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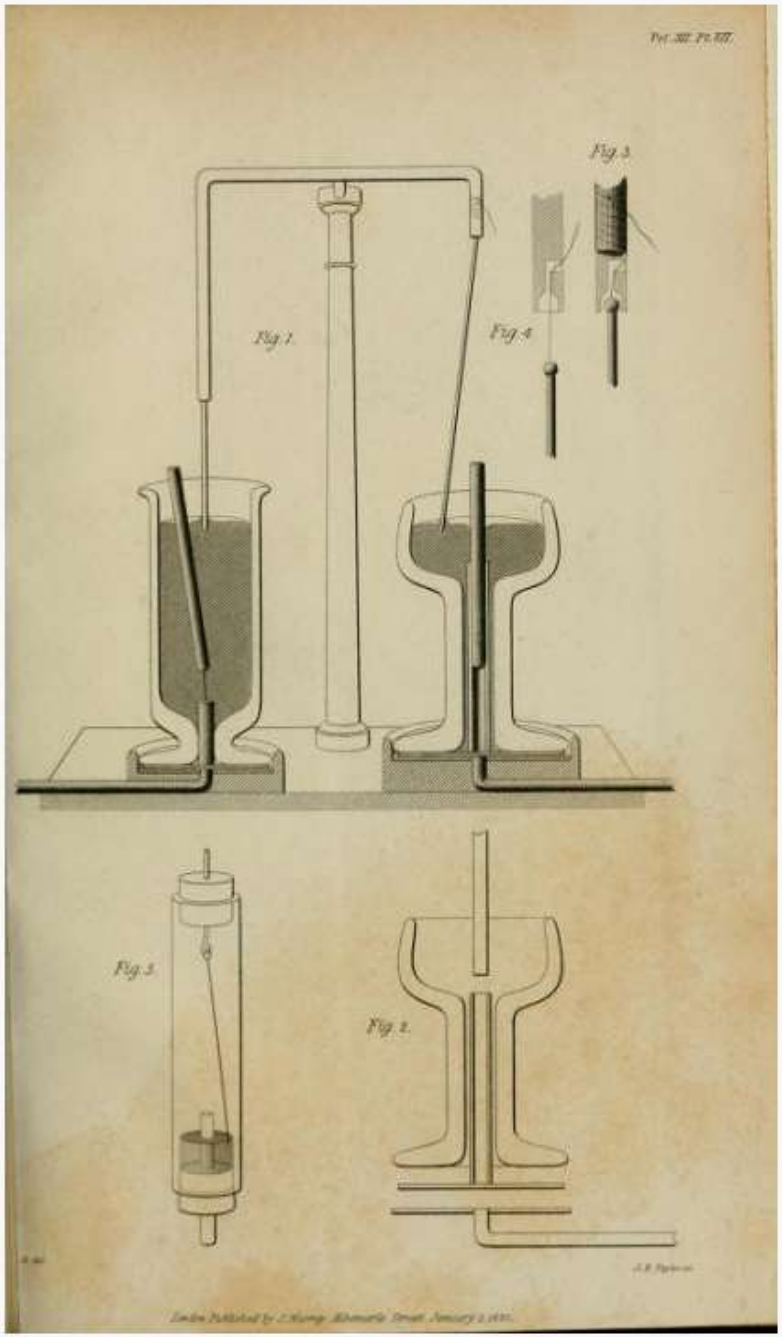

Original plate illustrating Michael Faraday's electric motor.
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sulphur, which being deducted from the joint amount of the sulphur and charcoal, amounting to 225 grains (E*b*) leave 196.5 grains for the weight of the charcoal.

H.

Assuming that 1000 parts of crystallized alum yield upon average, when decomposed by muriate of baryta, 945 grains of sulphate of baryta, it follows that 1000 parts of the alum ore of Freienwald, containing 28.5 of sulphur, should produce sulphuric acid sufficient (with the due addition of potassa) to form 260 parts of alum, for which scarcely one-sixth part of the alumine in the ore is required. But the quantity of alum produced at the works, falls infinitely short of this estimate in consequence of the very imperfect acidification of the sulphur.

I.

The following view of the components of this alum ore is suggested by the above experiments.

Sulphur	G		28.50
Carbon	G		196.50
Alumina	D *e*		160.
Silica	D *d*		400.
Black oxide of iron (with a very slight trace of manganese	D *f*	72.5	64.
Of which deduct for the composition of sulphate of iron		8.5	
Sulphate of iron	A *c*		18.
Sulphate of lime	A *c*		15.
Magnesia	E *e*		2.50
Sulphate of potassa	E *d*		15.
Muriate of potassa	E *d*		5.
Water	E *a*		107.50
			1012.

Some of the above results, however, require further investigation, and the magnesia is probably in the state of sulphate in the ore. The excess of 1.5 per cent. in the analysis is insignificant in such experiments.

Art. VIII. *Description of an Electro-magnetical Apparatus for the Exhibition of Rotatory Motion. By* M. Faraday, *Chem. Assist. in the Royal Institution.*

The account given in the *Miscellanea* of the last Journal, of the apparatus invented in illustration of the paper in the body of that Number, being short and imperfect; a plate is given in the present Number, presenting a section of that apparatus, and a view of a smaller apparatus, illustrative of the motions of the wire and the pole round each other. The larger apparatus is delineated, Fig. 1. Plate VII. on a scale of one-half. It consists of two glass vessels, placed side by side with their appendages. In that on the left of the plate the motion of a magnetic pole round the connecting wire of the voltaic battery is produced. That a current of voltaic electricity may be established through this cup, a hole is drilled at the bottom, and into this a copper pin is ground tight, which projects upwards a little way into the cup, and below is rivetted to a small round plate of copper, forming part of the foot of the vessel. A similar plate of copper is fixed to the turned wooden base on which the cup is intended to stand, and a piece of strong copper wire, which is attached to it beneath, after proceeding downwards a little way, turns horizontally to the left hand, and forms one of the connexions. The surfaces of these two plates intended to come together, are tinned and amalgamated, that they may remain longer clean and bright, and afford better contact. A small cylindrical and powerful magnet has one of its poles fastened to a piece of thread, which, at the other end, is attached to the copper pin at the bottom of the cup; and the height of the magnet and length of the thread is so adjusted, that when the cup is nearly filled with clean mercury, the free pole shall float almost upright on its surface.

A small brass pillar rises from the stand behind the glass-vessels: an arm comes forward from the top of it, supporting at its extremity a cross wire, which at the place on the left hand, where it is perpendicularly over the cup just described,

bends downwards, and is continued till it just dips into the centre of the mercurial surface. The wire is diminished in size for a short distance above the surface of the mercury, and its lower extremity amalgamated, for the purpose of ensuring good contact; and so also is the copper pin at the bottom of the cup. When the poles of a voltaic apparatus are connected with the brass pillar, and with the lateral copper wire, the upper pole of the magnet immediately rotates round the wire which dips into the mercury; and in one direction or the other, according as the connexions are made.

The other vessel is of the form delineated in the plate. The stem is hollow and tubular; but, instead of being filled by a plug, as is the aperture in the other vessel, a small copper socket is placed in it, and retained there by being fastened to a circular plate below, which is cemented to the glass foot, so that no mercury shall pass out by it. This plate is tinned and amalgamated on its lower surface, and stands on another plate and wire, just as in the former instance. A small circular bar magnet is placed in the socket, at any convenient height, and then mercury poured in until it rises so high that nothing but the projecting pole of the magnet is left above its surface at the centre. The forms and relative positions of the magnet, socket, plate, &c. are seen in fig. 2.

The cross wire supported by the brass pillar is also prolonged on the right hand, until over the centre of the vessel just described; it then turns downwards, and descends about half an inch: it has its lower extremity hollowed out into a cup, the inner surface of which is well amalgamated. A smaller piece of copper wire has a spherical head fixed on to it, of such a size that it may play in the cup in the manner of a ball and socket-joint, and being well amalgamated, it, when in the cup, retains sufficient fluid mercury by capillary attraction to form an excellent contact with freedom of motion. The ball is prevented from falling out of the socket by a piece of fine thread, which, being fastened to it at the top, passes through a small hole at the summit of the cup, and is made fast on the outside of the thick wire. This is more minutely explained by Fig. 3, and 4. The small wire is of such a length that it may dip a

little way into the mercury, and its lower end is amalgamated. When the connexions are so made with the pillar and right hand wire, that the current of electricity shall pass through this moveable wire, it immediately revolves round the pole of the magnet, in a direction dependant on the pole used, and the manner in which the connexions are made.

Fig. 5, is the delineation of a small apparatus, the wire in which revolves rapidly, with very little voltaic power. It consists of a piece of glass tube, the bottom part of which is closed by a cork, through which a small piece of soft iron wire passes, so as to project above and below the cork. A little mercury is then poured in, to form a channel between the iron wire and the glass tube. The upper orifice is also closed by a cork, through which a piece of platinum wire passes, which is terminated within by a loop; another piece of wire hangs from this by a loop, and its lower end, which dips a very little way into the mercury, being amalgamated, it is preserved from adhering either to the iron wire or the glass. When a very minute voltaic combination is connected with the upper and lower ends of this apparatus, and the pole of a magnet is placed in contact with the external end of the iron wire, the moveable wire within rapidly rotates round the magnet thus formed at the moment; and by changing either the connexion, or the pole of the magnet in contact with the iron, the direction of the motion itself is changed.

The small apparatus in the plate is not drawn to any scale. It has been made so small as to produce rapid revolutions, by the action of two plates of zinc and copper, containing not more than a square inch of surface each.

In place of the ball and socket-joint, (fig. 3, and 4,) loops may be used; or the fixed wire may terminate in a small cup containing mercury, with its aperture upwards, and the moveable wire may be bent into the form of a hook, of which the extremity should be sharpened, and rest in the mercury on the bottom of the cup.

Fig. 3.

Fig. 1.

Fig. 4.

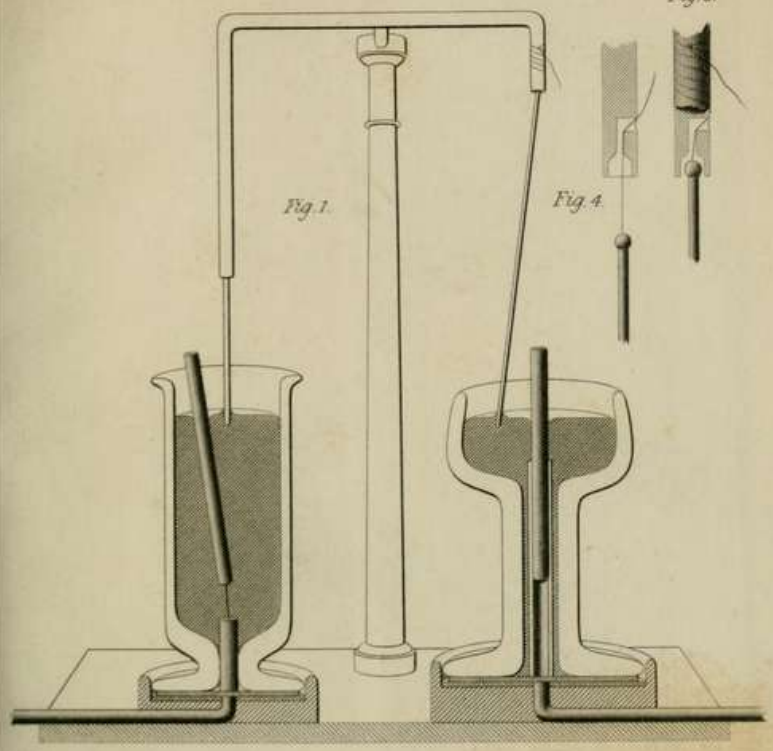

Fig. 5.

Fig. 2.