

Recent Developments in "Aero-Electrics".

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THE alarming rate at which the world's supply of coal and oil is being used up, persuades the industrialists to assess its reserves: of what may be regarded as inexhaustible power-producing materials, such as wind, tide, solar energy, timber and all vegetable products capable of yielding alcohol. The scarcity of fuel caused by the war has revived the interests of engineers, specially towards the immense and ever present power which is available in the winds. At present many people regard wind-power as of negligible importance, but the intensive researches carried out in various countries lead to the fact that wind is a much more dependable source of power than hitherto expected. The entire water-power resources of the world would be negligible against the gigantic potentialities of wind power. Given proper conditions, it can be turned to a very practical account. Russia has already ascertained that the winds blowing over the Soviet Union contain a potential generative power of some 10,000 million KW. Previously the feasibility of erection of windmills was only possible in low-lying countries as in Holland where a wind of medium strength is almost constantly blowing; and innumerable mills like these are already under successful operation in various countries, not as an industrial concern but as small units for isolated communities. Amongst the scientific investigators the name of the Danish physicist Professor Poul la Cours comes first being the pioneer, but the aircraft industry is solely responsible for enabling the manufacturers to be certain about the actual performance of their windmills in accordance to the designs.

The meteorological data for selecting the most favourable spot with known nature of the disposable wind energy previous to the erections of windmills is as essential as the hydro-electric survey before launching a water-power scheme. Actually the central Aero-hydrodynamic Institute of Moscow has already kept themselves busy in obtaining information about their country through the agency of 1,387 meteorological observatories and at the same time striving to improve the machinery, designed and constructed for the wind-power establish-

ments. At present we can look upon three types of wind-power generators which will enable the electric energy supply on a commercial scale: (1) The improved form of those found to be most suitable by Danish people empirically; (2) The Rotating Cylinder invented by J. D. Madaras, an U.S.A. engineer; the principle being the same as employed by A. Flettner for propelling his wind-driven rotor ship; (3) The high-zone-wind-Power Stations where the wind turbines will be placed as high as 1,500 ft. above the ground surface.

TYPES OF WHEEL.

The maximum amount of power which can be extracted out of the air depends on suitably designing the blade-form concerning its effective area and profiles. These wheels are divided into two classes: *viz.*, slow or high speed runners. A high-speed runner evidently differs from a slow-speed one in having very few long and narrow blades. Governing of speed is generally done by a couple of springs in the former, while an auxiliary vane mounted normally brings the desired effect for the latter. Only very recently the invention of 3-6 bladed fast rotors with automatic adjustable propeller profiles (Fig. 1) have rendered the use of storage accumulators unnecessary.

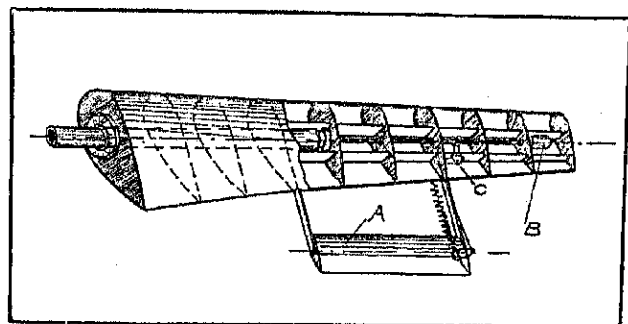


Fig. 1.

Stream-lined self-regulating blades.

Besides the successful operation in Baku of a 45 ft. diameter windmill (Fig. 2) in connection with oil industry, the improvised experimental wheel of 100 ft. diameter at Balaklava in Crimea (Fig. 3) has satisfactorily withstood a year of continuous operation, under the rigours of climatic variations, thereby firmly establishing the possibilities of utilising the energy of the

wind in parallel with the existing hydro-electric plants, particularly in winter when



Fig. 2.
45 feet diameter windmill in Baku.

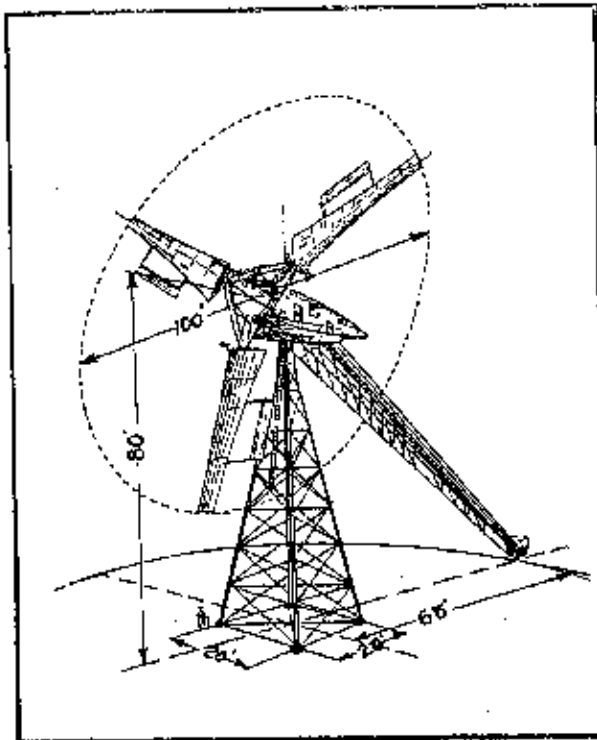


Fig. 3.
100 feet diameter windmill in Balaklava.

in cold countries many rivers, supplying hydro-electric schemes, are ice-bound. Both

of them are fitted with three self-regulating blades as shown in Fig. 1. Here the weight B controls the pitch of the blades for constant speed centrifugally in relation with the wind velocity changes, by governing the movements of A through the lever C. The stream-lined blades made out of light wood and metal at Balaklava are each 35 ft. long with the greatest width of 7.5 ft. The inclined shaft of this 100 ft. wheel has been geared with an asynchronous 100 KW. generator rated at 220 volts, 3-phase, 50 cycles, 600 syn. r.p.m. with a power factor of 84 per cent. Special thrust bearings have been provided to compensate the inclination. The machine room is housed inside a steel framed structure and the whole rotates on a spherical pivot on top of the 85 ft. high tower. The structure is connected with a tail-piece (containing the ladder) which terminates on a motor driven platform rotating on a circular track of 65 ft. radius. The motor on the platform is automatically actuated by a directional vane over the machine room to throw the wheel into the wind. When the unit arrives at synchronous speed the generator is automatically cut in, and after the wind dies down the generator is automatically cut out until the wind rises again. The safety of the equipments is assured by means of an automatically controlled protective system. Three phase 220 volts power is transmitted from the generator by a sliding connection and cables to the power house for stepping up to 6.6 KV. for the network. Low voltage generation was adopted for the safety of the experimenters. The erection of a 30,000 KW. set is under schematic form in view of the extreme dependability of this set.

ROTATING TOWERS OF J. D. MADARAS.

This unique contrivance is the outcome of a very recent enterprise. An industrial plant according to the proposed scheme will consist of twenty or more duraluminium cylinders, each 90 ft. high and about 25 ft. in diameter, capped on the top by discs extending 5 ft. beyond its circumference (Fig. 4) and so mounted on bearings that it can turn freely. Each will be placed on a truck and independently driven by a small motor. The towers being smooth surfaced and at the same time moving in a stream of air is bound to develop an increased translational force in accordance with "Magnus Effect", an experimental fact after the German physicist

Magnus, who first demonstrated it in 1852. This force will be utilised in driving the trucks around a circular track and the

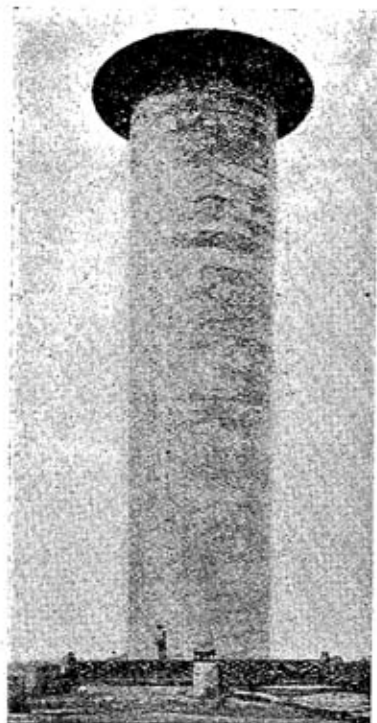


Fig. 4.

The experimental rotor of Madaras in New Jersey.

production of electric power will be effected by huge generators geared to the wheels. Even a wind velocity of 10 m.p.h. is able to produce a peripheral velocity of 50 m.p.h.

in the tower. Each such unit will weigh 150 tons and can be depended upon to generate 1,000 KW. On the basis of preliminary calculations it is claimed that the installation costs per KW. will be only about £10, $\frac{1}{3}$ th the average cost of a hydroelectric plant. By establishing such generating stations in specially windy location, we can tide over the greatest problem—what to do when the wind refuses to blow?

HIGH-ZONE WIND POWER STATIONS.

This is the last and a very bold attempt on the part of a German engineer Herr Herman Honnef to harness the wind for power. With the materialisation of this plan the question of a favourable and suitable location can easily be dispensed with as there is always plenty of wind high above the earth's surface. The idea is to erect five "windmills" on the top of a colossal tower 1,500 ft. high made out of welded steel tubes. Each will be 250 ft. in diameter and the unit is speculated to generate 50,000 KW.

The modified electric generators have already assured the future of small windmill installations, as hundreds of them have been giving good service for a period of years. Also the difficulties in the regulation of big wheels especially in storms, and direct linking to high voltage transmission systems, are sure to be surmounted within a very short time due to the sincere interest evinced by engineers all over the world to obtain the cheapest energy from nature.

Lyochromes.

RECENT work on the chemistry of a new group of pigments of great physiological importance, now called Lyochromes, has yielded very valuable information regarding their constitution (*Nature*, 1934, **133**, 553-56). These animal pigments are related to Warburg's respiratory ferment on the one hand, and to vitamin B₂ on the other. They are insoluble in the common neutral organic solvents but are soluble in water, and exhibit a characteristic yellow-green fluorescence which changes reversibly to a violet fluorescence on addition of acids or alkalis. Further, they are reversibly reduced to a leuco-base by reducing agents such as hydrosulphite while being highly resistant towards oxidising agents.

One of the richest sources of these pig-

ments is whey from which they can be adsorbed by fuller's earth. The adsorbate can be washed with alcohol and water and eluted by pyridine. By employing this technique, Ellinger and Koschura obtained concentrates from which five crystalline coloured substances designated lactoflavines *a-e*, were isolated. These five substances differ from each other in their crystalline form, solubility and intensity of colour in solution. The flavines *a*, *b* and *c* answer the murexide test and on warming in solution decompose into soluble pigments and substances of a purin character; they are therefore called purin-lyochromes. Lactoflavine *d* gives a negative murexide test while *e* gives the test only with chlorate and hydrochloric acid.

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