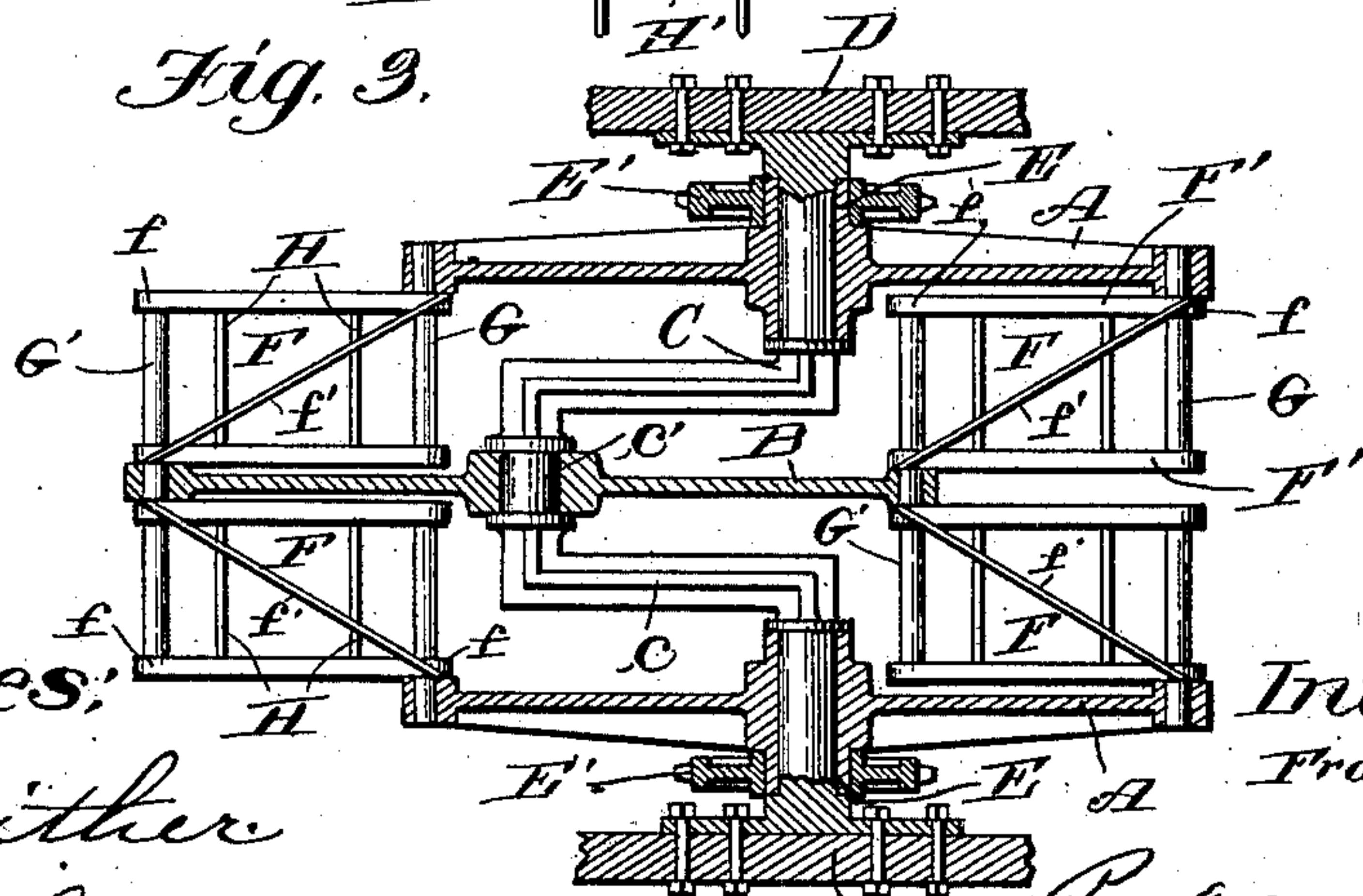
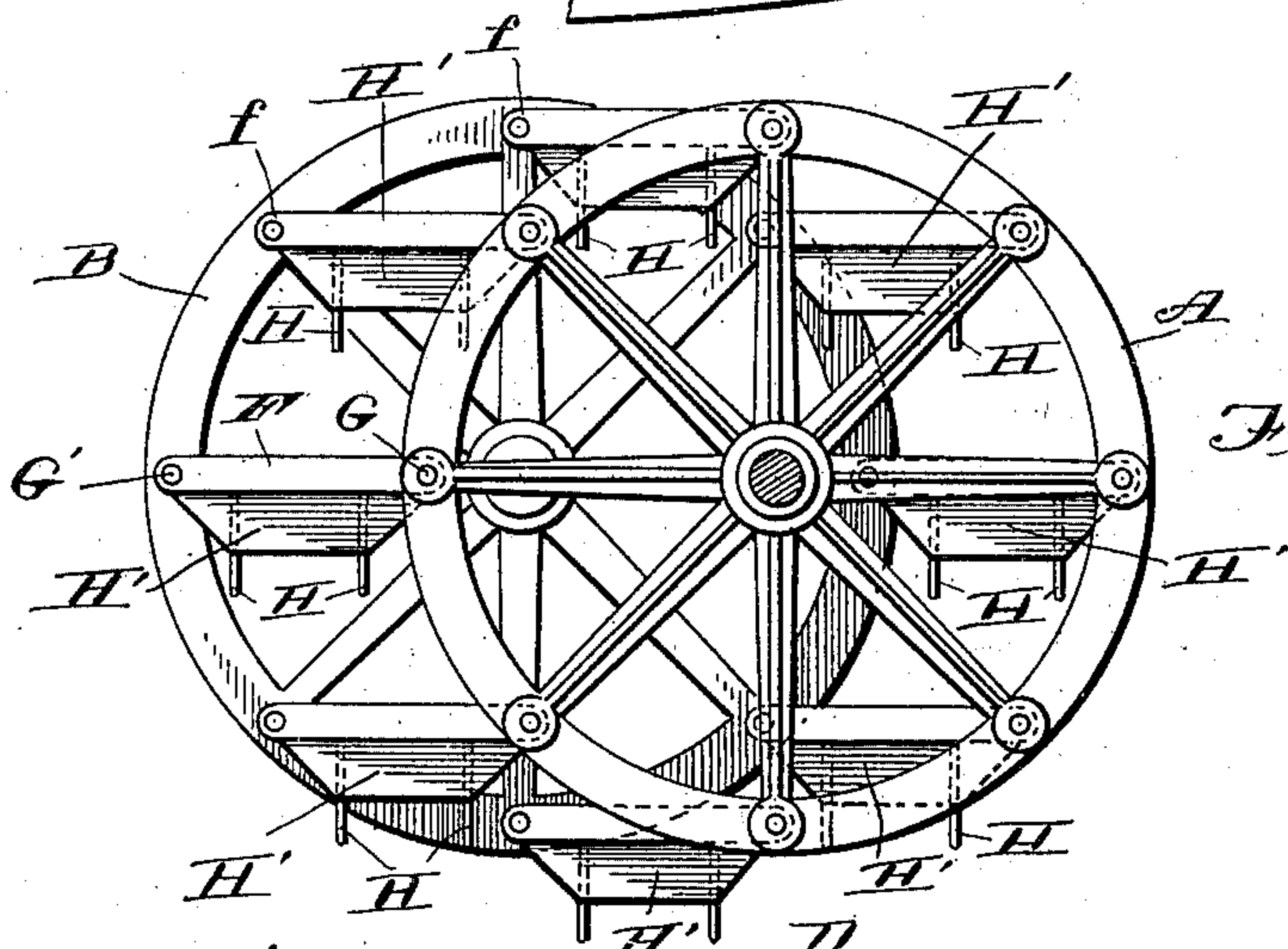
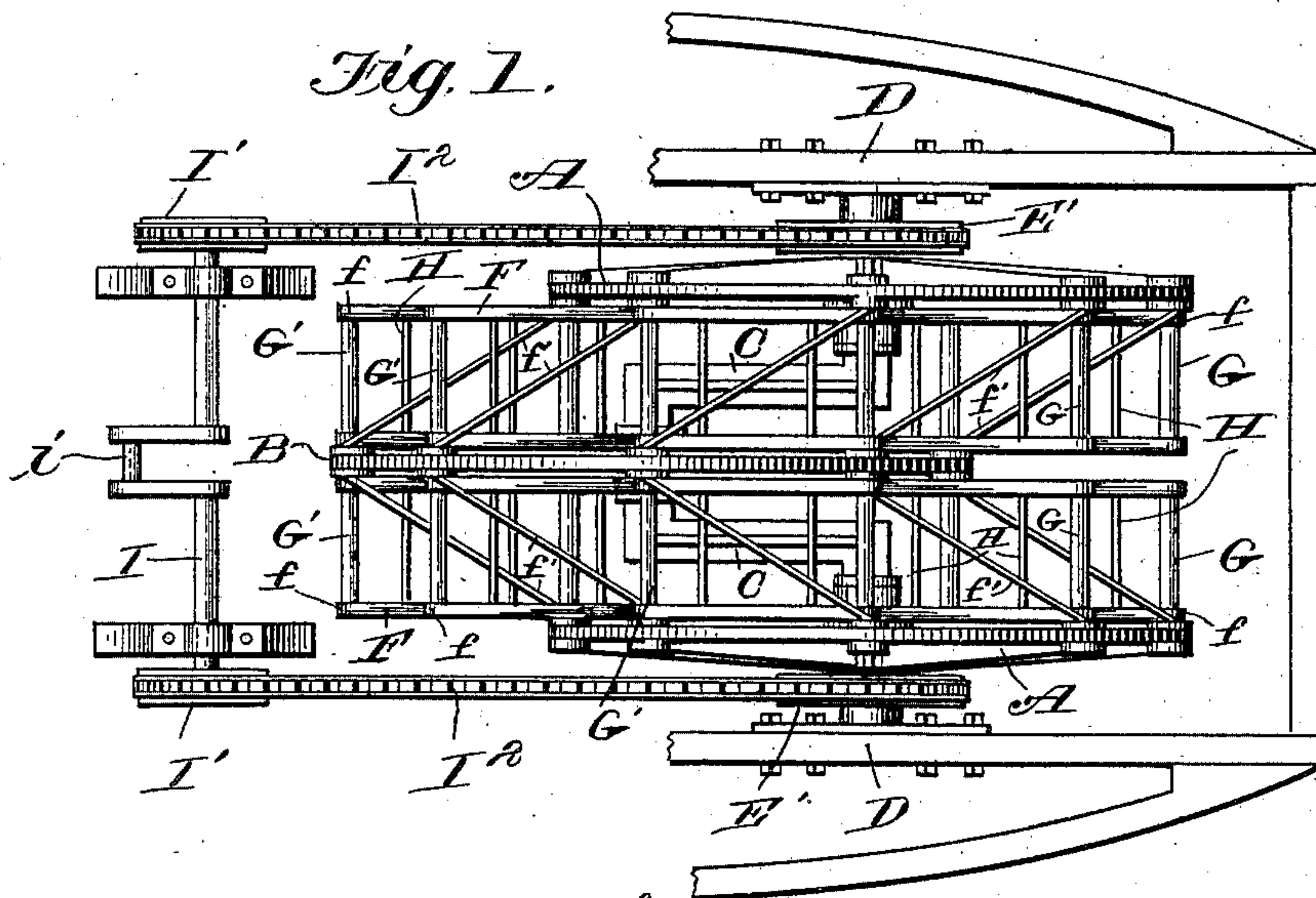


F. EXLINE.  
PADDLE WHEEL.

(Application filed Jan. 15, 1902.)

(No Model.)

2 Sheets—Sheet 1.



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No. 704,478.

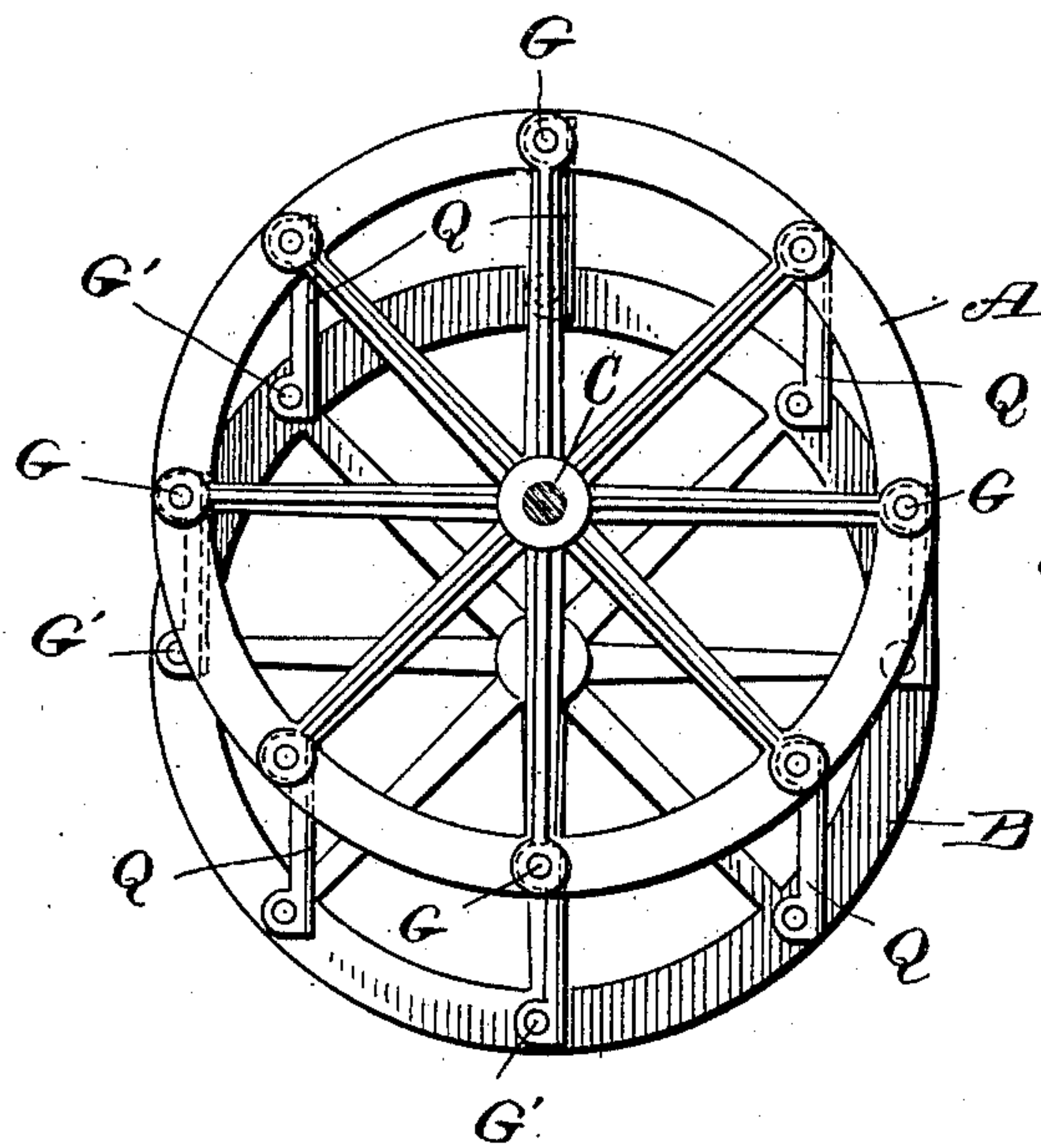
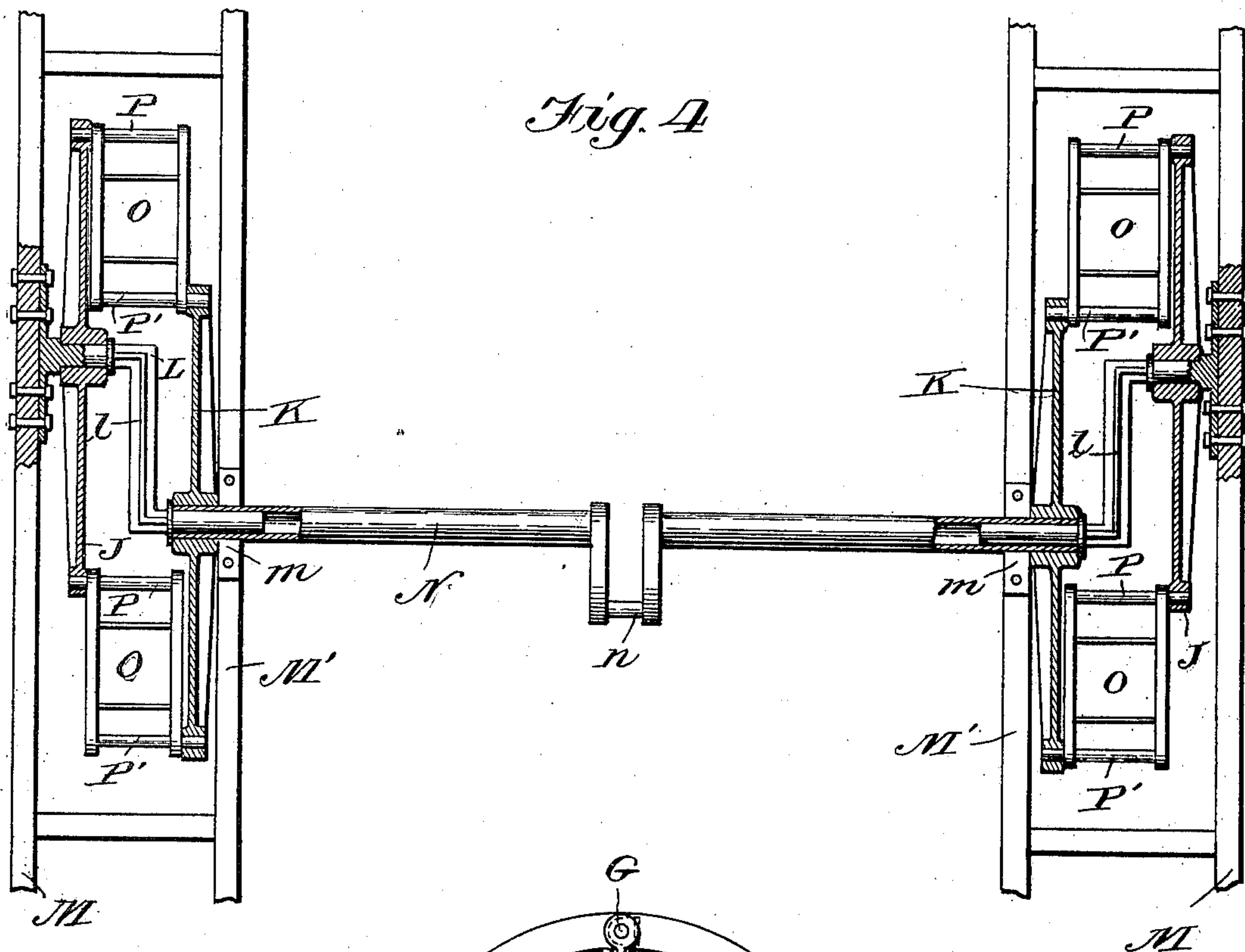
Patented July 8, 1902.

F. EXLINE.  
PADDLE WHEEL.

(Application filed Jan. 15, 1902.)

(No Model.)

2 Sheets—Sheet 2.



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# 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. 704,478, dated July 8, 1902.

Application filed January 15, 1902. Serial No. 89,865. (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 adapted more especially for stern-wheel vessels. Fig. 2 is a side view of the wheel. Fig. 3 is a horizontal axial section of the wheel. Fig. 4 is a plan view showing two similar wheels embodying my invention applied to a side-wheel boat. Fig. 5 is a side view of a wheel, showing a modified form of that illustrated in Figs. 1, 2, and 3.

As shown in said drawings, Figs. 1, 2, and 3, A A designate two rotative lateral wheel members, and B an intermediate rotative wheel member arranged eccentrically with respect to the members A A. Said members A A are mounted on the end portions and the member B is mounted on the middle portion of a bent supporting-bar C, the ends of which are rigidly attached to the supports or frame members D D and which is so shaped as to form between the wheel members A A two transversely-extending parts c c, connected by an intermediate part or bearing c', which is offset from the end portions of the bar and on which is mounted the intermediate member B. The lateral wheel members A A are attached to sleeves or hollow driving-shafts E E, which are mounted on the end portions of the supporting-bar C, and to which are attached, outside of said wheel members, sprocket-wheels E', which may be employed as one means through which motion may be given to the said wheel members A A. The transverse parts c c of the supporting-bar C

are arranged horizontally, so that the central offset bearing c' is in the same horizontal plane with the end parts of the bar on which the exterior wheel members are mounted, said central offset part or bearing c' being rigidly held in position by means of the rigid connection between the ends of the bar C and the frame members D D.

F F designate paddle-frames, which are located between the outer parts of the wheel members A A and the intermediate wheel member B and have pivoted connections at their inner and outer margins with said wheel members by means of oppositely-directed pivot-rods G G'. The pivot-rods G are rigidly secured to the outer margins of the side wheel members A A and project inwardly therefrom, while the pivot-rods G' are rigidly attached to the outer margin of the intermediate wheel member B and project outwardly from the same or toward the members A. Said pivot-rods are arranged parallel with the shaft and extending along the inner and outer ends of the paddle-frames, which latter are arranged horizontally or parallel with the parts c c of the bar C and are always held by the pivot-rods in a horizontal position. Attached to the paddle-frames F F are paddle-blades H H, which extend downwardly from said frames, each paddle-frame being provided with one or more paddle-blades. The drawings show two blades on each frame; but a greater or less number may be used, as desired. The paddle-frames are herein shown as made of a rectangular form and provided with bearings f f for engagement with the pivot-rods G G', the pivot-rods being adapted to turn freely in said bearings. The distance between the axes of the two pivot-rods engaging any one of the paddle-frames is equal to the distance between the pivotal axes of the wheel members A A and B, and the pivot-rods for each frame are located in a plane parallel with a plane passing through the axes of said wheel members. It follows from this construction that when both side members A A are revolved the intermediate member B will turn with them and the outer and intermediate members will maintain the same relative positions and all of the blades will remain in planes parallel with each other. The paddle-frames



being provided with vertically-depending blades H H, it will be manifest that the said blades on the descending side of the wheel will enter the water in a vertical position, while those on the ascending side of the wheel will leave or emerge from the water also in a vertical position, so that said blades will not tend to lift the water on leaving the same.

So far as the general construction of the wheel is concerned the paddle frames and blades may be constructed and connected with each other in any desired or preferred manner. As a further improvement, however, I construct each of said frames of two side bars F' F', which are provided with bearing-apertures forming the bearings *f f*, by which they are engaged with the pivot-rods G G'. Said side bars are connected with each other by means of the blades H H, which extend between and are rigidly secured to said side bars, and also by oblique braces *f'*. To hold the plates rigidly in position at right angles to the frame-bars, depending metal plates H' H' are attached to the bars and extend downwardly from the same toward the lower edges of the blades. The plates are secured to the inner faces of said plates H' H' by rivets or other attaching means at the ends of the blades. The plates H' H' thus arranged serve to brace or hold the blades rigidly in position, and they also serve to hold or confine the water upon which the blades are acting in a manner to prevent the escape of the water at the side edges of the blades, and thus enable the blades to secure a better hold upon the water in propelling.

As before stated, the wheel is driven by giving rotative motion to both of the side members A A through sprocket-wheels E' E' on the hollow driving-shafts E E or other suitable driving devices. In order to maintain the said side members always in the same relative position, I prefer to drive the two side members from a common source of power and through a connection operating to give corresponding movement to the said side members. The devices shown for this purpose are adapted for use where sprocket-wheels E' E' are employed, the same consisting of a driving-shaft I, arranged parallel to the bar C and provided with two sprocket-wheels I' I' and link belts I<sup>2</sup> I<sup>2</sup>, trained over the sprocket-wheels I' and the sprocket-wheels E'. Said driving-shaft I may be given motion by any suitable motor—as, for instance, it may have a crank *i* at its center, by which motion is transmitted thereto from the pitman of a steam-engine or other like motor.

The intermediate wheel member B turns freely on its bearing, and motion is transmitted thereto from the side members A A through the paddle-frames connecting them. This will be made clear from an inspection of Fig. 2, from which it will be seen that when the member A is rotated the paddle-frames at the top and bottom of the wheel will exert

a pull or push upon the intermediate member B, so as to give to the two members exact correspondence of movement.

In Fig. 4 I have shown a construction in paddle-wheels adapted for use upon a side-wheel vessel. In this instance each wheel is provided with a single set of paddle-frames and constitutes, in effect, one-half of the wheel structure shown in Figs 1, 2, and 3. As shown in said Fig. 4, each wheel consists of two lateral wheel members J and K, arranged eccentrically with respect to each other. The exterior side members J are mounted on the outer end of a supporting-bar L, which is bent or shaped to bring its end portions in offset relation, the transverse part *l* of the bar which connects the offset end portions thereof being arranged horizontally. The outer end portion of said supporting-bar is rigidly attached to a longitudinal beam M, extending outside of the wheel. The inner end portion of the bar L, which is parallel with its outer portion, extends into the end of a hollow driving-shaft N, through the medium of which both wheels are driven. Said driving-shaft is supported in bearings *m* on a beam or support M', located inside of the inner wheel member K. Said wheel member K is attached rigidly to the driving-shaft N, outside of said bearing *m*, so that said member K in this instance constitutes the driving member of the wheel. O O are the paddle-frames, which are located between the two members J and K. The outer member J is provided at its margin with rigidly-attached pivot-rods P and the inner member K with similar rigidly-attached pivot-rods P', and the paddle-frames are mounted on said pivot-rods in the manner hereinbefore described in connection with Figs. 1, 2, and 3. The details of construction in the paddle frames and blades shown in said Fig. 4 are also like those shown in Figs. 1, 2, and 3 and hereinbefore described. For actuating the wheels illustrated in Fig. 4 a motor may be applied to act upon the driving-shaft N in any suitable manner. Said driving-shaft is herein shown as provided with a crank *n*, which may be engaged by the connecting-rod or pitman of a steam-engine; but the shaft may be given motion by any other suitably-connected motor. In the construction shown in Fig. 4 the paddle-frames are arranged horizontally and are always held in horizontal positions during the rotation of the wheel, so that the paddle-blades operate in the same manner as set forth in connection with the double form of wheel shown in Figs. 1, 2, and 3, which is more especially adapted for use as the paddle-wheel of a stern-wheel vessel.

Fig. 5 shows a wheel like that illustrated in Figs 1, 2, and 3, except that the parallel end portions of the supporting-bar B and the intermediate offset part of said bar are arranged in a vertical plane, and in place of the paddle-frames paddles or blades Q are directly pivoted to the wheel members A A



and B by engagement with the pivot-rods G and G'. In this construction the axis of rotation of the intermediate wheel member B, which is mounted on the central offset part 5 of the bar, is vertically beneath that of the side members A, and as a result said intermediate member only enters the water when the paddle-blades are immersed.

It will be manifest that the paddle-blades 10 shown in Fig. 5 serve equally with the paddle-frames shown in the other figures of the drawings as a means for connecting the eccentric wheel members with each other, so that driving power applied to one member, 15 as in Fig. 4, or to the two exterior members, as in Figs. 1, 2, 3, and 5, will be transmitted to the other member.

I claim as my invention—

1. A wheel comprising two rotative members arranged eccentrically with respect to each other, a stationary supporting-bar having parallel, offset, rigidly-connected portions on which said rotative members are mounted, means for driving one of said rotative members, pivot-rods rigidly attached to said rotative members, and connections between said pivot-rods, whereby motion given to one member is transmitted to the other.

2. A wheel comprising two rotative members arranged eccentrically with respect to each other, a stationary supporting-bar having rigidly-connected, parallel, offset portions on which the said rotative members are mounted, pivot-rods rigidly secured to the said rotative members, and paddle-frames 35 pivotally engaging and connecting said pivot-rods.

3. A wheel comprising two rotative members arranged eccentrically with respect to each other, a rigid, stationary bar having rigidly-connected, parallel, offset portions on which the said rotative members are mounted, pivot-rods on said members, paddle-frames having pivotal engagement with said pivot-rods, and paddle-blades attached to said paddle-frames. 45

4. A wheel comprising two rotative members arranged eccentrically with respect to each other, a stationary supporting-bar having rigidly-connected, offset portions on 50

which said rotative members are mounted, and one end of which is rigidly attached to a support, a hollow driving-shaft which engages one of the offset parts of the supporting-bar and to which one of said rotative members is 55 attached, driving means applied to said hollow shaft for turning said member attached thereto, pivot-rods on the wheel members, and means connecting said pivot-rods whereby motion is transmitted from the driven to 60 the non-driven member.

5. A wheel comprising two rotative members arranged eccentrically with respect to each other, a stationary supporting-bar having rigidly-connected, parallel offset parts on 65 which said rotative members are mounted, said offset parts being arranged in the same horizontal plane, means applied to one of said members for driving the same, pivot-rods rigidly attached to said members, horizontally- 70 arranged paddle-frames mounted on said pivot-rods and connecting the same, and blades rigidly attached to and extending downwardly from said paddle-frames.

6. The combination with eccentric, rotative 75 wheel members, and paddle-frames pivotally connected therewith, and blades attached to said paddle-frames, said frames being provided with vertically-arranged side plates depending from the frames and attached to the 80 ends of said blades.

7. A wheel comprising two exterior rotative members, an intermediate, eccentric, rotative member, a stationary supporting-bar on which said exterior rotative members are mounted, 85 said supporting-bar having a central offset part on which the intermediate member is mounted, said bar being attached at its ends rigidly to stationary supports, pivot-rods on the exterior and intermediate members and 90 connections between said pivot-rods.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 8th day of January, A. D. 1902.

FRANK EXLINE.

Witnesses:

C. CLARENCE POOLE,  
WILLIAM L. HALL.