Donations to the Library were received from the Royal Astronomical Society, The Chemical Society, and the Institute of Actuaries of London; the Oesterreichischen Ingenieur-Vereines, Vienna, Austria; the Regents of the University of New York, Albany, N. Y.; F. H. Storer, Esq., Cambridge, Mass.; the Ohio Mechanics' Institute, Cincinnati, Ohio; the State Agricultural Society, Madison, Wisconsin; and from Dr. Alexander Wilcocks, Prof. John F. Frazer, and the American Philosophical Society, Philadelphia.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement of the receipts and payments for the month of May.

The Board of Managers and Standing Committees reported their minutes.

Candidates for membership in the Institute (5) were proposed, and the candidates proposed at the last meeting (4) duly elected.

In compliance with a request from the Committee on Meetings, the President gave a brief description of the large balloon of Professor Lowe, with which he proposes to attempt a transatlantic voyage. Its dimensions were stated to be 110 feet in horizontal diameter, and about 120 in height; the cubical capacity being 700,000 cubic feet. The idea of the æronaut is to inflate with about one-half the quantity of gas the balloon will hold, so as to allow room for expansion as the machine rises. The buoyancy of the ordinary coal gas being about 40 lbs. to the thousand feet, the buoyant power with this degree of inflation will be about 14,000 lbs., of which about 5000 lbs. will be required to sustain the balloon and trappings, including a life-boat, with sails, &c. The remaining floating power beyond the weight of passengers and provisions, will be balanced by portable ballast, which is to be thrown overboard as occasion requires. Prof. Lowe expects to rise to the height of three miles, and there travel East-by-North in the prevailing upper current of the atmosphere, which he supposes to have a velocity of nearly 100 miles an hour, and will therefore waft him across the Atlantic in less than two days.

COMMITTEE ON SCIENCE AND THE ARTS.

Report on Ritchie's Rhumkorff's Induction Apparatus.

The Committee on Science and the Arts constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination—"An Improvement on Rhumkorff's Induction Apparatus," by E. S. Ritchie, of Boston, Massachusetts,

REPORT:—That, as it appears from the description of the apparatus by Mr. Ritchie, hereto annexed; his apparatus differs from those made before him in the following particulars:—

In making the primary helix of greater diameter, and of larger wire; the iron core is made longer than the helix; the primary helix is insulated more thoroughly from the secondary, by a glass bell with a broad flanch below, on which the secondary coil rests; the secondary coil is wound differently, in place of winding in successive helices, it is wound by spirals alternately outward and inward, beginning with the base. In this way, it will be seen that between any two points nearly in contact, there is less difference of intensity than in the old mode, and thus less thickness of insulating material is required, and a greater length of coil can be put within the inductive influence. This secondary helix is also more carefully covered with insulating material; the condenser (which is Fizeau's invention) is divided into three sections, so that the power of the instrument may be modified by the use of one, two, or all of the parts. The interrupter is modified and placed under the control of the operator, by which a more sudden and slower brake can be made, and thus the power of the instrument increased.

The Committee have experimented upon the apparatus constructed by Mr. Ritchie, for the Department of Arts of the University of Pennsylvania, and they find that this apparatus excited by three cells of a carbon battery, the zincs of which are five inches in diameter and eleven inches in height, is capable of giving a spark of eleven inches in length; while, so far as the Committee is aware, no spark over three inches has ever been obtained, either by Rhumkorff or his English improver, Hearder, until after an instrument constructed by Mr. Ritchie on this plan had been sent to England; and even now a spark of the same length from one of those instruments requires much larger batteries than those of Mr. Ritchie.

The Committee regard the modifications which Mr. Ritchie has introduced into the apparatus as improvements, and his mode of winding the coil, especially, as novel, ingenious, and highly valuable; and believing that this apparatus is destined to be of great importance in the arts, owing to the economy, simplicity, and energy with which it generates a powerful electric current; and regarding some of the modifications of Mr. Ritchie to be original and of great utility, they recommend the award of the *Scott's Legacy Medal and Premium* to Mr. E. S. Ritchie, of Boston, for his Improved Rhumkorff's Induction Apparatus.

By order of the Committee,

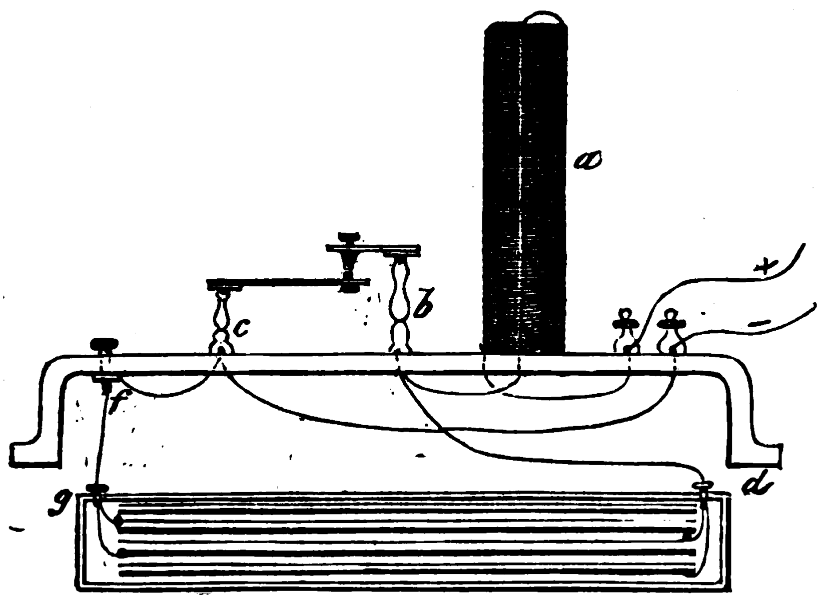
WM. HAMILTON, *Actuary*.

Philadelphia, May 10th, 1860.

Description of Ritchie's Rhumkorff's Induction Apparatus.

The primary helix is made of No. 9 copper wire, which is about ¼th of an inch in diameter, insulated, and wound in three courses; its length is about 180 feet, and it encloses a bundle of carefully annealed iron wire of about 1½ inches in diameter. Wires are used instead of a solid bar as they can be more readily and perfectly annealed. One end of the wire of the primary helix passes directly to a pole cup for connecting with the battery; the other end of the wire connects with the pillar, *b*, carrying a screw capped with platinum. This is in contact with a similar platinum cap on a spring, supported upon a pillar, *c*. This pillar connects with the other pole cup. When the battery is attached, the iron bundle or core becomes a powerful electro-magnet, but is demagnetized by breaking the circuit, by depressing the spring, separating the platinum caps. This is called the "interrupter," or "break-piece." The hammer and ratchet wheel are to effect this interruption at pleasure. Over this primary is placed for insulation a bell glass, and over the bell glass is placed the

Secondary helix.—This is made of insulated copper wire of one-eightieth of an inch diameter, covered with silk, and of about sixteen miles in length. The terminals are conducted for convenience to glass pillars furnished with discharging rods.



+ AND — BATTERY WIRES.

a, Primary Helix. One wire connects with + pole; the other passes to pillar (*b*). The circuit is completed through pillar (*c*) to the other pole cup.

b connects directly with knob of condenser, by a wire, at (*d*).

c connects through screw *f* with knob of condenser; or three screws at *f* bear upon 3 knobs (*g*), which each has a separate bundle of condensers. The alternate sheets of all are united at the opposite pole at *d*.

Thus far the instrument is in principle the same that has been in use for years, though incapable of throwing a spark in the air across an interval. But connected with the interruptor is a

Condenser, due to Fizeau. This is simply a Leyden jar of great surface, and is made of oiled silk with coatings of tin foil. The silk is in sheets, about 18 by 10 inches, piled up with intervening sheets of foil, a little smaller in size. Every other sheet of foil is connected by a small ribbon of foil, extending out on one side, while the alternate sheets of foil are similarly connected by ribbons, extending on the opposite side. The whole pile is enclosed for convenience in a box, and placed within the basement. The two bundles of ribbons of foil, connect with two pieces of metal coming through the cover of the box; the whole may be considered as a battery of Leyden jars, and these metallic pieces are the discharging knobs. When the box is in place, these knobs connect with the two pillars above mentioned; so that each cap of platinum of the interrupter is in metallic connexion, the one with one side of the Leyden jar, the other cap with the opposite side of the Leyden jar.

On the opposite page is a drawing which will show the connexions.

I will now give the particulars in which my instrument differs from those previously constructed.

I use a primary helix of larger proportionate diameter and of larger wire. The iron core I make much longer than either the primary or secondary helix (these are of equal length); the core I make from 50 to 100 per cent. longer. The intensity of an electro-magnet being greatest at the middle, I thus obtain a more intense magnetic force, and the intensity and volume of the induced current is much increased.

I insulate the two helices much more perfectly. Glass tubes have been used, but as the discharges took place through the iron core, I closed one end, making the tube into a bell glass, and still further added to its effect by making a flanch project from the lower edge.

In all previously constructed instruments, the secondary helix was wound longitudinally as a spool of thread, each course or stratum being insulated from the next by gutta percha or other material; but after many courses are thus laid, the intensity becomes sufficient for the spark to break through or pass around from the outer to the inner stratum, and consequently the limits of power were soon reached, and the longest spark obtained was not over three inches. Rhumkorff had then obtained but about half an inch with a single instrument. Much greater intensity in this form is impossible, as each insulation must be increased proportionately in thickness, and this would carry the outer strata beyond the influence of the iron core. I devised a mode of winding the helix which obviated this difficulty. I wind my helix in strata perpendicular to the helix, and wind it as a sailor coils a rope upon the deck: beginning with a small circle, he winds arounds this his rope until the circle is as large as desirable; he lays a turn upon this last one, and commences a second stratum or layer, winding now each turn within the last, until he reaches the size of circle he commenced with; again, a third stratum upon this.

I build my coil in the same manner. I make a cylinder of gutta percha, with a flanch or head as large in diameter as the coil is to be. Each stratum is parallel with the head and between each is an insulation; but as I now only desire to prevent the spark from leaping from the wire where one layer is commenced to the wire where the next lies upon it (and the length is but a few hundred feet), a very thin insulation is enough, and a disc of oiled silk is sufficient. The helix can be built up indefinitely, as I make the section no deeper than that the intensity obtained in each stratum equals its thickness with the thickness of insulation. Consequently, if the spark cannot leap further than from layer No. 1 to No. 2, it cannot leap to the 3d, or the 10th, or the 100th, because the *distance* from the 1st to the 3d and

10th, &c., is proportionately greater—when wound longitudinally it is otherwise. A sufficient insulation may protect No. 1 from No. 2 course, but No. 10 has ten times the intensity, and is necessarily brought very near No. 1, and the insulation fails. In this case the coil is ruined. But, as I wind it, if battery force is put on enough to make the spark leap its entire length, it does no harm.

I also cover the helix outside, sometimes entirely and sometimes only the lower portion, with gutta percha.

In previously-constructed instruments, the interrupter used was De La Rive's automatic break-piece. I found this far too rapid, that *time* was required, and that for different results a very varied rate is requisite; also, that a *sudden* break is more effective. I devised the interrupter to meet these requirements, and place the discharges more in control of the operator. By my interrupter, a longer and a far more voluminous discharge is produced.

I divide the condenser into two or three parts, and connect each through a screw, so that either or all may be used, or all may be disconnected.

To introduce these changes, of course the entire form and arrangement of parts are different from all others.

So far as I have information, not until after I had published my mode of constructing this instrument and had sent one to the order of Gassiot, of London, throwing over twelve inches, had any been made of over three inches of spark.

I respectfully submit the instrument with these explanations to the Committee on Science and the Arts of the Franklin Institute.

E. S. Ritchie.

Boston, Dec. 10, 1858.

METEOROLOGY.

For the Journal of the Franklin Institute.

The Meteorology of Philadelphia. By James A. Kirkpatrick, A. M.

May.—The month of May, 1860, was distinguished for its thunder storms, and the number of days on which rain fell. There were no less than eight thunder storms at Philadelphia during the month, though but little damage resulted from them here. Those of the 21st and 30th of the month, however, were very violent and destructive; the former in Ohio, and the latter in the north-western part of Pennsylvania.

Rain fell at Philadelphia on nineteen days of the thirty-one, showing a greater number of rainy days than has ever before been noticed in the month of May. In May, 1858, rain fell on eighteen days, and in 1853 and 1854, on fifteen days. The average number of rainy days for the month of May, during nine years, is thirteen.

The mean temperature of the month was less than 1° above the average, while it was about half a degree colder than May, 1859.