Description of Dubos Power Plant

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Harnessing the Winds

Just how unreliable is the wind?

Well, that literally depends on where you look. In New York and New Jersey it may be a fine example of something not to be trusted. In Antarctica, on the other hand, one spot had a steady gale of more than 45 miles per hour for 7 months without any interruption.

With all the natural distrust one may feel about the reliability of the wind one must admit that wind power has been of great importance in history. It was the first natural power used by mankind. For many centuries ships moved by wind power or they did not move, unless they were small enough to rely on muscle power in a calm sea. Mankind discovered and explored the distant places on this planet mostly by wind power—that is, when exploring journeys could be made by ship. The occasional attempts to power land vehicles by means of sails failed; the "wind wagon" of an enterprising Dutchman, which excited his contemporaries almost three centuries ago, was a sporting device rather than a means of transportation. The same is true of its offspring, the iceboat, although there have been many more of those.

But while the wind could not be harnessed by our forefathers for land transportation, for many centuries it did something even more important: it ground the grain for the daily bread. A fact not known to the many generations of windmillers in the Christian kingdoms of the European North during the late Middle Ages and early modern times is that they were using a "heathen device," for the windmill seems to have been invented by the Arabs. It appeared in northern Europe in the twelfth century, after the early Crusades, and first became common in Germany and the Netherlands. For the Dutch, wind power was the means of literally making their country—their windmills pumped their made land dry. Elsewhere wind power pumped water too, but for the opposite reason—to irrigate the crops. Even now in the United States and Canada about half a million pumping windmills are doing their chore almost daily.

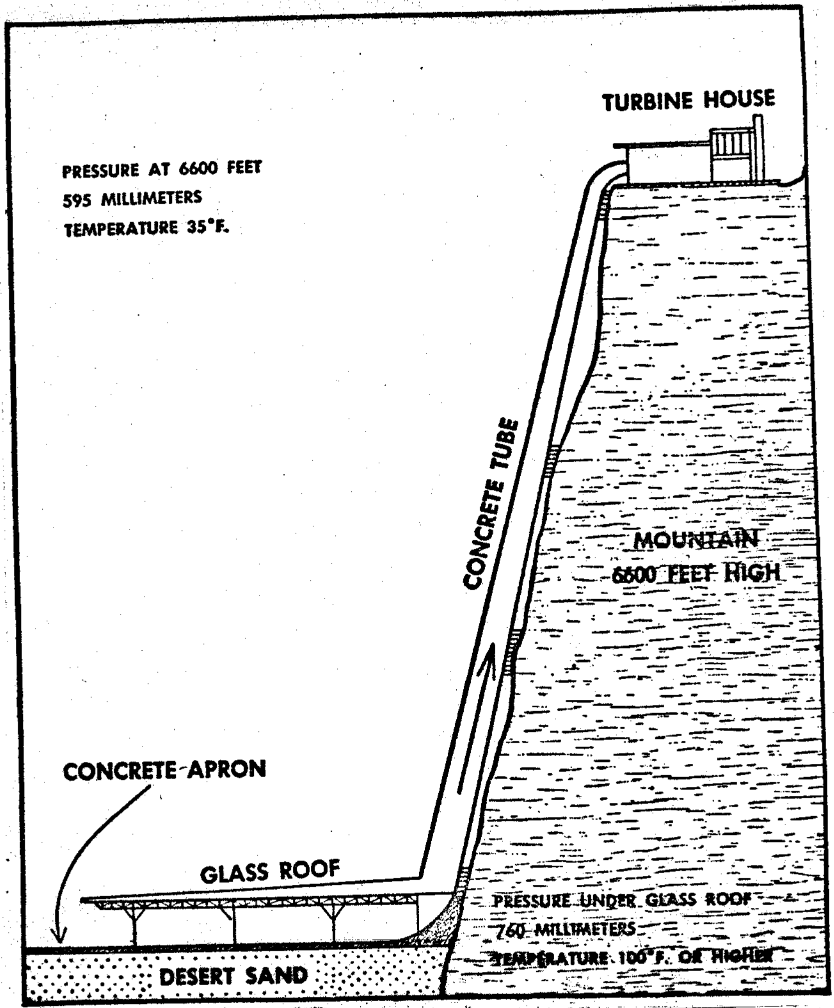
Navigation by wind power was not a matter of choice until steam was harnessed. But the other uses all tend to demonstrate the unreliability of the wind. All these are chores which have to be done, but not at regular intervals or according to a strict timetable. You can grind enough grain to last for months with a few days' work in a windmill and it does not matter much just when you start. Irrigation is virtually a hallmark of unfirm power, as we know from the discussion of solar energy. Mention of solar energy at this point is not purely accidental; wind—not its direction, which is influenced by the earth's rotation and many other factors—is the direct result of solar energy.

Now if wind is a form of solar energy and its main drawback is its unreliability, couldn't we solve the problem by using solar energy to make a reliable wind?

This question is sheer nonsense if you have in mind a wind from east to west or from south to north. But, under certain conditions and with certain restrictions, it might be possible to make a vertical wind.

The idea was developed by the French physicist Bernard Dubos and submitted to the French Academy of Sciences at about the time Georges Claude submitted his plans. Amusingly the two plans even show a few similarities because both are based on differences in temperature levels. The Academy—usually considered conservative by its friends and reactionary by its enemies—recommended that Dubos's idea be followed up, especially in French North Africa, which has no fuel and needs power. As a matter of fact Dubos had the North African Atlas mountains in mind when he developed his plans.

To make a powerful vertical wind, he said, you need a hot desert plain under a mostly cloudless sky and, in the near neighborhood, fairly high mountains with nearly vertical faces. In the desert plain the air pressure will probably be near normal, balancing a column of 760 millimeters of mercury. On the mountain top, an assumed 6600 feet above the desert, the pressure will be around 595 millimeters of mercury. In addition to that, and more important, the temperature of the air on top of the mountain will be somewhere between 30 and 40 degrees Fahrenheit, while the air just over the desert sands will be between 100 and 110 degrees. Normally the air between the desert and the mountain top will be quietly layered with slowly decreasing temperatures and pressures as you go up. But if you opened an avenue for the hot desert air, using the equivalent of an enormous chimney, a storm unparalleled in speed in Nature would develop inside the chimney, neatly packaged in the pipe



44. Principle of Professor Dubos's power plant

and ready for exploitation. One could count on a speed of about 180 feet per second; the volume of air moving at this speed would depend mostly on the chimney's diameter.

The wind turbine that utilized this typhoon in a pipe would have to be at the upper end, on top of the mountain. The mountain would also support the chimney, which would be anchored to its side. In order to make the scheme effective, the supply of heated air must be steady, and no heat must be lost through the walls of the chimney. The supply could be improved by having the chimney flare out at the bottom into a large glass-roofed area. The necessary insulation of the chimney could be accomplished most simply if the enormous pipe—it should have a diameter of about 30 feet—were made of porous cement, which is not very heavy and is a fine insulator.

When finished, a power plant designed along these lines would look rather like some water-power plants which have enormous penstocks coming down a mountainside. But in these plants the movement through the penstocks is down; in a Dubos power plant it would be up. There is little doubt that a Dubos power plant would work. Whether it would work efficiently is another question which probably cannot be answered without first building and studying a pilot plant.

Another French idea for the utilization of wind power, developed by the researchers of the aerodynamical institute at St. Cyr, somewhat resembles Dubos's scheme in that it also works with a "chimney." But the dimensions are much smaller and the principle is entirely different. The device consists of a sheet-metal chimney just strong enough to stand up under wind, which is open on top and has a number of large holes around the bottom so that the air can enter freely. The height of such a chimney would be about 60 to 75 feet. At its crown a "collar" is attached, a fairly short section of a similar chimney of double the diameter. This collar is held in place by narrow supporting struts, so that air can enter into the space between chimney and collar without any obstruction. If such a device is exposed to