A

JOURNAL

Periodicals. - London.

OF

NATURAL PHILOSOPHY, CHEMISTRY,

AND THE ARTS:

ILLUSTRATED WITH ENGRAVINGS.

BY WILLIAM NICHOLSON.

VOL. I.

LONDON:

PRINTED FOR G. G. AND J. ROBINSON, PATERNOSTER-ROW.

M.DCC.XCVII.

but it would have diſappeared totally, if the want of perfect flatneſs in the cloth had not prevented its being inclined beyond a certain angle with regularity. The branches of the croſs at right angles to the inclined wires alſo nearly vaniſhed.

But when the warp or longitudinal wires were inclined to the axis of viſion, the images were altered in their relative brightneſs and poſition, in a manner which it would be too prolix to relate. Theſe changes terminated in an hexagon with ſix radii, as in Fig. 12. when the inclination was about 45 degrees. In this, as in all the changes, the ſpectra were coloured with the red fartheſt from the centre, and they all pointed to the centre. This unexpected appearance led to an examination of the cloth by a ſimple magnifier in both poſitions of inclination, when it was found, that in the firſt deſcribed poſition the interſtices of the wires appeared to be nearly long ſquares, or parallelograms; but in this laſt deſcribed poſition the threads of the warp being in reality bended by the operation of weaving over the weft, in angles of about 35° out of the plane, did apparently meet, ſo as to leave apertures of the form of equiangular triangles, and no doubt cauſed the hexagonal combination in Fig. 12.

After this imperfect deſcription of a phenomenon of ſome curioſity, I muſt decline entering into any diſcuſſion of the conſequences to which it ſeems to lead. Sir Iſaac Newton's Experiments on Inflection, with the edges of two knives, are ſimple, and at firſt conſideration do not appear difficult to be underſtood. Yet, ſimple as they are, there are certainly many variations yet to be made, and admeaſurements to be taken, before the popular explanations of the mutual agency of bodies and light upon each other can be admitted without heſitation. This proceſs of examination affords ſome peculiar facilities, on account of the great quantity of light which is ſimilarly affected, and the poſſibility of applying a magnifying power and micrometer. Subſequent meditation may perhaps ſuggeſt the cauſe why the radii in theſe figures are triple, and parallel to each other, while all the ſpectra individually diverge from a centre: but I have rather choſen to refer them as they are to the examination of philoſophers. And I am the more induced to hope that this examination will be made, when it is conſidered, that the appearance preſents itſelf through any fine muſlin or cambric to the naked eye, though ſtill better with the opera-glaſs or perſpectives, which are in the hands of every one, and that the wire-cloth of fine ſieves or wine-ſtrainers is a material eaſy to be procured.

III.

Deſcription of an Inſtrument which renders the Electricity of the Atmoſphere and other weak Charges very perceptible, without the Poſſibility of an equivocal Reſult.

IN the year 1787, when the electrical doubler engaged the attention of philoſophers, for its aſtoniſhing power of magnifying the minuteſt quantity of ſimple electricity, and the ſubſequent diſcovery of its ſpontaneous electricity had greatly reduced its apparent utility, I had the pleaſure of a converſation with the Reverend Abraham Bennet, of Wirkſworth, the inventor, who ſhewed me his method of depriving this inſtrument of much of its adherent electricity, by working it for a time with all its parts in communication with the earth. But at the ſame time he remarked, that if he were to make an inſtrument in which this

 electricity

electricity ſhould be totally removed, he would have recourſe to a ſimple multiplier, and not a doubler. I did not apprehend the contrivance from this ſlight deſcription, which at my requeſt, however, he readily extended, and convinced me of the full value of his invention. I then mentioned my intention to conſtruct an inſtrument on that principle, which ſoon afterwards I did. It was ſhewn to Sir Joſeph Banks and his friends, at his houſe, nearly at the ſame time, and in the ſame year transferred to the celebrated Mr. van Marum of Harlem, who now poſſeſſes it. From various other avocations, I was prevented from cauſing any others to be made. It is not therefore wonderful that the ſame thought ſhould ſince have occurred to ſo great a maſter of the ſubject as M. Cavallo, who in the third volume of his Electricity, publiſhed in 1795, gives a deſcription and engravings of an inſtrument very different in form, but the ſame in principle. The form I have given it, which is all the ſhare I had in the contrivance, is more calculated for a ſpeedy repetition of the proceſs than M. Cavallo's: but his inſtrument is much eaſier to be made by one who is not profeſſionally a workman. Mr. Bennet's notion with regard to form was very different from either. Both inſtruments have the property, that a ſimple or ſmall aggregate of electricity will not be multiplied unleſs its intenſity exceed that of the adherent electricity of the plates, ſuppoſed to be contrary; and both are capable of deſtroying their own electricity, and exhibiting unequivocally what they receive by communication, however weak it may naturally be, provided the ſupply be kept up. They are both alſo limited as to the extent of their multiplication; that is to ſay, the effect will be denoted by a fixed number or multiplier, ſo long as the neareſt diſtance of the plates continues unaltered. For example, if this number were 100, the inſtrument would ſhew no electricity which was leſs intenſe than the $\frac{1}{100}$th part of what the electrometer demanded to act upon it. This coefficient is nevertheleſs capable of being enlarged at pleaſure, by adjuſting the plates to a leſs diſtance aſunder.

Fig. 8. repreſents a vertical ſection of the inſtruments. A is a metallic vaſe, having a long ſteel axis which paſſes through an hole in the ſtand H at K, and reſts on its pointed end in an adjuſtable ſocket at C. The uſe of the vaſe is, by its weight, to preſerve, for a conſiderable time, the motion of ſpinning which is given by the finger and thumb applied to the nob at the top of the inſtrument. The ſhaded parts D and E repreſent two circular plates of glaſs nearly $1\frac{1}{2}$ inch in diameter. The upper plate is fixed to the vaſe, and revolves with it; the lower is fixed to the ſtand. In the lower plate are inſerted two metallic hooks, diametrically oppoſite each other, at F and G. They are cemented into holes drilled in the edge of the glaſs, which is near two-tenths of an inch thick. In the upper plate are inſerted in the ſame manner two ſmall tails of the fine flatted wire uſed in making ſilver lace. Theſe tails are bended down ſo as to ſtrike the hooks in the revolution, but in all other poſitions they remain freely in the air without touching any part of the apparatus. At C is a ſcrew, which by raiſing or lowering the vaſe keeps the faces of the glaſs plates from each other at whatever diſtance may be required. The faces of the glaſs plates which are oppoſed to each other are coated with ſegments of tin foil, as repreſented Fig. 9 and 10, the latter of which repreſents the upper plate. Each of the tails communicates with the tin foil coating to which it is contiguous, as does alſo the hook F with that coating of the lower plate neareſt to it. But the hook G is entirely inſulated from the whole apparatus, and is intended to communicate only with the electrified body or atmoſpherical conductor L.

The lower coating neareſt to G is made to communicate permanently with the ſtand H, and conſequently with the earth.

In this ſituation, ſuppoſe the motion of ſpinning to be given to the apparatus, and the effects will be theſe:—One of the tails will ſtrike the hook G, by which means the upper coating annexed to that tail will aſſume the electric ſtate of L by communication. But this ſtate, on account of the proximity of the lower uninſulated plate to which it is, at that inſtant, directly oppoſed, will be as much ſtronger than that of L, as a charge exceeds ſimple electrization. The tail G with its plate or coating proceeds onward, and after half a revolution arrives at the ſituation to touch the hook F. The upper coating, the lower on the ſide of F, the hook F itſelf, and the tail V, muſt then conſtitute one jointly inſulated metallic maſs, in which no charge ſubſiſts, but which is ſimply electrified by the whole charge received at G. And of this maſs the ſurfaces of the plates themſelves, conſtituting the electric well of Franklin, will throw out all their electricity to the hook and tail. But the coating and its tail inſtantly paſs round, leaving F electrified, and proceed to bring another charge from G and depoſit it as before. The balls at F are therefore very ſpeedily made to diverge. It is ſcarcely neceſſary to remark, that the two upper coatings do nothing more than double the ſpeed of the operation; one of the tails being employed in collecting, while the other is depoſiting: and that the gold leaf electrometer may be advantageouſly ſubſtituted for the cork-balls.

The inſtrument I cauſed to be made was five inches high. The receiving ſide G was connected with a coated jar of four ſquare feet coating, and the giving ſide F was connected with Bennet's gold leaf electrometer. The electrometer was rendered as ſtrongly poſitive as it was capable of being, and the jar was rendered negative, by giving it as much of that power as was produced by drawing a common ſtick of ſealing-wax once through the hand. In this ſtate the jar was incapable of attracting the fineſt thread. The vaſe was then made to ſpin; and the effect was, that the leaves of the electrometer firſt gradually collapſed, and then in the ſame manner gradually opened, and ſtruck the ſides of the glaſs of the electrometer with negative electricity. The experiment was renewed and repeated with every requiſite variation.

IV.

Obſervations on the Art of Printing Books and Piece Goods by the Action of Cylinders.

—— Experto credite.

WE may conceive three ways of delineating figures, or writing. The firſt and moſt ancient conſiſts in making the traces ſucceſſively by a bruſh, a pen, or other inſtrument. This is deſign, painting, or writing. In the latter methods, either the whole or the greater part of the figures are made by the action or preſſure of an original pattern againſt the material intended to be written or painted upon. It is the art of printing. The colouring matter is either depoſited from the face of prominent parts of the original form, which is uſually called a block or type; or elſe it is preſſed from cavities cut in the face of the original, which in this caſe is called an engraved plate. Moſt books are printed

Dr. Blair's Improvement of compound object Senses.

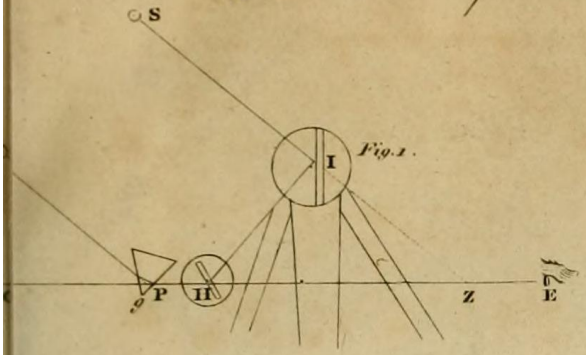

Fig. 1.

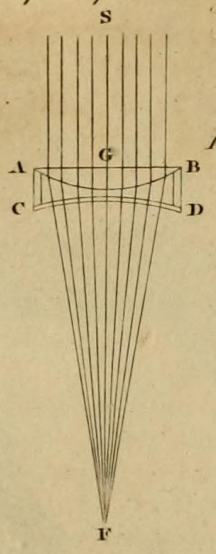

Fig. 2.

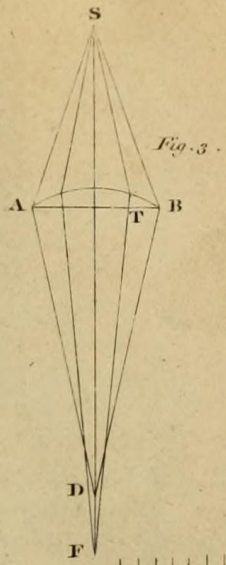

Fig. 3.

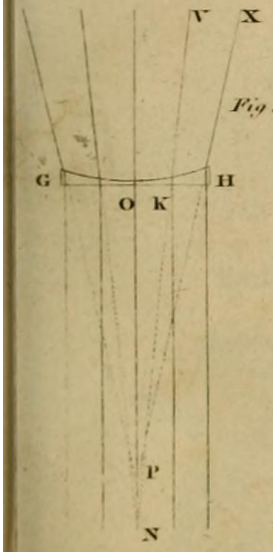

Fig. 4.

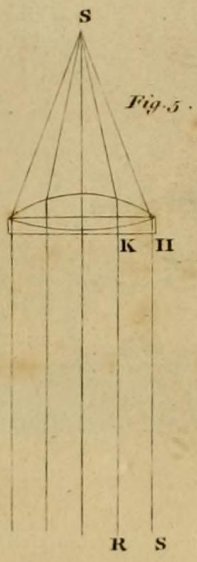

Fig. 5.

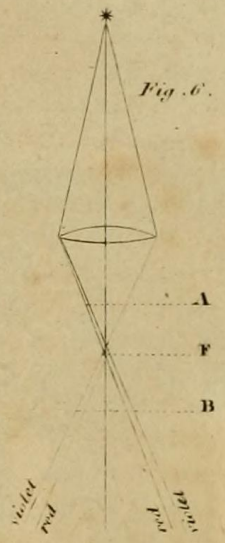

Fig. 6.

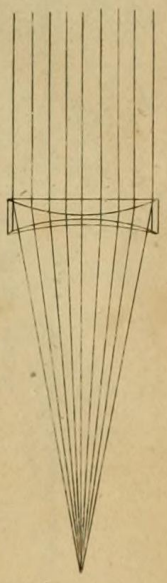
Fig. 7.

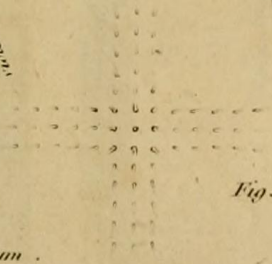
Fig. 11.

Uncommon Solar Spectrum. p. 13.

Fig. 8.

Electrical Instrument. p. 16.

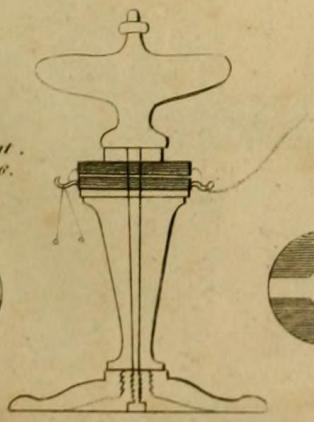

Fig. 9.


Fig. 10.

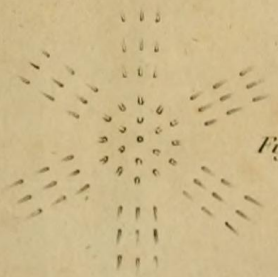
Fig. 12.