

(No Model.)

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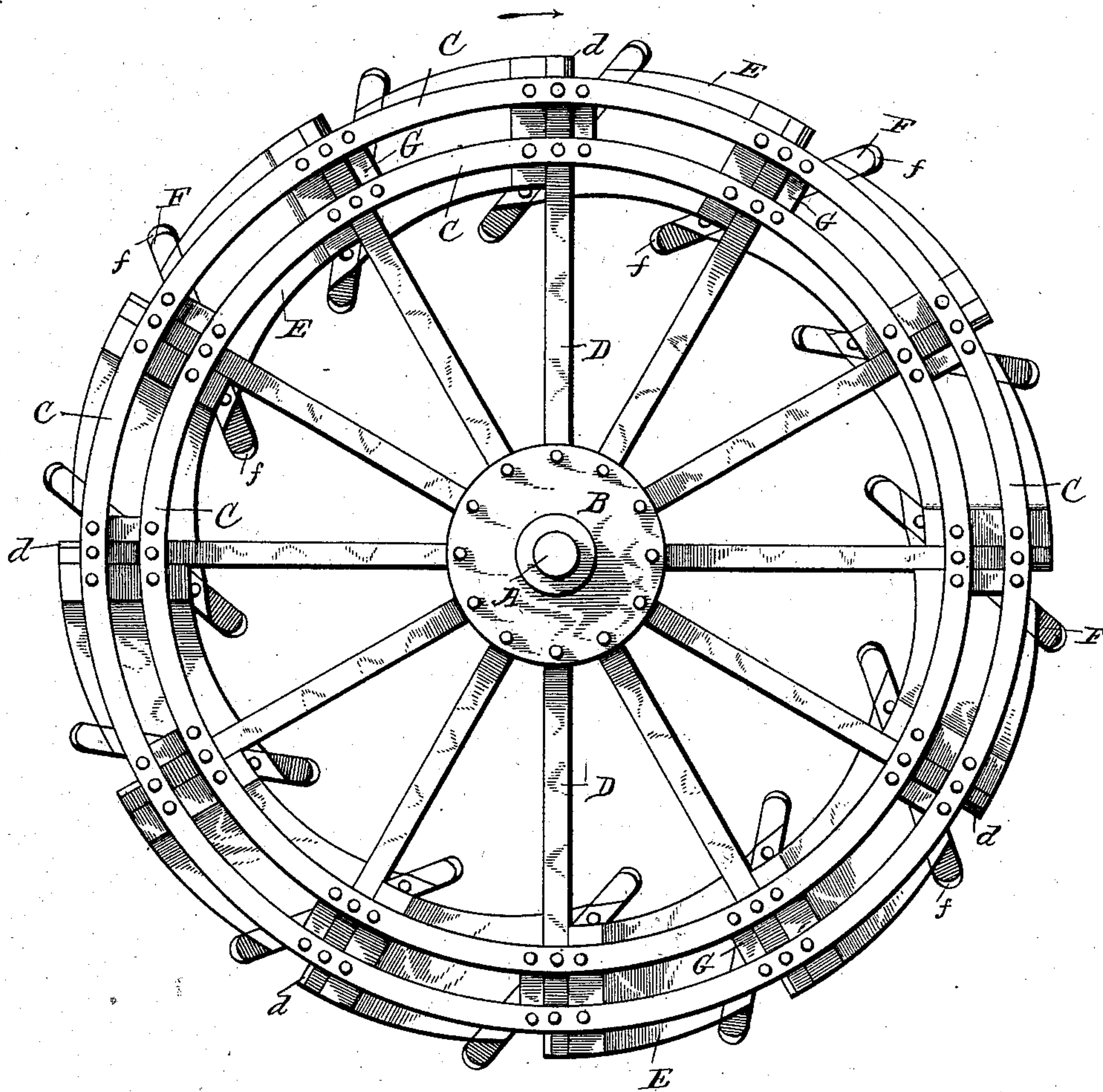
J. C. THAYER & J. PHELAN.

PADDLE WHEEL.

No. 389,672.

Patented Sept. 18, 1888.

Fig. 1.



Witnesses

*Albert Speiden.*

*Robert Owens.*

Inventors

*John C. Thayer.*

*Joseph Phelan.*

By Their Attorneys.

*Anderson & Myers.*



(No Model.)

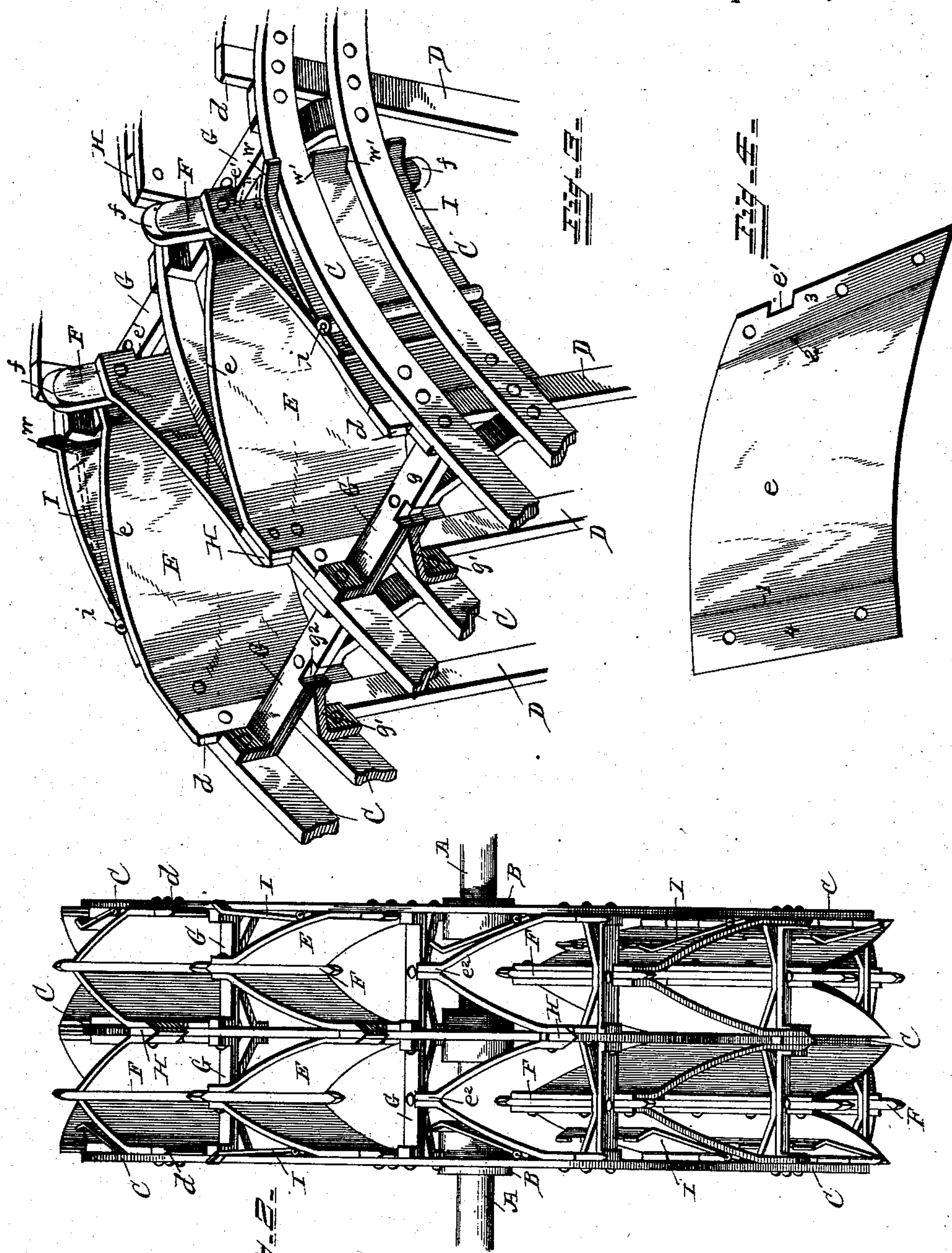
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# UNITED STATES PATENT OFFICE.

JOHN C. THAYER AND JOSEPH PHELAN, OF NEW YORK, N. Y.

## PADDLE-WHEEL.

SPECIFICATION forming part of Letters Patent No. 389,672, dated September 18, 1888.

Application filed February 24, 1888. Serial No. 265,178. (No model.)

*To all whom it may concern:*

Be it known that we, JOHN C. THAYER and JOSEPH PHELAN, citizens of the United States of America, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Paddle-Wheels, of which the following is a specification, reference being had therein to the accompanying drawings.

Our invention relates to improvements in the class of paddle-wheels for steamboats termed "feathering" wheels; and it has for its objects, first, to provide the wheel with buckets so constructed and rigidly secured in the frame-work in such manner that they will accurately feather on entering the water, exert full propelling-power so long as they occupy a vertical position therein, commence cutting or feathering out of the water immediately after passing over the center or out of a vertical position, and empty on leaving the water, discharging directly into the succeeding bucket, whereby very nearly the whole amount of force required to drive the wheel is that exerted in carrying the buckets over the center.

Another object of our invention is to construct the buckets in the arc of a circle, and so position them in the wheel that they will gradually incline inward from front to rear, whereby should a bucket meet an obstruction—such as floating ice—its leading corners only will take the shock.

Another object of our invention is to prevent liability of the wheel expanding or collapsing under great pressure, which object we accomplish by means of trusses so disposed in the frame-work as to rigidly support the rings and arms and to serve as a lock for the rear ends of the buckets.

Another object of our invention is to provide the buckets with automatically-acting reversing-blades on their outer sides, for the purpose of giving increased propelling-surface to the wheel when revolving in a backward direction.

Another object of our invention is to provide the wheel with a number of external and internal ice-cutters, whereby such floating cakes of ice as may come into contact with it will be broken into such fragments as to be in-

capable of injuring the wheel or wheel-house or of clogging the wheel.

Our invention consists in certain details of construction and combinations of parts, which will first be described in connection with the accompanying drawings, and then clearly pointed out in the claims.

In the drawings, Figure 1 is a side elevation of our improved paddle-wheel, the reversing-blades being omitted. Fig. 2 is a view in perspective of the face of the wheel. Fig. 3 is a detail perspective view of a portion of the wheel. Fig. 4 is a side elevation of one of the plates from which the buckets are formed.

Referring to the drawings, A represents the shaft; B, the hub, of ordinary construction; C, the rings, of which there are three sets; and D, the arms. The arms are firmly bolted or riveted to the hub, and the rings are bolted or riveted to the arms, as usual.

The buckets E are each constructed of two segmental metal plates, *e*, the front ends of which are cut on a rearward slant from the outer to the inner edge, (from the top to the bottom, as the plate is represented in Fig. 4,) while their rear ends are cut on a still greater slant in the same direction. These plates are bowed from the point 1 to the point 2, leaving the portions 3 and 4 flat, to serve as flanges by which to secure the plates to a keel-post, F, and to the inner sides of the side and middle rings, the front ends of the plates abutting squarely against the arms D and the rear ends aligning with the keel-post. Now, as the front end of the bucket slants rearward and as it abuts squarely against the arms, which radiate from the hub, it follows that the inner portion of the rear end of each bucket extends inward out of a true circle and beyond the next succeeding arm, and therefore into the mouth of the next bucket following, as clearly shown in Fig. 1. As the inner portion of the bucket thus drops inward from front to rear out of a true circle, the outer portion of the bucket likewise drops inward from front to rear, whereby should the bucket come into contact with an obstruction the shock will be borne solely on its front end.

G represents a series of metal braces or trusses riveted to the inner sides of the rings



C, immediately in front of each arm and set flatwise in the arc of a circle, these trusses being constructed of straight pieces  $g$ , with flanged ends, and arc-shaped pieces  $g'$ , also with flanged ends, both pieces being riveted together at the center. Each truss is formed midway with a recess,  $g^2$ , in its edge, into which the rear end of the bucket, also formed with a recess,  $e'$ , interlocks. It will thus be seen that while these trusses are so disposed as to feather in the water, and therefore offer the minimum resistance to the motion of the wheel, they effectually tie the rings together, brace the arms, and support the buckets, thereby avoiding danger of an expansion or collapsing of the wheel.

By the use of keel-posts at the rear of the buckets we are enabled, by simply sharpening their ends, as at  $f$ , to utilize them as external and internal ice cutters to break up such cakes of floating ice as may come into contact with the wheel, or which, perchance, may work inside of it; but in case the cutters are not needed we can dispense with the keel-post and rivet the rear ends of the plates forming the bucket to each other, as at  $e^2$  in Fig. 2.

As an additional means for cutting the ice external of the wheel, we prefer to extend the side sets of arms beyond the rings and bevel their leading edges, as at  $d$ . The middle set of arms, however, we find most convenient to extend only to the periphery of the outer ring; and in lieu of the projecting beveled end we employ a short beveled piece of metal, H, on the top of the ring and riveted between the adjoining sides of the two buckets, the leading edges of which are also beveled to correspond with the bevel on piece H. It is evident, however, that we might form effective cutters by simply sharpening the leading edges of the buckets, in which case, of course, none of the arms need extend beyond the periphery of the outer rings.

I represents a reversing-blade, hinged at its rear end to the outer side of each bucket at a point just within the water-line of the bucket, as at  $i$ , the forward end of the blade being flared outward to form a wing,  $w$ , the said wing being recessed, as at  $w'$ , so that it may pass over the rings and be supported thereby. It will thus be seen that the blade closes the open space between the rings, and that the blade and side of the bucket form an additional bucket as the wheel revolves backward.

Although we have arranged the buckets in pairs side by side, it is evident we may use but a single series without departing in the least from the spirit of our invention.

The operation of our wheel is as follows: We will suppose that it is revolving in a forward direction, as indicated by the arrow on Fig. 1. Now, on reference to that figure, it will be seen that the lowest front corners of the bucket first strike the water, and that the bucket continues to descend edgewise and fill until it assumes a position vertical to the shaft, in which position it offers the greatest resist-

ance. As soon as the wheel passes over the center it begins to cut out of the water in the same manner in which it entered, meanwhile emptying over the inner portion of its rear end into the succeeding bucket, so that by the time it leaves the surface of the water it is entirely emptied. When the wheel revolves in a backward direction, the water will impinge on the wings of the reversing-blades and throw the outer ends of the blades out against the rings, closing the openings between the latter, and thus forming auxiliary buckets.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a paddle-wheel, the combination, with the rings and a brace or truss secured transversely between them, of a bucket constructed of two segmental plates secured at their front ends to the rings and bowed inward toward each other until they meet at their rear ends, where they are secured together and to the brace.

2. In a paddle-wheel, the combination, with the rings and a brace or truss secured transversely between them, of a bucket constructed of two segmental plates having rearwardly-sloping ends secured at their front ends to the rings radially from the hub, and bowed inward toward each other until they meet at their rear ends, where they are secured together and to the brace.

3. In a paddle-wheel, the combination, with the rings and a brace or truss secured transversely between them, of a bucket constructed of two segmental plates and a keel-post, the said plates being secured to the rings and bowed inward to the keel-post at the rear, to which they are secured, and which in turn is secured to the brace.

4. In a paddle-wheel, the combination, with the rings and a brace or truss secured transversely between them, of a bucket constructed of two segmental plates having rearwardly-sloping ends, and a keel-post having sharpened ends, the said plates secured at their front ends to the rings radially from the hub and bowed inward to the keel-post, to which they are secured flush with its rear edge, and which in turn is secured to the brace or truss.

5. In a paddle-wheel, the combination, with three sets of rings and braces or trusses secured transversely between them, of a series of buckets placed in pairs, said buckets each constructed of two segmental plates secured at their front ends to the rings and bowed inward toward each other until they meet at their rear ends, where they are secured together and to the brace.

6. In a paddle-wheel, the combination, with three sets of rings and braces or trusses secured transversely between them, of a series of buckets placed in pairs, said buckets each constructed of two segmental plates having rearwardly-sloping ends secured at their rear ends to the rings radially from the hub and bowed inward toward each other until they meet at



their rear ends, where they are secured together and to the brace.

7. In a paddle-wheel, the combination, with three sets of rings and braces or trusses secured transversely between them, of a series of buckets placed in pairs, said buckets each constructed of two segmental plates having rearwardly-sloping ends, and a keel-post having sharpened ends, the said plates secured at their front ends to the rings radially from the hub and bowed inward to the keel-post, to which they are secured flush with its rear edge, and which in turn is secured to the brace or truss.

8. In a paddle-wheel, the combination, with three sets of rings, braces or trusses secured transversely between them, three sets of arms, the side sets of which extend beyond the peripheries of the rings, the projecting portions being beveled on their leading edges, and short beveled metal pieces on the periphery of the central ring, of a series of buckets arranged in pairs, said buckets each constructed of two segmental plates having rearwardly-sloping ends, and a keel-post having sharpened ends, the rear ends of the plates being secured to the post, which in turn is secured to the truss, and the front ends of the plates secured to the rings radially from the hub and flush with the

outer ends of the arms and central beveled piece, for the purposes set forth.

9. In a paddle-wheel, the combination, with the rings and the buckets, constructed as described, of reversing-blades formed with wings at their front ends and hinged at their rear ends to the outer sides of the buckets, for the purposes set forth.

10. In a paddle-wheel, the combination, with the rings and arms, of a brace or truss constructed of a straight metal piece having flanged ends and an arc-shaped piece, also having flanged ends, the two pieces united at the center and secured flatwise in the arc of a circle to the inner ends of the rings in front of and against the arms, for the purposes set forth.

In testimony whereof we affix our signatures in presence of witnesses.

JOHN C. THAYER.  
JOSEPH PHELAN.

Witnesses as to signature of J. C. Thayer:

ALBERT SPEIDEN,  
ROBERT OWENS.

Witnesses as to signature of Joseph Phelan:

JOHN JEROLEMAN,  
JACOB APPELL.