(No Model.)

D. W. LORD.

BUOYANT PROPELLER.

No. 484,503. Patented Oct. 18, 1892.

Fig. 8.

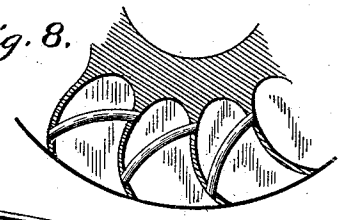


Fig. 1.

Fig. 2.

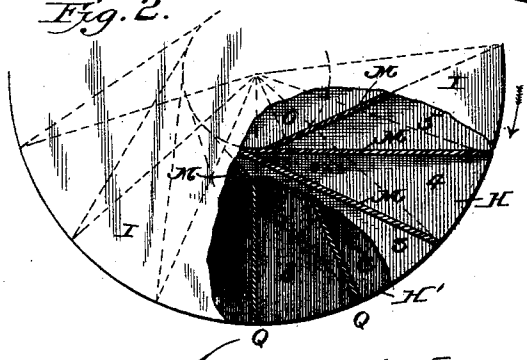


Fig. 3.

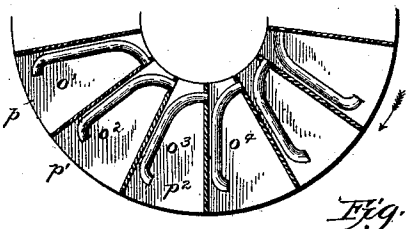


Fig. 4.

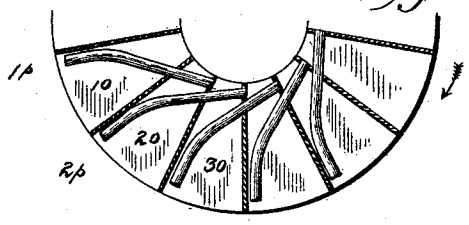


Fig. 5.

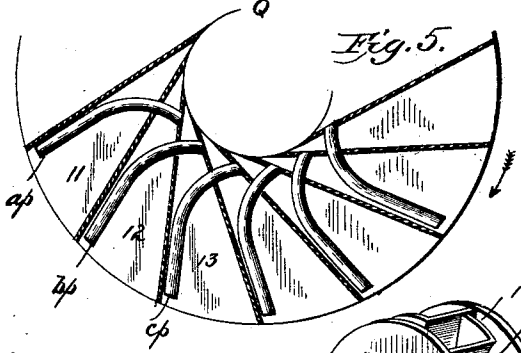


Fig. 6.

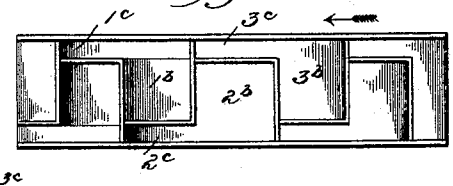
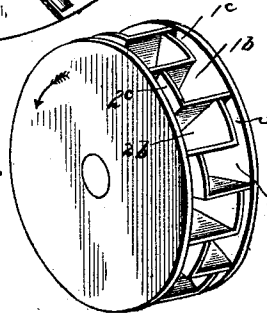


Fig. 7.



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DANIEL W. LORD, OF MALDEN, MASSACHUSETTS.

BUOYANT PROPELLER.

SPECIFICATION forming part of Letters Patent No. 484,503, dated October 18, 1892.

Application filed June 14, 1892. Serial No. 436,706. (No model.)

To all whom it may concern:

Be it known that I, DANIEL W. LORD, residing at Malden, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Buoyant Propellers, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to buoyant propellers.

Figure 1 is a plan of a vessel, showing one form of wheel or buoyant propeller, as hereinafter described. Fig. 2 is a broken side elevation of the propeller-wheel, Fig. 1. Figs. 3, 4, and 5 are broken vertical sections of modifications of the propeller-wheel. Fig. 6 is a diagram or partial plan of propeller-buckets modified in construction, but involving the same principle of operation; and Fig. 7 is a perspective of a wheel with such buckets. Fig. 8 is a broken section of a wheel with curved buckets.

The general principle of the construction of my propeller-wheel is that it shall be always buoyant. It has a number of open-mouthed buckets, which buckets contain air. The theory of operation of the propeller-wheel is that it shall rest on the water with one or more of the buckets at the bottom of the wheel, the open mouth of the bucket forming temporary walls inclosing a certain body of water with a considerable body of air imprisoned above the water. As the water enters but a little way into the bucket, (being excluded by the imprisoned air,) the water in the bucket will be practically a stratum of limited thickness acting as a base of more or less solidity, on which the weight of the propeller is supported for an instant. The rapid advance of the buckets successively imprisons other bodies of water and air. The progression is on much the same principle as that which enables the skater to pass rapidly over thin ice or the runner to pass quickly from block to block of ice which would be insufficient to sustain the weight for a considerable length of time. The wheel is sufficiently buoyant to support itself even when at rest. The same theory of operation is set out in my patent, No. 438,815, of October 21, 1890. In the present invention I introduce a somewhat different construction and mode of operation.

In Fig. 1, A denotes the frame or guards of the vessel or boat.

B is a bow or front compartment at the front of the wheel, which compartment preferably is entirely above water and does not extend down to the water-line.

C is the rear compartment or hull proper, which trails slightly in the water at the stern, but is mainly supported at its front by the buoyant wheel W. The hull is steered by any usual rudder.

The hull or frame may have side wings or buoys D, which may be a little above water. Should the boat tip or waves run high one or both of these buoys D will rest on the water and give stability. The form of the buoy will be such as to give as little resistance as may be to the progress of the boat. The wheel W may have a shaft provided with cranks E, said shaft having bearings in the frame, or other connections may be made, so that the buoyant wheel W will support the boat, or at least the front part thereof, instead of being supported by the frame or hull. The wheel may be driven by power connected to the shaft—say at cranks E—or in other manner, as hereinafter stated. Such a craft is designed especially to run for short distances at high speeds over the surface of the water to carry light loads, as to carry a life-line from shore to a wrecked vessel, or possibly to carry a pilot. It may also be utilized to carry a torpedo, or for other purposes.

The main feature of novelty of my propeller-wheel lies in the means by which the wheel-compartments are relieved of water to prevent dragging or lifting of the water by the wheel. The wheel W is of light weight and has a large number of buckets with open mouths at its periphery. As the wheel rotates, these buckets are brought in rapid succession upon the surface of the water, confining the air in the buckets and largely excluding the water by means of this body of confined air. As the side of the bucket which first enters the water (which I call the "advanced side" of the bucket) rises from the water the bucket opens to the external air; but I provide an opening to the air in advance of this, or at least in ad-

vance of the opening of any considerable area of the main bucket to the air, in any one of several ways.

Referring to Figs. 1 and 2, it will be seen that the cylindrical surface of the wheel is divided into open-mouthed buckets in series, 1 2 3, &c., denoting the outer buckets and *a b c*, &c., the central buckets, which buckets are separated from each other by partitions running in planes parallel to the shaft or axis, and by the disks H H′ forming partitions parallel with the end walls I I′ of the wheel. The partitions M M between the buckets 1 2 3 are placed tangent to the hub O. Thus the buckets 1 2, &c., are wedge-shaped, but do not extend to the center of the wheel. The buckets *a b c* are separated by radial partitions Q, and these open-ended wedge-shaped buckets do extend to the center of the wheel, or nearly so. From this arrangement, as shown in Fig. 2, it will be seen that the bucket 3, for instance, may have an opening through the partition H into either one of the buckets *a*, *b*, or *c* of the radial or middle series of buckets. (The partition is shown broken, so that bucket 3 communicates with buckets *b* and *c;* but this is merely to illustrate. Openings may be made in the partitions, as at *x* or *x x*, according to the connection desired.) With a given area of the bucket and velocity of wheel movement it is desirable to carry the opening a short distance in the lead, while with other proportions a greater lead is desirable. Therefore the bucket 3 in one variety of wheels will have an opening near its narrow inner end into the bucket *b* and all the other buckets in series 1 2 3, &c., with corresponding openings.

When the wheel rotates on the water, the bucket *b* enters the water first and the water enters its mouth for a little distance, the air being driven back into the bucket 3; but as the area of bucket *b* is less than that of bucket 3 this movement of air is relatively small. As soon as the mouth of the bucket 3 gets below the water-line both the buckets are closed by the water and the pressure of air in the upper portion of the buckets is equalized and the air is somewhat compressed. The partitions forming the buckets hold a stratum of water inclosed in the mouth of the buckets 3 and *b*. As the mouth of bucket *b* rises above the water-line the air in both buckets *b* and 3 is put into communication with the outer air through the mouth of bucket *b*. At this time both buckets are rising and usually at a speed greater than that with which water which has been depressed will rise to its normal level. Consequently there is a tendency to produce a vacuum in the bucket 3; but as air is free to enter this bucket from the bucket *b*, which communicates with the outer air, this tendency is overcome and the water is prevented from being lifted or dragged up at the rear side of the wheel by suction.

The relation of bucket 4 to bucket *c* is the same as that just described of bucket 3 to bucket *b*, and it must be borne in mind that buckets 4 enter the water to sustain the wheel by their buoyancy before buckets 3 and *b* become non-buoyant, so that the wheel is not permitted to sink into the water to any considerable depth.

With the construction described the two outer buckets 3 3 are connected in like manner to the bucket, as *b*, of the central series, so that when all these buckets have their mouths in the water the two buckets 3 3 act as one bucket, and the series is made up of the two buckets of the outer rows and the one bucket of the inner row.

As has been described, the proportions or the speed may be such that it is desirable to have buckets 3 open into bucket *a*, buckets 4 into bucket *b*, and so on—that is, the large or what may be called "buoyant" buckets may open into either the first or second small or air-passage bucket in advance, but the series will be uniform by preference.

Instead of having one series of buckets radial and another tangential to the axle, all may be tangential in opposite directions, or some of the buckets may overlap others in other ways. Precisely the same result will be effected by an arrangement of pipes *p p′*, &c., which lead from the buckets o' o^2 o^3, &c., to the side of the bucket in advance, as shown in Fig. 3, the pipes being open throughout their length—that is, pipe *p*, leading from the interior of bucket o^2 to the front part of bucket o', is an equivalent for the bucket *b*, having an air-passage leading from the bucket 3 and opening in advance of said bucket.

In Fig. 4 the arrangement of buckets 10 20, &c., is shown, with pipes 1^p 2^p, &c., leading to the second bucket in front, the relation of the buckets and pipes being the same as the described relation of the bucket 4 with the bucket *b*, Fig. 2.

Fig. 5 shows an arrangement of pipes *ab bp*, &c., with buckets 11 12, &c., having partitions tangent to the hub instead of radial to the hub. The operation will be apparent. The form of the outer ends of the pipes and the radial distance of the mouths of said pipes from the center of the wheel may vary according to the circumstances of the case. If the pipes are not carried out to the periphery of the wheel, the air from said pipes will have some effect on the air-pressure in the leading-buckets, into which they open. The intrusion of water into the pipe may be prevented by a bend or curve of the pipe near its outer end.

Figs. 6 and 7 show the arrangement of buckets side by side in series, each bucket 1^b 2^b, &c., having a narrow leading-trough 1^c 2^c, &c. The leading-trough has the same function hereinbefore described for the small leading-buckets or for the leading-tubes—that is, the main bucket communicates with a smaller or advance bucket or passage which enters and leaves the water in advance of the main bucket.

Fig. 8 shows the principle applied to arched or curved buckets.

From the foregoing it will be understood that numerous structures can be made on the same general principle. No definite rule can be laid down for construction which will apply under all circumstances.

The wheel may have a central chamber, in which air or gases may be confined, or this central chamber may contain the motor—such as a storage-battery, a momentum or fly wheel, a rocket composition, or other source of energy—or a coil of conducting-wire to propel or steer the machine may be carried in the wheel or on the hull and played out as the boat progresses, as in some forms of torpedo-boat.

The boat may be propelled by a screw at the stern or by any other mechanism or mode of propulsion, and the wheel, rolling over the surface of the water, will tend to raise and support the load. The buoyant wheel itself when put in rapid rotation will act as a fly-wheel and drive the boat until its momentum is exhausted.

The boat illustrated has only one wheel shown; but of course any desirable arrangement of wheels may be made to secure stability. Boats with wheels arranged at the angles of a triangle or a square are well known, and I may arrange my wheels in some such manner when desirable.

I do not herein claim the construction of hull in connection with the wheel, the same being held to be a separate invention. I hereby reserve all rights which I may have as inventor to said invention.

I claim—

1. The buoyant propeller having open-mouthed buckets, substantially as described, with air-passages from those buckets opening a distance in advance of the main mouths of said buckets.

2. The buoyant propeller-wheel of generally-cylindrical form, having open-mouthed buckets around its periphery, each bucket having an air-duct opening in advance of the main mouth.

3. The buoyant propeller-wheel having open-mouthed buckets radial to its shaft and other buckets tangential to said shaft, the series of buckets being side by side in the wheel and overlapping and having openings connecting certain of the buckets in series, substantially as described.

4. The wheel having open-mouthed buckets arranged side by side and air-passages leading from the inside of such buckets to points in advance of the leading edges of the buckets proper, substantially as described.

5. The wheel having water-tight overlapping buckets with their mouths outward and having air-passages connecting certain of the buckets in series, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

DANIEL W. LORD.

Witnesses:
W. A. BARTLETT,
PHILIP F. LARNER.