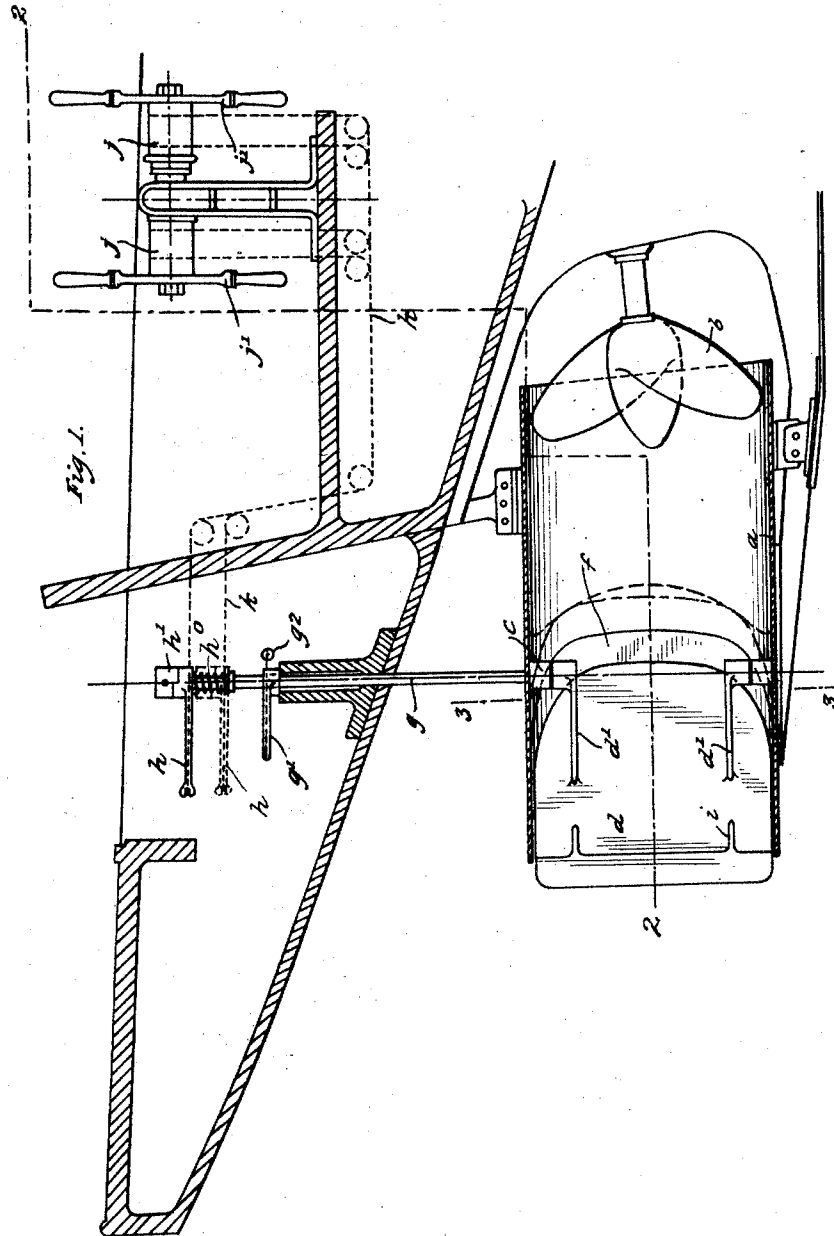


E. S. G. REES.
 APPARATUS FOR MANEUVERING SHIPS AND AIRCRAFT.
 APPLICATION FILED NOV. 2, 1920.

1,415,705.

Patented May 9, 1922.

6 SHEETS—SHEET 1,



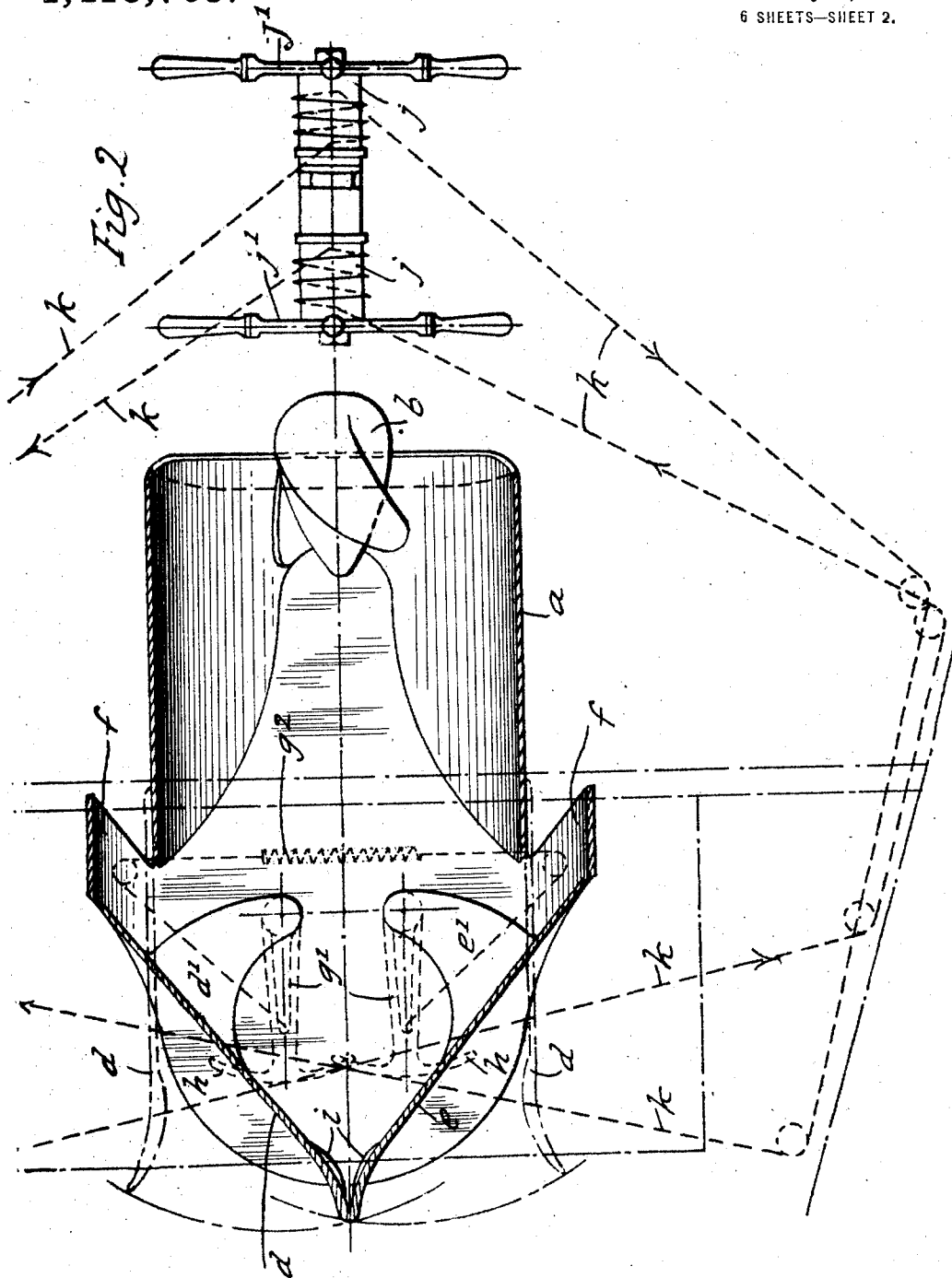
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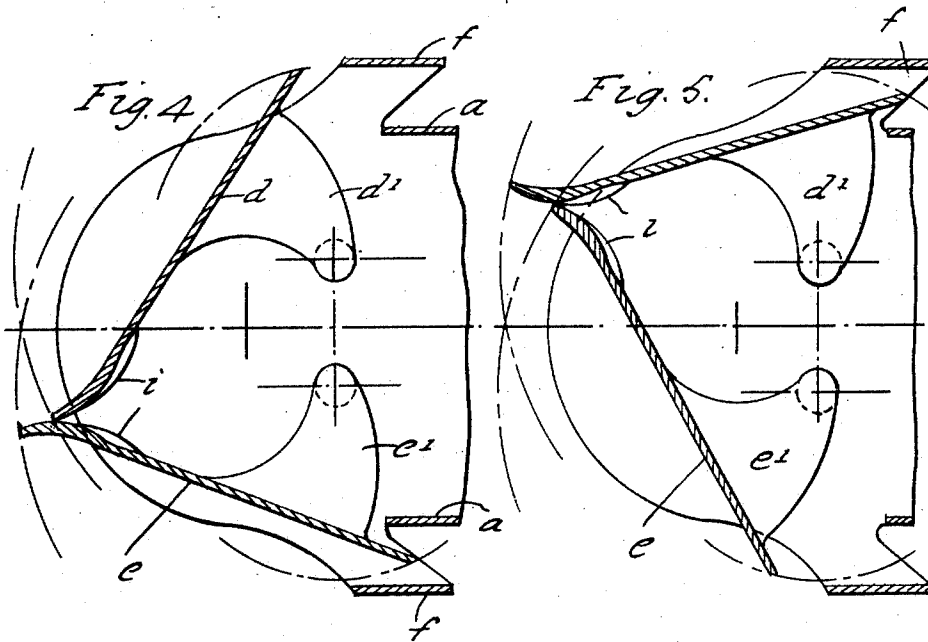
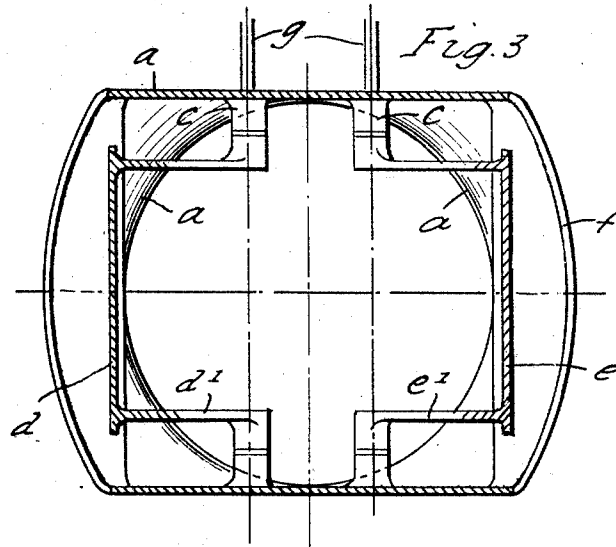
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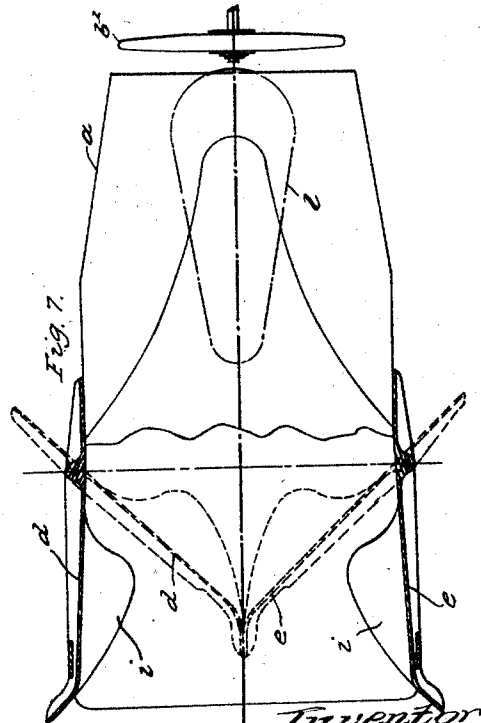
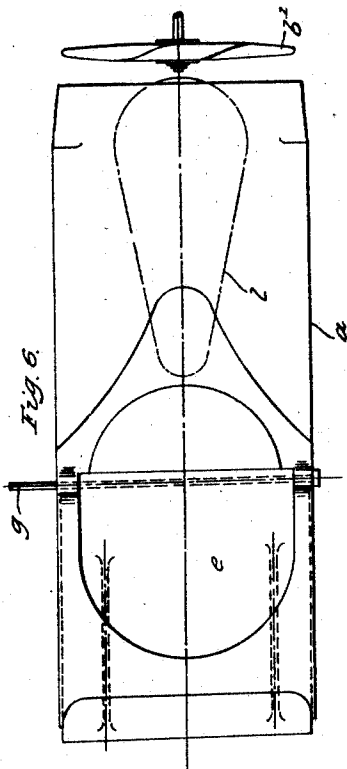
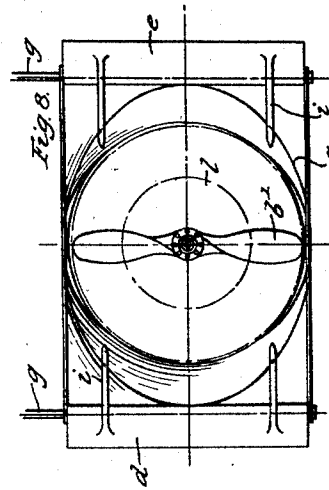
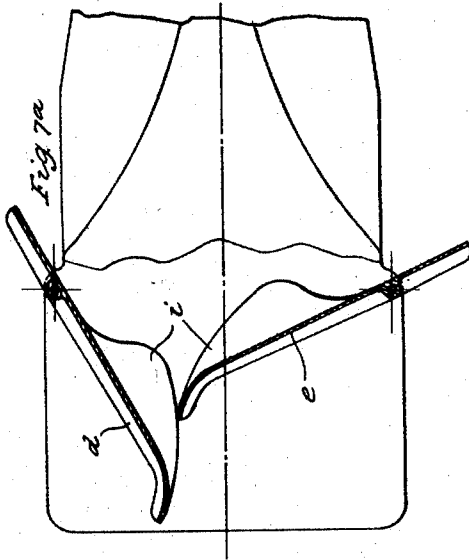
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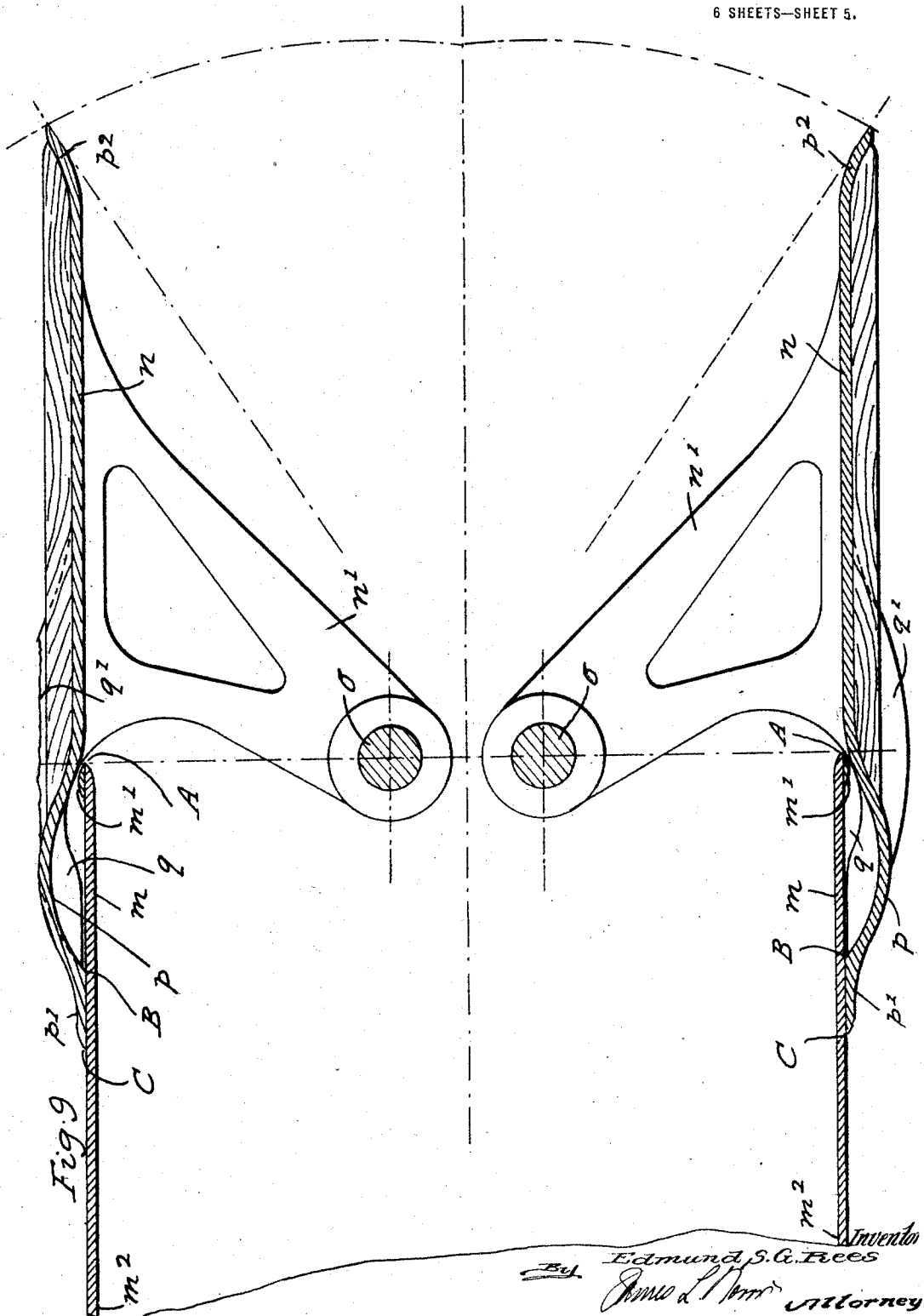
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6 SHEETS—SHEET 5.



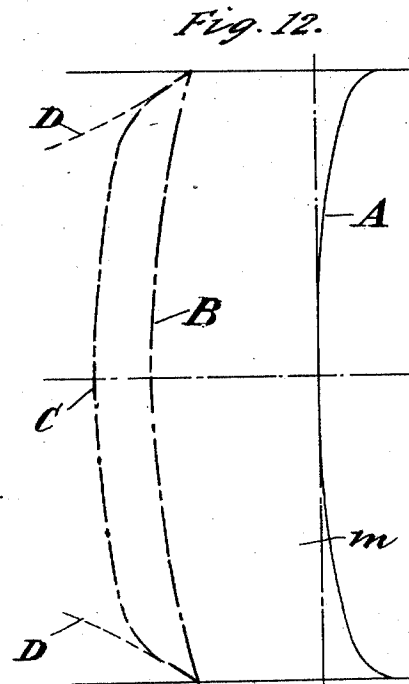
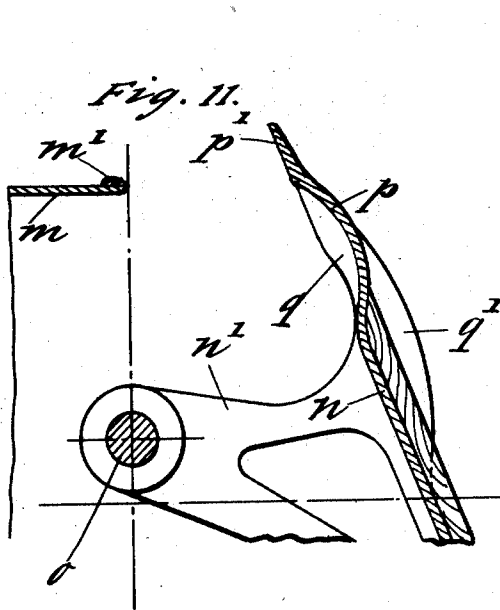
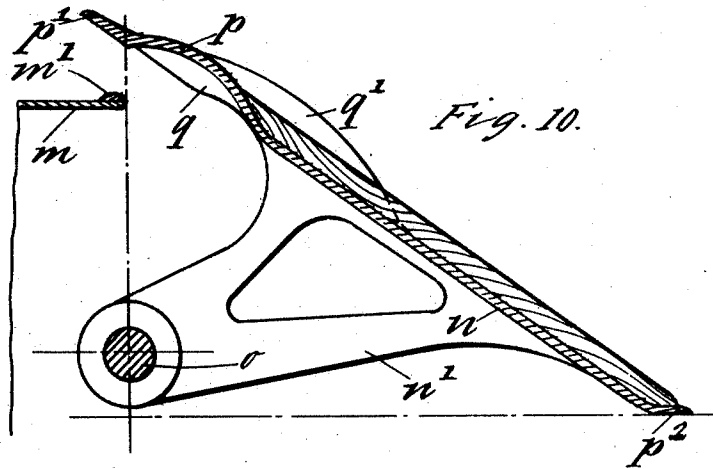
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6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR MANEUVERING SHIPS AND AIRCRAFT.

1,415,705.

Specification of Letters Patent.

Patented May 9, 1922.

Application filed November 2, 1920. Serial No. 421,363.

To all whom it may concern:

Be it known that I, EDMUND SCOTT GUSTAVE REES, a subject of the King of Great Britain, residing in Wolverhampton, England, have invented certain new and useful Improvements in Apparatus for Maneuvering Ships and Aircraft, of which the following is a specification.

This invention relates to apparatus for maneuvering ships, aircraft and other craft driven by screw propellers wherein the fluid stream set in rearward motion by the propeller is confined within a fixed duct or tube which is open at each end and the direction of flow of the stream within the fixed tube and its issue therefrom is controlled by means of pivoted vanes or pallets at the rear end of the tube. Such a maneuvering apparatus enables the propeller to be driven continuously in one direction and the speed and direction of movement of the craft to be varied as required solely by manipulation of the maneuvering apparatus.

The present invention seeks to increase the efficiency of such maneuvering apparatus by improvements in the construction of the pivoted pallets and the means for operating them and of the fixed duct with which they co-operate. In this improved construction the pallets, which are mounted on parallel posts the axes of which preferably lie between the longitudinal axis of the duct and the walls of the same, are formed with abutting tips on their rear edges shaped to remain in contact over a considerable angular range of movement when the pallets are swung together in the same sense with closed rearward edges for sternward maneuvering. Also, the forward portions of the pallets are so shaped and dimensioned that, while in the full speed ahead position they close on the outer surface of the walls of the fixed duct or tube of which they then form a continuation, in all other positions they form in conjunction with the said walls forwardly directed nozzles or channels through which the water banked up in the tail end of the tube by the closure of the pallets is ejected or deflected. The pallets are operated by gear with an interposed yielding clutch or spring permitting the continued movement of the operating wheel or its equivalent and of one of the pallets after the other pallet is arrested in its limiting position against the wall of the fixed duct.

The fixed duct is preferably given such a rearward expansion as may be necessary for its efficient action as an augments while at the same time facilitating the fitting and operation of the pivoted vanes or pallets by making the sternward portion of the duct of square or oblong cross section while the front portion is of circular section merging either directly into the square part or into an intermediate part of oblong section which in turn merges into an oblong sternward portion.

These other features of the invention will be more particularly described with reference to the accompanying drawings, wherein Fig. 1 is a central longitudinal section of the stern of a ship fitted with augments tube and maneuvering pallets constructed and operating in accordance with the invention; Fig. 2 is a part sectional and part plan view of same on line 2—2 of Fig. 1; Fig. 3 is a transverse section of the augments tube on line 3—3 of Fig. 1 but with the pallets in fore and aft positions; Figs. 4 and 5 horizontal longitudinal sections of the tube and pallets showing the latter in the positions for going astern to port and to starboard respectively; Fig. 6 is a longitudinal elevation of a modified construction of augments tube shown in association with an air propeller; Fig. 7 and 7^a are plan views of same showing the pallets in alternative positions; Fig. 8 is an end elevation; Fig. 9 is a sectional plan showing the tail end of a fixed maneuvering tube and a modified construction of apparatus embodying the invention, with both pallets in position for full speed ahead; Fig. 10 is a half plan showing a pallet in position for full speed astern; Fig. 11 a similar view showing the pallet hard over for going to starboard; and Fig. 12 is a diagrammatic side view of the rear end of the tube.

It will be understood that when the invention is applied to aircraft the maneuvering tubes may be arranged with the axes of the maneuvering pallets horizontal instead of vertical as shown, while in the case of submarines they would be so arranged when the apparatus is used to effect submersion or emersion of the vessel.

Referring first to Figs. 1-5, the augments tube *a* which is rigidly fixed below the counter of the vessel in substantially axial alignment with the propeller *b* has a forward or entrance portion of circular cross section of

a dimension just sufficient to encircle the propeller blades with only a small clearance. This merges into a sternward or tail portion which is square in cross section, the top and bottom plates of which are rigid with the remainder of the tube and furnish pivot posts *c* for the pallets *d*, *e* which, in the open position shown in dotted lines in Fig. 2, constitute the rear portions of the side walls of the square. External to the plane of each side wall and rigid with the tube are two forwardly directed nozzles or ducts *f*, which may be regarded as being obtained by off-setting a vertical strip on each side of the square portion of the tube so as to increase the width thereof locally. When the rear edges of the pallets *d*, *e* are closed in the central position shown in full lines in Fig. 2 their forward edges are closely adjacent to the rear edges of the offset strips forming the nozzles *f*, so that the flume from the propeller is then deflected to either side and forwardly by the pallets and is discharged from the augments tube through the nozzles *f* forwardly parallel with the axis of the tube and the centre line of the ship, or substantially so. The area of the nozzles is designed to give the fullest possible conversion of the potential energy of the water within the augments tube into speed energy.

The pivots of the pallets are carried by inwardly projecting brackets *d'*, *e'* which bring the pivot axes considerably inside the planes of the side walls of the augments tube. There are certain advantages resulting from this disposition of the pivot axes as compared with pivots in the planes of the pallets which will be referred to later.

The steering or maneuvering pillars *g* by which the pallets *d*, *e* are manipulated are carried up through the counter of the ship and have arms *g'* rigidly attached to them and sector arms *h* connected with them through yielding clutch members *h'* of such character that when the two sector arms are turned continuously in the same sense by the operating gear, the gear can be continued to be turned in that direction after either of the pallets has reached its limiting position. Suppose, for example, that the pallet *d* is in the position shown in full lines in Fig. 2 and the pallet *e* in the position shown in dotted lines and that the two pallets are swung together by the operation of the steering gear applied through the sector arms *h* until pallet *d* is in the position shown in dotted lines in Fig. 2 and pallet *e* in the position shown in full lines. Pallet *d* can move no farther in the same direction but its sector arm *h* can, since the clutch *h'* slips compressing its holding spring *h''*, and consequently the operating gear can be continued to be turned in the same direction and with it the pallet *e* even when pallet *d* has

been arrested by the wall of the tube *a*. The pallets are urged towards the open or dotted line position by means of a tension spring *g''* which is connected by suitable flexible connections with the ends of the arms *g'*.

The rear edges of the pallets are curved outwardly so as to remain in contact with each other over a considerable period of angular movement when they are swung in the closed position either to port or to starboard, and to assist in the relative sliding movement involved in such motion the inner curved surface of the tips of the pallets may be continued in the form of webs *i* adapted to continue in engagement with the inner face of the opposing pallet throughout the range of the swinging movement of the pallets, or substantially so.

The sector arms *h* by means of which the pallets are operated, are actuated by means of drums *j*, each having its own steering wheel *j'* and flexible cords *k* which wind around the respective drums and are led around suitable guides and connected with the inner ends of the sector arms. The drums *j* are normally coupled by means of a clutch which may be of the ordinary dog type so that both pallets are actuated simultaneously by rotation of either steering wheel *j'*, but the drums can be declutched one from the other against the action of a return spring by outward axial movement of one of them, in which case the two steering wheels are separately usable for turning the pallets in either direction. Thus, the extent of the separation of the rear tips of the pallets which is required is effected by the separate operation of one or both of the steering wheels, and any subsequent joint movement of the pallets in the same sense for steering purposes is effected by the steering wheels in their clutched position.

Referring now to Figs. 6-8, apart from the fact that the construction in these figures is shown in association with an air propeller *b'* in rear of which within the augments tube *a* there may be provided a stream line body *l* of such dimensions and shape as will give any required rate of expansion of the passage inside the augments tube, the principal differences between this construction and that already described consist in the steering pillars *g* and the pallets *d*, *e* lying in the planes of the pallets themselves, which necessitates the webs *i* which continue the curve of the inward surfaces of the rear tips of the pallets, being of considerably greater depth in order to maintain contact between the web and its opposing pallet over any considerable range of lateral swing of the pallets, and in the transition from the circular entrance of the augments tube *a* to the oblong rear portion there is interposed between the two an intermediate

elliptical section. Further, the circular front portion itself expands slightly from front to rear of its length.

For constructional reasons the rectangular portion of the augments tube or the rearward part of it carrying the maneuvering pallets is conveniently made separate from the remainder or forward portion of the augments tube, and in certain cases of propulsion this forward portion may be omitted entirely and only the tail portion of the tube carrying the maneuvering pallets fitted immediately in rear or just embracing the propeller. The pallets may have their pivot axes either in the planes of the side walls of the fixed tube or duct or these axes may approximate to the axis of the duct or even be coincident therewith while the fixed side wall of the duct may be constituted solely by the forward nozzles or offset portions of the side walls. In the latter case when the rear edges of the pallets are closed in the central or astern position and their forward edges are contiguous with the rear edges of the offset strips, the pallets in conjunction with the fixed side walls act simply as deflectors of the propeller flume and not as nozzles or converters of energy.

In the modified construction shown in Figs. 9-12, m represents the side walls of a square or oblong fixed tube which may be immediately in rear of a driving propeller or may be the tail section of an augments tube hereinbefore described. The pallets n are carried by brackets n' swinging on vertical pivots o and may be regarded as comprising two parts, viz: the main or body part n to which the brackets are attached and which in the open position (Fig. 9) of the pallets form continuations of the side walls m , and forwardly projecting portions p which overlap the side walls m and are bulged outwardly as shown, save for the tip portions p' which lie flat against the walls of the tube. The extent of overlap of the pallets and tube is such that even when a pallet is hard over (Fig. 11) the forward tip p' of the pallet projects beyond the line of the wall m and no part of the deflected stream of water is divided forwardly inside the tube.

It will be seen that pallets having their forward ends constructed as herein shown form in conjunction with the rear ends of the walls m properly constituted discharge nozzles with converging inlets and diverging outlets for all positions of the pallets approximating to that shown in Fig. 10. The construction of these nozzles and their diverging outlets may be determined entirely by the formation of the pallet tips p' or in part by shaped vertical strips m' on the outer rear edges of the walls m , which also serve as reinforcements.

The concave surfaces of the pallets may be reinforced by webs as indicated at q , q'

formed integrally with or riveted to the pallets, and the outer hollow of the body portion n between the forward bulging portion p and the outwardly curved rear tips p' may be filled in with wood or otherwise encased to reduce skin friction, and prevent the formation of whirls and eddies in the full speed ahead position.

Fig. 12 shows the tail part of an augments tube the side wall m of which terminates on the line A which corresponds with the rear edge of the end wall indicated at A in Fig. 9. Similarly the dotted lines B, C represent respectively the lines of the angular corner or heel of the pallet tip p' and of the front edge of the pallet which are indicated by corresponding reference characters in Fig. 9. The line D is the corner or angle resulting from the merging of the forward circular or elliptical portion m' of the augments tube into the rectangular tail portion.

It will be understood that many modifications may be made in the construction illustrated without exceeding the scope of the invention as herein described and claimed, as for example the position of the pivots both laterally and fore and aft with respect to the fixed tube. They may, for example, be coincident on the centre line of the tube, or they may be in the planes of the side walls or in any intermediate position.

Having thus described the nature of the said invention and the best means I know of carrying the same into practical effect, I claim:—

1. In ships and other propeller driven craft, in association with the propeller an augments tube of circular section at its forward end and of rectangular section and greater area at its rear end.

2. In ships and other propeller driven craft, in association with the propeller an augments tube of circular section at its forward end and oblong section at its rear end connected by an intermediate portion of substantially oval or elliptical section.

3. An augments tube as claimed in claim 2 having its forward circular portion increasing in cross section from front to rear.

4. In ships and other propeller driven craft, a fixed tubular duct associated with a driving propeller, rudder pallets pivotally mounted upon the duct and having their rear edges shaped to remain in contact over a considerable angular range of movement when swung together to one side or the other in the same sense.

5. In ships and other propeller driven craft, a fixed tubular duct, a driving propeller associated with said duct, rudder plates pivotally mounted upon the duct on separate axes inside the planes of said plates, said plates having their rear edges shaped to remain in contact over a consid-

erable angular range of movement of the same when swung together to one side or the other in the same sense.

6. In ships and other propeller driven craft, a fixed tubular duct associated with a propeller, rudder pallets pivotally mounted upon the duct, gear for operating said pallets and a yielding clutch between said gear and said pallets permitting one pallet to be put hard over by continued operation of the gear after the other pallet is arrested in its limiting position.

7. Apparatus for maneuvering ships and

aircraft comprising a fixed tube extending rearwardly of the propeller, pallets pivoted to said tube for controlling the discharge of fluid streams from the tube, the forward portions of the pallets being shaped to form in conjunction with the walls of the fixed tube forwardly directed nozzles or discharge passages for all positions of the pallets approximating that of full speed astern.

In testimony whereof I have signed my name to this specification.

EDMUND SCOTT GUSTAVE REES.