(No Model.) 2 Sheets—Sheet 1.

E. T. GRIFFITH.

MARINE PROPELLER.

No. 299,923. Patented June 3, 1884.

Fig. 1.

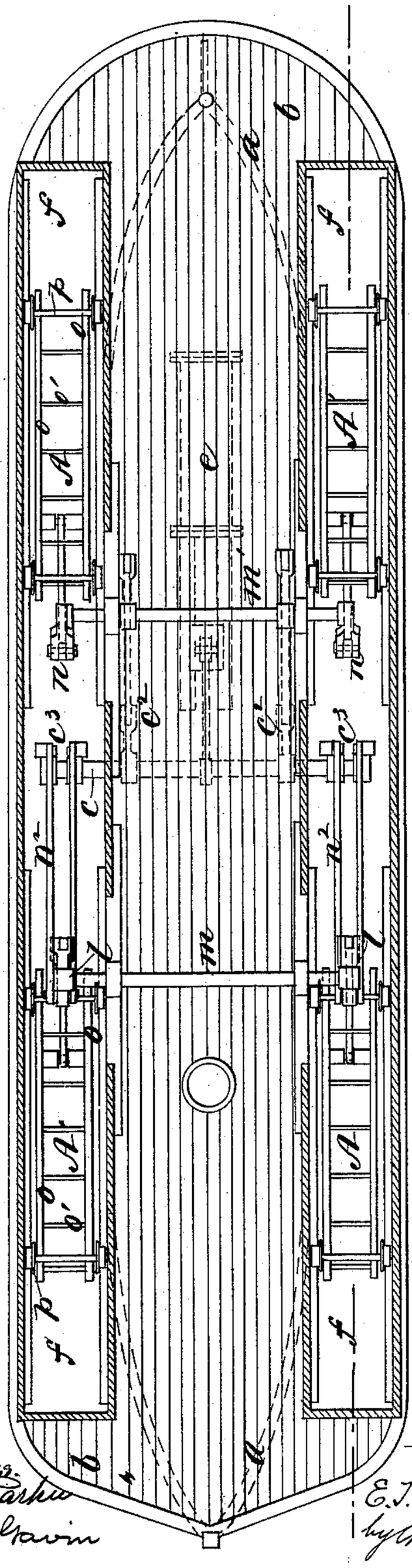
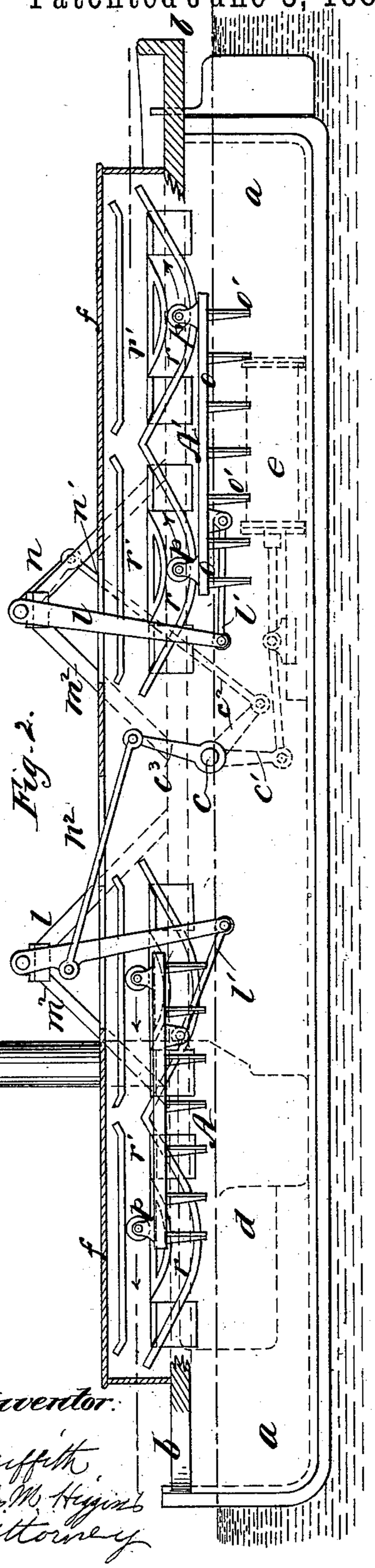


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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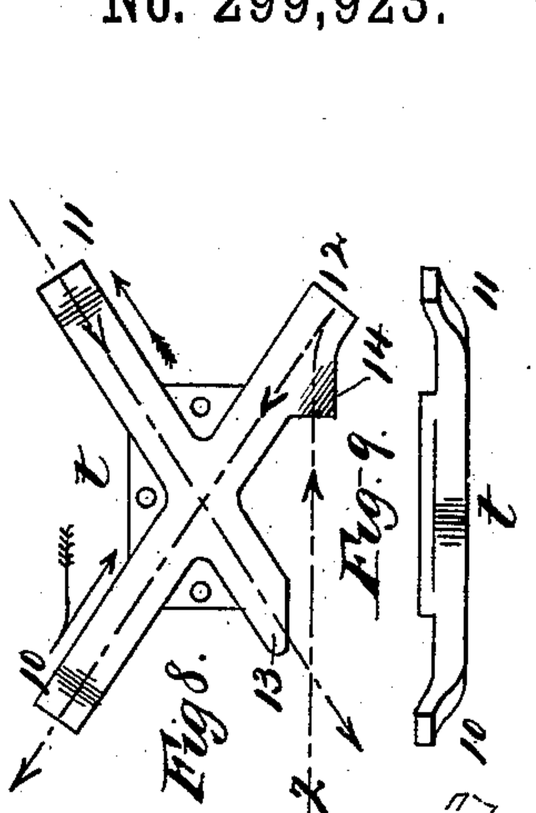

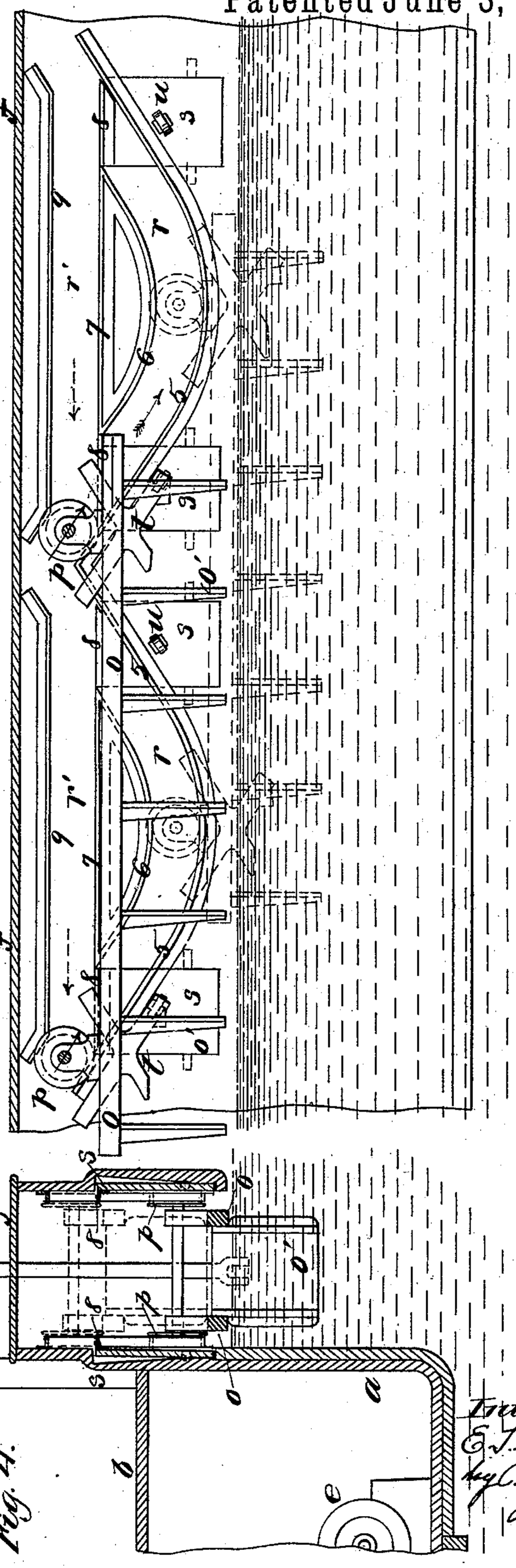

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UNITED STATES PATENT OFFICE.

EVAN T. GRIFFITH, OF BROOKLYN, NEW YORK.

MARINE PROPELLER.

SPECIFICATION forming part of Letters Patent No. 299,923, dated June 3, 1884.

Application filed February 28, 1884. (No model.)

To all whom it may concern:

Be it known that I, EVAN T. GRIFFITH, of Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Marine Propellers, of which the following is a specification.

My invention relates to reciprocating paddle-propellers, and is an improvement upon that type of reciprocating propeller shown in Boynton's Patent No. 13,078, of 1855, in which a series of flat paddles are fixed on a sliding truck or carriage arranged to move in ways or tracks on each side of the boat, the paddles being always disposed at right angles to the water-line, but the truck being arranged to move during its idle stroke in an upper track with the paddles out of the water and in a lower track during the active stroke with the paddles immersed.

My improvements lie more particularly in the mechanism for imparting motion to the paddle-trucks from the engine, and in the construction of the ways or tracks of the paddle-trucks and the switching devices at each end of the stroke, where the lower way joins the upper way, whereby the truck is switched from the lower way for the active or immersed stroke onto the upper way for the idle or return stroke, and vice versa, as hereinafter fully set forth.

In the annexed drawings, Figure 1 presents a plan view of a tow-boat provided with my improvements; and Fig. 2 is a side elevation thereof, partly in section. Fig. 3 is an enlarged fragmentary sectional side elevation showing more particularly the paddle-trucks and their ways and switches. Fig. 4 is a cross-section of the boat at the location of the switches in the paddle-boxes. Fig. 5 is an enlarged fragmentary cross-section of the switch portion of the way in the paddle-box, showing one of the switches thrown out; and Fig. 6 is a similar view with the switch thrown in. Fig. 7 is a broad side or front view of the switch-plate, Fig. 8 is a broad side or front view of the switching-shoe on one end of the paddle-truck which operates the switches, and Fig. 9 is a plan view of said shoe.

My invention is more particularly designed and adapted for canal-boat propulsion or towing, but is of course also adapted for river or harbor towing or other marine propulsion. The boat which I illustrate in Figs. 1 and 2 is designed for towing only, being equipped with engines, fuel, and crew; but of course the invention may be adapted to freight or passenger boats when desired.

In Figs. 1, 2, 3, and 4, *a* indicates the hull of the vessel, and *b* the main deck, which overhangs the hull considerably on each side, and on these overhanging portions are fixed the paddle-boxes *f*, which are long and flat, and extend nearly the entire length of the vessel, as shown best in Figs. 1 and 2. At about the middle of the vessel is placed the main shaft *c*, which in this case is a rocking and not a rotary shaft, and is disposed across the vessel, with each end projecting from the sides of the vessel into the paddle-boxes at or near the water-line, as shown best in Fig. 2. On one side of the shaft—say in the front of the boat—is situated the boiler *d*, and on the opposite side, in the stern, is placed the engine *e*, which is preferably of the reciprocating kind, the connecting-rod of which is jointed to a crank-lever, *c'*, on the middle of the main shaft *c*.

Now, A A' indicate the reciprocating propellers or paddle-trucks, two of which are disposed in each paddle-box, one toward the front and the other toward the rear, with the main shaft *c* extending across the center of the boat between the said front and rear paddles.

l l indicate two long pendent levers, which project down into each paddle-box toward the surface of the water and near the ends of the front and rear paddle-trucks, and are connected with said trucks by links *l'*, as shown best in Fig. 2. These paddle-levers *l l* are fixed on rock-shafts *m m'*, which are mounted in bearings on gable-shaped frames m^2, which project above the paddle-boxes on each side of the boat, the said shafts *m m'* being parallel with the main shaft *c*, but elevated above the same on the outside of the vessel, as shown in Figs. 1 and 2. The rear paddle-shaft, *m'*, is provided with crank-arms *n*, which are connected by links *n'* with crank-arms c^2 on the main shaft *c* within the hull of the vessel, while the similar crank-arms, c^3, fixed on the ends of the shaft outside the hull, are connected by links n^2 directly with the front paddle-

levers, *l l*, as well shown in Figs. 1 and 2. It will, therefore, be seen that the main shaft is operatively connected with the paddle-trucks in such manner that when a rocking motion is imparted to the shaft by the action of the engine a reciprocating movement will be imparted to the two sets of paddle-trucks in relatively reverse order, so that the rear paddle will always make an immersed and propelling stroke while the front paddles are making an idle or return stroke, and vice versa, as shown in Fig. 2.

The paddle-trucks consist of two strong parallel longitudinal beams or timbers, *o o*, joined rigidly by the transverse paddle-plates *o' o'*, (see Figs. 3 and 4,) which may be of wood or of wrought or cast metal, said plates depending from the beams *o o* parallel with each other and presenting a flat or a concave face to the water when immersed, as will be understood. I prefer to use a series of paddle-plates to each paddle-truck, as shown; but do not of course limit myself to any particular number. The top of the paddle-trucks are provided with flanged truck-wheels *p*, which are fixed on axles, which are mounted in suitable bearings that rise from the timbers *o o* in the manner of railway-car wheels, and these wheels are adapted to roll on the rails of either of the two ways *r r'*, through which the truck moves successively during its propelling and its return stroke, respectively. The lower way, *r*, is the propelling-way in which the wheels of the truck move during the propelling-stroke, and this, as shown, is curved into two loops or arcs, the curve being tangent to the water-line, each loop or arc corresponding to one pair of the truck-wheels, the stroke of the paddle-truck being equal to the length of one of the loops or half the length of the truck, as will be understood from the drawings. The upper way, *r'*, is straight, and is termed the "return-way," in which the truck makes its idle or return stroke with its paddles raised out of the water, as shown in the left of Fig. 2. Now, on each side of the paddle-boxes, at the positions where the curved ways *r r* intersect or run into the straight ways *r'*, are pivoted the switch-plates *s*, as shown best in Figs. 3, 4, 5, and 6, the said plates being disposed in a vertical plane pivoted on a horizontal axis, *s'*, parallel with the length of the boat, and they are constantly forced out of sockets in the sides of the paddle-boxes by underlying springs s^2, as shown best in Figs. 4 and 5, so that short switch-rails 8, which are affixed on the top edge of the switch-plates, will be in line with the straight rails 7, and thus continue the said rails over the entrance to the curved ways *r*, whereas when the said switch-plates are pressed inward, as shown in Fig. 6, the switch-rails will retire into their sockets out of line with the straight rails 7, and thus uncover the entrance to the curved ways *r*, and permit the truck-wheels to roll from the rails of the straight way onto the rails of the curved ways, thus allowing the truck to be switched from one way to the other. Now, the said switch-plates are operated at each end of the stroke by the cam-shoes *t* on each end of the truck, which shoes are of an irregular cross-shape, having a number of radial arms, one or other of which collides with a cam-roller, *u*, projecting from the switch-plate in the path of one or other of the said arms when the truck approaches the ends of its stroke. The upwardly-projecting arms 10 11 of the cam-shoes (see Fig. 8) are alike, and their tips are bent or beveled off with a cam or wedging face, as shown in Fig. 9. The tip of the downwardly-projecting arm 12 is, however, level with the main face of the arm; but this tip is broader and more prolonged in a horizontal direction, as indicated by the dotted line *z* in Fig. 8, so as to form a projecting wing, 14, which has a beveled or cam face similar to the tips 10 and 11. The remaining arm 13 is shorter than the others, being cut off above the line of the cam-face 14 on the arm 12, so that this short arm will pass off the roller of the switch-plate at the end of the active stroke, as will hereinafter appear.

Now, referring to Fig. 3 and the adjacent views, the operation of the truck and its switching-levers will be readily understood with a brief explanation. In Fig. 3 the truck is shown at the end of its idle stroke ready to commence the active stroke, in which position the paddles are still raised wholly out of the water, with the truck-wheels at the top of the inclined or curved rails 5, which, as shown, project a little above the rails 7 of the straight or return way *r'*, and the top rails, 9, of the straight way are also slightly bent up at each end, to allow the truck-wheels to mount slightly above the straight rails 8 and 7 of the return-way at each end of the stroke, as will be understood. In this position of parts it will be seen that the flat end of the cam-arm 12 will be over the cam-roller of the switch-plates *s*, and hence the switch-plates will be pressed into their sockets, as seen in Fig. 6, with the switch-rails 8 thrown out from under the truck-wheels, thus leaving the entrance to the inclined ways *r* clear. Hence, if the truck is now pressed forward, the wheels will enter the ways *r* and roll down the inclined rails 5, thereby immersing the paddles and causing the same to sweep through the water in a gradually descending and then gradually ascending path, corresponding to the form of the ways *r*, but with the paddles always at right angles to the water-line, as will be understood. As the trucks approach the end of their active stroke the paddles will of course be nearly raised out of the water and the truck-wheels will approach the opposite summit of the inclined rails 5; but before the truck-wheels reach this summit the cam-arms 11 will collide with the rollers on the opposite switch-plates, and thus press the switch-plates outward, removing the switch-rails 8 from the path of the truck-wheels, (see Fig. 8,) and thus allow the truck-wheels to mount the summit of the in-

clined rails 5 above the switch-rails in the position corresponding to that shown in full lines in Fig. 3, where the wheels are shown at the opposite end of the stroke. As soon, however, as the truck-wheels have mounted to the summit of the inclined rails, as above described, having passed the switch-rails, the short cam-arm 13 will have passed off the roller of the switch-plates, thus allowing the switch-plates to again fly out and throw their switch-rails 8 under the truck-wheels in line with the straight rails 7 of the return-way r'. When the reverse movement is now imparted to the truck, the wheels will roll back in the direction of the dotted arrows in Fig. 3 in a straight line on the rails 8 7 until the wheels arrive at the end of the straight way, as shown by full lines in Fig. 3, when the truck-wheels will mount the summit of the inclined ways, removing their weight from the switch-rails 8, and at the same time the cam-wings 14 will collide with the rollers of the switch-plates, and the level tip 12 will slide over the rollers, thereby pressing out the switch-plates, removing the switch-rails from under the truck-wheels, and leaving the wheels free to move down the inclined ways for the next propelling stroke, as before described, as soon as the propelling motion is imparted to the truck.

It may now be seen that by the switching devices described the trucks may be shifted in a smooth and simple manner from one set of ways to the other, and that the construction and action of these switching devices are a great improvement over those heretofore employed in simplicity and certainty, as the switches consist of few parts and are operated by the terminal movements of the truck itself.

It will be also seen that this form of propelling apparatus has characteristic advantages, as it provides a positive reciprocating paddle action, with a large paddle-surface presented to the water and always at right angles to the water-line, hence without indirection and loss of power, and as the action is positive and the surface large, the hold upon the water is correspondingly great, so that the paddles may be moved slowly without making any objectionable swell or disturbance in the water, and yet propel with great force, so that the apparatus is particularly well adapted for canal propulsion.

If desired, a rotary motion may be imparted to the main shaft c, instead of a rocking motion, in which case the cranks $c' c^2 c^3$ would be shorter, so as to impart the same reciprocating motion to the paddle-trucks during one revolution.

The links $l' l^2$ may be made adjustable in length, and also adjustable in their connection radially on the levers l, so that the stroke of the trucks may be adjusted as may be required to bring the truck-wheels fully to the end of the rails at each reciprocation, as will be understood.

It will be noted that in my invention I employ a straight return-way and a curved propelling-way, formed in two arcs or loops tangent to the water, with the wheels on each end of the paddle-truck moving in the respective loops, and switching devices at the points of intersection of the loops with the straight way. This arrangement is novel and advantageous, and while I prefer the particular form of switching devices set forth, yet any equivalent devices may be employed in connection with the described form of ways without departing from my invention.

What I claim is—

1. In a propelling apparatus, the combination, with a reciprocating paddle-truck, of ways therefor, having the propelling or active path formed into two arcs or loops tangent to the water-line, with rollers on each end of the truck moving in said loops, and with an overlying straight way extending the length of both loops and intersected by each end of said loops, with suitable switching devices at the said points of intersection for shifting the truck-wheels from the rails of one set of ways to the other, and suitable means for imparting motion to the said truck, substantially as herein set forth.

2. In a propeller apparatus, the combination, with a reciprocating paddle-truck and a propelling and a return way in which the same is movable, of the pivoted switching-gates s 8, arranged at the intersections of the two ways, and cams or projections on the ends of the truck, arranged to actuate said switches at each end of the stroke, substantially as and for the purpose set forth.

3. The combination, with the reciprocating paddle-truck A, having wheels, of the return-way r' and propelling-ways r, formed with the straight rails 7 and curved or inclined rails 5, with the switch-plates s, having rails 8, arranged at the intersection of the two ways, and cam-shoes t on the ends of the truck for operating said switch-plates, substantially as herein set forth.

4. In a propelling apparatus, the combination, with the shaft c and an engine for revolving the same, of the pendulous levers l l and reciprocating paddle-trucks A, with cranks on the said shaft, links n^2, connecting said cranks and levers, and links l', connecting said levers and trucks, substantially as herein shown and described.

5. In a propelling apparatus, the combination, with the main shaft c and an engine for imparting motion thereto, of two cranks, c^2 c^3, set reversely on said shaft, two paddle-trucks arranged to act reversely with the two pendulous levers l l, connected with said trucks, and links n' and n^2, connecting said cranks and levers in reverse order, whereby one truck will advance while the other retires, substantially as herein set forth.

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Witnesses:
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