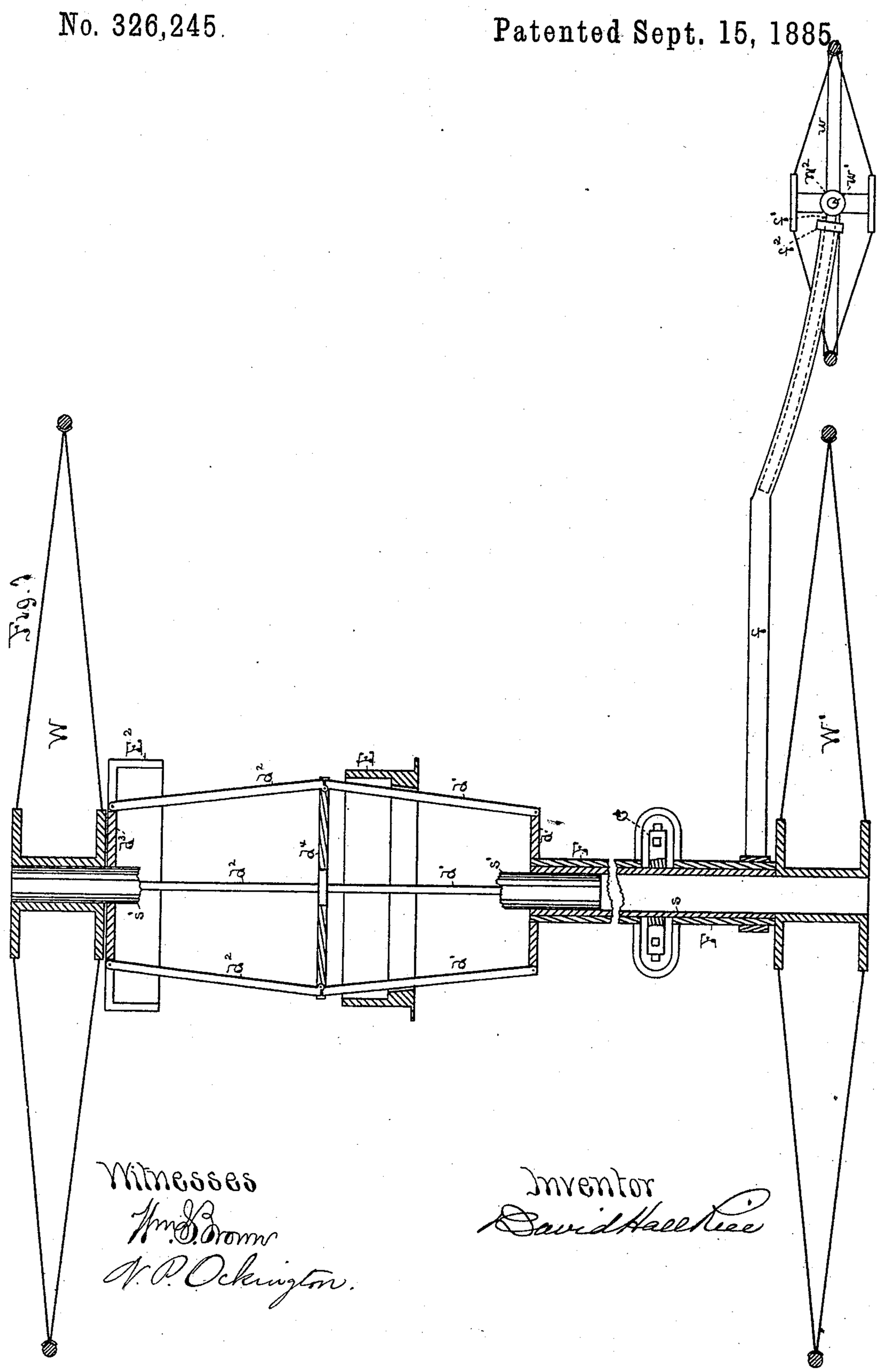
(No Model.)

8 Sheets—Sheet 1.

D. H. RICE.

TRICYCLE.

No. 326,245. Patented Sept. 15, 1885.



Witnesses
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N. P. Ockington.

Inventor
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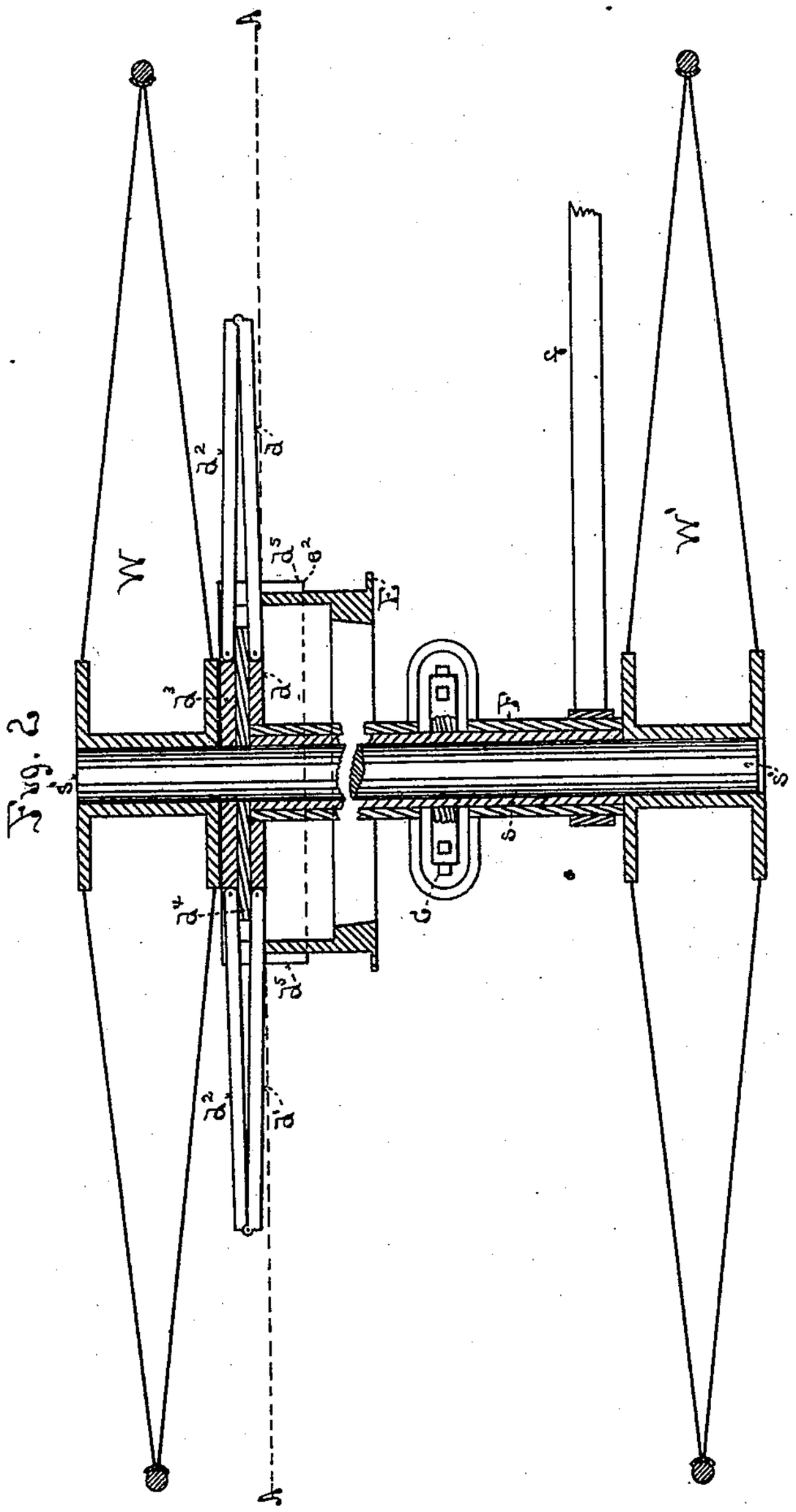
(No Model.) 8 Sheets—Sheet 2.

D. H. RICE.

TRICYCLE.

No. 326,245. Patented Sept. 15, 1885.



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(No Model.) 8 Sheets—Sheet 3.

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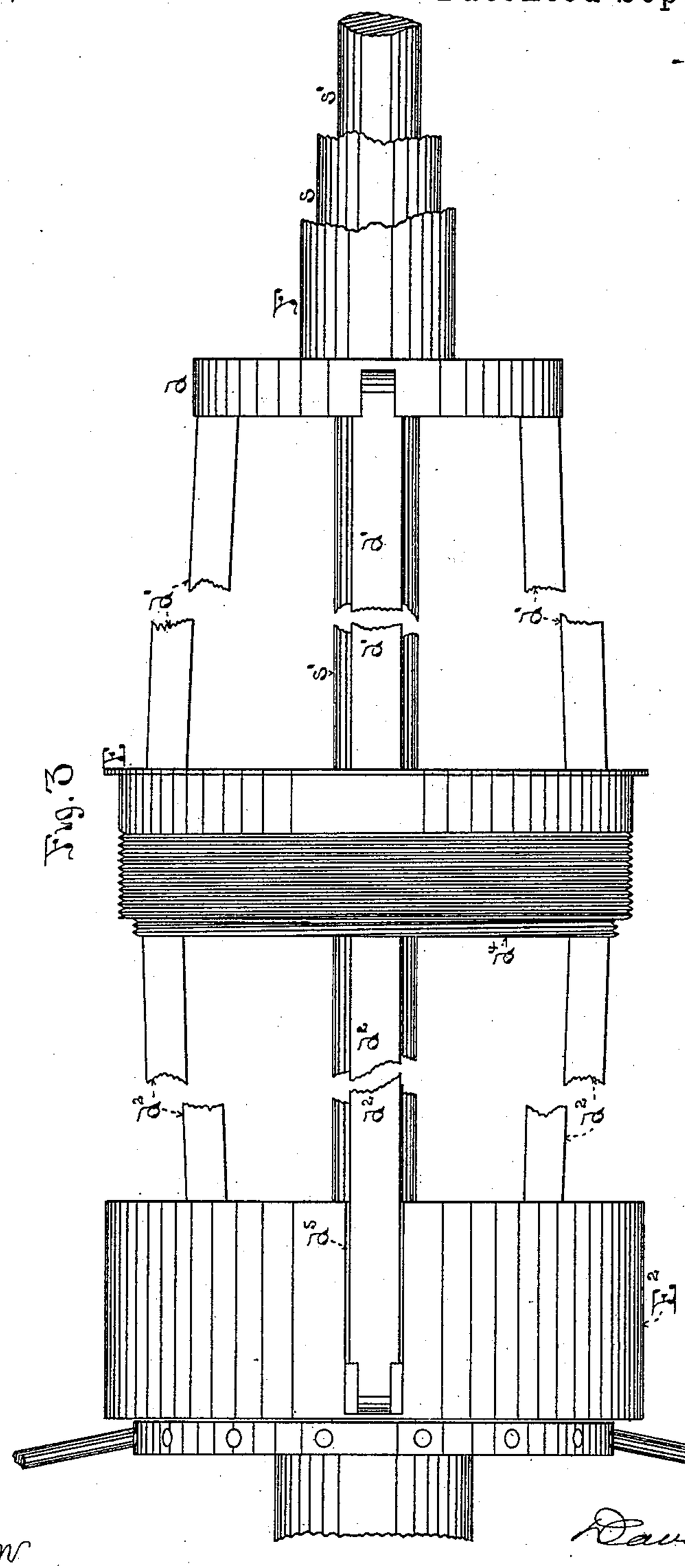
TRICYCLE.

No. 326,245. Patented Sept. 15, 1885.



Witnesses
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TRICYCLE.

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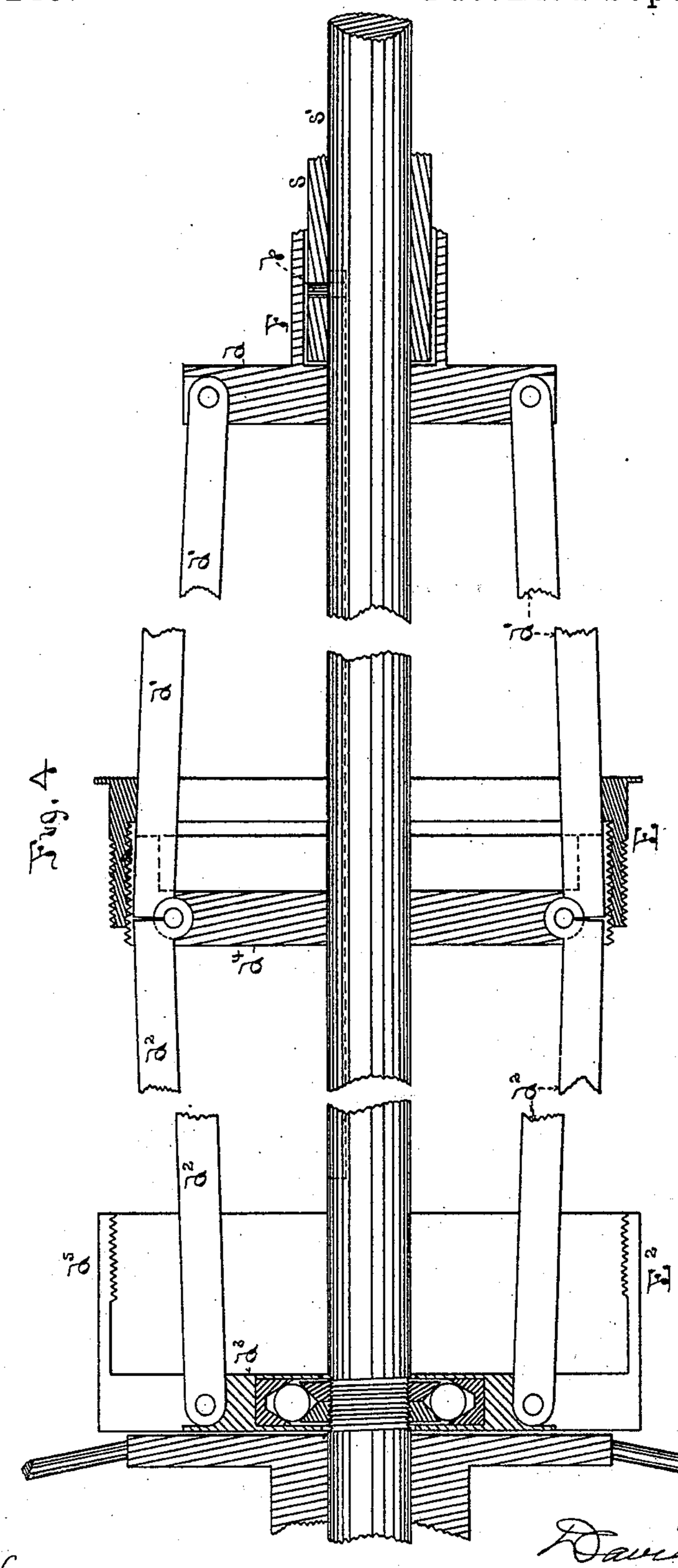

Fig. 4.

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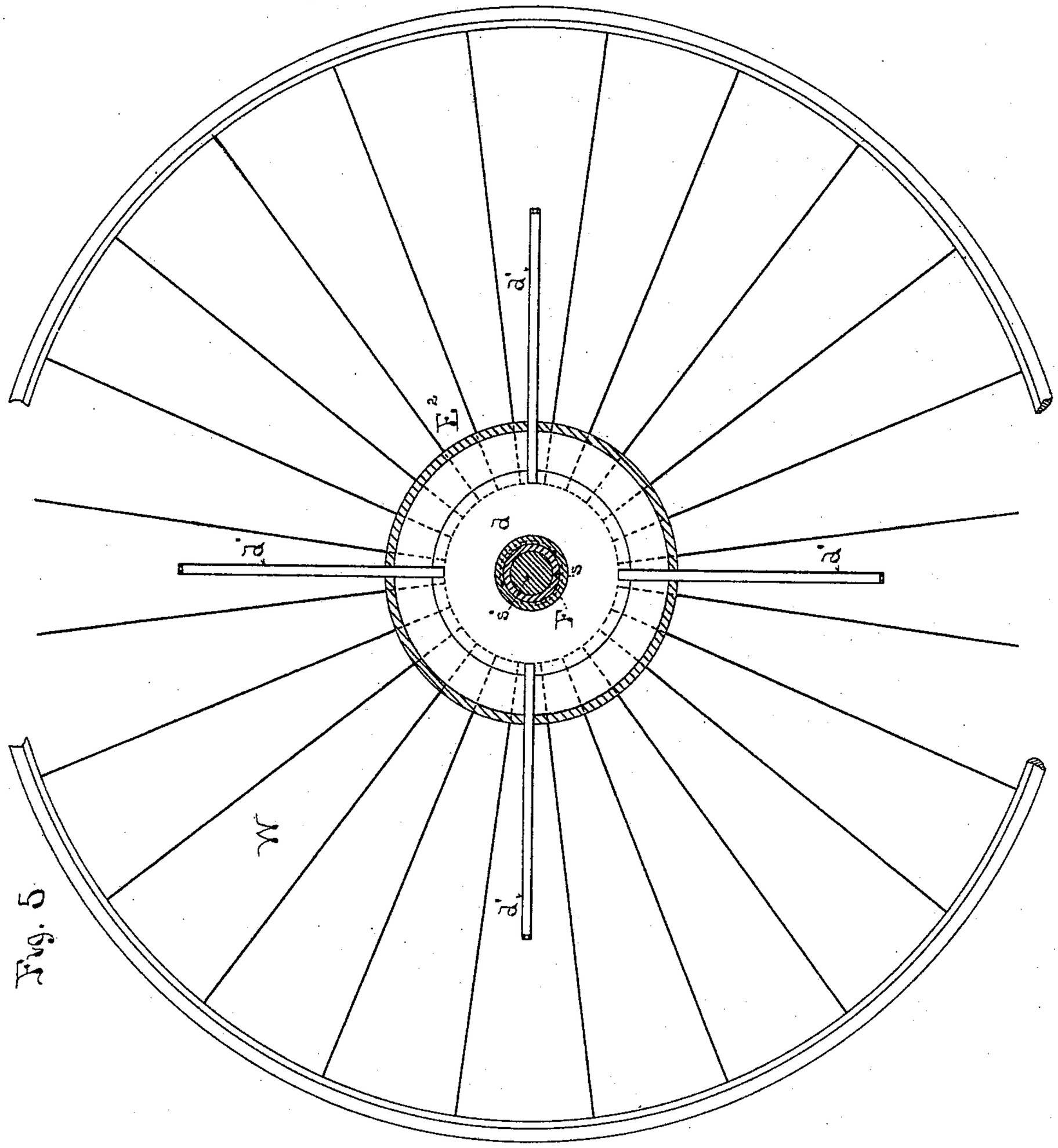

Fig. 5

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8 Sheets—Sheet 6.

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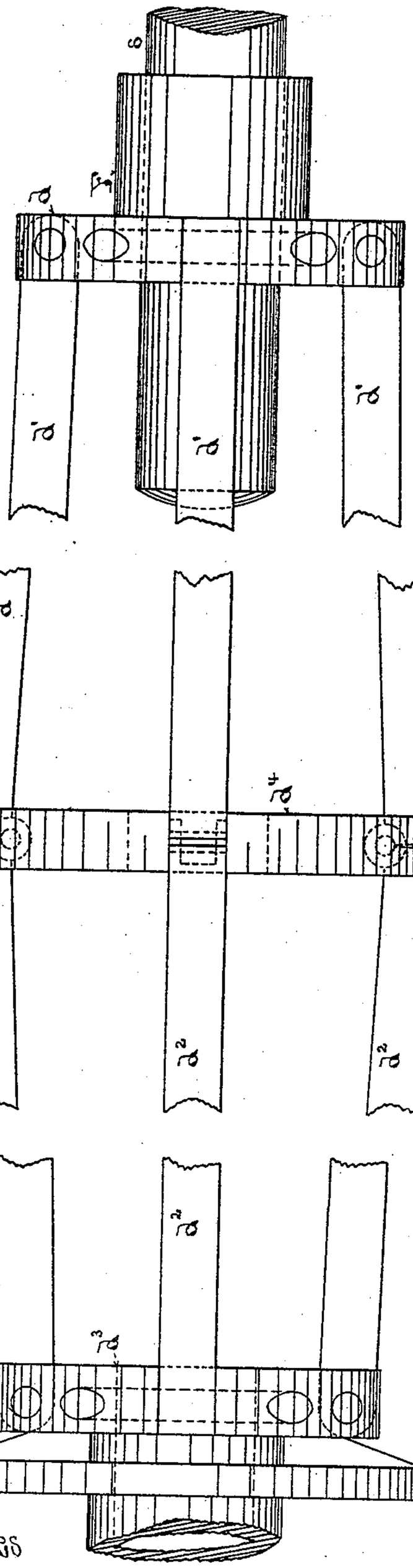

Fig. 6.

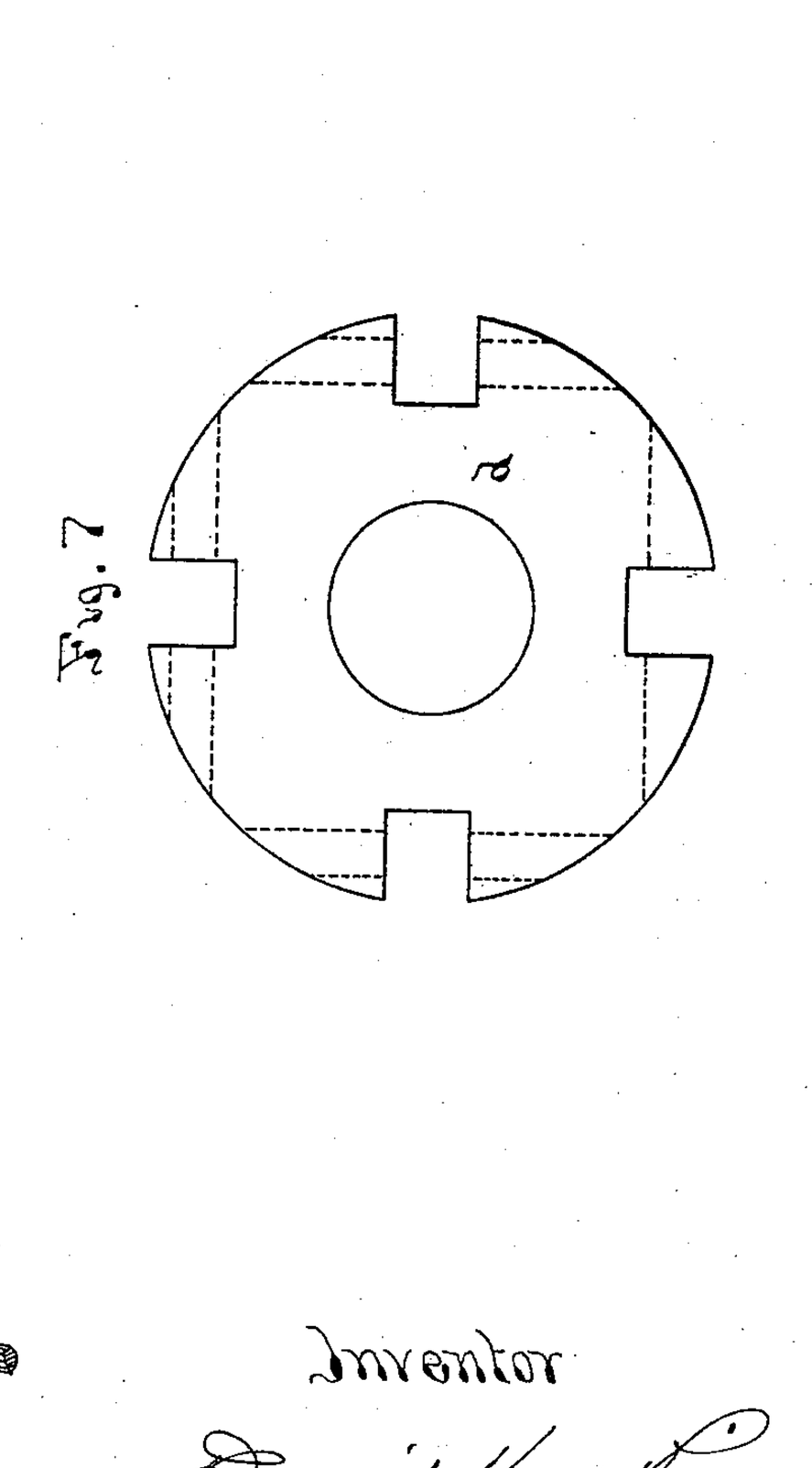

Fig. 8.

Fig. 7.

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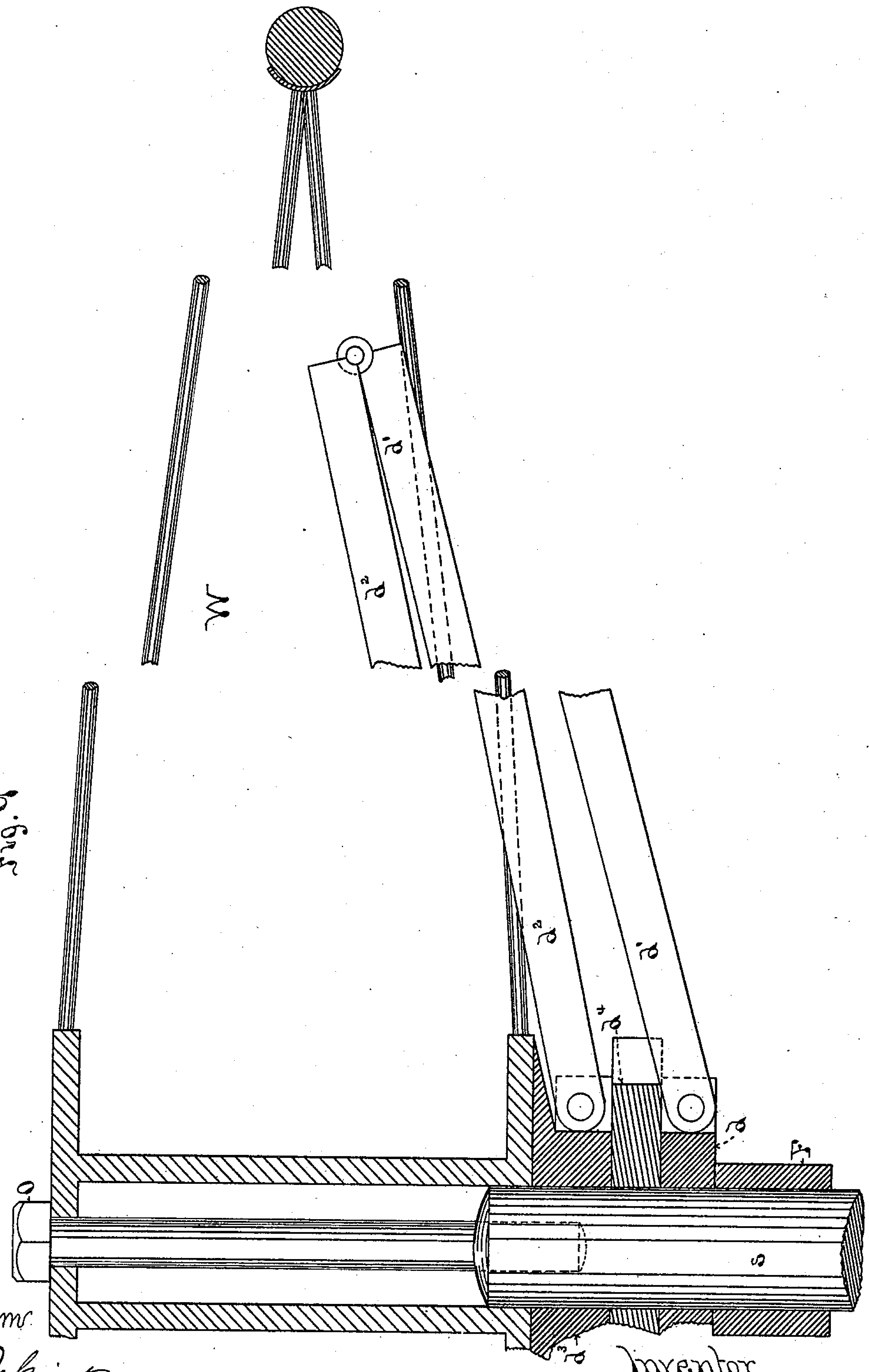

Fig. 9

Witnesses

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(No Model.) 8 Sheets—Sheet 8.

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TRICYCLE.

No. 326,245. Patented Sept. 15, 1885.

Fig. 11.

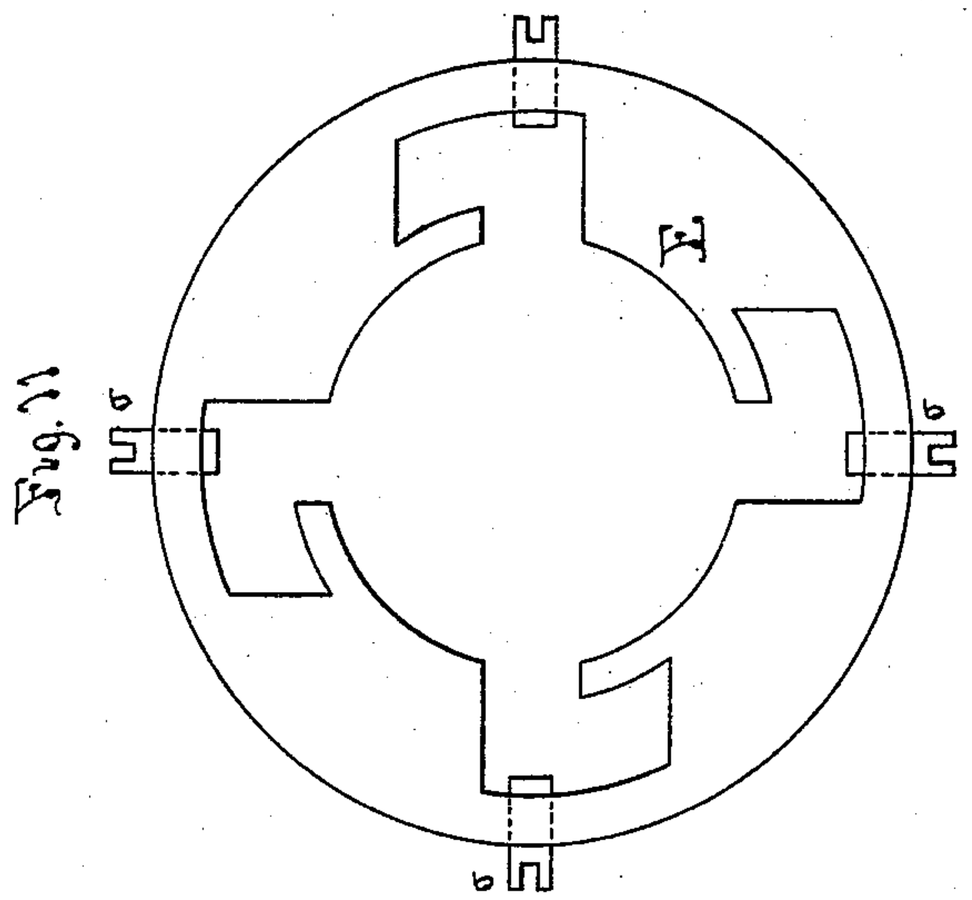
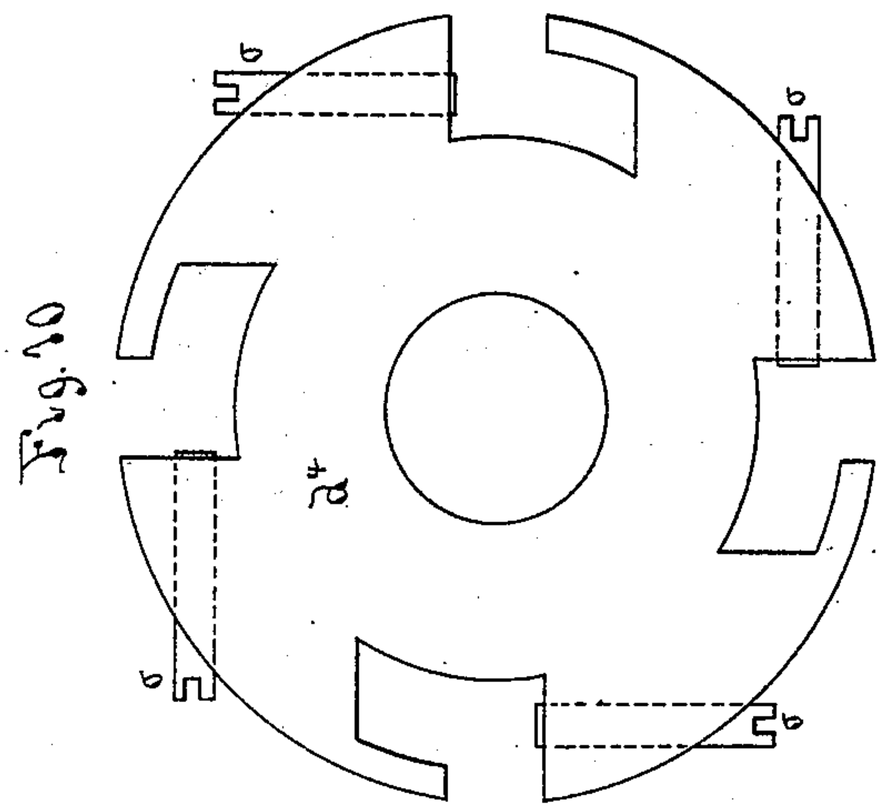


Fig. 10.



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Inventor
David Hale Rice

UNITED STATES PATENT OFFICE.

DAVID HALL RICE, OF LOWELL, MASSACHUSETTS.

TRICYCLE.

SPECIFICATION forming part of Letters Patent No. 326,245, dated September 15, 1885.

Application filed July 25, 1885. (No model.)

To all whom it may concern:

Be it known that I, DAVID HALL RICE, of Lowell, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Tricycles and Similar Vehicles, of which the following is a specification.

My improvement relates to road-vehicles, and more especially to that class of them known as "tricycles;" and it consists in certain improvements and combinations of their several parts, substantially as hereinafter described and claimed.

The object of my improvements is to provide a means of expanding the vehicle-wheels to track in the smooth parts of the road or way, and also to allow of its wheels being expanded apart lengthwise of the way to give them a longer bearing and cause the vehicle to run easier, at the same time, when the wheels are closed up, the vehicle occupies no more room than those now in use. My improvements may also be employed to contract the tricycle from the dimensions necessary for its practical use to shorter and narrower ones to facilitate its passing through doors and narrow spaces in storing or shipping it.

In the drawings, Figure 1 is a top view of a tricycle provided with my improvements, and being shown partly in section and with the seat, treadle mechanism, and steering apparatus removed to better show its working parts. Fig. 2 is a view of the same, except the steering-wheel, with the wheels closed or compressed together. Fig. 3 is an enlarged view of the main wheel expanding mechanism detached and in its expanded position. Fig. 4 is a horizontal section through the same. Fig. 5 is a side view of the wheel and its expanding mechanism from the dotted section-line A A, Fig. 2. Fig. 6 is an enlarged view of the expanding mechanism applied to extend the main-wheel shaft instead of to extend the frame of the vehicle in its expanded position. Figs. 7, 8, 10, and 11 are details of the same. Fig. 9 is a view of the same in its closed position, partly in section, showing how it is fastened in such closed position.

It is found most convenient to construct the tricycle for use in cities and on paved roads to track about thirty inches wide and about thirty-six inches long on the roadway. In country roads, however, the wheel-tracks of other vehicles are much wider—often as wide as fifty-six inches—and as these are frequently the only parts of such roads smooth enough for a tricycle to traverse, the rider cannot pass over them, and his use of the machine is consequently practically confined to the paved streets of cities and the comparatively few smooth roads in their vicinity. As the bicycle is not confined to two tracks of a certain distance apart, it is not thus restricted in its use, and my improvement is designed to enable the tricycle to traverse roads now impracticable for it. When it is expanded to a wider track, however, it also requires the forward wheel to be expanded farther from the one behind it in proportion, to give it a longer and steadier bearing upon the road-track, and I have also provided for this.

W W′ are the two large wheels of the tricycle, and *w* is the small wheel. F is the tubular frame of the machine, which is provided with struts or bridging-pieces forming an open connection between its two ends around the sprocket-wheel and clutch mechanism C in the ordinary and well-known manner. This sprocket-wheel is driven by the treadles and a chain-belt in the ordinary way, and with the clutch is attached to the hollow shaft *s*, which is divided within the clutch in the manner shown in the patent granted to me April 21, 1885, No. 316,061, to allow the wheels to revolve independently in turning corners; but any other well-known differential-gear mechanism may be employed for the purpose. Any other well-known form of frame may be used, instead of a tubular one, surrounding the wheel-shaft, if desired.

To the frame F is attached the arm *f*, made of tubular steel, which carries the steering-wheel *w* at its outer end.

The wheel W′ is attached to the tubular shaft *s* at one end, and this shaft revolves in suitable bearings in the frame F. At the other end of the frame from arm *f* is attached to it the disk *d*, and in the outer edge of this disk are formed four equidistant notches or slots, in which are pivoted four rods, *d′ d′*, of equal length and of about one-half the length to which it is desired to expand wheel W′ outward. These rods *d′* are so pivoted in the disk *d* that they will swing freely from a position nearly

radial to shaft *s* to a position nearly parallel to it, and projecting outward from it, as shown in Fig. 1. At their outer ends the rods *d' d'* are pivoted to the ends of four other rods, d^2 d^2, which are of about the same length, and are in turn pivoted at their opposite ends to the disk d^3 in the same manner as rods *d'* are pivoted in disk *d*, thus forming of the several pairs of rods and the disks what are known as "lazy-tongs." These lazy-tongs form when expanded a skeleton extension of the frame F, and are capable of closing up to the position shown in Figs. 2 and 5, when they stand radially to the frame and allow disk d^3 to be drawn inward nearly to disk *d*. It will be observed that at every point in the path of their expansion or contraction they hold the center of disk d^3 in line with the center of shaft *s*, and thus preserve the axial relation of wheel W, which is supported by disk d^3 to the driving-shaft. Disk d^3 carries in it (see Fig. 4) a ball-bearing of the ordinary construction, fitted to bear upon the shaft *s'* and support it. This shaft *s'* is made to slide in and out through the shaft *s*, and is fixed in the hub of wheel W. It has in one side of it a longitudinal groove, (shown in dotted lines in Fig. 4,) into which the pin *p*, fixed in shaft *s*, projects, which allows of and governs the necessary longitudinal movement of shaft *s'* in shaft *s*, while causing the former to be driven by the latter. Thus, when the disk d^3 is expanded outward, it carries wheel W with shaft *s'* with it, keeping them always in axial position to shaft *s*, and preventing any cramping or disarrangement of the parts.

In order to arrest the expanding movement of the lazy-tongs *d' d²* at the proper point and secure them in that position, I mount upon the shaft *s'* loosely a disk, d^4, somewhat larger in diameter than disks *d* d^3, and form in its edge four equidistant notches, *n' n'*, of proper size to receive and hold snugly the joints of each pair of rods *d' d²*, where they are pivoted together as they are drawn inward toward shaft *s'* by the expansion of the rods. As the rods are expanded the disk d^4 is slid along on shaft *s'* and turned so as to bring these notches under the joints of the rods to seat the latter in them, and the projections of the joints fit into recesses in the bottoms of the notches, as shown in Fig. 4. In order to secure the several described parts in this position, a screw-thread is formed on the circumference of the disk d^4, and a sleeve-ring, E, having a corresponding screw-thread on its inner face, is slid along over the outside of the rods *d' d'* and screwed over the disk d^4, thus confining and binding them in place in their notches in the disk. The sleeve-ring E is so constructed as to bind upon the outsides of the jointed rods firmly when screwed up to place, as shown in Figs. 1 and 4.

It is evident that other means may be employed to hold the jointed rods in place in the disk d^4—as for instance, a series of dogs set in the edge of the disk and swinging forward over the joints of the rods and held there by set-screws—the main thing being the jointed rods and the disk d^4 trussing them at their uniting joints, as described, and various means can be employed to secure the rods in the disk d^4. This construction forms a very light and strong extension of the frame F of the tricycle, and a second seat may be secured to the sleeve-ring E or disk d^4 when it is expanded, forming a "sociable," so called.

When it is desired to close up the tricycle the ring E is unscrewed and slid back over the tubular frame F, and the jointed rods are folded up into the position shown in Figs. 2 and 5, the shaft *s'* telescoping into the shaft *s*, and the disk d^4 sliding inward between disks *d* and d^3, as shown. To hold the parts in this position the following mechanism is employed: Disk d^3 projects outward beyond the points where the rods d^2 d^2 are pivoted, and carries on its outer edge a tubular sleeve, E^2, which just fits over sleeve-ring E. Slots d^5 are cut through this extension of disk d^3 and sleeve E^2 to allow the rods d^2 the necessary movement in folding up and expanding, and on the inside of sleeve E^2 is formed a screw-thread, which engages with one formed on the outside of ring E. When the tricycle is closed up, the sleeve E^2 projects past both rods d^2 and *d'*, and the sleeve-ring E is brought up and screwed inside of sleeve E^2 until its edge bears against the rods *d' d'* and binds the whole firmly together. A bolt with a head large enough to overlap on the hub of wheel W' may, however, be screwed into the end of shaft *s'*, which enters that wheel when the tricycle is closed up, thus holding the parts together in substantially the same manner as is shown on Fig. 9, for the modification hereinafter described.

When the tricycle is expanded, as hereinbefore described, it is found advantageous to expand the steering-wheel *w* farther forward and away from the wheel W'. To accomplish this readily I form the hollow tubular arm *f*, which carries the wheel *w*, curved toward its outer end from frame F, in such an arc that its axis prolonged will cut a right line passed through the rims of wheels W' and *w* at the point where the wheel *w* is to be adjusted when closed up, and again at the point where it is to be adjusted to when it is expanded. I then provide a rod, *f'*, which fits the bore of the arm *f*, so as to slide freely therein, and is curved to correspond with it. The latter rod carries at its outer end the pivot *w'*, on which the sleeve w^2 turns, the latter being attached to a yoke or fork each side of which extends down to the axle on each side of wheel *w* in the usual manner; but such yoke or fork is not shown, as its construction is well understood. The outer end of arm *f* is split, and has a screw-thread turned on its outside surface, over which is screwed the nut f^2, the threads being cut on a tapering surface, so that the screwing up of the nut will clamp hollow arm *f* onto rod *f'* firmly. By loosen-

ing this nut and sliding rod f' outward the wheel w will be carried outward until the curved rod f' brings it to track again with wheel W', when by screwing up the nut f^2 it will be secured in that position farther from wheel W'.

The curved part of arm f may be inclined downward and made to cut a given horizontal line at these same two points of adjustment of wheel w, or all the downward inclination may be given to arm f in the straight portion between frame F and its curved part, as here shown, if desired. Although I prefer this curved form of arm f and rod f' to expand wheel w, I do not confine my invention to it, as the rod may be curved at the outer end to bring wheel w into line with wheel W', and the arm f may be straight, with a straight part of the rod sliding back and forth in it.

Figs. 6, 7, 8, 9, 10, and 11 show the same expansion mechanism applied to the shaft instead of the frame of the tricycle. In this modification the collar d is secured directly to the shaft s, which is shown as made solid and provided with a suitable bearing in that end of frame F. The collar is made fast to the shaft in such a position as to allow the end of it to project through disks d d^4 d^3 into the hub of the wheel. When the extension is closed, as shown in Fig. 9, the disk d^3 is secured firmly to the hub of the wheel by brazing. The rods d^2 are made shorter than the rods d', so that when they are closed up they will incline into the wheel between its spokes, and as they revolve with the wheel be out of the way of the rider. When the rods d' d^2 are expanded and contracted, they cause the disk d^3 to carry the wheel outward and inward with it in substantially the same manner as when the wheel is attached to this disk by its shaft and bearing, as first described. When the rods are expanded, they may be held in place in disk d^4, substantially as before described, and when they are contracted they are held in place by the bolt O, which is provided upon its inner end with a corresponding thread tapped in a hole in the end of shaft s, as shown in dotted lines in Fig. 9.

As in the mechanism first described, the wheel will be supported in line with the shaft s at every point in its path of expansion.

In Figs. 10 and 11 I have, however, shown modifications of the disk d^4 and of the outer ring, E, which enable either one to be used without the other to support the jointed rods d' d^2. In these modifications the series of notches which receive the jointed rods are made in the outer edge of disk d^4 or in the inner edge of an inwardly-projecting flange of collar E in the shape of what is known as a "bayonet-joint," so that when the rods are introduced into the notches the disk or collar may be turned and lock them into the L-shaped part of the notch. Each notch is provided with a set-screw, o, arranged to bring its end or side to bear upon the jointed rods when screwed up and clamp them beneath the locking part of the notch firmly. By means of suitable shoulders formed upon the rods d' d^2, and which may be made to bear against the faces of the disks d d^3 d^4 when the rods are expanded, all play or movement of the pivots by which the rods are held together or attached to the disks d d^3 can be avoided, and the extension of the shaft be made practically rigid; but I do not consider such shoulders essential to accomplish that result. Such shoulders may also be so formed and proportioned as to abut solidly together, (when the requisite amount of expansion has taken place,) at the ends of the rods d' d^2, and the disk d^4 may thus be dispensed with to arrest their expansion, and a collar or sleeve, like E, be then driven over their outside surfaces to hold them in that position; but I prefer the disk, as it forms a strut to strengthen the rods at their central point. It is also evident that the disks d d^3 may be dispensed with, and the jointed rods d' d^2 pivoted directly to the frame F or shaft s at one end and to the wheel W at the other without departing from the principles of construction of said rods.

What I claim as new and of my invention is—

1. In a vehicle, in combination with the wheel W', shaft s, and frame F, the jointed rods d' d^2, carrying the wheel W, and capable of expanding and contracting it outward and inward, substantially as described.

2. In a vehicle, the combination of the wheel W', shaft s, frame F, and jointed rods d' d^2, carrying the wheel W, and capable of expanding it outward and contracting it inward, with the disk d^4, and suitable clamping mechanism adapted to secure said rods to said disk, substantially as described.

3. The combination, with the wheels W W', frame F, and arm f, of the wheel w, mounted in a support expansible and contractible lengthwise of the track of the wheels carried by the arm f, substantially as described.

4. In combination with the frame F and arm f, the wheels W W', mounted upon a support expansible and contractible transversely of the wheel-track, and the wheel w, mounted upon a support expansible and contractible longitudinally of said wheel-track, substantially as described.

5. The combination of the shaft s and wheel W with the jointed rods d' d^2, forming an extension of said shaft when expanded and having the rods d^2 made shorter than the rods d', measured from the shaft outward, whereby the rods are caused to incline toward the wheel when closed together, substantially as described.

6. The combination, with the wheel W', frame F, and shaft s, of the jointed rods d' d^2, carrying the wheel W, and capable of expanding it outward and contracting it inward, and a clamping mechanism adapted to secure said rods in their expanded position, substantially as described.

7. The combination, with the wheel W',

frame F, and shaft *s*, of the jointed rods *d' d²*, carrying the wheel W, and capable of expanding it outward and contracting it inward, and a clamping mechanism adapted to secure said rods in their contracted or closed position, substantially as described.

8. The combination of the wheel W', frame F, and shaft *s*, with the disk *d*, jointed rods *d' d²*, disk *d³*, and wheel W, substantially as described.

9. The combination of the wheel W', frame F, shaft *s*, disk *d*, jointed rods *d' d²*, disk *d³*, and wheel W with the clamping-collar E or *d⁴*, substantially as described.

10. The combination of the wheel W', frame F, shaft *s*, disk *d*, jointed rods *d' d²*, disk *d³*, and wheel W with the clamping-bolt O, substantially as described.

11. The combination of the frame F and wheel W' with the hollow curved arm *f*, and the curved sliding rod *f'*, carrying the wheel *w* and crossing the track of the wheel W' at two points in its path of expansion or contraction, substantially as described.

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