

RECENT DISCOVERIES IN ELECTRICITY.

(Communicated.)

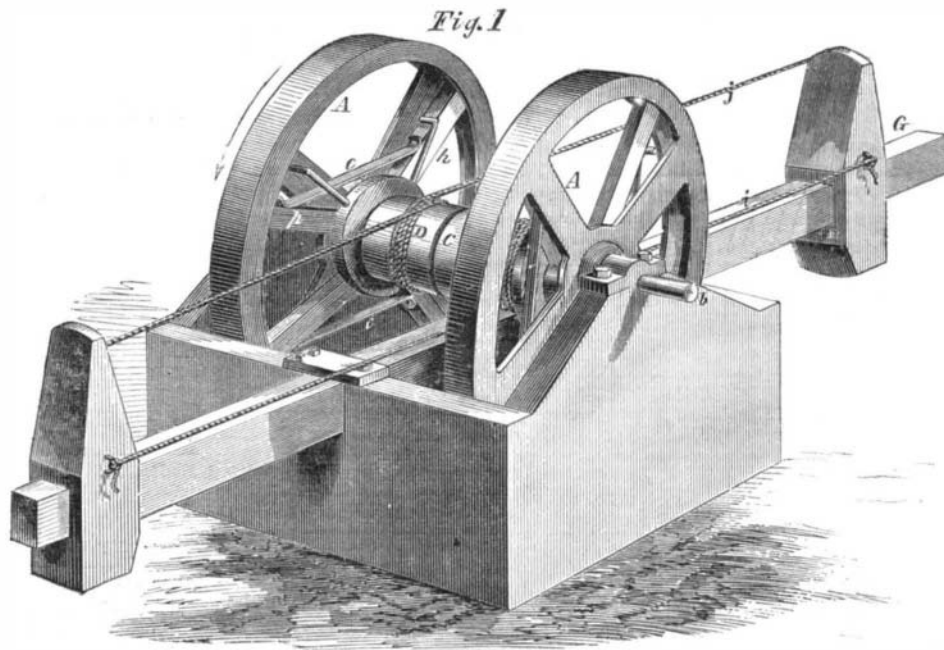
According to the *Annual of Scientific Discovery* for 1860, the researches made in the department of electricity, during the past year, have been most important; Messrs. Faraday and Grove, of England, occupying, as in years past, the most prominent position as investigators. The results of the experiments instituted by the latter gentleman are exceedingly curious, and must be regarded as all but proving the truth of the modern theory which assumes that electricity is not, in any sense, a material substance, but only an affection (state) or motion of the particles of ordinary matter. Thus he shows conclusively, by a great number of carefully instituted experiments that electricity cannot be conducted, or rather transmitted through a vacuum, and that in transmitting electricity through gaseous media, the facility of transmission is increased by a degree of attenuation in the media, but that when a certain point of attenuation is passed, transmission becomes difficult, and finally impossible. Now, if electricity be a subtle fluid flowing through matter, as the old theories had it, it would, we should suppose, fill up the vacuum (as running water fills up a depression in its channel) and pass on in the line of conduction; but as it does not thus act, the inference is unavoidable, that the presence of ordinary matter is necessary to its transmission, and that if space could exist void of matter, then there could be no electricity.

It is also extremely interesting to note how the establishment of one or two new facts in science, like those developed by Mr. Grove, speedily becomes the basis of new investigations, and the instrument for extorting fresh secrets from Nature. Thus the experimental result, that a certain degree of attenuation of air or gas forms a good conductor, or easy path for the electrical force, while either a greater or less degree of density offers more resistance, and this increasing toward either extremity of density or rarefaction, furnishes a possible method of determining the height of the aurora borealis; since, if this beautiful phenomenon is due, as is generally believed to the circulation of currents of electricity to and from the poles of the earth, the height where the transit of electricity takes place will be just that at which the density of the air is such as to render it the best conductor. This density being known from laboratory experiments, and the decrement of density of the atmosphere being in proportion to its distance from the earth, and capable of mathematical determination, the height of the aurora is at once made probable, if not certain. Conversely, also, by ascertaining the height of the aurora by parallax, *i. e.*, the angle subtended from different positions, we may be enabled to verify the calculated ratio of decrement in the density of the atmosphere as we recede from the earth's surface.

If electricity is unable to pass over or through a vacuum, it is probable that all the other so-called imponderable forces—light, heat, magnetism, and possibly attraction—obey the same law; and as these agencies freely travel the interplanetary spaces, the supposition of Newton that such spaces may be filled with an ethereal form of matter receives an indirect but powerful support. Taken in connection with the long-recognized fact, that some comets are apparently resisted in their motions, as if by friction against the medium they traverse, this evidence in favor of Newton's suggestions becomes very strong, and will probably induce scientific men to generally admit, hereafter, that matter exists in four rather than three states of attenuation, *viz.*, the solid, the liquid, the gaseous, and the ethereal.

NEW MODE OF CONVERTING RECIPROCATING RECTILINEAR INTO ROTARY MOTION.

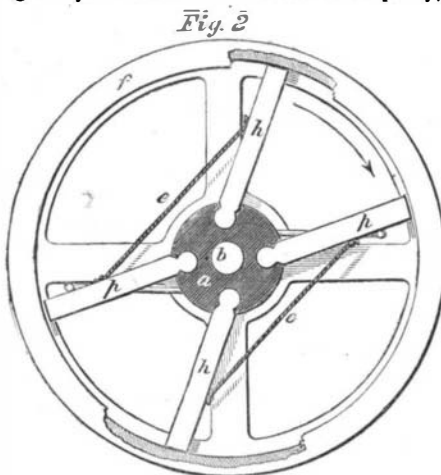
It is said that some of the early treatises on mechanics laid down the proposition that the loss of power in turning a crank, by means of a piston moving back and forth in a straight line, was one third. If such a statement has been published in any respectable work, it only shows to how great an extent certain mechanical delusions have prevailed in the world, for a very simple demonstration will satisfy any one that there is no loss of power whatever by the crank motion. There are,



HATHAWAY'S METHOD OF CHANGING MOTION.

however, important objections to this mechanical device, one of the most manifest of which is the great strain on the parts in large engines; and in consequence of these objections numerous efforts have been made to devise other modes of converting rectilinear into rotary motion. One of the most ingenious of these devices is illustrated in the accompanying cuts. It will doubtless attract the attention of mechanics, as the same idea may be made available in other combinations, especially to replace the ratchet and pawl in certain situations.

The two wheels, A A, Fig. 1, are rigidly secured to the common shaft, *b*, which has two pulleys, C and D, running loosely upon it. The two bands, *i* and *j*, are wound around the pulleys in opposite directions, so that, when the frame, G, is moved back and forth, a reciprocating rotary motion is communicated to each pulley, the



pulley, C, turning to the right when the pulley, D, is turning to the left, and *vice versa*. Now, this invention consists in the plan by which each pulley is made to take hold of the wheel with which it is connected whenever it is turned in one direction, and to release its hold when it is being drawn back in the opposite direction, thus each pulley operating alternately to turn the common shaft. The plan is plainly shown in Fig. 2. Two arms, *h h*, longer than the radius of the wheel, have their ends, which are smoothly rounded, inserted loosely into the pulley, and their outer rounded ends in contact with the inner

surface of the rim of the wheel, which projects inward a sufficient depth for this purpose. The position of these arms is slightly inclined from the radius, so that, as the pulley is turned in the direction indicated by the arrows, the ends of the arms are pressed against the rim of the wheel, and the wheel is carried round. But when the pulley is turned in the opposite direction the ends of the arms fall away from the rim of the wheel, allowing the pulley to be turned back in a direction opposite to the motion of the wheel without any considerable friction.

In order to retain the ends of the arms in easy contact with the rim, ready to be brought to their bearings whenever the pulley is turned in the direction of the motion of the wheel, the light springs, *e e*, are attached to the arms and to the supplementary short arms, *p p*, the latter being prevented from turning over by the spokes, *r r*, which are inserted into the pulley.

The patent for this invention was obtained through the Scientific American Patent Agency, April 3, 1860, and the claims will be found on another page. Persons desiring further information in relation to it will please address the inventor, Mr. Joshua Hathaway, at Marietta, Ga.

TRANSPLANTING TREES.

—If the Commissioner of the Central Park (says a city cotemporary) would

give strict orders to mark the north side of trees with red chalk before they are taken up, and when set out, to have the tree put in the ground with its north side to the north in its natural position, a larger proportion would live. Ignoring this law of nature is the cause of so many transplanted trees dying. If the north side is exposed to the south, the heat of the sun is too great for that side of the tree to bear, and therefore it dries up and decays.

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