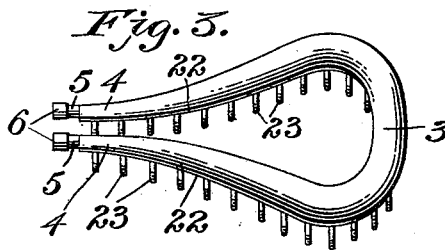
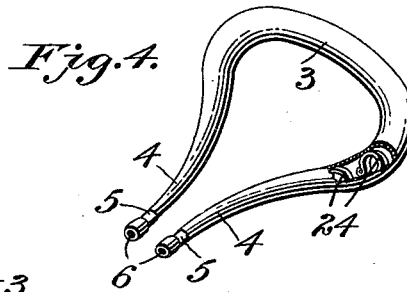
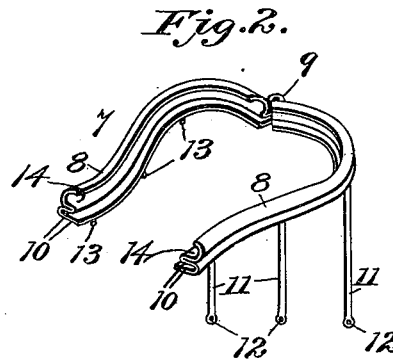
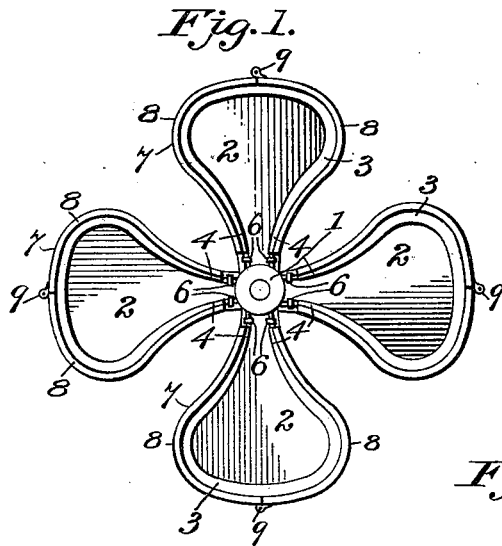


A. B. KOKERNOT.  
SCREW PROPELLER.

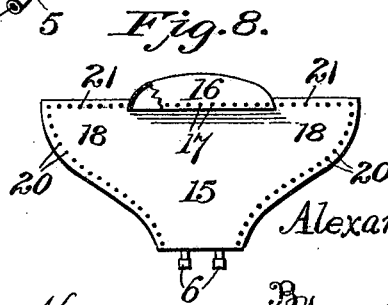
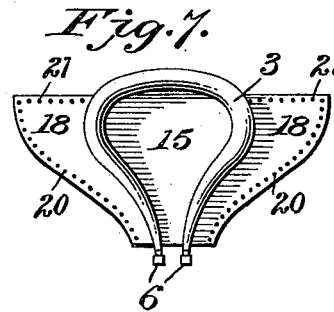
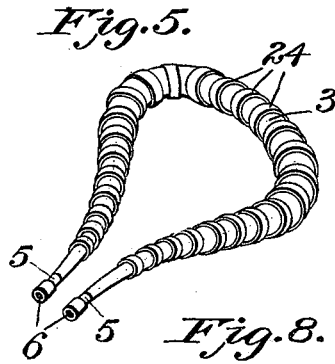
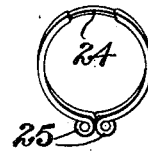
(Application filed Sept. 22, 1899.)

(No Model.)

2 Sheets—Sheet 1.



*Fig. 6.*



Alexander B. Kokernot Inventor

Witnesses  
Edwin G. McKee  
R. M. Smith.

By

*E. J. Siggers*

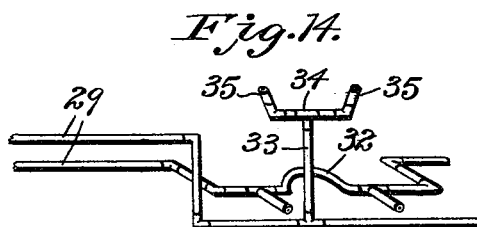
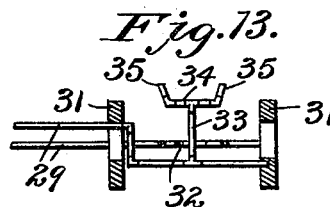
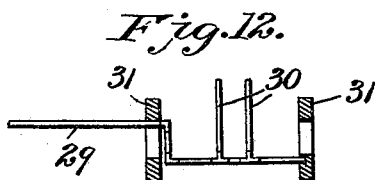
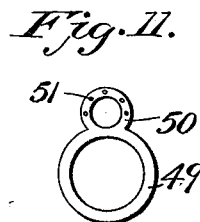
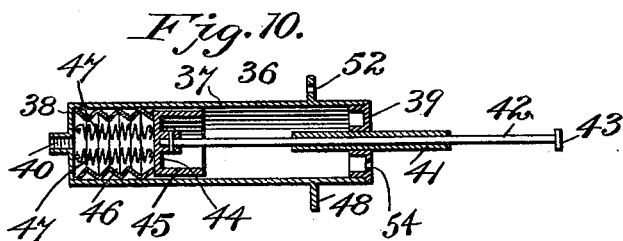
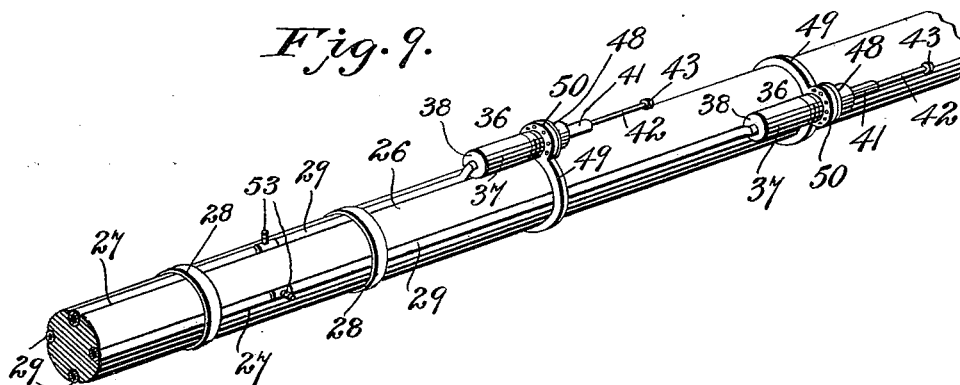
Attorney

A. B. KOKERNOT.  
SCREW PROPELLER.

(Application filed Sept. 22, 1899.)

(No Model.)

2 Sheets—Sheet 2



Alexander B. Kokernot. Inventor

Witnesses  
Edwin G. McKee.  
R. M. Smith.

By *E. J. Figg* Attorney

# UNITED STATES PATENT OFFICE.

ALEXANDER BENJAMIN KOKERNOT, OF NEW ORLEANS, LOUISIANA.

## SCREW-PROPELLER.

SPECIFICATION forming part of Letters Patent No. 645,856, dated March 20, 1900.

Application filed September 22, 1899. Serial No. 731,330. (No model.)

*To all whom it may concern:*

Be it known that I, ALEXANDER BENJAMIN KOKERNOT, a citizen of the United States, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented a new and useful Screw-Propeller, of which the following is a specification.

This invention relates to screw-propellers; and the objects of the invention are to reduce the slipping action of the propeller to a minimum, to render a small cross-sectional area of the blades or flukes effective, to permit a slowly-driven propeller to be more effective in operation, to economize in the motive power, to increase the power and efficiency of the wheel, and attain the maximum propelling power of a wheel of a given area or size.

The device contemplated in this invention is auxiliary to a propeller-wheel of ordinary construction and consists of a cushion so constructed and connected with a reflex bellows as to impart more responsive and greater resistance properties to the auxiliary device, approaching as nearly as possible a perfect reaction.

The improvement is also designed with special reference to any accident which would cause injury to the auxiliary device, in which case the normal efficiency of the propeller will not be impaired or affected.

The above objects are attained by simple means, easily applied and reliable in operation, as hereinafter more fully explained, and illustrated in the drawings.

The invention consists in a screw-propeller embodying certain novel features and details of construction and arrangement of parts, as hereinafter fully described, illustrated in the drawings, and incorporated in the claims.

In the accompanying drawings, Figure 1 is a face view of a screw-propeller equipped with the auxiliary device forming the subject-matter of this invention looking toward the active side of the blades or flukes and showing the manner of securing the cushion-clasps or binding-frames upon the blades and also the cushions or tires. Fig. 2 is a detail view of one of the clasps or frames detached and thrown partially open. Fig. 3 is a detached perspective view of one of the cushions or tires. Fig. 4 is a similar view with the attaching-studs omitted, the said view being partially broken

away to show the interiorly-arranged suspension-springs. Fig. 5 is a similar view of a cushion, showing the exteriorly-arranged springs. Fig. 6 is a detail view of one of the springs. Fig. 7 is a plan view of one of the flexible blade-coverings looking toward the side which carries the cushion. Fig. 8 is a reverse plan view of the same. Fig. 9 is an enlarged perspective view of a section of the driving-shaft. Fig. 10 is an enlarged longitudinal section through one of the reflex bellows. Fig. 11 is a plan view of one of the clips or rings by means of which the bellows are mounted on the driving-shaft. Fig. 12 is a plan view of the rear end portion of one of the pipes leading from the bellows to the cushions, showing the manner of branching the pipe, so as to communicate with the opposite ends of its respective cushion. Fig. 13 is a similar view showing the manner of crossing the adjacent pipes within the propeller-hub, so that the said pipes will not interfere with each other. Fig. 14 is an enlarged diagrammatic view illustrating the principle of Fig. 13.

Similar numerals of reference designate corresponding parts in all the figures of the drawings.

I have illustrated in the drawings a propeller of the ordinary type comprising a hub 1 and blades or flukes 2, which may be of any desired size, shape, or configuration and number, as this invention has nothing to do with the general construction of the propeller, being applicable to all kinds of screw-propellers.

One of the essential features of the present invention resides in the application to the blade or fluke of a screw-propeller of a peripheral cushion or tire, (shown at 3,) which extends around and bounds the outer edge of the blade and is disposed on the rear or active surface thereof. One of such cushions is employed for each blade, and consists of a hollow inflatable sack which is composed of flexible material which will yield to the resistance offered by the water under the rapid rotation of the propeller. The material of the cushion may consist of rubber or of textile material or of a combination of both, the essential idea being that the cushion or tire be flexible throughout. The cushion is also of the greatest cross-sectional area at its cen-

tral portion, and it tapers therefrom to the opposite extremities, which are contracted or reduced, as shown at 4, the said extremities being provided with metal sleeves 5, which, if desired, may be equipped with other sleeves or couplings 6, adapting the terminal portions of the cushion to be connected with pipes leading to reflex bellows in the manner hereinafter set forth.

Several methods of attaching the cushions or tires to their respective blades may be employed. A practical and efficient means for accomplishing this purpose consists of a cushion-clasp or binding-frame 7, constructed of metal and comprising twin sections 8, hinged together at the point 9, so that they may be opened or moved apart in applying the clasp or frame to the propeller blade or fluke. The clamp or frame conforms exactly to the shape of the peripheral edge of the propeller-blade and in cross-section resembles the letter U, in that it embraces oppositely-located portions or flanges 10, designed to bear respectively upon the front and rear surfaces of the propeller-blade and to hug closely and fit snugly thereto. The hinged sections of the clasp or frame are securely retained in their applied positions on the blade by means of straps or stays 11, which are preferably of metal, each of said straps being connected at one extremity to one of the hinged sections 8 and having means at its other extremity for engaging the remaining section, the said means consisting, preferably, in providing the free end of the strap with an opening at the point 12 to receive a stud or button 13 on the other section. The straps 11 pass across the rear or inactive surface of the blade, and do not therefore interfere with the operation of the same. The frame or clasp 7 is provided along its inner edge and in that flange which is located on the active side of the blade with a continuous groove 14, forming a seat for the cushion or tire 3, said cushion being cemented or otherwise secured within the groove, and being thus retained in proper working shape. At the same time the cushion bears against and finds its support upon the active surface of the blade, where it may act with full effect upon the water.

Another means of securing the cushion or tire to the blade is illustrated in Figs. 7 and 8, wherein the fastening means is shown as consisting of a flexible blade-cover 15 of any suitable material, having the cushion 3 firmly united to the outer surface thereof, or that surface which is disposed away from and out of contact with the blade. The cover 15 is provided with a hollow extension or cap 16, in which the outer extreme portion of the blade is received, and the inner edge of said cap is provided with lace holes or perforations 17. The blade-cover 15 is also provided with oppositely-extending lateral flaps 18, extending inward as far as the propeller-hub 1 and having their outer edges curved in ogee shape. The flaps are provided along their

outer and top edges with eyelet holes or perforations 20 and 21, respectively, and securing-laces are passed alternately through the holes 17 and 21 to secure the flaps along their top edges to the cap 16 and also through the holes 20 in the side edges of both flaps, so as to draw the same tightly across the back of the blade. In this manner the cover is stretched tightly across the active side of the blade, leaving a smooth surface which will offer no obstruction to the water.

If desired, the cushion 3 may be provided along that side which comes in contact with the blade with a metal strip 22, extending longitudinally of the cushion and provided with laterally-projecting threaded studs 23 to receive securing-nuts. The studs 23 may be passed through correspondingly-located openings near the periphery of the blade, thus securing the cushion directly to the blade without the interposition of the clasp or frame 7 or the cover 15, or said studs may be inserted through openings in the cover 15 for securing the cushion thereto. Any of the means above described may be employed for securely attaching the cushions or tires to their respective blades.

In order to impart the desired stiffness and power of resistance to the cushions, I employ in connection with each cushion a plurality of springs 24, which are substantially in the form of resilient split rings of metal, the terminals of which are rounded, as shown at 25, to prevent puncturing the material of which the cushion is formed. These springs are preferably covered with some textile material to prevent abrasion of the cushion, and they may be located either within the cushion, as shown in Fig. 4, or upon the exterior of the cushion, as shown in Fig. 5, the springs in the latter instance being secured along their lengths to the outer surface of the cushion, so as to properly support the latter.

The driving-shaft 26, upon which the propeller is mounted, is grooved longitudinally upon its outer surface to provide seats 27 for a plurality of pipes 29, which may thereby be located within the circumferential surface of the shaft and flush with its outer surface. These pipes 29 may extend any required distance along the shaft and are held in place by retaining-collars 28 at suitable intervals. The propeller is fastened in any usual manner upon the end of the driving-shaft, and the propeller-hub is of hollow construction, so as to form a space or chamber in which the opposite ends of the pipes 29 are received. Each pipe 29 is bifurcated or provided with branches 30 within the hollow hub of the propeller, the said branches leading to opposite ends of the respective cushion supplied by that pipe. Each pipe 29 passes through a pair of heads or disk-shaped plates 31, secured to the front and rear ends of the hollow propeller-hub, the pipe 29 being supported within the hub in this manner and the heads 31 being secured to the hub in any preferred way.

In order to prevent adjacent pipes from interfering with each other within the hollow propeller-hub, one of said pipes may be formed as shown in Fig. 12, while the adjacent pipe is provided with an arch or bridge 32, spanning one of the branches 30, or the first-named pipe may be provided with a single lateral extension or branch 33, passing under the arch or bridge 32 and having a T extension 34, terminating in nipples 35. It will be understood that each pipe 29 terminates in a pair of nipples 35, which are connected by means of the couplings 6, hereinabove described, to the opposite ends of the respective cushion or tire 3, and in this manner and by means of the plurality of pipes, above described, an independent air-supply is communicated to each cushion.

Each pipe 29 is connected at its opposite end to an independent pair of bellows 36, the construction of which is best illustrated in section in Fig. 10. Each pair of bellows consists of an outer shell 37, which is preferably cylindrical and having both ends closed by heads 38 and 39. The head 38 is provided with a central opening 40 for the reception of the end of one of the pipes 29. The opposite head 39 has inserted therethrough and permanently mounted therein a guide-tube 41, the same projecting both upon the outside and inside of the head 39 to form an elongated bearing for a sliding stem or indicator 42, carrying a knob or button 43 at its outer end. Upon the inner end of the stem 42 is mounted a piston comprising a disk-shaped head 44, extending rearwardly from which is a cylindrical shell 45, which slides in contact with the inner surface of the outer shell 37. The head 38 of the outer shell 37 and the head 44 of the piston are connected by a pair of bellows 46, tightly joined to both heads, so as to prevent the escape of air passing in and out from the pipe 29. Springs 47 are arranged within the shell 37, so as to exert a pressure on the piston, and these springs may be arranged either between the piston and the head 38 or between the piston and the head 39, according to preference, the said springs serving to preserve the proper equilibrium of the piston, while the stem 42 indicates the extent of the pressure exerted upon the cushions or tires on the propeller-blades. The shell 37 is exteriorly threaded, as shown, and the threaded portion terminates in a circumferential flange or shoulder 48.

Surrounding the shaft 26 is a clip or collar 49, provided with a superimposed eye or ring 50, which is internally threaded to receive the shell 37. The shell 37 is screwed into the ring 50 until the flange 48 bears against the adjacent side of the ring 50, and the flange 48 and the ring 50 are provided with registering holes 51 and 52 to receive screws, bolts, or rivets, whereby the outer shell of the bellows is securely connected to the collar 49 and supported thereby upon the shaft 26. In order to avoid interference between the sev-

eral pairs of bellows, they are preferably arranged one in rear of the other, as illustrated in Fig. 9. However, where only a few pairs of bellows are employed, they may be arranged in a circumferential series upon the shaft, in which event the collar 49 may be provided with a number of eyes or rings 50, corresponding to the number of bellows employed. Each bellows has a vent 54.

In order to primarily inflate the cushions and compress air within the cushions and bellows, the several pipes 29 are individually equipped with inflating-valves 53, adapted to receive a suitable air-pump in a manner that will be readily understood.

The propeller hereinabove described when attached to a vessel may be inclosed within a crate or cage of wire or other suitable material in order to prevent injury thereto. Except under extraordinary conditions, however, such crate or cage will be unnecessary. Should the cushions or other parts of the apparatus for any reason get out of order or the operation thereof become impaired, this will in no wise interfere with the normal efficacy of the propeller itself. The cushions will be made of some light, tough, flexible material impervious to water and air.

I have illustrated some variations in the form of the means for attaching the cushions to their respective blades or flukes, and it will be obvious that the buoyant attachment may also be greatly varied in shape, figure, or form and number and position on the flukes. I therefore do not desire to limit myself to the specific applications and attaching means hereinabove described, but reserve to myself the right to change, modify, or vary the construction within the scope of this invention.

By means of the construction set forth the tendency of the blade to slip ineffectually through the water is reduced, and greater efficiency is obtained from a propeller of a given area. It will of course be understood that any compression of a portion or all of any particular cushion or tire will result in a similar action upon the piston of the bellows, and the latter will operate with a reflex action to resist the yielding action of the cushion and restore the active portion of the cushion to its normal position. The cushion thus acts with a yielding force upon the water and does away with the rigidity of the ordinary propeller, which in many cases is caused to operate upon and lift a dead-weight of water without any beneficial or driving effect. In the event that one of the cushions or tires should burst or become punctured or otherwise injured or destroyed the indicator-stem will give visual notice thereof.

Having thus described my invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. A screw-propeller having an inflatable cushion on its active surface, as and for the purposes described.

2. A screw-propeller having its active surface provided with a pneumatic-cushion surface, as and for the purposes described.
3. A screw-propeller provided along an edge thereof with an inflatable cushion-surface, substantially as and for the purposes described.
4. A propeller-blade provided with a continuous inflatable cushion along the active edge thereof, substantially as described.
5. A screw-propeller provided on its active surface with a governable or adjustable inflatable cushion, substantially as described.
6. A propeller-blade having a cushion along its active edge, substantially as described.
7. A propeller having an inflated cushion on its active surface, in combination with a reflex air device in communication therewith, substantially as described.
8. A propeller having an inflated cushion on its active surface, in combination with a pair of reflex bellows, communicating therewith, substantially as described.
9. The combination with the blades of a propeller, of cushions on the active faces thereof, and an independent reflex bellows for each cushion, substantially as described.
10. The combination with the blades of a propeller, of air-cushions thereon, a driving-shaft on which the propeller is mounted, and reflex bellows mounted on said shaft, and communicating with the cushions, substantially as described.
11. The combination with the blades of a propeller, of air-cushions thereon, a driving-shaft, independent pipes for the respective cushions, extending longitudinally of said shaft, and inflating-valves connected with said pipes, substantially as described.
12. A propeller, and a yielding cushion on the active side thereof, in combination with attaching means for securing the cushion to the propeller, substantially as described.
13. A propeller, and a yielding cushion on the active side thereof, in combination with a cushion-encircling frame for binding the cushion against the propeller and holding it thereon, substantially as described.
14. A propeller, and a yielding cushion on the active side thereof, in combination with a driving-shaft, and a series of pipes located in longitudinal recesses in the shaft and communicating with the cushions, and having inflating means, substantially as described.
15. A propeller, and a yielding air-cushion on the active side thereof, in combination with a driving-shaft, pipes leading to said cushions and arranged in grooved seats extending longitudinally of the shaft, and retaining means surrounding the shaft and en-

gaging the pipes, substantially as described.

16. A propeller, and a yielding air-cushion on the active side thereof, in combination with a driving-shaft, a pipe leading to the cushion and arranged in a grooved longitudinal seat in the shaft, a retaining-collar encircling the shaft and engaging the said pipe, and a pair of reflex bellows mounted on the shaft and communicating with said pipe, substantially as described.

17. A propeller, and a yielding cushion on the active side thereof, in combination with a driving-shaft, a pipe leading to the cushion and extending longitudinally of the shaft, a pair of bellows mounted on the shaft and communicating with said pipe, and an indicator attached to and actuated by the bellows, substantially as described.

18. A propeller having a hollow hub, and a yielding cushion on the active side thereof, in combination with a driving-shaft, a pipe extending longitudinally of the shaft, a reflex air device connected thereto, and a coupling within the hollow hub of the propeller connecting the pipe and cushion, substantially as described.

19. The combination with a propeller-blade, of a flexible air-cushion thereon, means for inflating said cushion, and springs for expanding the cushion, substantially as described.

20. The combination with a propeller-blade, of a flexible air-cushion mounted thereon, and circular springs extending circumferentially of the cushion for expanding the latter, substantially as described.

21. The combination with a propeller-blade, of a cushion extending around the edge thereof and having its extremities arranged adjacent to the propeller-hub, and an inflating-pipe extending into the hub, where it is branched and connected to the terminal portions of the cushion, substantially as described.

22. The combination with a propeller-blade, and a flexible air-cushion thereon, of a driving-shaft, a collar thereon having an internally-threaded eye, an exteriorly-threaded pair of reflex bellows screwed into said eye, a flange on said bellows adapted to be fastened to the eye, and a pipe leading from the bellows to the cushion, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ALEXANDER BENJAMIN KOKERNOT.

Witnesses:

A. GUILTAUTT,  
GEO. MONTGOMERY.