THERMO-MAGNETIC MACHINES.

IT would seem that at the present time there is being developed in the United States a new kind of engine, capable, at least in theory, of turning, by a magnetic method, the latent energy contained in fuel either into mechanical work or into the energy of electric currents. In this kind of machine the variations produced in the magnetic power of metals, such as iron and nickel, by heating and cooling them, are made the means of generating in the one case electric currents, in the other mechanical motion. The latter application was the earliest to be suggested. In the columns of NATURE (vol. xix. p. 397) will be found a note, extracted from the Journal of the Franklin Institute, upon a thermo-magnetic motor devised by Prof. E. J. Houston and Prof. E. Thomson, of Philadelphia. In this curious apparatus a disk or ring of thin steel is mounted on a vertical axis so as to be quite free to move, with its edges opposite the poles of a horse-shoe magnet. This wheel becomes of course magnetized by induction. When, however, heat is applied at a point on the circumference, the change thereby produced in the magnetic susceptibility of that part causes the disk to move round so as always to bring into line with the poles those portions of the disk which are for the time being the most susceptible to magnetization. Hence if the heating is continuous there will be a continuous rotation; the parts of the disk cooling as they leave the source of heat, and again becoming heated as they pass through the place where heat is being applied. The very same kind of thermo-magnetic motor was reinvented, in 1886, by Prof. Schwedoff, of Odessa, who, in a paper in the *Journal de Physique*, pointed out that this was a genuine case of conversion of heat into work, and gave the theory of the transformation and the cycle of operations from the thermo-dynamic point of view.

The next stage of invention in point of time, though it has only just been made public, is the suggestion by Mr. E. Berliner, of Washington, to use these thermo-magnetic variations in iron for the purpose of generating electric currents. In June 1885 Mr. Berliner filed an application for a patent for an "electric furnace generator," of which the following are the underlying principles:—"If," he says, "I take a magnet and provide it with a coil around its pole or poles, and place before this magnet and in proximity to the coil a piece of iron heated to bright red, nothing will occur to disturb the magnetic field; but the instant the iron cools down to a dull red, the magnetism becomes excited, and a momentary current of electricity is produced in the coil. I may go a step further and have a series of such magnet coils and iron armatures, and by connecting the coils into the same circuit, and cooling the armatures in rotation one after the other, a number of electrical impulses will be produced, which, when they follow one another rapidly, will approximate to a continuous electric current. . . . The current thereby produced might be utilized to charge another coil surrounding the magnet and reinforce the field; and in that case the magnet might be substituted by a tubular core of iron, . . . or a series of coils and magnets might be placed toward one larger armature disk, forming a common armature, heated by one furnace."

The most recent suggestions in this line come from Mr. T. A. Edison, who, independently of Mr. Berliner, has devised an almost identical generator, to which he has given the name of a "pyro-magnetic dynamo." At the recent meeting of the American Association of Science, a paper by Mr. Edison, giving an account of his machines, was read, and has been largely noticed in the non-technical press, as though it were an absolutely new departure in electric science. The famous inventor may certainly lay claim to having worked out in greater detail the practical problems of construction. In the generator there are eight double-pole electro-magnets arranged radially. At the top the eight poles converge toward a central space; and about a foot below the other eight poles converge toward a second central space. In these central spaces lie two soft iron disks, forming the cheeks of the armature, and pierced with eight large holes, each to receive eight vertical armature cores, each of which consists of a roll of corrugated sheet-iron surrounded with a coil of wire insulated with asbestos. The eight wire coils are connected up together and joined to a commutator, just like the coils in the armature of Niaudet's dynamo. This armature stands over a furnace, the heated gases of which are led up through the interstices of the eight rolls of sheet-iron. By the use, however, of a revolving screen of fire-clay the ascending hot gases are cut off successively from some of these tubular cores so that they are alternately heated and cooled, giving rise to electric currents in the coils, which currents are collected above by the action of the commutator. The arrangement appears to have been constructed with Mr. Edison's well-known ingenuity. The inventor has also constructed a pyro-magnetic motor, which consists essentially of a powerful field-magnet (independently excited) having between its poles as a rotating armature a bundle of small vertical tubes of very thin iron, which are packed in a convenient drum-like form and mounted on a vertical spindle. From a furnace underneath rise currents of heated air, and pass through the iron tubes; but, by a screen placed in a suitable position below, the heated air is prevented from rising through some of the tubes, and instead thereof a blast of cool air is blown down these: the cooled tubes, becoming more highly magnetic, are more powerfully attracted by the poles of the field-magnet, and move forward, only to be afresh heated, whilst a new set of tubes comes into position to be cooled and attracted. Mr. Edison states that already a speed of 120 revolutions per minute is practicable; and he is building one of these motors calculated to work at 3 horse-power. Whether the sanguine hopes which he expresses as to the economic working of such motors and generators, as compared with existing engines and dynamos, will be fulfilled in the future is as yet a matter of speculation. But the practical problem, even though it is surrounded by many obvious difficulties, is of so tempting a nature, and the attempt to solve it is so daring, that we must wish to our Transatlantic friends the utmost success in their efforts to supersede the present wasteful methods of utilizing the latent energy of fuel.

NOTES.

THE following is the list of names recommended by the President and Council of the Royal Society for election into the Council for the year 1888, at the forthcoming anniversary meeting on the 30th inst.:—President: Prof. George Gabriel Stokes. Treasurer: Dr. John Evans. Secretaries: Prof. Michael Foster, the Lord Rayleigh. Foreign Secretary: Prof. Alexander William Williamson. Other members of the Council: Sir William Bowman, Bart., Henry Bowman Brady, Prof. Arthur Cayley, W. T. Thiselton Dyer, Prof. David Ferrier, Dr. Edward Frankland, Dr. Arthur Gamgee, Prof. Joseph Henry Gilbert, Prof. John W. Judd, Prof. Herbert McLeod, Dr. William Pole, William Henry Preece, Admiral Sir George Henry Richards, K.C.B., Prof. Arthur William Rücker, the Earl of Rosse, and Sir Bernhard Samuelson, Bart.

MR. F. J. JACKSON has presented to the Natural History Museum an interesting set of animals collected by him during his three years' residence in East Africa. The birds are particularly valuable, and contain many species new to the Museum collection. Mr. Jackson resided for some time in the Kilima N'jaro district, and procured several rare species hitherto only known from the late Dr. Fischer's collections in the Berlin