(No Model.) 2 Sheets—Sheet 1.

T. DUFFY.

MOTOR FOR VESSELS.

No. 353,296. **Patented Nov. 30, 1886.**

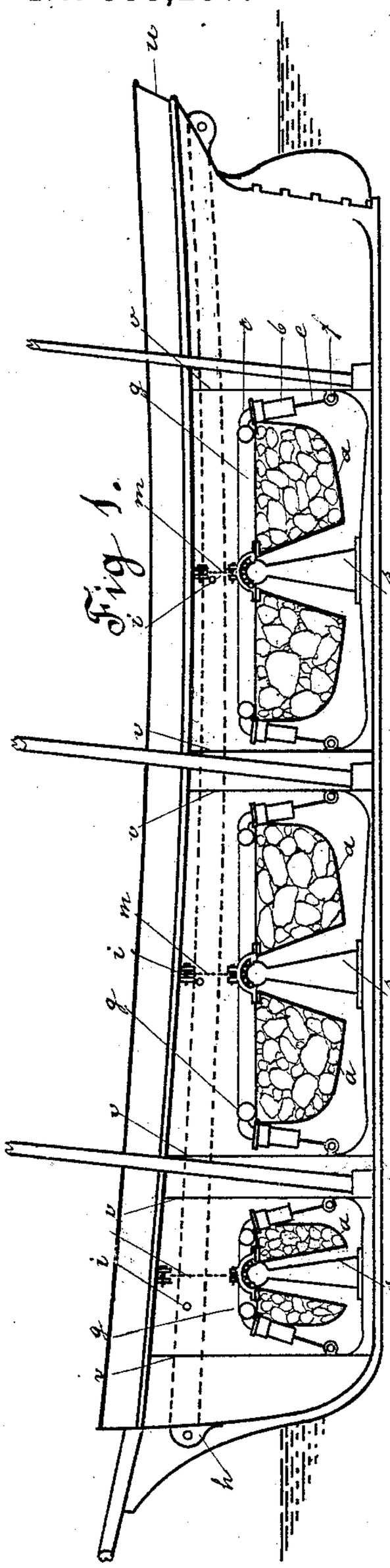

Fig. 1.

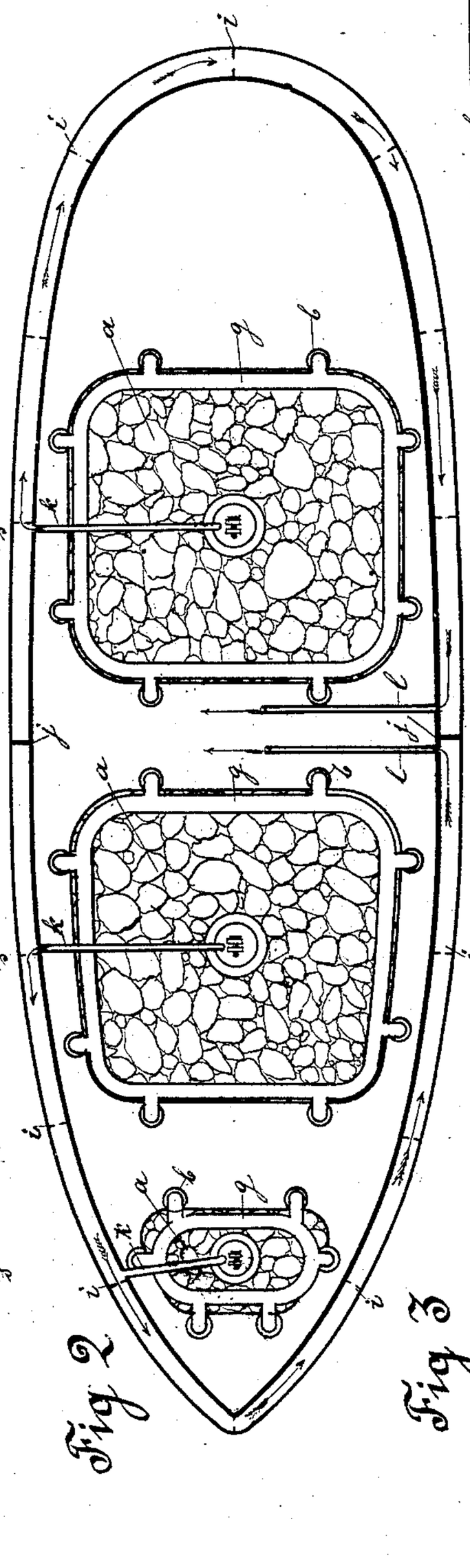

Fig. 2.

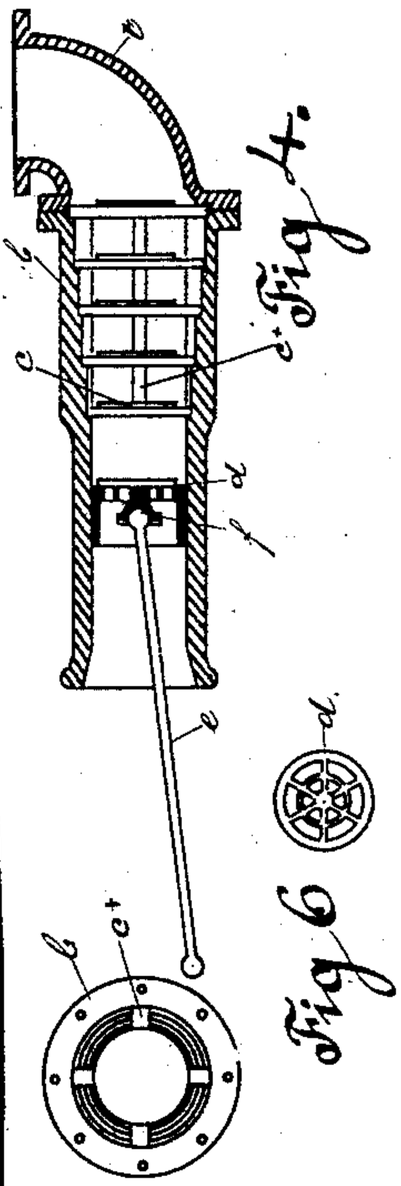

Fig. 4.

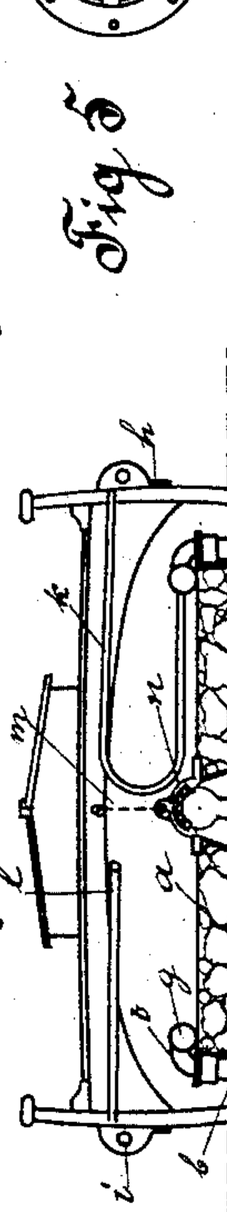

Fig. 6.

Fig. 3.

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Alphonso B. Smith

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(No Model.) 2 Sheets—Sheet 2.

T. DUFFY.

MOTOR FOR VESSELS.

No. 353,296. **Patented Nov. 30, 1886.**

Fig 7.

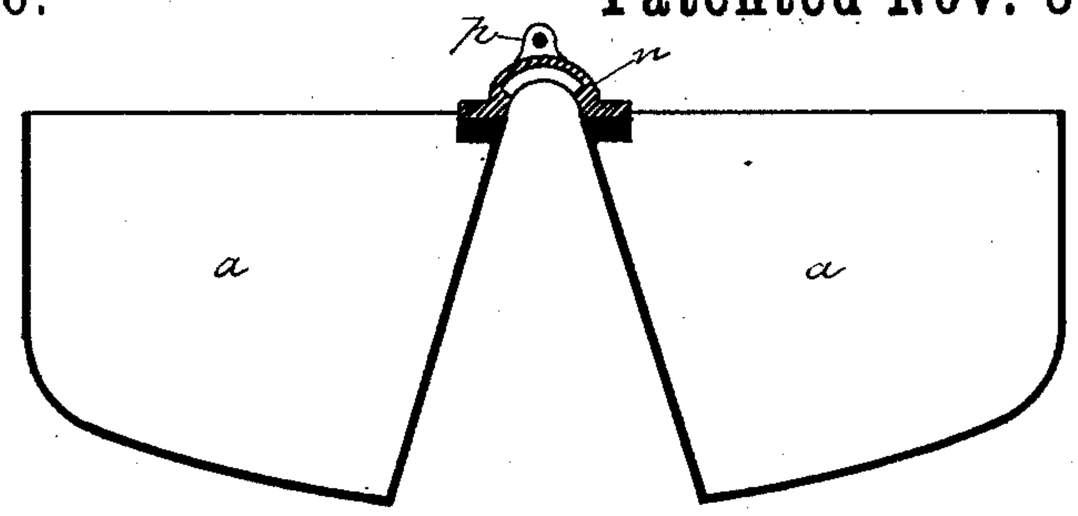


Fig 8.

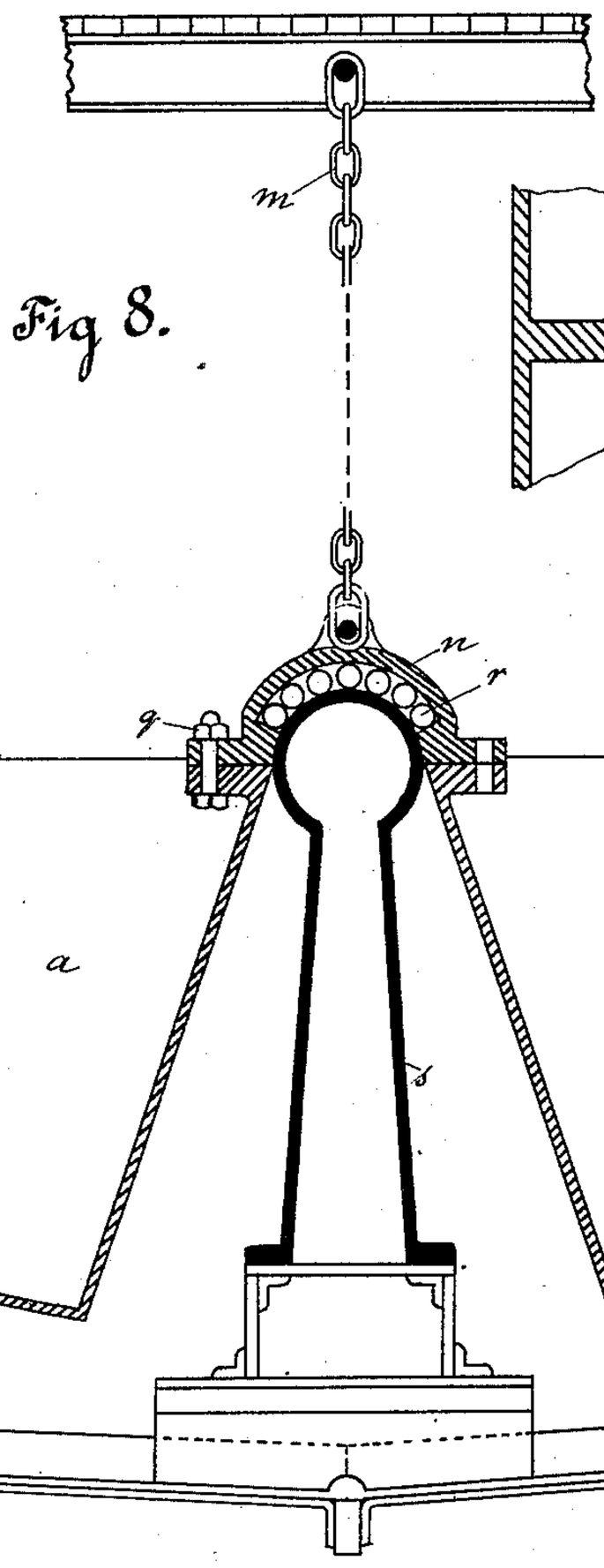


Fig 11.

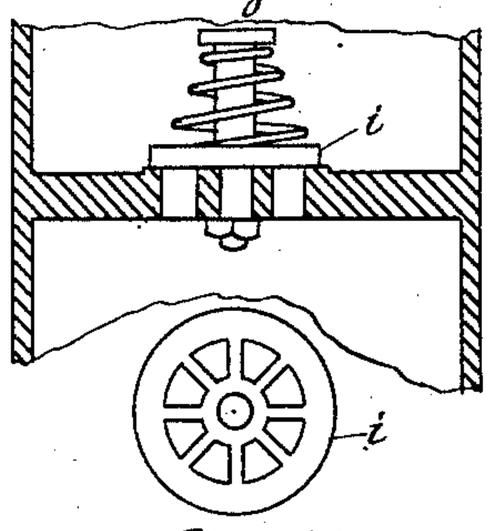


Fig 12.

Fig 9.

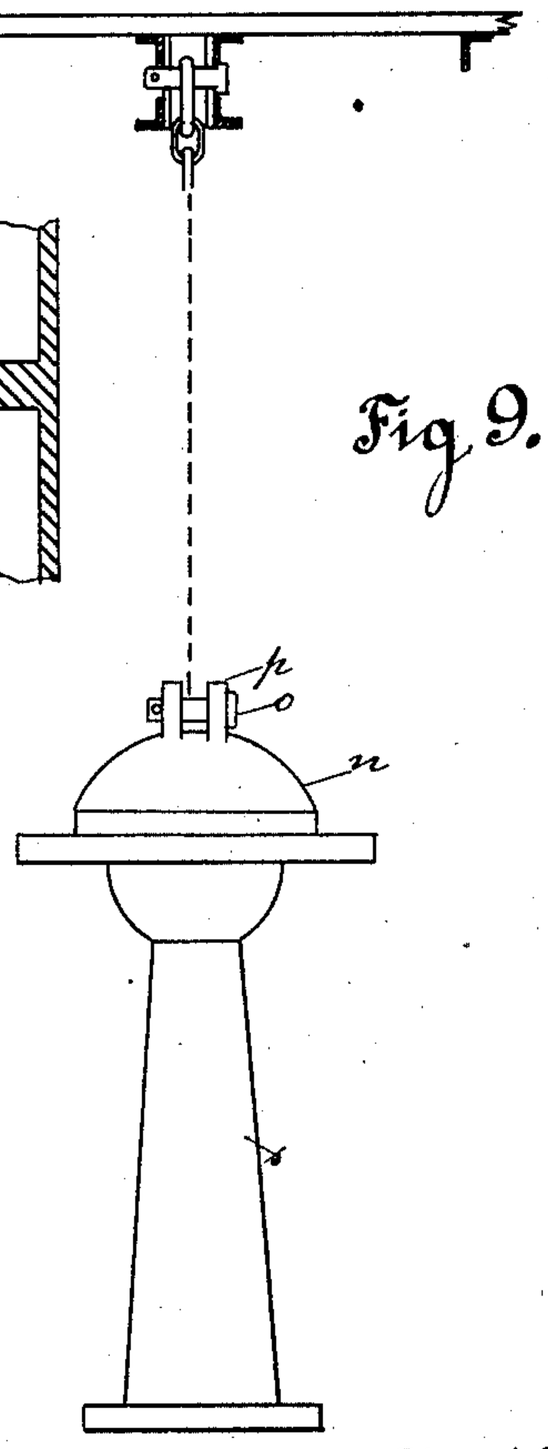
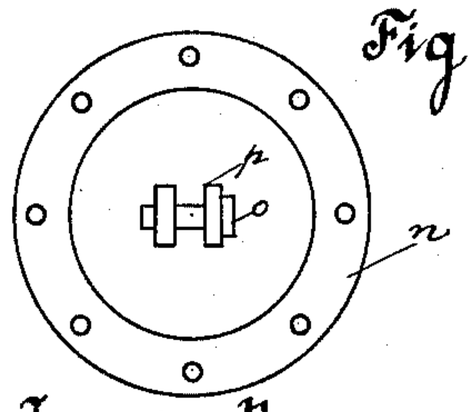


Fig 10.



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UNITED STATES PATENT OFFICE.

TERRENCE DUFFY, OF SAN FRANCISCO, CALIFORNIA.

MOTOR FOR VESSELS.

SPECIFICATION forming part of Letters Patent No. 353,296, dated November 30, 1886.

Application filed August 21, 1885. Renewed August 13, 1886. Serial No. 210,806. (No model.)

To all whom it may concern:

Be it known that I, TERRENCE DUFFY, a resident of San Francisco city and county, State of California, have invented a new and useful Motor for Vessels; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings.

My invention relates to means for compressing air by the motion of the vessel, and storing the same and using it for propelling the vessel, generating electricity for light and signals, taking in and discharging cargo, and for all purposes on shipboard requiring power.

The following description fully explains the nature of my said invention and the manner in which I proceed to construct, apply, and operate the same, the accompanying drawings being referred to by figures and letters.

Figure 1 represents a section through the middle of ship, showing the arrangement of three oscillating basins with the air-pumps and attachments. Fig. 2 is a plan view of the same, showing the external air-chamber with partitions, valves, and pipes. Fig. 3 represents a cross-section of vessel and oscillating basins, showing the arrangement of air-pumps and pipes and external air-chamber. Fig. 4 represents a longitudinal section through one of the air-pumps, showing the bucket and receding valves with their guides. Fig. 5 is a plan view of the air-pump, showing recesses and guides. Fig. 6 is a plan view of the bucket. Fig. 7 is an enlarged view of one of the oscillating basins. Fig. 8 is an enlarged view of the pivot-stand, with ball-head, cap, and friction-balls, showing part of the oscillating basin and part of the vessel. Fig. 9 represents elevation of the pivot-stand and the cap and its attachment to the suspending-chain, and the attachment of the chain to the deck-beams. Fig. 10 is a plan view of the cap. Fig. 11 is an enlarged view of one of the valves in the external air-chamber. Fig. 12 is a plan view of one of the same.

In Fig. 1, *a* is the oscillating basin; *b*, air-pumps; *c*, connecting-rod to same; *f*, universal joint attaching connecting-rod to vessel; *t*, pipe from air-pump to internal air-chamber, *g*; *h*, external air-chamber; *i*, valves in subdivisions in same; *m*, suspending-chain for oscillating basin; *n*, cap attached to oscillating basin; *s*, pivot-stand with ball-head; *u*, vessel, and *v* bulk-heads in same.

In Fig. 2, *a* is the oscillating basins; *g*, internal air-chamber around top of oscillating basin; *i*, valves in subdivisions in external air-chamber; *j*, midship partition in external air-chamber; *k*, flexible tube from internal air-chamber to external air-chamber, and delivery-pipes *l* from external air-chamber to engines.

In Fig. 3, *a* is the oscillating basin; *b*, air-pumps, and connecting-rod *e* and universal joint *f*; *g*, internal air-chamber; *h*, external air-chamber; *k*, flexible tube from internal to external air-chamber; *m*, suspending-chain for oscillating basin; *n*, cap over ball-head, and *s* pivot-stand and ball-head.

In Fig. 4, *b* is the air-pump; *c*, receding valves in same; *d*, bucket in air-pump; *e*, connecting-rod with universal joint *f*, and *t* pipe to internal air-chamber.

In Figs. 5, 6, *c* is the receding valve in air-pump, with recesses $c^{\times}$ for guide-bars on pump-barrel, and *d* bucket in air-pump.

In Fig. 7, *a* is the oscillating basin; *n*, cap over ball-head, and *p* lug on cap.

In Fig. 8, *a* is the oscillating basin, and *m* suspending-chain for same; *n*, cap over ball-head; *q*, bolts attaching cap to oscillating basin; *r*, steel friction-balls between cap and ball-head, and *s* pivot-stand and ball-head.

In Figs. 9, 10, *n* is the cap over ball-head, and *o* bolt through lugs *p* for attaching suspending-chains.

In Figs. 11, 12, *i* is the valve in external air-chamber.

The motor may be applied to vessels of any size.

Fig. 1 shows three oscillating basins, each in a compartment in the hold of the vessel. The compartments are formed by water-tight bulk-head *v*. The oscillating basin *a* is supported on a pivot-stand, *s*, having a ball-head. The stand is massive and is constructed of wrought-iron, and is bolted to the keelson. The basin is suspended from the deck-beams by a chain, *m*, which is attached to a cap, *n*, by a bolt, *o*, passing through lugs *p* on the cap. The cap is attached by its flange to the flanges on the basin by bolts *q*. The pivot-stand is placed in the conical space in the center of the basin, and acting between its ball-

head and the cap there are a number of friction-balls, Fig. 8.

An internal air-chamber, *g*, is placed around the top of the oscillating basin, and an external air-chamber, *h*, extends around the vessel under the plank-sheer. Air-pumps *b*, having their connecting-rod *e* attached by a universal joint, *f*, to the sides or bottom of the vessel, connect with the internal air-chamber by a pipe, *t*, and from this chamber a flexible tube, *k*, conveys compressed air to the external air-chamber. The external air-chamber is divided amidship by a solid air-tight partition, *j*, Fig. 2, the chamber aft receiving compressed air only from the after pumps, and the chamber forward being supplied only from the pumps forward of the partition. Each division of the external air-chamber is subdivided by partitions having valves *i*, Figs. 11, 12. Pipes *l* deliver compressed air from each division of the external air-chamber to the engines, Fig. 2.

The basins *a*, ballasted with the cargo, are oscillated by the motion of vessel, and this action of the basins operates the air-pumps, which compress the air and force it into the internal air-chamber, from which it is conducted by flexible tubes *k* to the after and forward divisions of the external air-chamber, where it is stored or conducted by pipes to the engines for service in propelling the vessel, generating electricity for lighting the vessel or supplying signals, receiving cargo or discharging it, or for any other service requiring a motor. The valves in the subdivisions aft and forward of the midships-partition *j* in the external air-chamber, permit the passage of air, but prevent it from returning, and force it to the point of delivery, as shown by the course of the arrows, Fig. 2.

The pivot-stand bears the strain of the ballasted oscillating basin, the suspending-chain serving to relieve the pressure, and the air-pump relieves both the pivot-stand and the chain. The arrangement of the balls between the cap and the ball-head of the pivot-stand tends to the free and regular oscillation of the basin. The balls are made of a hard and rigorous metal, preferably of steel, to prevent friction and wear.

The receding valves in the air-pumps have a cumulative action adapted to the stroke. The parallel bars on the pump-barrel fit into recesses in the valve and guide it. The external air-chamber, clasping the vessel below the plank-sheer, adds materially to its buoyancy, strength, and safety.

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

1. The combination, with the swinging basin, air-chamber mounted on top thereof, air-pump connected to side of basin and communicating with the air-chamber on top, and the pump-rod connected to fixed part of vessel.

2. The combination, with the swinging basin, air-chamber on top thereof, and exterior air-chamber on outside of vessel connected to interior air-chamber by a pipe or analogous means, air-pump connected to swinging basin and communicating with chamber on top of basin, and pump-rod connected to fixed part of the vessel.

In testimony whereof I have hereunto set my hand and seal.

TERRENCE DUFFY. [L. S.]

Witnesses:
A. B. SMITH,
J. H. HITCHINS.