Description and use of a patent medical electrical machine, made by Thomas Blunt, (late Nairne and Blunt), optician and mathematical instrument maker to His Majesty, 22, Cornhill / [Thomas Blunt].

Contributors

Blunt, Thomas.

Publication/Creation

London : Darton & Harvey, 1807.

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DESCRIPTION AND USE

OF A

PATENT

MEDICAL ELECTRICAL MACHINE,

MADE BY

THOMAS BLUNT,

(LATE NAIRNE AND BLUNT,)

OPTICIAN AND MATHEMATICAL INSTRUMENT-MAKER TO HIS MAJESTY,

22, *CORNHILL.*

Conductors for the Preservation of Buildings from the Effects of Lightning erected in any Part of England.

LONDON:

PRINTED BY DARTON AND HARVEY, GRACECHURCH-STREET.

1807.

DESCRIPTION AND USE

OF

BLUNT'S

Medical Electrical Machine.

FROM the knowledge which the world already possesses, of the properties and action of Electricity, we have, although but in its infancy, obtained two real advantages, of which it is here our sole business to speak. The first is, the construction of an apparatus, which is proved by experiment, and the acquaintance we have formed with atmospheric electricity, to preserve buildings, ships, trees, &c. from the destructive effects of lightning. The second, is the addition of an article to the Materia Medica, which has been, and when impar-

tially attended to, generally is found to be, accompanied with very great and singular success. To this last article we now bend our attention, and proceed to lay down directions for the medical use of this Machine.

REFERENECES FROM THE FIGURES OF APPARATUS, &c. IN THE PLATES, TO THEIR TECHNICAL TERMS.

Fig. 1. Plate I. represents the machine complete, with its conductors and other fixed apparatus.

AA. The glass cylinder.

BB. The pillars by which the cylinder is is supported and insulated.

CD. The conductors, C being the positive, and D the negative.

EE. The pillars by which the conductors are supported and insulated.

F. The winch or handle, by means of which the cylinder is turned.

GG. The mahogany board, on which is fixed the whole of the machine.

H. The piece on which the negative conductor is supported, and which slides into two grooves underneath the board GG; by releasing the screw I, this piece, and of course the pillar and conductor, may be drawn farther from the cylinder, so as to give sufficient room for conveniently taking off the cushion and rubber from the conductor, when occasion requires it.

K. is

K. is the cushion of the silk rubber to the cylinder.

M. a groove, intended to receive one end of a clamp which fastens the machine to a table when in use.

NN. A piece of tinfoil or brass, fastened on the mahogany board, so as to form a metallic communication between the brass buttons, x and z, for a purpose hereafter to be mentioned.

a. Is the Leyden jar or bottle.

b. Is the electrometer.

c. The brass clamp.

d. A nubbed wire, which screws into the end of the prime conductor, to hang the Leyden jar on when in use.

ee. A pair of insulated directing rods, for the purpose of directing the electric shock, spark, &c. without inconvenience to the operator.

f f. A pair of wood joints, each with a vertical and horizontal motion when fixed respectively in the two conductors, as hereafter directed.

h h. Brass or wood conical pieces, to screw occasionally on the ends of the directors.

g g. Metallic tubes, with flexible joints to use occasionally as directors.

DIRECTIONS FOR PROPERLY ARRANGING THE SEVERAL PARTS OF THE MACHINE, AND THE METHODS OF CLEANING AND PREPARING IT FOR USE.

I. LIFT the machine carefully out of its box, by the wood work at each end of the cylinder, or rather by the tops of the pillars which support the cylinder; and set it on a table, so near the edge that it may be fastened thereto with the brass clamp.

II. Next observe, that the position of the winch is reversed, for the conveniency of packing the machine in a shorter box than it could otherwise be: to fix this rightly, release the small wood button at the end of its axis, and slide the winch off; then, having returned it in its proper position, tighten the wood button again.

III. Release the button I, slide the piece H a little way (two or three inches) outwards, and with a hand at each end of the cushion K, slide it steadily out of its grooves, (i. e.) in a direction from that end of the cylinder where the handle is, towards the other end.

IV. Take

IV. Take a clean silk handkerchief, dry it well by the fire, and, while it is yet warm, wipe all the parts of the machine very clean, so that they be perfectly free from damp or dust, particularly the cylinder and glass pillars: the best and safest method of wiping the cylinder, is to revolve it, and at the same time to hold the silk handkerchief on its upper side, rubbing it backwards and forwards longitudinally. The machine should be wiped thus in every part whenever it is used; and if it should be continually in use for any considerable time together, it must be wiped thus, now and then.

In damp, or hot sultry weather, the machine must be used in a room where there is a fire. The cushion and its silk rubber must always be wiped very well from dust, amalgama, &c. It will sometimes be found very advantageous to the action of the machine, to dry the silk rubber before the fire, but not *the cushion;* the wood-work of it being damp, is rather an advantage than otherwise.

The machine being thus wiped clean and dry, replace the cushion and rubber, and sliding the piece H into its proper place again, tighten the screw I.

Turn back the silk rubber on the negative conductor, and, with one of the cards spread with amalgama, which are sent with the machine, rub the cylinder for about a minute in a similar manner as before, with the silk handkerchief, then turn the rubber on the cylinder and excite the machine.

Now hang a chain to the button of the negative conductor, that will reach to the ground.

Apply a knuckle within an inch or two of the prime conductor, while at the same time you excite the cylinder; and, if strong and vivid sparks proceed from it to the knuckle, the machine is in perfect order.

By continued rubbing, the amalgama on the card will of course become hard and dry; there must then be a small piece more (the size of a pea) spread thinly on it with a broad knife.

The cylinder will often contract on its surface a number of small oblong black specks; these are occasioned by the natural ruggedness of the glass, and the continual rubbing of amalgama on it, in which is always a considerable portion of grease: they must be taken off with a dry cloth, being

first softened by a sponge dipped either in strong soap-suds or spirits of wine.

It now, I presume, only remains to point out the methods of applying the machine and its apparatus to medical purposes.

To conceive clearly its principles of action, we must, for our present purpose, consider that the electric fluid is supposed to have access to, and to pervade, in a certain indeterminate proportion, every metallic and other conducting substance in nature, while it remains uninsulated, i. e. connected with the earth, and that when such bodies become insulated, the electric fluid has no longer access to them*.

When the surface of a conducting body, or its atmosphere, is in its natural state, or contains only its natural share of the electric fluid, we can then perceive from it no electrical appearances, and therefore say it is not electrified. But if it is either deprived of part of its natural quantity of the electric fluid by any means, or otherwise is made to contain more than its na-

* We take no notice here of the Electricity which an insulated conductor acquires from the air; any observations on it would tend but to complicate the matter, and would be totally foreign to our explanation.

tural

tural quantity, we, in either case, say it is electrified, negatively or positively, as it may happen; in the first instance, it is electrified negatively, as being deprived of part of its natural share of the electric fluid; in the second, positively, as being made to possess more than its natural share. Any apparatus, therefore, by means of which we can produce these changes, (i. e. either rarify or condense the electric fluid,) is an electrical machine. Now it is absolutely necessary to have the means of producing, on occasion, both these phœnomenæ for medical purposes, as well as philosophic experiments; this machine is, therefore, expressly so constructed as to answer either, or both these purposes, with the least possible trouble: thus, by the joint electric properties of the glass cylinder and silk rubber of the machine, the cushion and the negative conductor are continually exhausted of their natural quantity of Electricity; or rather, their natural quantity of Electricity is continually rarefied, and, from the construction and situation of the positive conductor, the fluid is condensed on it, in the same degree that it is rarefied on the negative. If any conducting substance, as a

knuckle,

knuckle, elbow, or any part of the human body, whose extremity is somewhat round, be brought within the striking distance of the positive conductor, (two or three inches,) it will part with its superfluous fluid, visibly, in a vivid spark; the fluid thus passes through the body back to the earth, and the conductor is restored to its natural state; this is termed a positive spark. A negative spark is thus; if the knuckle, &c. be applied to the negative conductor, it will emit a portion of its natural quantity of the fluid, to supply the deficiency in the conductor, assuming nearly the same appearance as before.

To obtain a regular supply of the fluid from the positive conductor, as is requisite in all medical or other experiments, it becomes, of course, necessary to enable the negative conductor to recruit itself, in the same proportion as it is robbed for the supply of its fellow: to do this effectually, a communication must be formed between it and the earth, by hanging a chain from the button at its side; then, on exciting the machine, (i. e. revolving the cylinder,) a regular supply of the electric fluid may be expected, as long as the proper degree of friction

friction is kept up between the cylinder and the rubber, as has been directed. To obtain a regular action from the negative conductor, (i. e. to keep it continually so much rarefied, as to be able to disturb the fluid on any other body containing only its natural quantity,) we must, in the first place, insulate it, by taking off the chain hung from it, thereby confining its action to the body which may be applied to it, and hang the chain to the positive conductor, which will then convey to the earth the fluid exhausted from the negative conductor, as fast and regularly as it receives it, so that the positive will remain in its natural state, and the negative be exhausted more or less, as may happen.

What has been already said, will, I presume, render it tolerably evident, that this machine will either rarefy or condense, i. e. act either positively or negatively, without almost any additional trouble.

THE METHODS OF APPLYING THE MACHINE AND APPARATUS TO THE PURPOSE OF PRODUCING THE ELECTRIC SHOCK, SPARK, &c.

FIG 2. Plate I, represents the positive conductor with the apparatus, as affixed to it, for the purpose of giving the shock.

The first thing to be done in fixing the apparatus for this end, is, to screw the piece of nubbed wire d* into the end of the positive conductor, and to hang thereon the Leyden bottle a, by the hook at its top.

II. Hang a small chain from the hook at the bottom of the bottle, to the brass button z, at the upper corner of the bottom board of the machine, and another from thence to one of the insulated directors, e e.

III. Put the wood stem of the Electrometer b, into the hole at the upper side of the positive conductor, bring the brass ball of it opposite to the button at the side of the conductor, at a distance of an inch or two, and hang a chain from the wire of the Electrometer to the other insulated director†.

* See it, and the rest of the detached apparatus, in their separate state, in Plate 2.

† The balls screw off at *y*, the ring of the chain must then be slipped on the wire, and the ball screwed on again.

Next excite the machine, and let an assistant hold the balls of the two directors within a few inches of each other, or each in contact with distant parts of some conducting substance; when the bottle becomes charged, the discharge will take place through or along the surface of the conducting body, the most direct way between the two balls.

Therefore, when you wish to pass the shock through any particular part, all things being arranged as above directed, you have only to bring that part into the circuit of the shock, (i. e.) between the balls of the two directors; suppose, for instance, a shock was required to pass in an oblique direction through the body; then apply the balls of the two directors respectively to the opposite shoulder and hip; the body is then evidently brought into the circuit; and so for any other part.

It may possibly be found more convenient, in some positions of the machine, instead of hanging a chain from the bottom of the Leyden bottle to the button at the upper end of the machine's bottom board, and another from thence to an insulated director, to hang a chain from the Leyden

bottle

bottle to the button at the upper end of the board, and another, not from thence to the director, but from the button at the *lower* end of the board; this will have the same effect as immediately joining the two chains, there being a metallic communication between the two buttons.

The strength of the shock may always be regulated by observing the following directions:—In the top of the small Leyden bottle, or what appears to be the neck of the large one, is inserted two brass wires; one of them reaches down to the bottom of the large jar, and the other only so far as to touch the inside coating of the small one; when, therefore, you wish small shocks, take out the long wire, and use the jar with the small one only in its place; if you wish the shocks strong, then replace the long wire.

This will, perhaps, be attended to with more precision, when the reasons for it are properly understood. We must, for that end, first consider, that a Leyden phial can only be charged by making a communication between its inside coating and a prime conductor; in the present instance we must recollect, that the longest wire touches the inside

inside coating of the large jar only, and the short wire that of the small one; it is evident then, that it is only by means of the long wire that we can make a communication between the jars' inside coating and the prime conductor; therefore, when that means is taken away, of course the effect cannot be produced, i. e. the jar cannot be charged. The strength of the shock may also be considerably varied, by altering the distance of the Electrometer ball from the positive conductor; the farther off the ball is placed the stronger will the shock be, and *vice versa.*

The method of producing the electric spark, either in a negative or a positive state, has already been described; the manner in which the different apparatus is used for applying it to medical purposes, is what now alone remains.

The first, and most simple method of administering it, is for the patient to receive it from the conductor itself as has been described.

The next is, when, from the situation of the object to which it is to be applied, relatively to that of the machine, it may be inconvenient to apply it immediately to the

conductor

conductor, it becomes necessary to attach to the conductor a metallic chain, and, with one of the insulated directing rods, apply its extremity to the part required.

There is yet another apparatus for the purpose, which is intended to be made use of under circumstances where none of the other methods can be applied; such as, for instance, the patient lying in a bed, &c. for it must be observed, universally, that in making use of every sort of apparatus for applying the spark, no part of it must touch the earth, or any conducting substance, previous to its being in contact with, or opposite to, the part required; that is to say, it must touch no conducting body but the machine's conductor and the patient: when, therefore, a considerable length of conducting substance is wanted, if a chain was to be used at a length of more than one or two feet, or, in many instances, even that, its natural want of tension would render it impossible to use it, without suffering it to touch the ground, table, &c. in its way, and so destroy the intended effect; but this apparatus possesses all the necessary flexibility of a chain, and has, at the same time, from its construction, sufficient tension to prevent

the

the above-mentioned accidents. This apparatus is represented in Plate II. by the figures gg; ff, are wood joints, which are used in conjunction with the tubes, in manner following:—

From the piece f, unscrew the brass ball, and screw it on the end i of the tube; then screw the end k of the same tube on that part of the piece f whence the balls came; unscrew one of the insulated handles from its wire and ball, at n, and screw it to the tube at n; fix the joint by its brass stem into the positive or negative conductor, as may be required; then, holding by the insulated handle, give sparks from the brass balls.

There are two of these with this machine, to use together when there may be occasion, viz. one from the negative, and the other from the positive conductor.

In some cases, when the spark may be found to produce too pungent a sensation for the strength or sensibility of the part to which it may be applied, its action may be meliorated, and, at the same time, retain its full efficacy, by using wooden points on the ends of the directors, tubes, &c. in lieu of brass balls. These points may, on occasion, be substituted in all cases where the balls are used.

An insulating stool is, without doubt, indispensably necessary in every medical and electrical apparatus; but as one of a sufficient size for general purposes could not be inclosed in the box of our machine, without greatly increasing the bulk of it, and also the expence, besides the cost of the stool, I think it not expedient ever to connect them with the machines: they may be had separately of any size, and are purchased in that way to much greater advantage than otherwise.

To enumerate the happy effects generally resulting from a judicious application of Electricity in medical cases, or to select those cases which may appear remarkable, I should conceive not consistent with the nature of this descriptive treatise. The reader will find a great number of very interesting and singular accounts of such, in Cavallo, Becket, and Franklin's essays; when I mention these particularly, I would not have it seem, that from partiality, or any other cause, I exclude all others; there are, doubtless, many more, whose selections may, probably, be equally judicious, but their names do not at this moment occur to me.

Printed by Darton and Harvey, Gracechurch-ſtreet.

Plate I.

Fig: 1.

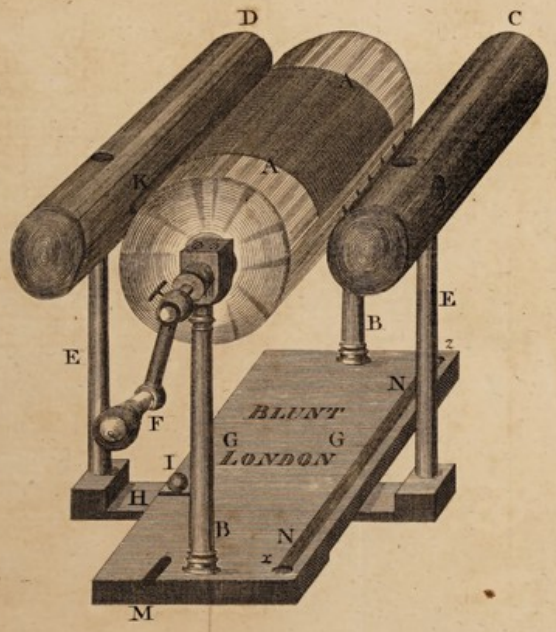

Fig: 2

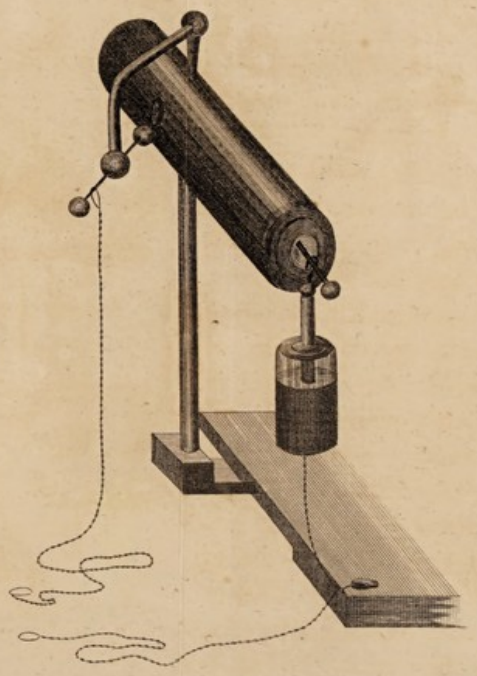

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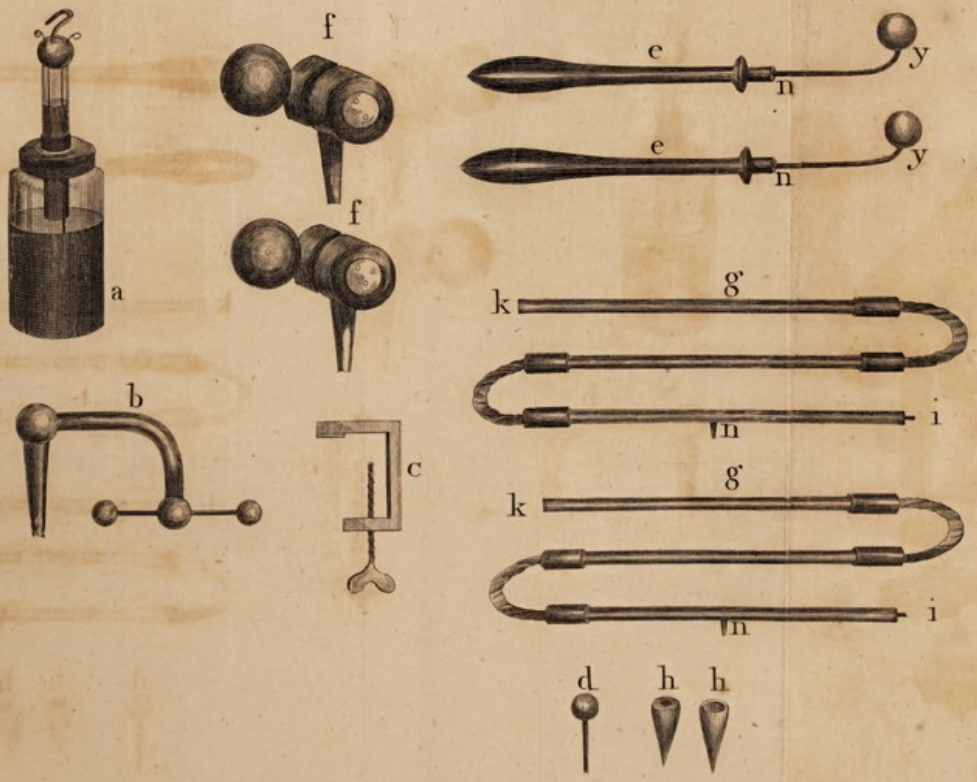
Plate II.



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