when a peg upon the hour wheel pushes the striking lever forward so as to cause it to be depressed by a similar peg upon the minute wheel.

Such is an outline of the mechanism of these clocks; but it is impossible to render further details upon the subject intelligible without reference to diagrams. A very large working model of the clock and of the striking apparatus, constructed for the occasion by Mr. Shepherd, was exhibited in the Theatre, as well as a model of the pendulum and its appendages made under the direction of Mr. C. V. Walker, to whom Mr. Brande was also indebted for a signal bell, upon the principle of Mr. Shepherd's clock bells, for the purpose of giving notice to the railway switchmen of the approach of trains in foggy weather.

Mr. Brande concluded by describing the arrangement of Mr. Shepherd's clocks as adopted in the extensive warehouse of Mr. Pawson in St. Paul's Churchyard, where eight dials are maintained in action by an electro-magnetic pendulum in the counting-house, and adverted to the Electric Clock at the Tunbridge Station of the South Eastern Railway, and to the intention of the Astronomer Royal to establish one at Greenwich for the purpose of sending time signals to the different Metropolitan Railway Stations, and to the Palace at Westminster.

[W. T. B.]

In the Library were exhibited :

Wheatstone's Wave-line Apparatus. [Exhibited by Mr. Appold.]
Balæniceps Rex, the King Stork, from the Interior of North Africa, the property of Mansfield Parkyns, Esq. M.R.I.; and a Group of Humming-birds. [Mounted and Exhibited by Messrs. Leadbeaters].

Head of a Walrus from the Arctic Regions — a Mandingo Dagger — a Model of the Milk-yoke Knapsack, and other objects, from the United Service Institution.

The Relational and Differential Slate, by Alfred Smee, Esq.
 Specimens of Jewelled Porcelain [by Messrs. Copeland] and
 of French Flower-carving [by Mr. W. G. Rogers].
 Models of Warming, Ventilating, Distilling, and Culinary Apparatus,
 by M. Andreoletti.

GENERAL MONTHLY MEETING,

Monday, February 2.

THE DUKE OF NORTHUMBERLAND, F.R.S., &c. President,
 in the Chair.

Bernard Edward Brodhurst, Esq. was *admitted* a Member of the
 Royal Institution.

Hewitt Davis, Esq.

Right Hon. Baron Parke.

Robert W. S. Lutwidge, Esq.

Alfred J. Woodhouse, Esq.

were duly *elected* Members of the Royal Institution.

The following PRESENTS were announced ; and the thanks of the
 Members returned for the same :—

FROM

Agricultural Society, Royal — Journal, Vol. XII. No. 2. 8vo. 1852.

Asiatic Society, Royal — Journal, Vol. XIII. Part 1. Vol. XIV. Part 2. 8vo.
 1851.

Asiatic Society of Bengal — Journal, No. 222, 223. 8vo. 1851.

Astronomical Society, Royal — Monthly Notices, Vol. XII. No. 1. 8vo. 1851.

Athenæum Club — List of Members, &c. 1851

Basel — die Naturforschende Gesellschaft — Bericht, 1848-50. 8vo. Basel,
 1851.

Beke, C T., Ph. D. &c. (the Author) — Enquiry into M. D'Abbadie's Journey to
 Kaffa to discover the source of the Nile. 8vo. 1851.

Summary of Recent Nilotic Discovery. 8vo. 1851.

On the Alluvia of Babylonia and Chaldæa. 8vo. 1851.

Bell, Jacob, Esq. M.P. (the Editor) — The Pharmaceutical Journal for January,
 1852. 8vo. 1852.

Brodhurst, Bernard E. Esq. M.R.I. (the Author) — Of the Crystalline Lens and
 Cataract. 8vo. 1850.

Buist, Dr. G. (the Author) — Some Observations on the "Remarks of Com-
 mander Montriau." 8vo. 1851.

Chemical Society — Journal, No. 16. 8vo. 1851.

Devincenzi, Signore Giuseppe (the Author) — Discorsi, 8vo. Napoli, 1845.

Delle Strade Ferrate Italiane, &c. 8vo. Napoli, 1848.

Editor — The Athenæum for December 1851, and Jan. 1852. 4to.

Ellis, Messrs., Exeter — Map showing the Time kept by Public Clocks in various
 Towns of Great Britain, 1851.

- Faraday, Professor* — Monatsbericht der Königl. Preuss. Akademie zu Berlin, Sept., Okt. 1851. 8vo.
- Franklin Institute of Philadelphia* — Journal, Vol. XXII. No. 2, 3, 4, 5. 8vo. 1851.
- Geographical Society, Royal* — Journal, Vol. XXI. 8vo. 1851.
- Glasgow, Philosophical Society of* — Proceedings, Vol. III. No. 3. 1850-1, 8vo. 1851.
- Hookham, Mr. T.* — The New Quarterly Review, No. 1. 8vo. 1852.
- Horticultural Society of London* — Journal, Vol. VII. Part 1. 8vo. 1852.
- Lovell, E. B., Esq. M.R.I., (The Editor)* — The Monthly Digest. December 1851, and January 1852. 8vo.
- Mackinnon, William A. Esq. M.P., F.R.S. (the Author)* — History of Civilisation and Public Opinion; 3rd Edition. 2 vol. 8vo. 1849.
- Museum of Practical Geology* — Introductory Discourses. 8vo. 1851.
- On the Opening of the School, Nov. 6, 1851, by Sir H. T. De la Beche, C.B., F.R.S.
- On the National Importance of Studying Abstract Science, &c. by Lyon Playfair, C.B., F.R.S.
- On the Relations of Natural History to Geology and the Arts, by Edward Forbes, F.R.S.
- On the Importance of Cultivating Habits of Observation, by Robert Hunt.
- Ryan, Dr. J.* — The Flax-Movement, &c. by the Chevalier Claussen. 8vo. 1851.
- On Claussen's Flax-Cotton, by E. M'Dermott. 8vo. 1851.
- Claussen's Specification. (Mech. Mag. No. 143.)
- Tilt, Edward John, M.D. (the Author)* — On the Diseases of Menstruation and Ovarian Inflammation. 12mo. 1850.
- On the Preservation of the Health of Women at the Critical Periods of Life. 16mo. 1851.
- Turner, Thomas, Esq. (the Author)* — The Law of Patents and Registration of Invention and Design in Manufactures. 8vo. 1851.
- Twining, T. jun. Esq. M.R.I. (the Author)* — Notes on the Organisation of an Industrial College for Artisans. 8vo. 1852.
- Jahrbücher des Vereins für Naturkunde im Herzogthum Nassau; Siebentes Heft. 8vo. Wiesbaden, 1851.
- Vereins zur Beförderung des Gewerbfleisses in Preussen* — Verhandlungen, Sept. und Okt. Berlin, 1851.
- Veale, John, Esq.* — Rudimentary Treatises. 12mo. 1851.
- Clay Lands and Loamy Soils, by Professor Donaldson.
- Descriptive Geometry (with Atlas, 4to.) by J. F. Heather, M.A.
- Equational Arithmetic, by W. Hipsley.
- Steam and Locomotion, by J. Sewell, L. E. Vol. I.
- Art of Painting on Glass, from the German of Dr. M. A. Gessert.
- Essay on the Art of Painting on Glass, from the German of E. O. Fromberg.
- Art of Playing the Piano-forte, by C. C. Spencer.
- White, Walter, Esq. (the Author)* — Papers on Railway and Electric Communications, Arctic and Antarctic Explorations, and the Sanitary Movement. 12mo. 1850-1.
- Vilkinson, H. Esq., M. R. A. S. (the Author)* — Observations on Muskets, Rifles, and Projectiles. 12mo. 1851.
- Villich, C. M. Esq. (the Author)* — Annual Supplement to Tithe Commutation Tables, 1851. 8vo. 1852.
- Vrontchenko, M. le Comte, Ministre de Finance, Russie* — Annales de l'Observatoire Physique Centrale de Russie, 1848, Par A. Kupffer. 4to. 1851.
- Compte Rendu Annuel, 1850. 4to. 1851.
- Vyld, J. Esq. M.P. (the Author)* — Notes on the Distribution of Gold throughout the World, &c. 8vo. 1851.
- W. Pickersgill, Esq. R.A.* — Portraits of Baron Cuvier, and Sir James Ross (Engraved from Paintings by himself.)
- Samuel Colt, Esq.* — American Revolving Pistol.

The following is a list of the names of the persons who have been elected to the office of Justice of the Peace for the year 1900.

1. J. W. Smith
2. J. B. Jones
3. J. C. Brown
4. J. D. White
5. J. E. Black
6. J. F. Green
7. J. G. Gray
8. J. H. White
9. J. I. Black
10. J. K. Green
11. J. L. Gray
12. J. M. White
13. J. N. Black
14. J. O. Green
15. J. P. Gray
16. J. Q. White
17. J. R. Black
18. J. S. Green
19. J. T. Gray
20. J. U. White
21. J. V. Black
22. J. W. Green
23. J. X. Gray
24. J. Y. White
25. J. Z. Black