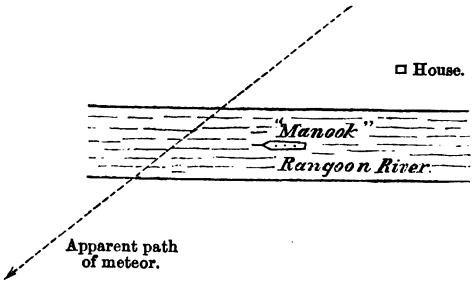
The two gentlemen on shore are both dead; but the mate is believed to be still living. It was often a matter of wonder to them that an occurrence which to them appeared so extraordinary was never publicly noticed; but it seems that they were the only Europeans who observed it, as I learn that, besides the natives of the place, the only other residents at that time were Armenians.

The whole account which I have been able to gather of this phenomenon so closely agrees with the description given of that class of meteors known as silent fireballs, or bolides, that I feel convinced that my informant must have witnessed one of these bodies in terrific proximity; and as I am not aware that any one has ever recorded such an experience, I have thought it worth while to draw up this *procès verbal*, to which my informant has attached her sanction.

When at Dundee I was much struck by Mr. A. Herschel's concluding experiment, which represented a silent bolide, and considerably startled the audience by its noiseless flash across the back of the hall. The gliding light and the accompanying heat forcibly recalled to my recollection the particulars I had gleaned of the Rangoon phenomenon.

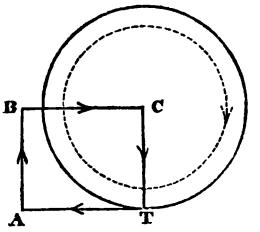


The above plan will assist in giving an idea of the relative position of the ship, house, and meteor.

VI. *On a Uniform-Electric-Current Accumulator.* *By* Sir William Thomson, *LL.D., F.R.S.**

CONCEIVE a closed circuit, C T A B C, according to the following description:—One portion of it, T A, tangential to a circular disk of conducting material and somewhat

* Communicated by the Author, having been read at the Meeting of the British Association, Dundee, September 1867.



longer than the radius; the continuation, A B, at right angles to this in the plane of the wheel, of a length equal to the radius; and the completion of the circuit by a fork, B C, extending to an axle bearing the wheel. If all of the wheel were cut away except a portion, C T, from the axle to the point of contact at the circumference, the circuit would form a simple rectangle, C T A B, except the bifurcation of the side B C. Let a fixed magnet be placed so as to give lines of force perpendicular to the wheel, in the parts of it between C the centre and T the point of the circumference touched by the fixed conductor; and let power be applied to cause the wheel to rotate in the direction towards A. According to Faraday's well-known discovery, a current is induced in the circuit in such a direction that the mutual electromagnetic action between it and the fixed magnet resists the motion of the wheel. Now the mutual electromagnetic force between the portions A B and C T of the circuit is repulsive, according to the well-known elementary law of Ampère, and therefore resists the actual motion of the wheel; hence, if the magnet be removed, there will still be electromagnetic induction tending to maintain the current. Let us suppose the velocity of the wheel to have been at first no greater than that practically attained in ordinary experiments with Barlow's electromagnetic disk. As the magnet is gradually withdrawn let the velocity be gradually increased so as to keep the strength of the current constant, and, when the magnet is quite away, to maintain the current solely by electromagnetic induction between the fixed and moveable portions of the circuit. If, when the magnet is away, the wheel be forced to rotate faster than the limiting velocity of our previous supposition, the current will be augmented according to the law of compound interest, and would go on thus increasing without limit were it not that the resistance of the circuit would become greater in virtue of the elevation of temperature produced by the current. The velocity of rotation which gives by induction an electromotive force exactly equal to that required to maintain the current, is clearly independent of the strength of the current. The mathematical determination of it becomes complicated by the necessity of taking into account the diffusion of the current through portions of the disk not in the straight line between C and T; but it is very simple and easy if we prevent this diffusion by cutting the wheel into an infinite number of infinitely thin spokes, a great number of which are to be simultaneously in contact with the fixed con-

ductor at T. The linear velocity of the circumference of the wheel in the limiting case bears to the velocity which measures, in absolute measure, the resistance of the circuit, a ratio (determinable by the solution of the mathematical problem) which depends on the proportions of the rectangle C T A B, and is independent of its absolute dimensions.

Lastly, suppose the wheel to be kept rotating at any constant velocity, whether above or below the velocity determined by the preceding considerations; and suppose the current to be temporarily excited in any way (for instance, by bringing a magnet into the neighbourhood and then withdrawing it); the strength of this current will diminish towards zero or will increase towards infinity, according as the velocity is below or above the critical velocity. The diminution or augmentation would follow the compound interest law if the resistance in the circuit remained constant. The conclusion presents us with this wonderful result: that if we commence with absolutely no electric current, and give the wheel any velocity of rotation exceeding the critical velocity, the electric equilibrium is unstable: an infinitesimal current in either direction would augment until, by heating the circuit, the electric resistance becomes increased to such an extent that the electromotive force of induction just suffices to keep the current constant.

It will be difficult, perhaps impossible, to realize this result in practice, because of the great velocity required, and the difficulty of maintaining good frictional contact at the circumference, without enormous friction, and consequently frictional generation of heat.

The electromagnetic augmentation and maintenance of a current discovered by Siemens, and put in practice by him, with the aid of soft iron, and proved by Maxwell to be theoretically possible without soft iron, suggested the subject of this communication to the author, and led him to endeavour to arrive at a similar result with only a single circuit, and no making and breaking of contacts; and it is only these characteristics that constitute the peculiarity of the arrangement which he now describes.

VII. *On Volta-Convection by Flame.* *By* Sir William Thomson *LL.D., F.R.S.**

IN Nichol's Cyclopædia, article "Electricity, Atmospheric" (2nd edition), and in the Proceedings of the Royal Institution, May 1860 (Lecture on Atmospheric Electricity), the author

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