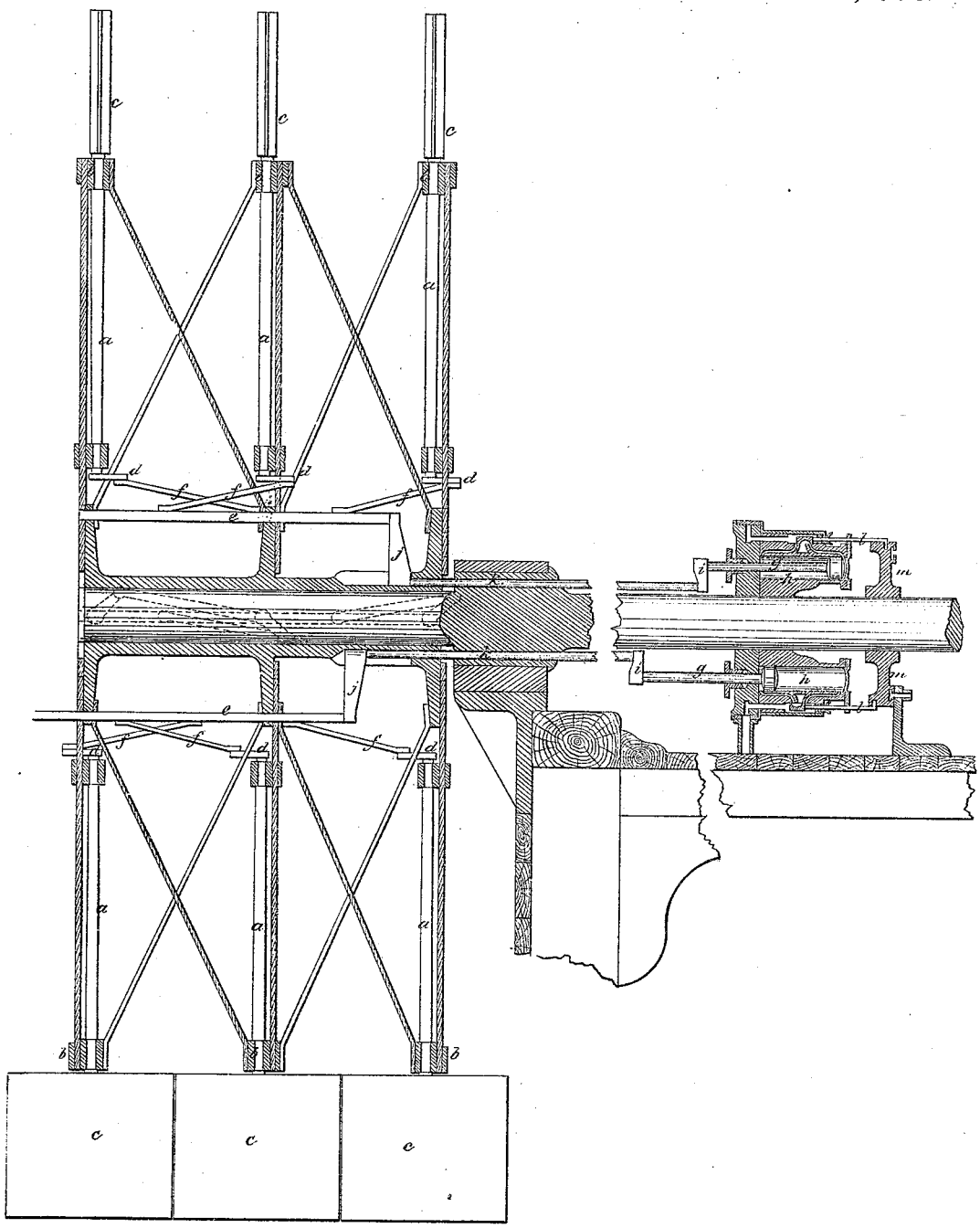
Sheet 1. 4 Sheets.

S. F. Gates.

Paddle Wheel.

No. 50,702. Patented Oct. 31, 1865.



Witnesses.

T. Goodwin
W. B. Gleason.

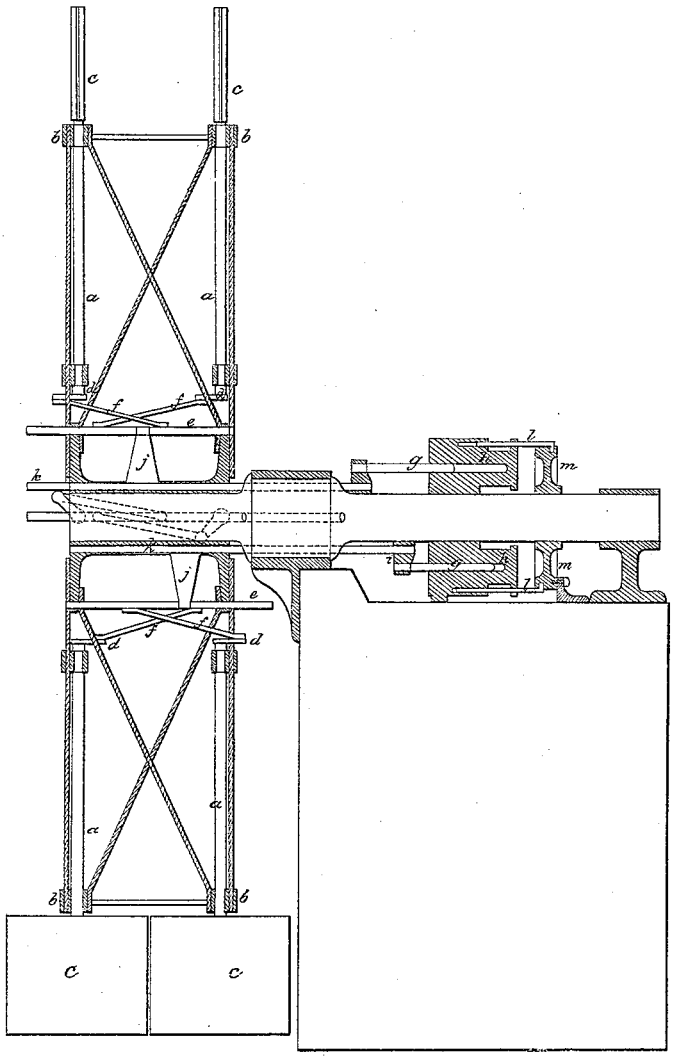
Inventor.

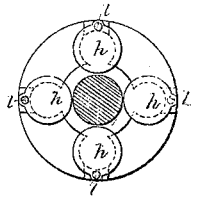
L. F. Gates
by his Atty
W. Crosby.

Sheet 2. 4 Sheets.

S. F. Gates.
Paddle Wheel.

No. 50,702. Patented Oct. 31, 1865.





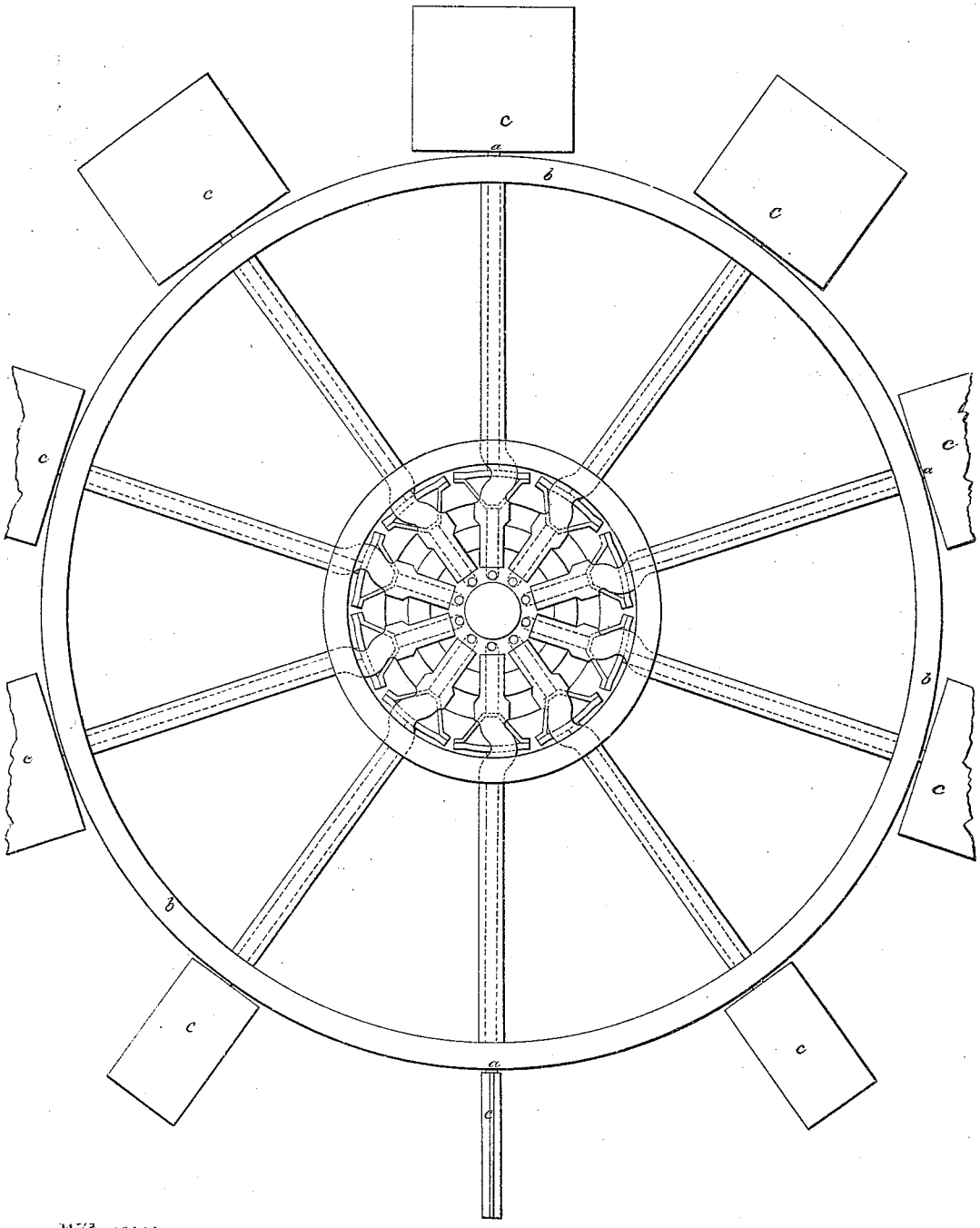
Witnesses.
H. Gould
W. B. Gleason

Inventor.
S. F. Gates,
by his Atty
W. B. Crosby.

Sheet 3. 4 Sheets.

S. F. Gates.
Paddle Wheel.

No. 50,702. Patented Oct. 31, 1865.



Witnesses.

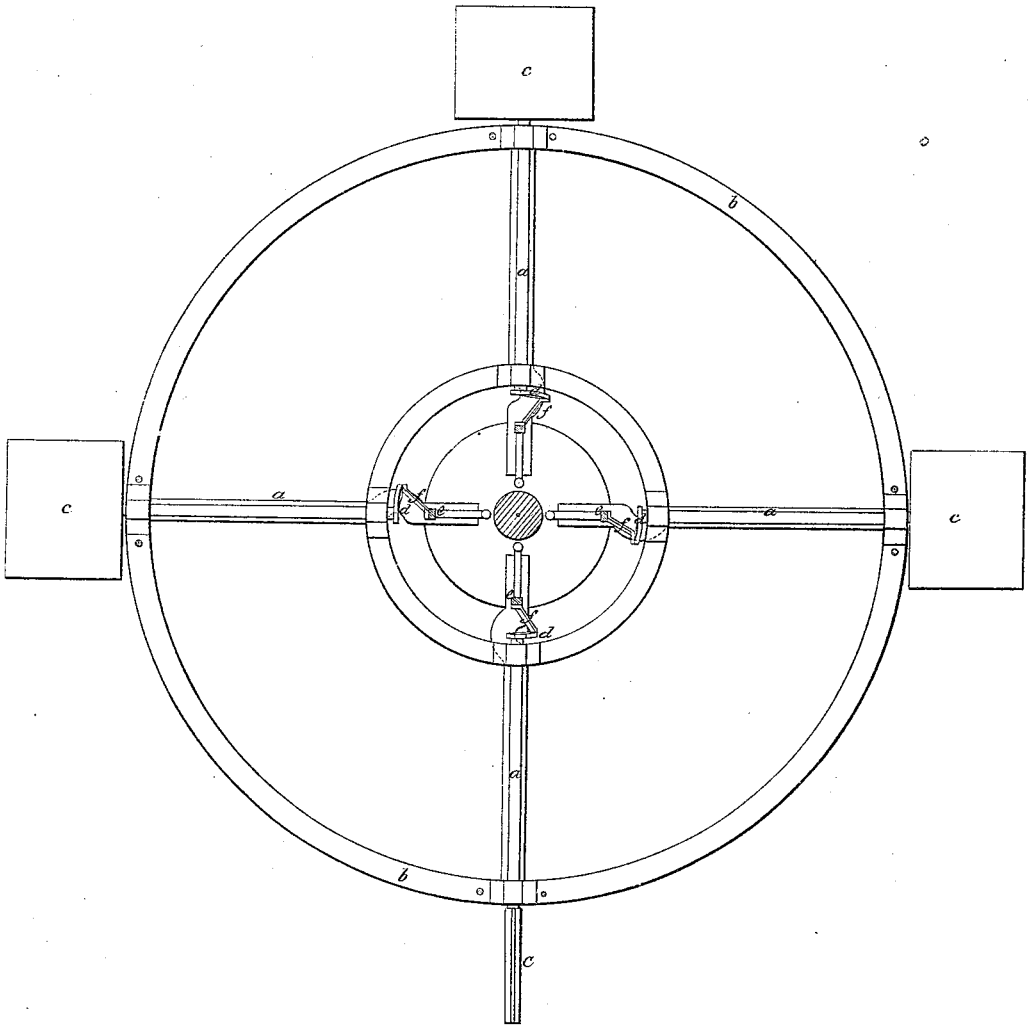
T. Gould.
W. B. Gleason.

Inventor:
S. F. Gates
by his Atty
W. B. Crosby

Sheet 4. 4 Sheets.

S. F. Gates.
Paddle Wheel.

No. 50,702. Patented Oct. 31, 1865.



Witnesses.
H. Gould.
W. B. Gleason

Inventor.
S. F. Gates
by his Atty
W. B. Crosby

UNITED STATES PATENT OFFICE.

STEPHEN F. GATES, OF BOSTON, MASSACHUSETTS.

IMPROVED FEATHERING PADDLE-WHEEL.

Specification forming part of Letters Patent No. **50,702**, dated October 31, 1865.

To all whom it may concern:

Be it known that I, STEPHEN F. GATES, of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Paddle-Wheels; and I do hereby declare that the following, taken in connection with the drawings which accompany and form part of this specification, is a description of my invention sufficient to enable those skilled in the art to practice it.

My invention relates to improvements in that class of feathering paddle-wheels in which the floats are mounted or secured to radial arms or shafts and are turned or feathered by moving from a position at right angles with the vessel's keel to one parallel therewith. In all previous devices for effecting the feathering of paddle-wheel floats the feathering movement is accomplished by the same motor which gives rotation to the wheel.

My invention consists in feathering the floats or paddles by means of a motor which is separate in its action from the force which rotates the wheel, by which certain advantages are attained, as will hereinafter be made to appear.

On Sheet 1, of the drawings, may be seen, in sectional elevation, a wheel of but four floats, the section being taken in the plane of the line *z z*, Sheet 2, on which sheet may be seen a sectional elevation of the same wheel, the section being taken in the plane of the line *y y*, Sheet 1. On Sheet 2 may also be seen an end view of the steam-cylinders which operate to feather the floats, and which surround the wheel-shaft and rotate with it. On Sheets 3 and 4 may be seen similar views to those first named on Sheets 1 and 2, but showing a wheel having my invention embodied more in detail and as required for practical use.

Throughout the drawings similar letters refer to similar parts.

The wheel represented is arranged as overhung, though my invention is equally applicable to wheels having outboard bearings. The frame-work of the wheel is made up as usual of hub and flanges, arms, rims, and braces, and in the wheel-frame are arranged in suitable bearings shafts *a*, in radial direction, extending from beyond the outer rim, *b*, toward the center of the wheel and so that said shafts can turn freely in their bearings. To the outer end of these shafts are fixed blades or floats *c*, and to the inner ends are fixed the cranks or rocker arms *d*, these being connected to sliding or reciprocating bars *e* by connecting rods or links *f*. Said bars *e* slide in suitable holes or mortises made in the flanges of the wheel-hubs, one bar actuating as many connecting-rods *f* as each float or paddle is divided into pieces, two being shown on Sheet 2 as composing one float or paddle, and three on Sheet 4.

To reciprocate the bars or slides *e* a series of small steam-cylinders, *h*, corresponding in number with the paddles to be worked are arranged around the wheel-shaft and secured thereto so as to revolve with it, the piston-rod *g* of each cylinder being connected with the slide-rod actuating the parts of one paddle by means of the cross-heads *i* and *j*, and the slide *k*.

Each cylinder has its own valve-chest and valve-rod *l*, by means of which rod the valve is shifted so as to cause reciprocations of its piston, movements of the valve-rod being caused by its rotation around a stationary grooved cylindrical cam, *m*, into the groove of which a roll or stud on the valve-rod projects, the movements of the valve taking place when the inclines of the cam-groove act on the valve-rod, the engine-piston, and consequently the floats remaining fixed while the projection on the valve-rod is engaged in the rests of the cam-groove.

Upon the shape and position of the cam-groove will depend the times and manner of the reciprocations of the pistons in the small cylinders *h*, and consequently the times of rest and partial rotation of the paddle-shafts *a*. Even in the same vessel it may be desirable to vary the times of the feathering movements of the paddles, and this may be effected by change in position of the cam *m*. For example, if it is desirable to make progress under sail alone, then by turning the cam *m* about ninety degrees on the main shaft the piston-rods *g* will be operated at such times as to cause the paddles, while in the water, to be and to remain parallel to the course of the vessel and thus prevent the retardation usual in sailing, and consequent upon the drag of paddle-wheel floats through the water.

As it may be desirable to cause the paddles to turn from their edgewise position when entering the water a little sooner when the ves-

sel is deep in the water than when she is light, and to hold on upon the water square to the keel longer when deep than light, two cam-grooves may be made in the same cam, differing from each other enough to cause the times of the reciprocating of the pistons to effect such object, and by means of joints in the valve-rods, and by sliding the cam on the main shaft one or the other of the cam-grooves may be made operative on the valve to suit the circumstances of the immersion of the paddle-wheels.

As the detail of the construction of the engines which operate only to feather the paddles is not of the essence of my invention, I need not particularly describe them herein, sufficient being shown in the drawings, Sheets 3 and 4, to enable a competent engine-builder to understand the arrangement.

I claim—

The construction of a paddle-wheel by which its floats are feathered by means of a motor independent in its action from the motor by which the wheel is rotated.

In witness whereof I have hereunto set my hand this 22d day of September, A. D. 1865.

STEPHEN F. GATES.

Witnesses:

J. B. CROSBY,

F. GOULD.