

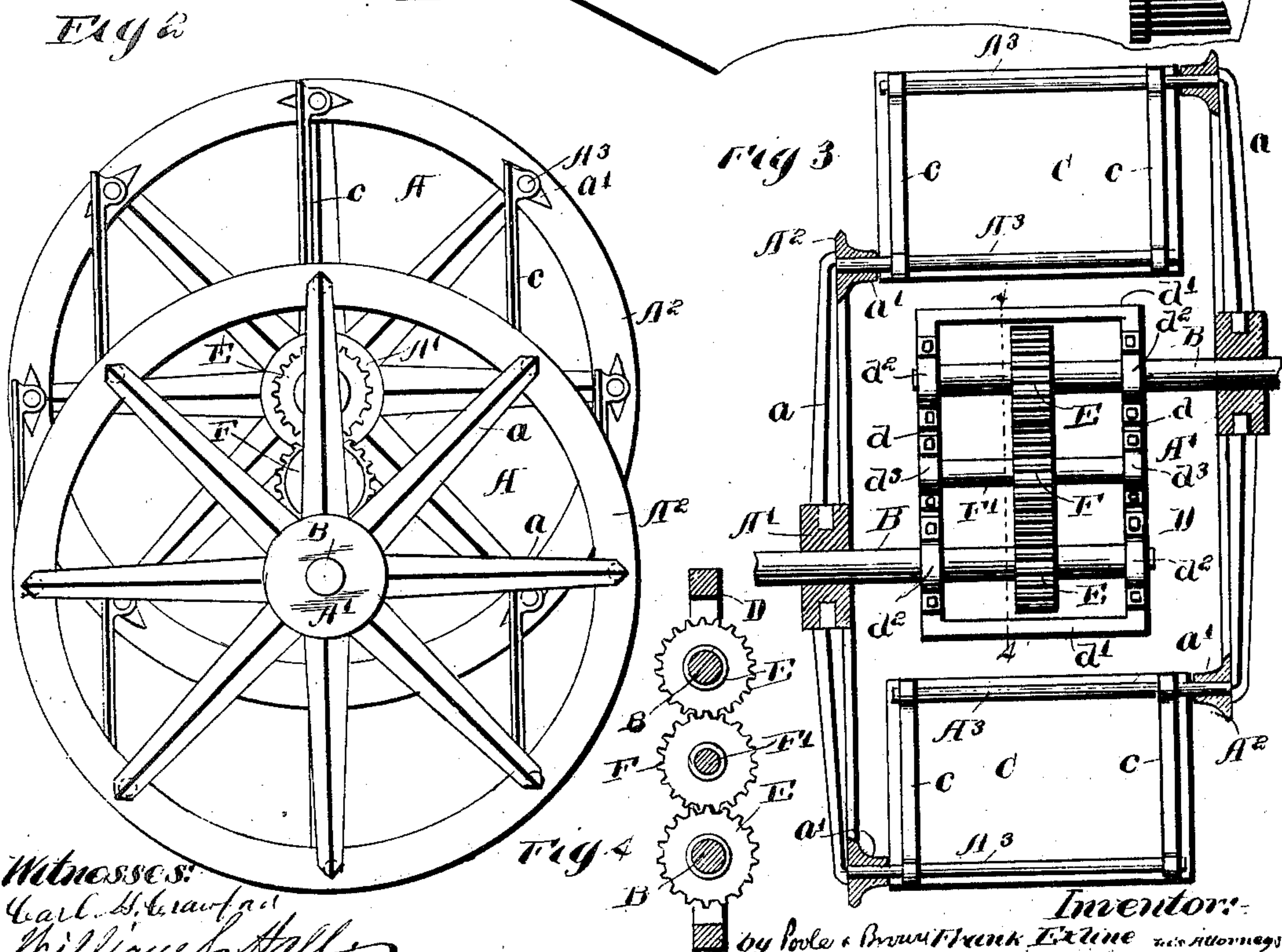
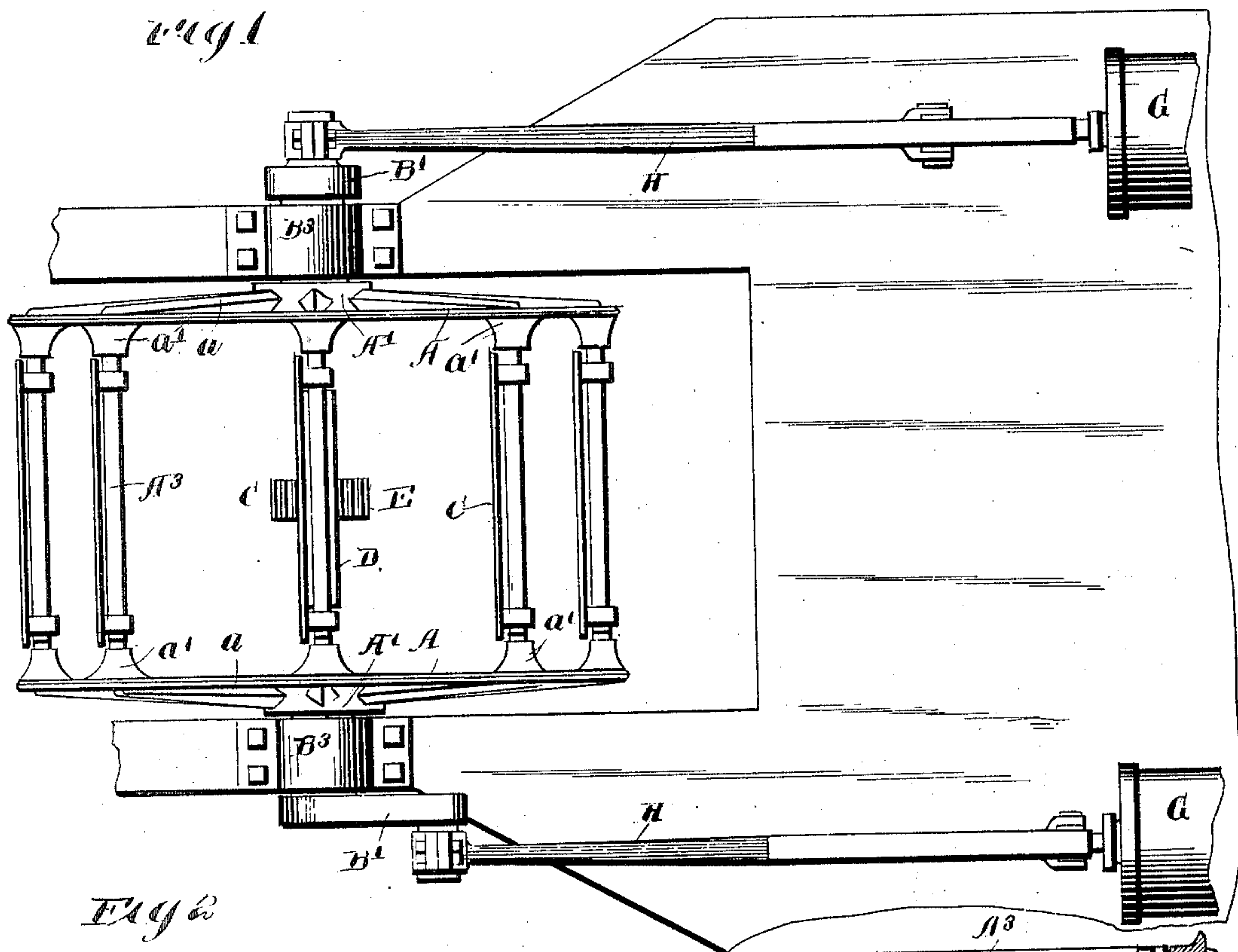
No. 704,477.

Patented July 8, 1902.

F. EXLINE.
PADDLE WHEEL.

(Application filed Nov. 16, 1901.)

(No Model.)



UNITED STATES PATENT OFFICE.

FRANK EXLINE, OF GEDDES, SOUTH DAKOTA, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO VERTICAL PROPELLER COMPANY, OF GEDDES, SOUTH DAKOTA.

PADDLE-WHEEL.

SPECIFICATION forming part of Letters Patent No. 704,477, dated July 8, 1902.

Application filed November 16, 1901. Serial No. 82,494. (No model.)

To all whom it may concern:

Be it known that I, FRANK EXLINE, of Geddes, in the county of Charles Mix and State of South Dakota, have invented certain new and useful Improvements in Paddle-Wheels; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to paddle-wheels for steamboats and like vessels; and the invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is a plan view of a paddle-wheel and its actuating devices made in accordance with my invention. Fig. 2 is a side view of the wheel. Fig. 3 is a vertical axial section of the wheel. Fig. 4 is a fragmentary detail section showing the means for causing both lateral members of the wheel to rotate in unison, taken on line 4 4 of Fig. 3.

As shown in said drawings, A A designate two rotative lateral wheel members, each of which is mounted concentrically on a shaft B. Said members each consists of a hub A', provided with radial arms *a*, forming what may be termed a "spider." Said hubs are rigidly attached to the shafts B B in the manner shown in Figs. 2 and 3. Said shafts B B are shown as mounted in bearings B³ B³. Said arms *a* are shown as connected at their outer ends with each other by means of flat rings A². The shaft-sections B B and the lateral wheel members A A are arranged eccentrically or out of line with each other, with the central axis of one shaft considerably above that of the other.

C C designate paddles or blades which are located between the outer ends of the arms *a* and are pivotally connected at their inner and outer margins with said arms by means of laterally-directed pivot-rods A³ A³ affixed rigidly to the ends of said arms *a* and extending inwardly from said arms along the inner and outer margins of said blades, said pivot-rods being parallel with the shafts

B B. The pivot-rods A³ A³ are connected with the said blades or paddles C C by means of bearing-strips *c c*, secured to the said paddles near the side edges thereof, and provided near their ends with bearing-apertures for the rods, these parts being so disposed that the said pivot-rods may turn freely in the said bearing-strips. The distance between the axes of the two pivot-rods engaging any one of the blades is equal to the distance between the axes of the shafts B B, and the pivot-rods for each blade are located in a plane parallel with a plane passing through the axes of the shafts B B. It follows from this construction that when both side members A A are revolved they will turn together or maintain the same relative position and that all of the blades will always remain in planes parallel with each other and with a plane passing through the central axes of the two shafts. The wheel herein shown being intended as a paddle-wheel for a steamboat or other power-actuated marine vessel, the central axes of said shafts B B are located in the same vertical plane, with the axis of one shaft below that of the other shaft. As a result of this arrangement the pivot-rods by which the blades are connected with the side members A A are vertically separated a distance equal to the vertical distance between the axes of the shafts, so that said paddles are held in parallel vertical positions and maintain such positions throughout the rotation of the paddle-wheel. It is manifest, therefore, from the construction described that the paddles or blades on the descending side of the wheel will enter the water in a vertical position and that the paddles or blades on the ascending side of the wheel will leave or emerge from the water in a vertical position and will not tend to lift the water on leaving the same, as do the paddles or blades which are set at a non-varying angle with respect to the axis of rotation of the wheel. It is also manifest that the efficiency of the blades in propelling is increased by the arrangement shown, for the reason that the effective pressure of the blades against the water is always horizontal or in the direction of movement of the boat, instead of being

largely downward or upward, as is the case where the paddles occupy substantially radial positions.

The lateral members or spiders A A are located at a distance apart considerably greater than the width of the blades or paddles, so that relatively wide spaces are left between the side edges of the said blades or paddles and the arms *a a* at both sides of the wheel. This construction is of advantage because lessening the liability of floating objects being caught between the blades and the arms, and thereby clogging the wheel. The pivot-rods A³ A³, which in effect form inward extensions of the arms *a a*, are made sufficiently stiff or rigid to properly support the blades or paddles notwithstanding the fact that the latter are considerably narrower than the space between the said arms and that the bearings on the blades engage the pivot-rods at points at a considerable distance inside of the said arms.

In the particular construction shown the pivot-rods A³ A³ are made integral with the arms *a a*, and the rings A² A², which serve to rigidly connect the outer ends of the said arms, are provided with apertures through which the said pivot-rods are inserted. Said rings are, moreover, provided with inwardly-projecting hubs or bosses *a'*, which terminate at their inner ends adjacent to the side edges of the blades or paddles, said hubs or bosses serving to stiffen the pivot-rods in their parts or ends adjacent to the arms *a a*. This particular construction in the rings A² is not, however, essential, inasmuch as said rings may be cast integral with or attached rigidly to the arms *a* themselves, and, if desired, the pivot-rods A³ may be attached to said rings instead of to the arms. Said arms *a a* are preferably made of diamond shape in cross-section, with their side edges forming acute angles, so as to lessen resistance in passing through the water.

In connection with the paddle-wheel made and described devices are provided for connecting the two rotative shaft-sections in such manner as to cause the same to positively rotate in unison one with the other, the same embracing mechanism located between the shaft-sections intermediate of the lateral members or spiders of the wheel. Said devices are as follows: The inner ends of the said shafts B B extend inside of the lateral members or spiders in overlapping relation, and the ends of said shafts have bearing engagement with a rigid open frame D, which is provided with lateral members *d d* and transverse members *d' d'* and has in its lateral members *d d* bearings *d² d²*, in which the ends of the shafts are adapted to turn or rotate. The frame D, made as described, serves to hold the overlapping ends of the shaft-sections positively in parallel relation to each other. Said shafts are provided between the lateral frame members *d d* with gear-wheels E E, which are affixed rigidly to the shafts

B B. Between said gear-wheels is located a gear-pinion F, mounted on a short shaft F', which is mounted at its ends in bearings *d³ d³* in the lateral members *d d* of said frame D. Said intermediate gear-pinion F intermeshes with the gear-wheels E E and serves to transmit motion from one to the other of said gear-wheels. Said gear-wheels E E and the intermediate gear-pinion F serve to transmit motion from one to the other of the shafts B B, thereby insuring at all times exact correspondence of movement in the two shafts. It follows from this construction that power for turning the wheel as a whole may be applied to either of the shaft-sections B B and that when power is so applied to one of the shaft-sections the other shaft-section will be driven therefrom and exact correspondence of movement in the two spiders or lateral members of the wheel will thereby be maintained. The driving connection between the shafts acts to prevent stress or strain coming on the pivot-rods A³ and consequent friction of the same in their bearings, such as would result if the two lateral members of the wheel were not connected in a manner to turn in unison.

For turning or driving the paddle-wheel I have shown actuating means embracing crank-arms B' B' on the outer ends of the shafts B B and two engine-cylinders G G, the piston-rods of which are connected with the crank-arms by connecting-rods H H. The crank-arms B' B' are arranged at right angles with each other, so that the piston of each cylinder will act on the wheel to turn the same while the piston of the other cylinder is at either end of its stroke, each piston acting to carry the crank-arm connected with the other piston past its dead-center, as common in cases where two cylinders are arranged to act on a single crank-shaft having two cranks. The employment of the frame D and the gearing operating in connection therewith to give to the shafts corresponding rotative movement is of especial advantage in connection with driving means embracing two cylinders and pistons, for the reason that such connection insures the turning of the shafts B B and the crank-arms thereon in unison with each other and enables the two cylinders to operate in connection with the paddle-wheel with its two shafts in the same manner as if used in connection with a single paddle-wheel shaft.

A main feature of my invention is embraced in the rigid frame D, adapted to engage the overlapping ends of both shafts and serving to hold the same positively and rigidly in parallel relation. One important advantage gained by the use of such frame is that by holding the overlapping ends of the shafts positively in parallel relation it takes from the bearings by which the shafts are supported on the vessel strains tending to cramp the shafts in said bearings and to thereby greatly increase friction, while avoid-

ing the necessity of using wide or double bearings, such as would be necessary to support in a horizontal position the two shafts if the same were without mutual support at their adjacent ends. Moreover, the said frame D by holding the two shafts positively in parallel relation gives unity and strength to the wheel as a whole, adapting it to withstand the shocks and strains coming upon it under the application of great power and resistance. At the same time the connection between the shafts and lateral wheel members or spiders afforded by said frame enables the wheel to be mounted in the same way as a solid wheel—that is to say, with its two shafts supported in bearings at either side of the wheel—without requiring any special or unusual construction in the bearings to hold the shafts in a horizontal position or from sagging at their ends which support the wheel.

Another important feature of my invention is embraced in the pivot-rods A³, attached rigidly to the spider-arms and extending along the upper and lower edges of the blades or paddles, so that they may have bearing engagement with said blades or paddles at both sides thereof. The pivot-rods thus arranged serve to maintain both lateral edges of the blades or paddles in vertical position and to effectively withstand the pressure coming on the blades in the operation of the wheel.

It will be understood that changes may be made in the details of construction of the device herein illustrated without departure from the spirit of my invention, and I do not wish to be limited to such details as herein illustrated, except as hereinafter made the subject of specific claims.

I claim as my invention—

1. A wheel comprising two rotative members arranged eccentrically with respect to each other, blades or paddles interposed between and pivoted to said rotative members, shafts to which said rotative members are attached, said shafts overlapping each other between the rotative members, and a rigid frame embracing laterally-separated side members with which said shafts have rotative engagement and by which said shafts are positively held in parallel relation.

2. A wheel comprising two rotative members arranged eccentrically with respect to each other, blades or paddles interposed between and pivoted to said rotative members, shafts to which said rotative members are at-

tached, said shafts overlapping each other between the rotative members, a rigid frame embracing laterally-separated side members with which said shafts have rotative engagement, gear-wheels attached to said shafts within said frame, and an intermediate gear-pinion mounted in said frame and intermeshing with both of said gear-wheels.

3. A wheel comprising two rotative side members arranged eccentrically with respect to each other, blades or paddles interposed between said members, and pivot-rods on the side members which extend inwardly therefrom along the upper and lower edges of said blades or paddles and which have pivotal engagement with the latter at both lateral edges thereof.

4. A wheel comprising two rotative side members arranged eccentrically with respect to each other, blades or paddles interposed between said members, and pivot-rods on the side members which extend inwardly therefrom along the top and bottom edges of the said blades or paddles and have pivotal engagement with the latter at both lateral edges thereof, said blades or paddles being considerably narrower than the space between the side members to afford wide spaces between the side edges of the blades or paddles and said side members.

5. A wheel comprising two rotative side members arranged eccentrically with respect to each other, shafts to which said side members are attached, said shafts overlapping each other between said side members and being provided with crank-arms arranged in angular relation to each other, blades or paddles interposed between and pivoted to said rotative members, a rigid frame having laterally-separated side members with which said shafts have rotative engagement, gear-wheels on the said shafts, an intermediate gear-pinion mounted in said frame and intermeshing with said gear-wheels, and two cylinders the pistons of which are severally connected with and give motion to the crank-arms on said shafts.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 11th day of November, A. D. 1901.

FRANK EXLINE.

Witnesses:

M. C. HORTZER,
JOHN A. FOERSTE.