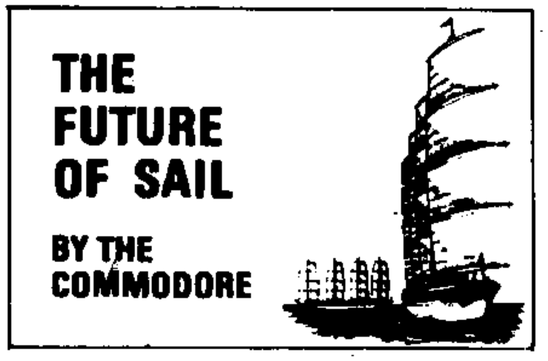

Some Mechanical Devices

TO the traditionalists, the future of sail means inevitably the return of the graceful billowing sails of yesteryear; but my postbag, as well as containing many interesting and stimulating stories of the past, mostly drawing the inference that such ships could once more pay their way because of the present high fuel prices, has for some time also had a relatively small but persistent percentage from those with an entirely different picture of what the future may hold for us.

After all, the dictionary accepts that any "wind-catching apparatus" may be termed a sail, and it is now many years since a sail-plane had anything other than rigid wings, whether plywood or lightweight fibreglass sandwich construction.

One of the most interesting lines of enquiry which have been suggested is to explore the possibility that modern discoveries in aerodynamics and constructional and mechanical techniques may at last enable man to achieve his age-old dream of finding a way to drive a vessel directly into the wind.

Since time immemorial, primitive man struggling in his coracle against the wind must have dreamed of a device which could turn the wind to his favour; and when later he found that, by putting up a sail to the wind he could without personal effort make progress over the water, he must have been disappointed to find how severely restricted were the directions in which he could voyage.

In New Testament times, St. Paul, in a succession of ships, battling for many months against contrary winds to get to Rome to make his appeal to the Emperor, forced first to make a detour of almost a thousand miles to pass to the North of Cyprus, and then a further detour of almost the same length to pass to the South of Crete, only finally to be shipwrecked on the island of Malta, must have dreamed the same wish.

So it is only natural that, when landbound man started to turn his thoughts towards using the air to sustain him in flight against the force of gravity, seaborne man should start wondering whether it might not likewise be possible to devise a mechanism to enable the wind to drive a ship in the direction from which it was blowing.

With risks of the use of oil as a political bargaining counter being added to the pressures of ever-rising prices with which we are now familiar, combining to make the need to conserve oil become ever more imperative, the search for means of harnessing the wind to assist or to provide ship propulsion is starting to attract the attention of a wider band of people with a perhaps more scientific outlook than the straight "back to sail" proponents.

They recognise a natural reluctance among those now concerned with powered shipping to embark on changes which would result in a need for large numbers of men to be trained in skills which are now unfamiliar (except in much smaller numbers in the leisure yachting industry) such as sailmakers and riggers, in order to build new ships; or to take any action which would necessitate the recruiting of men with different attitudes to seafaring (including the will, even if not as routine, then as a need in emergency to go aloft to control unruly canvas when things go wrong), and the need to acquire new skills, in the trimming and maintenance of sails. It is only natural for shipowners to express a preference for some mechanical means of using the wind to be developed in preference to a "return to canvas".

While not necessarily endorsing this philosophy, one must at least recognise its attraction to powered-shipowners, managers, captains and crews. Modern commerce is so complex an operation that any change tends to induce rising costs, so the smaller the change that need be made to introduce wind-power or wind-assistance, the better. Further, with the risks of pollution resulting from strandings and sinkings, the need for collision avoidance has placed increased emphasis on the routing of ships, especially the need for control zones in congested shipping waters such as the Channel.

Clearly the need for appreciable numbers of wind-driven ships to beat up Channel, bearing in mind the fact that the angles of their courses will change drastically with the wind shifts occurring as fronts move across or along their path, would be a baffling complication to the captains of large tankers accustomed to maintaing steady courses, and to reckon with other ships doing the same, adding to the already considerable number of "reasons and excuses" which could be cited in mitigation of yet another oil-polluting disaster.

Clearly if a means of wind-driven ship propulsion could be found which not only dispensed with sails and rigging but which also would enable the ship to travel in any direction, including directly towards the wind, it would be preferable from many standpoints to any form of conventional sail, provided that there was no appreciable economic disadvantage. It is not therefore surprising

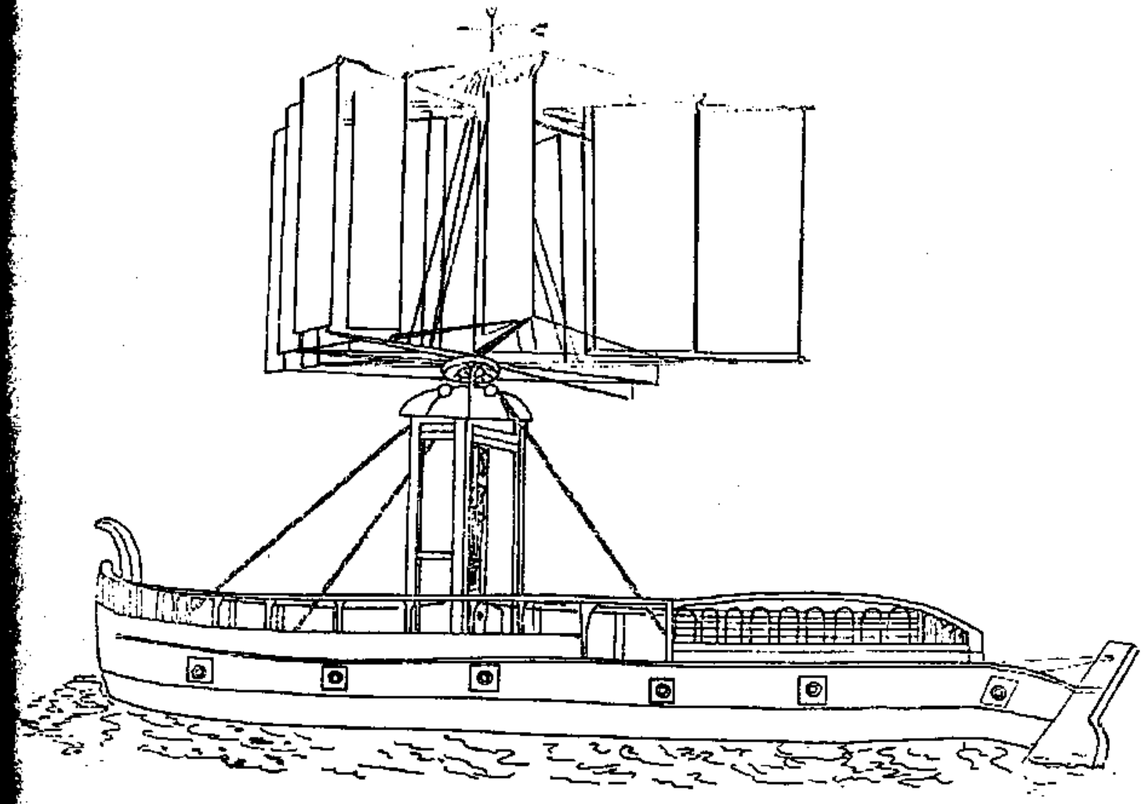

Fig. 1: Dawson's windship of 1811.

that at the present time some serious thought is being given to devising such a system.

A rotating device which could draw the wind equally from any angle, and which could then turn it into mechanical power for propulsion (whether by waterscrew, water jet, or even paddle wheel) could offer this possibility, provided only that the power it produced, and the mechanical efficiency of the transmission, and of the waterscrew (or etc.), was sufficient to overcome the windage of the rotating mechanism itself plus that of the ship and superstructure; and this is the basis of the endeavours which have been made to develop an omni-directional, all mechanical, system of wind propulsion.

Perhaps unexpectedly, the first such system to take to sea (though the Editor would be delighted to hear from any reader who has a better candidate for "first") seems to have anticipated not only the fuel crisis by almost two centuries, but the onset of powered shipping itself. For in 1811 one Robert Dawson took out a patent for a vertical axis wind-power device for propelling a ship. A sketch of the device is at Fig 1 on page 311, and the inventor's specification which, after presenting greetings to His most Excellent Majesty George the Third, describes his mechanism, is of such ingenuity that it will bear repeating here.

"I erect an upright spindle in a suitable framing, in which it is to turn, and so placed that motion from the said spindle can most easily, according to circumstances, be applied to the machinery to which power is wanted. This spindle rises into the open air, where I construct on it a framing in sockets, by which it revolves round the spindle horizontally; and in this framing I place vanes turning by means of spindles fastened to them vertically in the said horizontal framing, which permit them to turn round in their framing according as the wind presses on them. When the wind blows against these vanes there is a bearing that runs from the horizontal framing to the upright spindle, to which being fixed, the whole is caused to revolve together at a rate according to the strength of the wind. When this bearing is made tight and slipped into a groove, the wind acts upon the vane to which the bearing has reference, and power is gained from its operation on this vane. When the bearing is slipped out of the groove the bearing slips back, when the vane comes against the wind, and the same, keeping its edge to the wind, is out of power. As the bearings and vanes are increased so is the power; each vane that is added to be so placed that each overlaps the other a little, and from each vane a bearing runs to the spindle, and the power is by means of them increased or diminished, as required. By this construction of apparatus the whole force of the wind is received on the full surface of the vanes, and as the framing revolves the vanes turn, and present nothing on the contrary side of the spindle to the wind but their edges."

Beyond mentioning that the figure I have shown depicts "the apparatus applied to the navigation of a vessel", Dawson gives us no clue how the rotational effect his device obtained from the wind was to be translated into a forward thrust on the ship, but as the water-screw propeller had not then been invented, and even paddle-wheels must have been, to say the least, uncommon, it seems probable that there was a crank mechanism of some kind operating oars. It may be that what appear to be six portholes shown along the sides of the craft are in fact their locations."

Despite its astonishing appearance to our eyes, and the low overall efficiency which such a propulsion system would seem to have possessed, the craft is on record as having been built, and having successfully sailed from Bristol to London. No doubt at least the passage from Bristol to Land's End, and from the mouth of the Thames estuary to London, will have been accomplished into the eye of the prevailing winds. It would be most interesting to hear from readers whether any can remember reading references to any journeys made by this strange craft, or any references to their forebears having actually seen it.

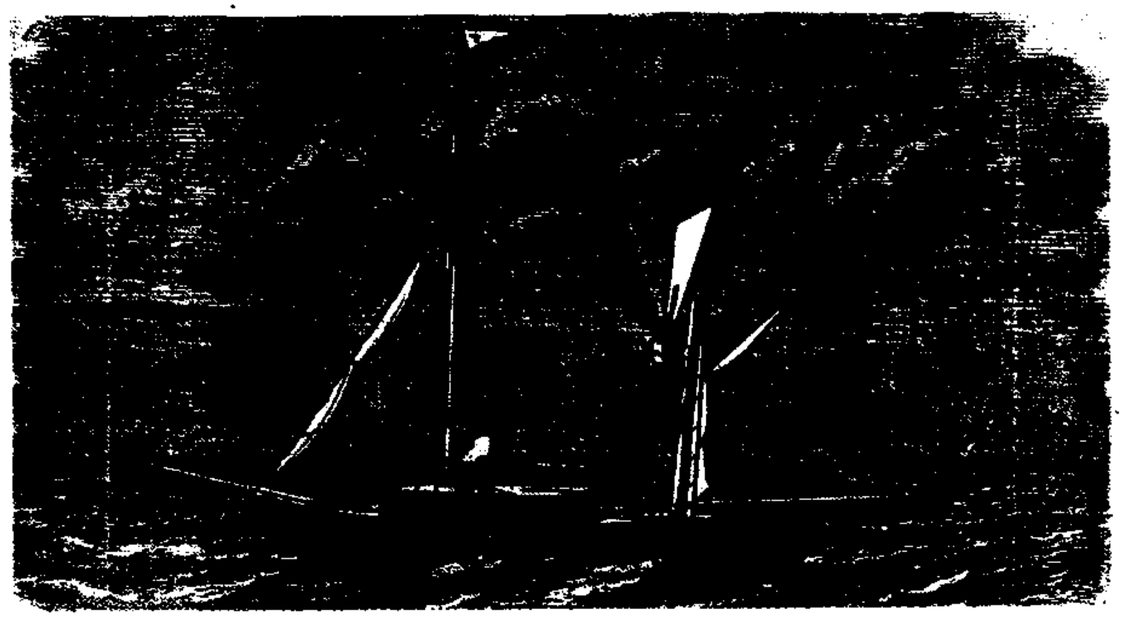

Fig. 2: The "City of Ragusa" of 1870.

The next reference to a rotating device being used to propel a ship is of two intrepid sailors who set out for the new world in 1870 in the ***City of Ragusa,*** a two-ton yawl which, in addition to its fore-and-aft sails, was also equipped with square sails on both masts, a windmill, and a waterscrew propeller: one of the first examples, perhaps, of what has since become known of the "belt and braces" principle (see Fig 2 above).

Those who believe that crews at sea should be kept busy, will be interested to hear that, in the event of the wind being too light to turn the windmill, or of this device suffering any mishap, the waterscrew propeller could be turned by hand! Readers who participated in last year's Fastnet Race, or closely followed its fortunes, will I am sure agree with me when I say that to set out to challenge the Atlantic from East to West in a vessel only 20 ft. long with a rig of that complexity requires a somewhat unusual type of man, and it is not therefore with particular surprise that we learn that Capt. Buckley in charge of the vessel had had a colourful past, which had included serving in the army of the Papal Government (during which time he had been taken prisoner by the invading forces of King Victor Emanuel); had been an officer of an American passenger steamer; had been master of a large vessel in the China trade; and had been decorated for saving two lives off the coast near Hythe. His companion, one Pietro di Costa, had been master of an Austrian merchant vessel which had been wrecked on the Goodwin Sands.

We know that she travelled safely from Liverpool to Queenstown, and that she was sighted by a pilot cutter 40 miles west of Cape Clear, her captain reporting that all was well. But what we do not know is whether this extraordinary little ship, with the immense drag of her masts, spars, rigging and furled sails, could actually travel directly into the wind driven by so primitive a windmill, driving such an early example of waterscrew propeller. But it would surely be remarkable if Capt Buckley, and his companion, neither of them strangers to the sea or to disaster of one kind or another, would set sail with such a device unless it had proved to them its ability to do something other rigs could not do.

One is left firmly with the impression that the rather pessimistic estimates of some who have assessed the performance of modern windmill ships, using all the technology devised from aircraft development, must be, to say the least, on the conservative side.