

R. FORWARD.  
FEATHERING PADDLE-WHEELS.

No. 174,220.

Patented Feb. 29, 1876.

Fig. 1.

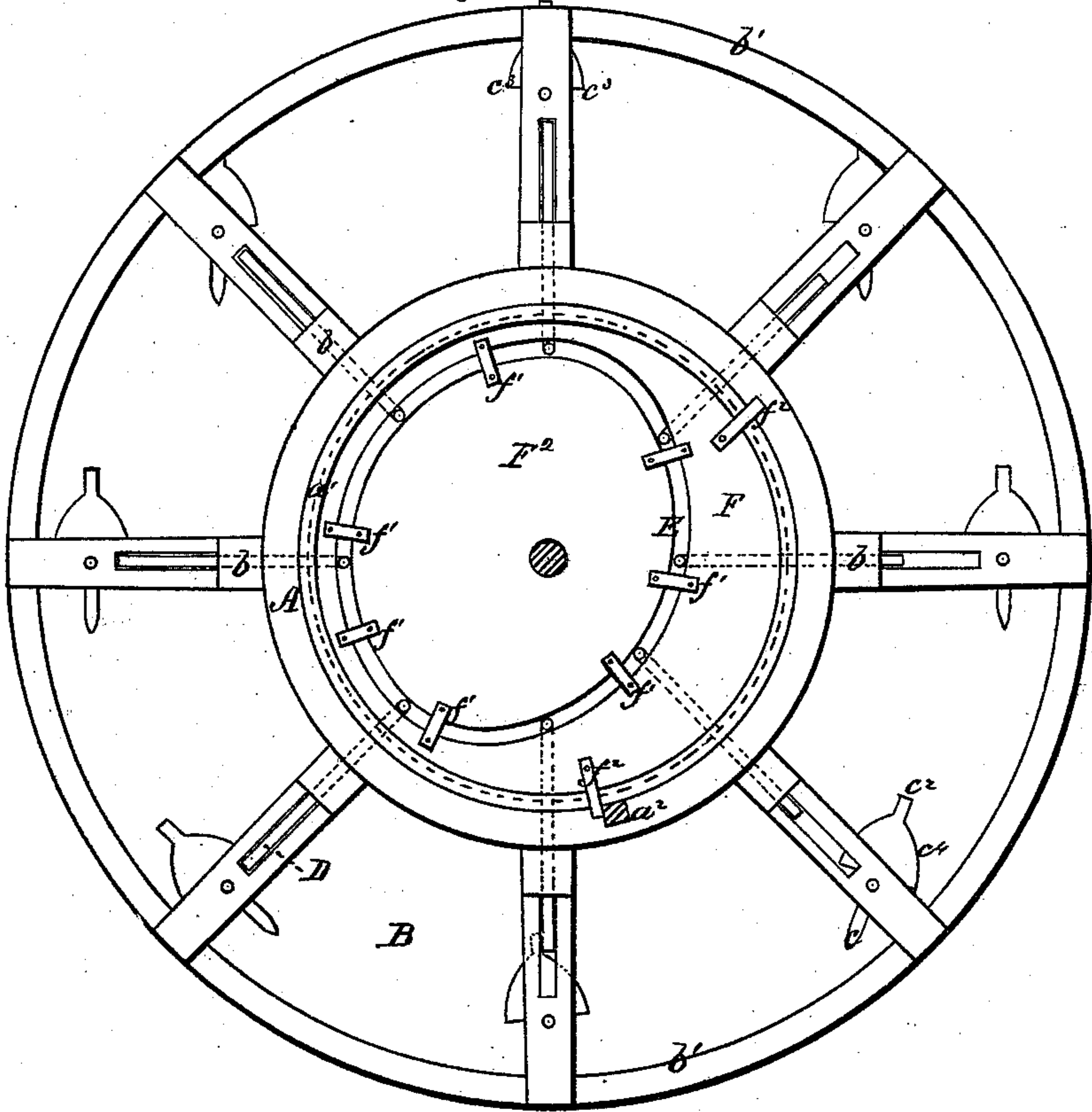


Fig. 2.

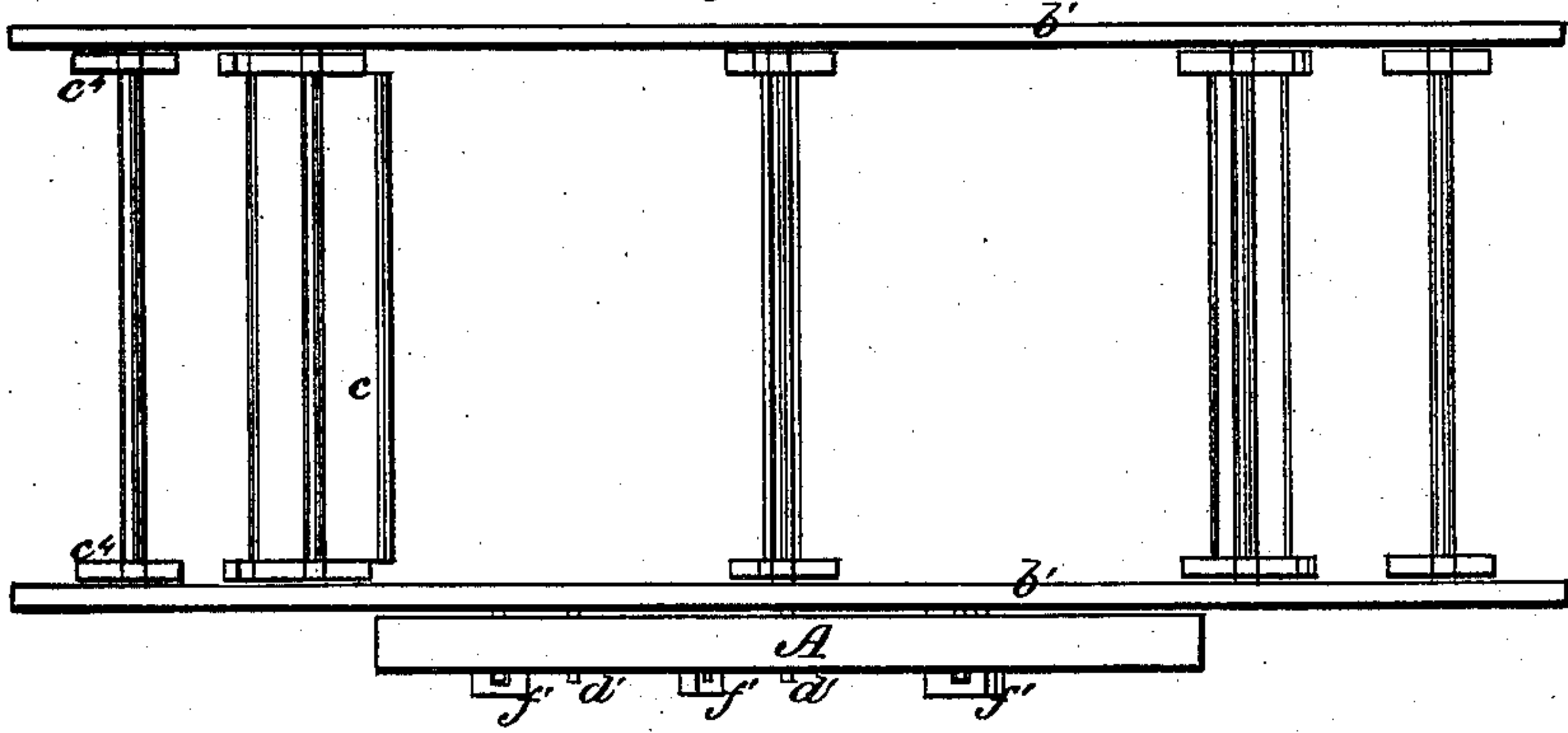
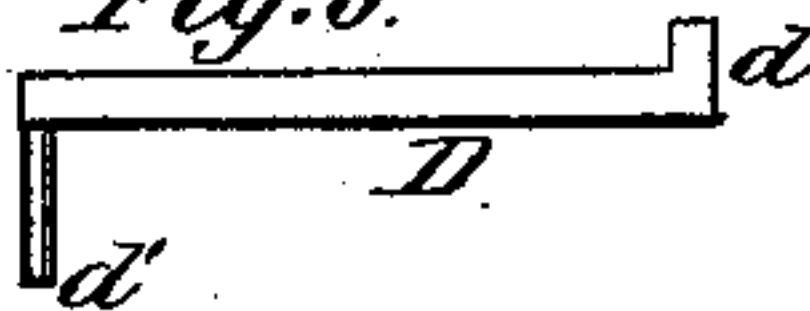


Fig. 3.



WITNESSES:

A. B. Robertson  
John Kemmon

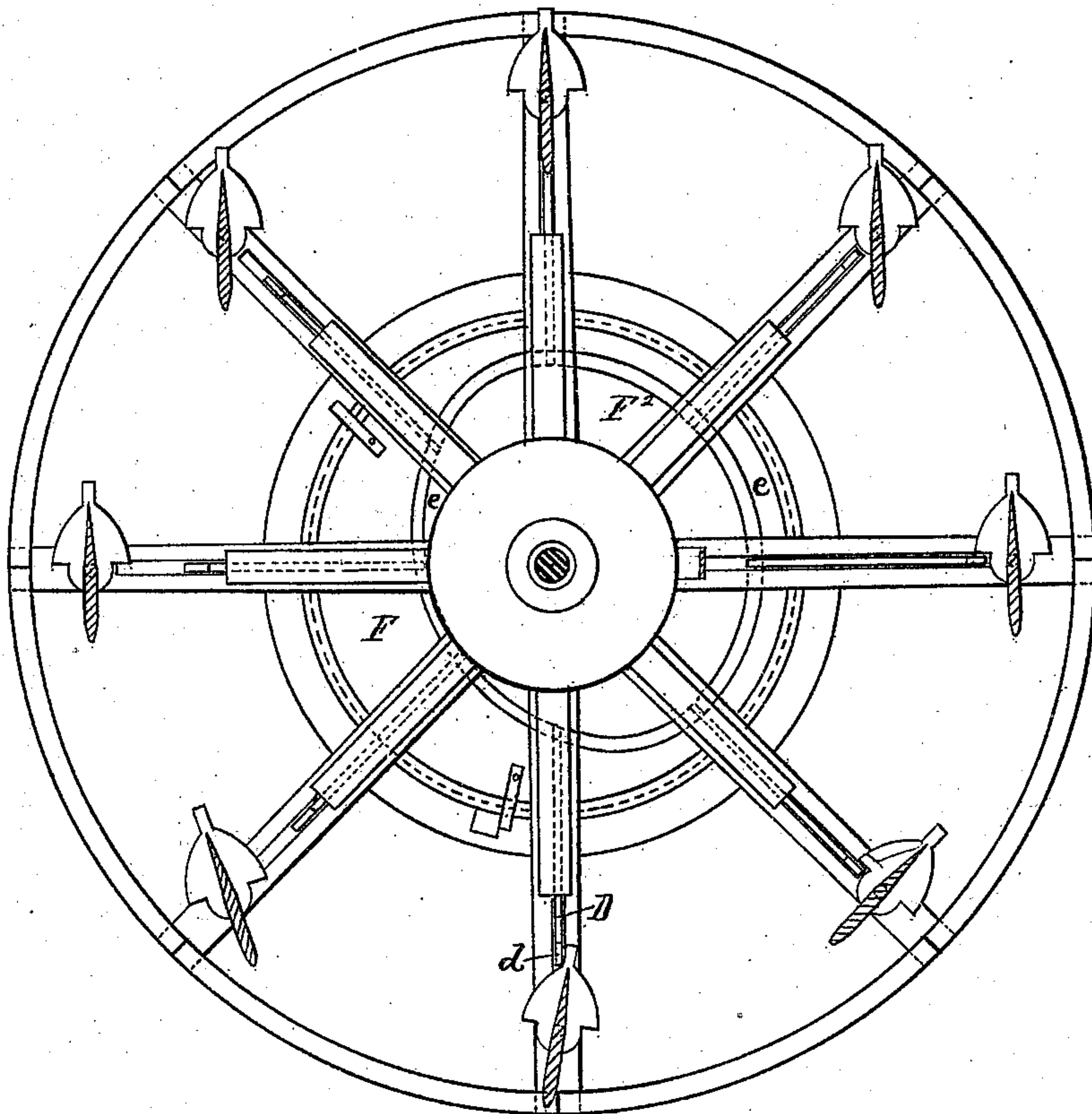
INVENTOR:

Ross Forward  
BY *[Signature]*

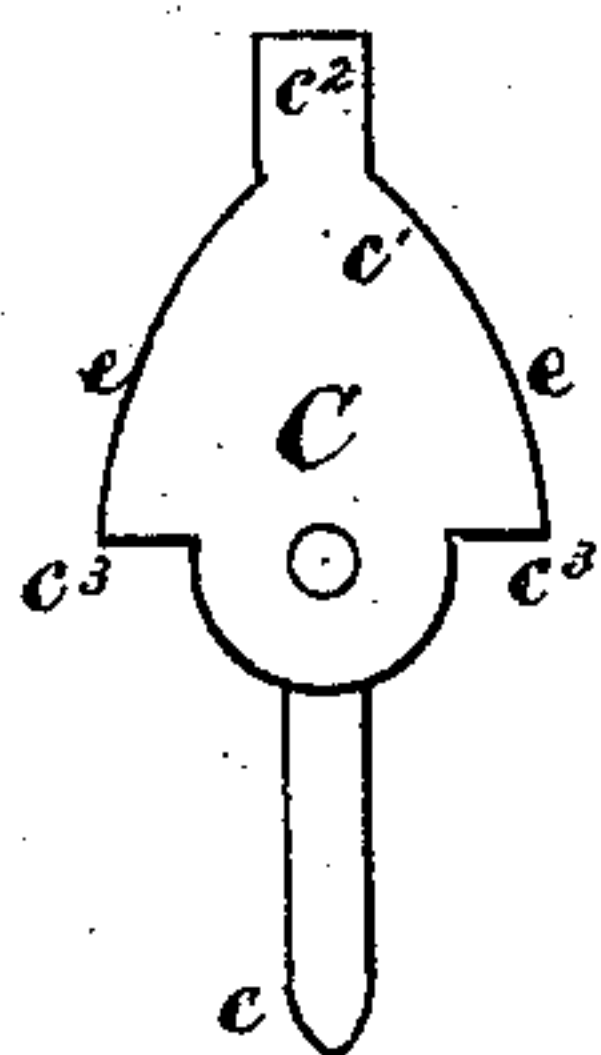
ATTORNEYS.

**R. FORWARD.**  
**FEATHERING PADDLE-WHEELS.**  
 No. 174,220. Patented Feb. 29, 1876.

*Fig. 4.*



*Fig. 5.*



**WITNESSES:**  
*A. B. Robertson.*  
*John C. Kemmer*

**INVENTOR:**  
*Ross Forward*  
**BY** *Wm. T. C.*

**ATTORNEYS.**



# UNITED STATES PATENT OFFICE.

ROSS FORWARD, OF CINCINNATI, OHIO.

## IMPROVEMENT IN FEATHERING PADDLE-WHEELS.

Specification forming part of Letters Patent No. 174,220, dated February 29, 1876; application filed January 12, 1876.

*To all whom it may concern:*

Be it known that I, ROSS FORWARD, of Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and Improved Paddle-Wheel; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, forming part of this specification, in which—

Figure 1 is a side elevation; Fig. 2, a plan view; Fig. 3, detail view of the locking device. Fig. 4 is a vertical section; Fig. 5, detail view of the cam.

The invention is an improvement in feathering paddle-wheels, and relates to the angle the paddles may be caused to assume to the surface of the water, and the means of locking the paddles in the several positions, as hereinafter described.

The invention will first be described in connection with the drawing, and then pointed out in the claim.

A represents the frame or pillow-block, in which is journaled the wheel B, having radial arms *b* and perimeters *b'*. C are the paddles pivoted near the ends of arms *b*, and made heavier on one side *c* than on the other *c'*, so that gravity will always tend to keep them in a perpendicular plane. They are also wider on one side, *c*, than on the other, *c'*, the latter being one-fifth to one-sixth less, in order that the greater pressure of water on one side of pivot will cause them to let go at the proper moment. *c*<sup>2</sup> are studs at each upper end of the paddles, and *c*<sup>3</sup> *c*<sup>3</sup> opposite shoulders on each side of the stud. F is a circular plate, in which is fastened, by clamps *f*<sup>1</sup> *f*<sup>1</sup>, the eccentric plate F<sup>2</sup>, so as to form the eccentric groove E, for the reception of slide-pins *d'*. This eccentric plate revolves upon the shaft of wheel, and, if left free to move from the force of impact from pins *d'* *d'*, would revolve on shaft in either direction, but, being provided with projections or stops *f*<sup>2</sup> *f*<sup>2</sup>, is capable of moving only until projections *f*<sup>2</sup> *f*<sup>2</sup> come in contact with studs *a*<sup>2</sup> *a*<sup>2</sup> on frame or pillow-block A, being held at rest on either side of same, according to the direction the wheel is revolved, each change of direction causing plate F to turn accordingly and bring the eccentric groove in a reverse position with refer-

ence to a vertical or horizontal line and the center of wheel, whereby the slides D are moved, and the paddles are governed in same manner, and held in same relative position in water, whether wheel is moved backward or forward. A paddle at the top of wheel will hang by gravity in a perpendicular plane, and by turning with the wheel will continue to do so until arrested by stud *d* on slide D advancing under shoulder *c*<sup>3</sup>, which it does before reaching the water, in which position it is held, cutting the water in any desired line, according to the depth of water and speed of boat, (this being varied and regulated by making shoulders *c*<sup>3</sup> and stud *c*<sup>2</sup> nearer to each other, as shown in drawing, by which edge of paddle drops more perpendicularly in the water,) so as to sink it directly edgewise until it arrives at the proper point for most effective work, (which is about thirty to thirty-five degrees of a line perpendicular to shaft on which wheel revolves,) where the slide-stud *d* withdraws so as to release the shoulder *c*<sup>3</sup>, when the uneven pressure of water on *c* and *c'*, and the heavier weight of *c*, causes the paddle to fall out and assume a perpendicular position, from which, for the distance of sixty to seventy degrees, the deeply-submerged paddle moves in nearly a horizontal plane against the solid body of water. Then the slide-stud *d* withdraws from *c*<sup>2</sup>, leaving the paddle-blade to swing loosely on its pivots or assume the upward path of least resistance through the water, and thence to its place of starting. The cam at each end of paddle with stud and shoulders is so graduated, in reference to the eccentric groove E, which governs the slide and withdraws stud *d*, that when the paddle is coming into position it does not fall with sudden blow, but, the stud *d* impinging and sliding upon cam *e*, the blade is brought gradually to the perpendicular, where it is held by stud *c*<sup>2</sup>. The arm-slides D have pins *d'* projecting into eccentric groove E, whereby they are moved at proper time to fasten and loosen the paddle-blades and govern their motion.

It will be observed that when the blade or paddle reaches a point where the retarding power of water to be lifted is encountered the paddles let go and remain entirely disconnected from all parts of wheel except pivots



on which they turn, and being so, are free to take the line of least resistance, avoiding all drag, rising to the surface feathered, and lifting no water in the rear.

I thus make a wheel with movable paddles so arranged as to feather, and cutting the water in front at any desired angle, making least resistance to their entry into the water until arriving at the effective point, and thence pushing to the length of one-fifth or one-sixth diameter of wheel where the ordinary paddle must lift the water in rising, but where my paddle, being free from any connection with rods, pins, or stops, feathers and rises with least possible resistance to the surface, thus gaining the entire force ordinarily required to submerge the paddle on one side and lift the incumbent water on the other. In short, the whole force of the engine is given to the direct push against the water, and the wheel being submerged to any desired depth, any desired resistance may be obtained.

The wheel is designed expressly to get the advantage of a deep hold upon the water, and its construction is based on the principle that the resistance to the movement of a paddle in the water is in direct ratio to its depth, and, further, that too great resistance at the

vertical point of the driving or paddle wheel of a steamer cannot be obtained, for thereby the boat will be moved rather than the wheel splashed through the water.

By this means I claim to save slip and greatly increase speed, affording greater economy in the transportation of freight, and putting steamboats for the carrying of passengers at many points in successful competition with railroads.

Having thus described my invention, what I claim as new is—

1. The paddles provided with heads having shoulders  $c^3$  and stud  $c^2$ , said heads being formed on or attached to the paddles above the pivot thereof, as and for the purpose specified.

2. The combination of a plate having an eccentric groove, E, and mounted loose on the wheel-shaft, to adapt it to be reversed in position, sliding rods D, provided with pins or arms working in said groove, and paddles C, pivoted above the center, and having heads constructed with shoulders  $c^3$  and stop  $c^2$ , substantially as shown and described.

ROSS FORWARD.

Witnesses:

SOLON C. KEMON,  
EDWD. W. BYRN.