March 30, 1926. 1,578,835

L. E. KOTHE

FLUID MOTOR

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Fig. 1.

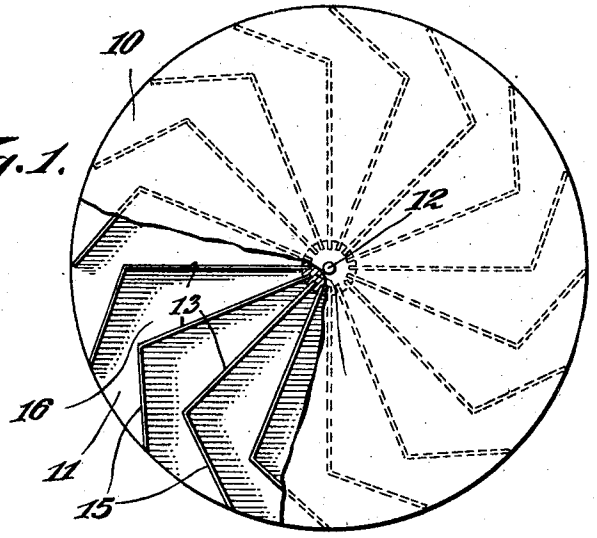

Fig. 2.

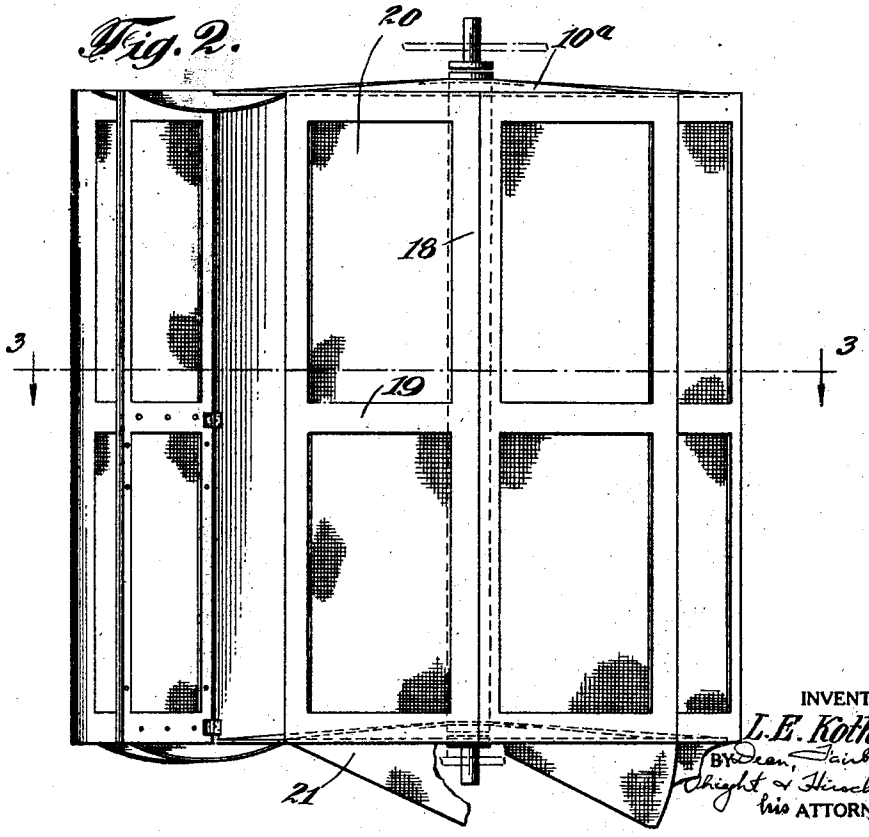

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Fig. 3.

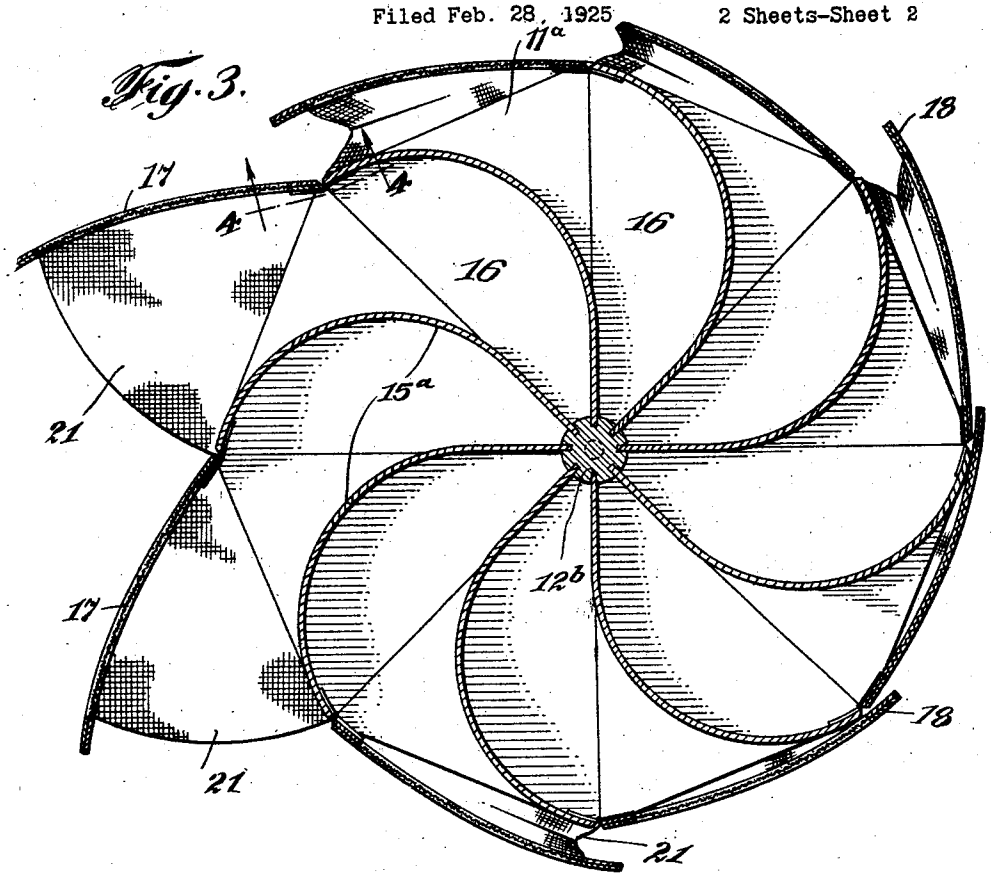
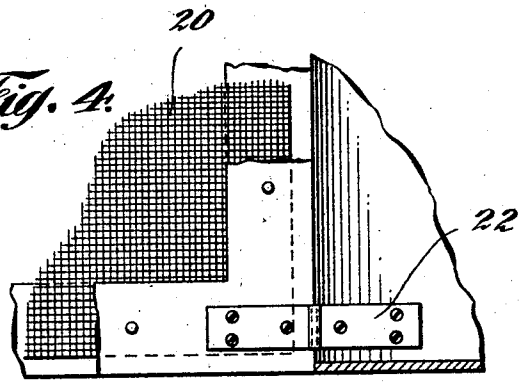


Fig. 4.



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Patented Mar. 30, 1926. 1,578,835

UNITED STATES PATENT OFFICE.

LOUIS E. KOTHE, OF ENGLEWOOD, NEW JERSEY.

FLUID MOTOR.

Application filed February 28, 1925. Serial No. 12,200.

To all whom it may concern:

Be it known that I, LOUIS E. KOTHE, a subject of the King of Great Britain, and resident of Englewood, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Fluid Motors, of which the following is a specification.

This invention relates to improvements in fluid motors, particularly to improvements in a reaction rotor which is adapted to serve as the main power converting element in such motor. I have shown a simplified generic embodiment of the invention which is readily adaptable for use as a wind mill, or a water wheel or the rotor of a steam turbine without involving any material changes in its construction and without departing from the reaction principle involved. In accordance with a preferred simple embodiment of the invention, the rotary power transforming element is in the nature of a drum including heads, a connecting hub and a plurality of partitions which extend from the hub to the periphery of the drum and define a series of fluid receiving pockets. The individual partitions serve as sails, buckets or vanes, depending upon whether the wheel is used as a wind mill, water wheel or turbine rotor and the individual pockets serve to store fluid actuating means upon the main power impulse and to subsequently release such fluid and obtain a secondary power impulse at the time of the release.

Preferably, the individual partitions are arranged so that a maximum leverage is obtained regardless of the nature of the fluid which furnishes power. Preferably each partition includes an inner section disposed in a substantially radial position relative to the hub of the drum and extending from the hub to a point closely adjacent the periphery thereof. Connected to this radial section and preferably integral therewith is a trailing section preferably disposed at a slightly obtuse angle to the radial section, adjacent pairs of such trailing sections providing tapered guiding chutes or deflectors for the motive medium so that the latter is directed against the outer ends of the radial partition sections with considerable force and at a sufficient distance from the center of the drum to obtain a powerful leverage. The trailing partition sections also receive a direct power impulse from the motive medium, the leverage afforded by the impingement upon such surfaces being longer than the initial impingement upon the radial sections. The pockets tend to store up energy in the nature of compressed air or steam, or in the case of a water wheel they serve to trap water and as the pockets move to the point where their outlet ends are no longer under the direct influence of the motive medium, such fluid, in escaping, impinges upon the trailing sections and imparts to them an additional secondary power impulse. I am thus able to obtain a maximum amount of power from a minimum motive force.

The rotary element or drum has the noteworthy advantage of embodying no individually movable parts and consequently is a compact sturdy structure which while light in weight, is unlikely to get out of order or to be injured by unusual weather conditions.

In a preferred specific embodiment in which the device is used as a wind mill, the effective surfaces of the partitions may be supplemented by the use of hinged sails or wings having limited outward swinging movement which have the effect of extending the partitions, as they move to leeward and which are feathered by air pressure to close the pockets as they move to windward. When the drum is used as a wind mill, it is preferably mounted upon the main vertical shaft of the mill, thereby eliminating the horizontal shafting which generally carries the sails and since it rotates always in the same direction regardless of the direction of the wind, eliminating the use of transmission mechanism between a horizontal and vertical shaft as well as the use of vanes and counterbalances. The device will be highly sensitive and efficient, comparatively simple in construction, light in weight, rugged and durable in use and unlikely to become damaged due to extreme weather conditions.

The means by which the above noted and various other objects are attained may be more fully understood from the following description in connection with the accompanying drawings, wherein:

Figure 1 is a top plan view of a simplified

type of motor constructed in accordance with the generic principles of power transformation involved in the present invention.

Figure 2 is a view in side elevation of a wind mill motor embodying the invention,

Figure 3 is a view in section on the line 3—3 of Figure 2.

Figure 4 is a detail showing the method of attaching the sails or wings to the drum.

The novel reaction principle involved may be best understood from the simplified and somewhat diagrammatic showing of Figure 1 wherein it will be noted that the rotary element is in the nature of a drum including a pair of heads 10, 11, connected by a central hub 12. Extending from the hub to the periphery of the drum are a number of partitions each of which includes a radial section 13 extending from the hub to a point closely adjacent the periphery, and a trailing section 15 forming a continuation of the radial section and trailing at a slightly obtuse angle thereto. The consecutive partitions cooperate to provide air pockets 16 and the trailing partition ends provide tapering deflectors for directing fluid motive medium into the pockets in such a manner that it will impinge on the outer ends of the radial partition sections, thereby obtaining a maximum leverage on each partition. This direction of motive medium against the outer ends of the radial partition sections occurs at the time when two adjacent trailing ends are in position so that the motive medium enters directly between them. Further rotation of the drum, however, will move the leading trailing section into a position where the motive medium may impinge directly thereon in which instance, an even longer leverage is obtained tending to rotational movement of the drum.

The motive medium is used to store up energy in the individual pockets at the time it enters the same, such energy being subsequently released and giving an additional power impulse. In the case of a gaseous fluid such as air or steam, the gas will be compressed in the pockets and as the mouths of the pockets move out of the direct influence of the motive medium and pressures at the mouth of the pockets are relieved, the motive medium will escape and rush out of the pockets with some violence, such escape of the motive medium serving to exert pressure on the trailing ends of the partitions and impart a secondary power impulse thereto.

Having thus explained generally the operation of the rotor in Figure 1, the construction and operation of the particular type of wind motor disclosed in Figures 2 to 4 will be more evident. In these figures, the motor includes heads 10^a, 11^a, a hub 12^b, and a series of partitions 15^a, the inner ends of which may be anchored in peripheral notches 12^b in the hub, and the edges of which may be secured to the heads in any approved manner. These partitions are somewhat different from the partitions shown in Figure 1, but the difference is merely relative since the same principles are involved. It will be noted that each partition while it projects from the hub in a substantially radial direction, trails toward its outer end although the sharply defined junction of the radial section and trailing section of each partition is omitted and the partitions are curved in a trailing direction at a progressively increasing rate toward their outer ends. The drum heads shown are of generally octagonal instead of the circular shape of Figure 1, although they might be of any regular polygonal shape desired, depending principally on the number of partitions utilized. I have shown the partitions as entering the drum hub opposite one corner of the head and having their trailing ends joining the periphery of the drum adjacent the following corner. I have also shown the use of a number of wings or sails 17 hingedly connected to the partitions at their outer ends and having a limited outward swinging movement. These wings are preferably curved on an arc struck from the center of the hub in order to offer a minimum resistance to the wind as they move to windward. Means for limiting the outward swinging movement of the partitions preferably includes flexible and approximately triangular webs 21 and such webs may be integral with the canvas covering 20 on the skeleton frames of the wings. This wing construction is conducive to lightness in weight and the canvas which covers the wings may be water proofed and otherwise treated in the manner of the material commonly used on air plane wings so that it will stand up well under the conditions of exposure, to which it will be subjected. It is desirable that there must be no escape of wind between the wing sections and the partition ends to which they are hingedly connected and I consequently provide some type of hinge structure which will serve to prevent such escape. For illustrative purposes only I have shown a leaf hinge, the leaves of which are countersunk in the partitions and the frames 18 of the wings 17. The heads of the drums are preferably inclined from their center to their periphery in order to effect drainage of rain water and the normal tendency of the webs as seen best in Figure 2 is to sag downwardly and prevent the collection of water therein.

It will be noted that the wings are slightly longer than the distance between the outer edges of consecutive partitions so that the following free end of each wing projects slightly from the outer periphery of the drum and from the hinge line of the succeeding wing, as seen most clearly in Fig-

ures 1 and 3. These projecting corners offer an inlet to the pockets which facilitates the initial outward swinging movement of the wings as they move into position where the wind can act on the projecting corners.

The drum will always rotate in the same direction regardless of which way the wind is blowing, the wind swinging open the scoop like deflector wings and operating on both the wings and the partitions as levers at one side of the drum to cause rotational movement thereof. As the wings pass from the leeward side of the drum toward the windward side, they are folded in or feathered by the pressure of wind thereon.

In the operation of the device, it will be noted that the partitions as they move to leeward, offer pocketing surfaces into which the air is deflected by the wings. The impingement of the air upon the partitions gives a considerable power impulse over and above the power obtained from the effective wing surfaces. In other words, both partitions and wings cooperate to act as sails.

In this connection, it may be noted that the motor with the curved partitions of Figures 2 to 4, is capable of use without the wings and that in such instance, the partitions moving to windward present convex wind deflecting surfaces so that most of the wind is spilled out of the pockets while partitions moving to leeward present concave surfaces tending in larger measure to trap and effectively derive power from the wind. The wind escaping from the pockets on the leeward side of the drum acts to deliver an additional power impulse to the trailing ends of the partitions.

It will be evident that the device may be used either as a wind or water motor and that it may be mounted in either vertical or horizontal position. When used as a water motor, the device is mounted in horizontal position and the wing portions are preferably omitted.

If the motor be mounted horizontally for use as a wind motor, it necessitates the provision of a vane to maintain it broad side to the wind and it also necessitates the use of a conventional type of transmission gearing, for converting rotary movement of a horizontal shaft into rotary movement of a vertical shaft. With the drum mounted in vertical position and directly keyed to the main power shaft of the mill, I am able to eliminate not only the vanes, and counterbalances, but also the mechanism commonly employed for operatively connecting such shaft to the horizontal power shaft bearing the motor. A reversal of the direction of rotation of the drum may be quickly effected by removing the drum, turning it upside down, and replacing it.

It will thus be seen that there is herein described apparatus in which the several features of this invention are embodied, and which apparatus in its action attains the various objects of the invention and is well suited to meet the requirements of practical use.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

The invention lends itself admirably to embodiment in a toy pinwheel, waterwheel or windmill.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. A wind motor including a drum formed with a plurality of partitions defining pockets extending from near the center thereof to substantially the periphery thereof and wings freely hinged at the outer ends of the partitions, those of said wings moving in direction opposed to the wind being closed by the pressure of the wind.

2. A wind motor including a drum formed with a plurality of partitions defining pockets extending from near the center thereof to substantially the periphery thereof and wings hinged at the outer ends of the partitions, having limited outward swinging movement from the outer ends of the pockets and free inward movement to close automatically by movement of the wing in direction opposed to the wind.

3. A wind motor including a drum formed with a plurality of partitions fixed therein and defining pockets extending from near the center thereof to substantially the periphery thereof and wings hinged at the outer ends of the partitions and adapted to be feathered by wind pressure, and having limited outward swinging movement from the outer ends of the pockets, said wings having their upper and lower edges connected by webs to the ends of the drum.

4. A motor of the class described including a drum, a plurality of partitions extending from the periphery to substantially the axis of the drum and forming air pockets and wings pivoted to the partitions and deflecting air into the pockets, approximately triangular webs at the ends of the wings limiting outward swinging movement thereof and cooperating therewith to form scoop-like baffles for deflecting air into the pockets and free to be feathered by wind pressure.

5. A motor of the class described including a drum, a plurality of partitions extending from the periphery to substantially the axis of the drum and forming air pock-

ets and wings pivoted to the partitions and deflecting air into the pockets, said partitions being curved from their inner to their outer edges away from the direction of rotation of the drum and adapted to cover the pocket, the pocket covering wings being hinged to the edge of the leading partition of each pocket and free to be feathered by wind pressure.

6. A motor of the class described including a drum of polygonal cross section including upper and lower heads, partitions extending from the axis of the drum to the periphery thereof and forming air pockets and wings hinged to the edges of the partitions and movable in innermost position to close the inlets to the pockets, said wings having limited outward swinging movement.

7. A motor of the class described including a drum including upper and lower heads, partitions extending from the axis of the drum to the periphery thereof and forming air pockets and wings hinged to the edges of the partitions and movable across the inlets to the pockets, said partitions having limited outward swinging movement, the means for limiting the outward swinging movement of the wings including substantially triangular webs connecting the upper and lower edges of the wings with the upper and lower heads of the drum.

8. A motor of the class described including a drum including upper and lower heads, partitions extending from the axis of the drum to the periphery thereof and forming air pockets and wings hinged to the edges of the partitions and movable across the inlets to the pockets to close the same, said partitions having limited outward swinging movement, said partitions being curved away from the direction of rotation of the drum whereby air directed into the pockets by a wing is trapped by the partitions to which the wing is hinged.

9. A motor of the class described including a drum having heads, and curved partitions extending from near the axis to substantially the periphery of the drum, and arcuate wings pivoted to the partitions and adapted to swing across the mouths of the pockets defined thereby to close the same.

10. A motor of the class described including a drum having heads, and curved partitions extending from near the axis to substantially the periphery of the drum, and arcuate wings pivoted to the partitions and adapted to swing across the mouths of the pockets defined thereby, said wings being curved on an arc struck from the center of the drum.

11. A motor of the class described including a drum having heads, and curved partitions extending from near the axis to substantially the periphery of the drum, and arcuate wings pivoted to the partitions and adapted to swing across the mouths of the pockets defined thereby to substantially close the same, and means for limiting the outward swinging movement of the wings including webs connecting the upper and lower ends of the wings to the heads of the drum.

12. A wind motor including a drum formed with a plurality of partitions defining pockets extending from near the center thereof to substantially the periphery thereof and wings hinged at the outer ends of the partitions, said wings comprising skeleton frames supporting taut sheets of flexible material.

13. A wind motor comprising a drum having upper and lower heads, a hub, partitions extending from the hub to the periphery of the drum, wings hinged to the partitions and adapted when in closed position to overlap each other and provide projecting ends offering wind resistance.

14. A device of the class described including a drum comprising upper and lower heads, a hub connecting the heads, uniformly spaced partitions extending from the hub to the peripheries of the head and defining air pockets and wings hinged to the partitions and curved on an arc struck from the center of the drum.

15. A device of the class described including a drum comprising upper and lower heads, a hub connecting the heads, uniformly spaced partitions extending from the hub to the periphery of the head and defining air pockets, wings hinged to the partitions and curved on an arc struck from the center of the drum, each wing being longer than the distance between the partitions whereby to provide free following edges overlapping the hinged edge of an adjacent wing and offering a projecting end to expedite the opening of the blade under the influence of the wind.

Signed at New York, in the county of New York and State of New York, this 27th day of February, A. D. 1925.

LOUIS E. KOTHE.