J. BARKER.

WINDMILL.

APPLICATION FILED JULY 24, 1908.

928,097.

Patented July 13, 1909.

3 SHEETS—SHEET 1.

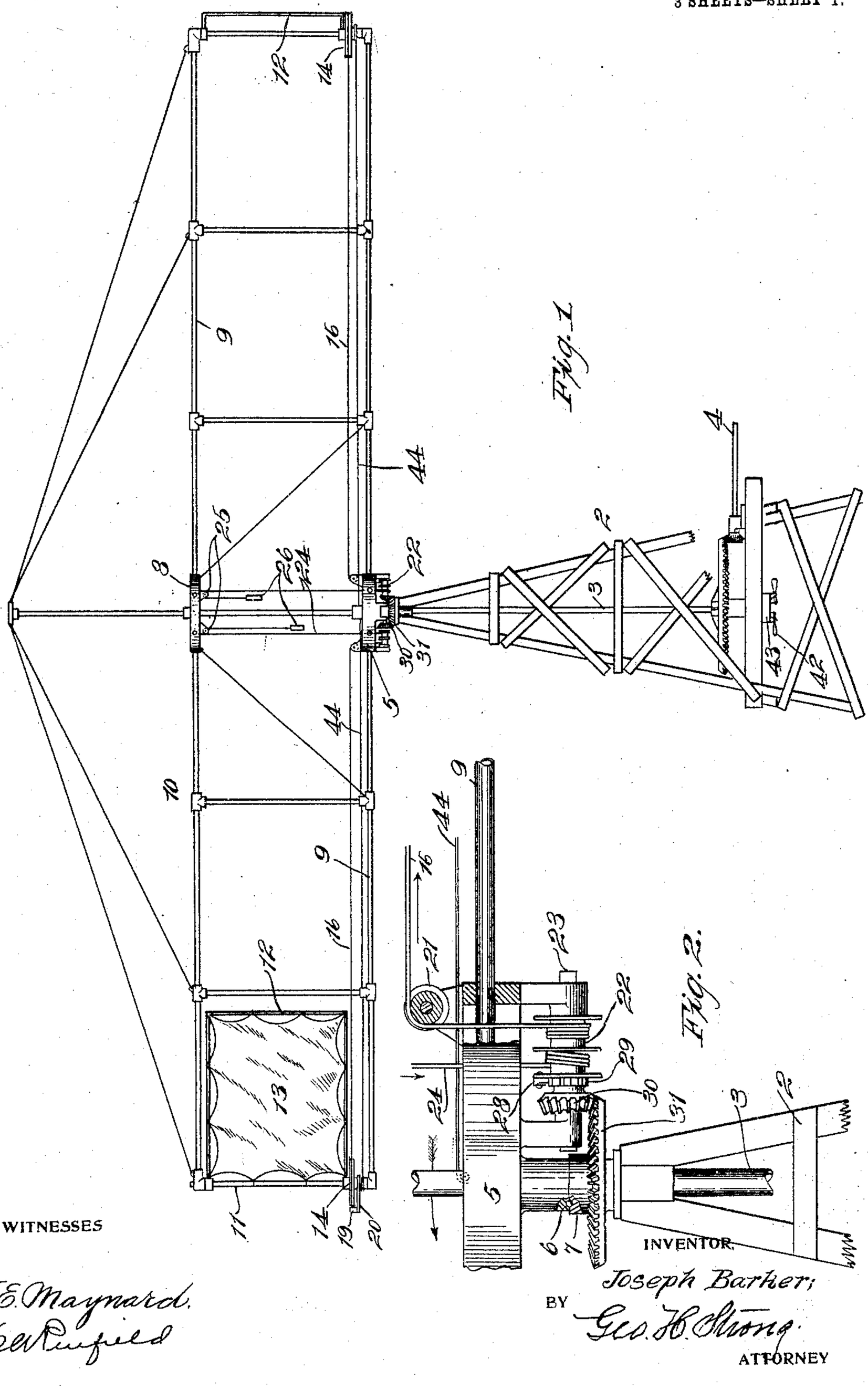

Fig. 1.

Fig. 2.

WITNESSES

F. E. Maynard.

C. W. Penfield

INVENTOR.

Joseph Barker;

BY Geo. H. Strong.

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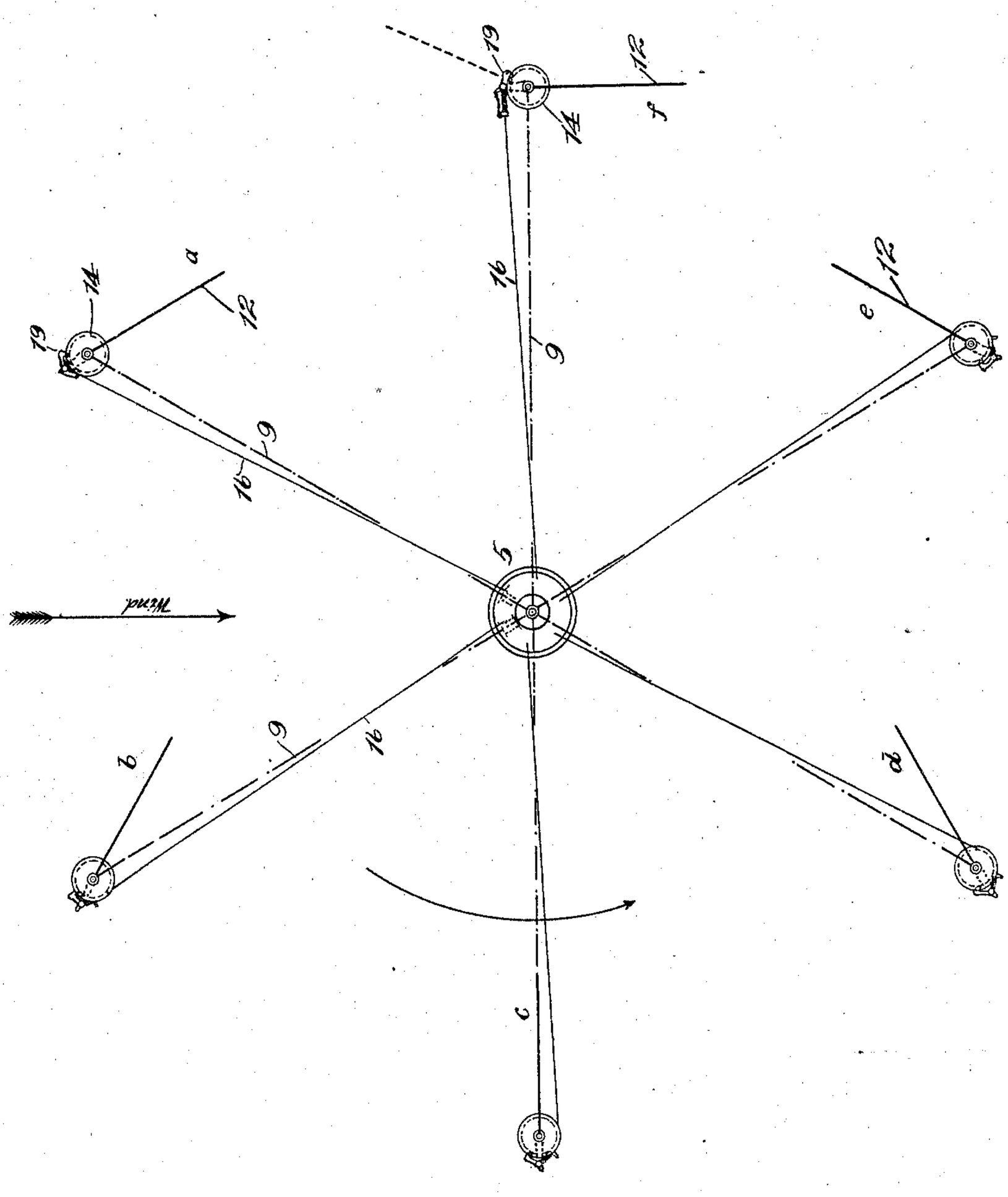

Fig. 3.

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3 SHEETS—SHEET 3.

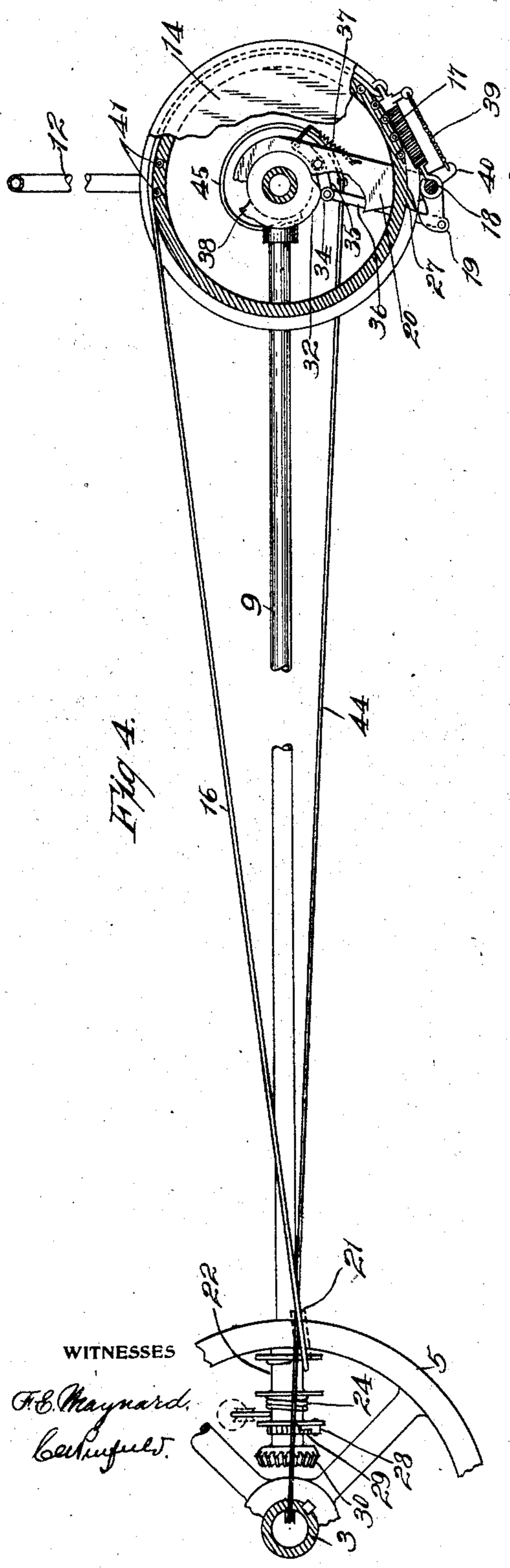

Fig. 4.

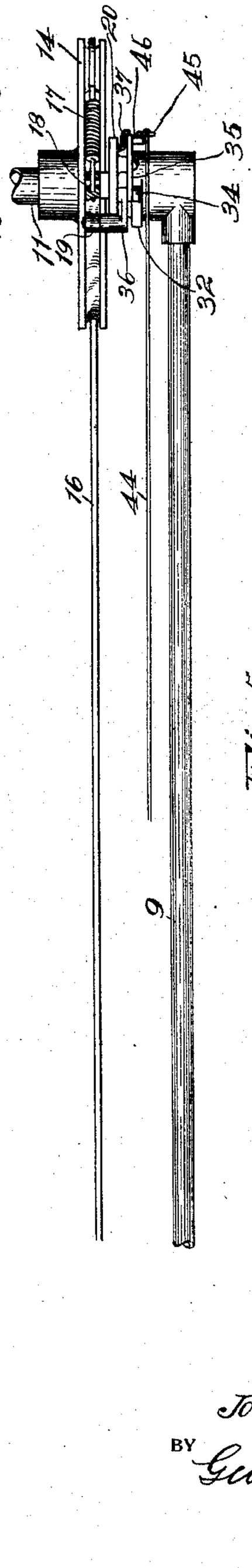

Fig. 5.

WITNESSES

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UNITED STATES PATENT OFFICE.

JOSEPH BARKER, OF CARSON CITY, NEVADA.

WINDMILL.

No. 928,097. Specification of Letters Patent. Patented July 13, 1909.

Application filed July 24, 1908. Serial No. 445,150.

To all whom it may concern:

Be it known that I, JOSEPH BARKER, a citizen of the United States, residing at Carson City, in the county of Ormsby and State of Nevada, have invented new and useful Improvements in Windmills, of which the following is a specification.

My invention pertains to windmills and particularly to that class wherein the power wheel is arranged horizontally.

Among the several objects of my invention, is the provision of a structure, that is extremely rigid, light and strong.

A further purpose is to devise a sail wheel that comprises a minimum number of different parts, is automatic in operation and very simple. It is desirable to obtain a motor of this variety that will translate the force of wind into mechanical power with the highest possible efficiency. To produce this maximum it is necessary to design a machine that offers the least frictional resistance to rotation, in its bearings. Since this resistance is proportional to the imposed weight, the elimination or reduction of resistance is imperative. Again; to produce maximum efficiency a structure must be devised that will present a large effective sail area for positive or favorable action and at the same time to manipulate this sail area so that little adverse or negative resistance is offered to the wind.

The invention consists of the elements, the construction and the combination of elements as will be fully set forth in the specification and accompanying drawings, in which—

Figure 1, is a side elevation of the mill, some of the sail arms being omitted. Fig. 2, is a detail in partial section of the sail controlling mechanism. Fig. 3, is a diagrammatic plan of the sails, Fig. 4, is a sectional detail of the sail latch-arm. Fig. 5, is a side elevation of the sail-sheave.

In actually reducing my invention to practice I employ the supporting tower 2, in which is mounted, in suitable anti-frictional bearings, a tubular mill shaft 3 from which power is transmitted to countershaft 4, by any efficient means. A hub 5 is secured to shaft 3, and bears upon balls 6 playing in a race-ring 7, mounted securely at the apex of the tower. The shaft 3 extends upward above the hub plate 5 a suitable distance and carries an upper hub plate or disk 8 and from these radiate any desired number of horizontally disposed tubular skeleton arms or spokes 9, suitably disposed to form a rotatable frame 10.

Rotatably mounted upon a pivot bar 11, at the outer end of the several arms 9, are sail-frames 12 which carry sails 13. The lower end of each frame adjacent to pivot 11 has a hub 14, provided with a peripheral groove adapted to receive a cable 16 connected to spring 17 the latter secured to the pivot 18 of latch 19 in the outer end of a radius arm 20 which latter is freely turnable about hub 14, and independently of the sail frame and hub. The other end of cable 16, after being passed over direction pulley 21 (Figs. 2 and 4) is secured to a winding drum 22, loosely journaled on a spindle 23 carried by and radially of the hub disk 5. Fastened to this drum 22 is another and oppositely wound cable 24, which is led over pulley 25 (Fig. 1) on hub disk 8 and has attached to its free end, any suitable means, as the weight 26, tending to unwind the cable 24 and wind up cable 16.

Assuming that the wind is blowing as indicated by the radial arrow, Fig. 3, the several sails will take the successive positions, as shown respectively at *a*, *b*, *c*, *d*, *e* and *f*, in the cycle of the arms 9 which latter are all securely braced horizontally and turn in unison, and toward the left in this instance.

For the purpose of locking a sail-frame temporarily to its hub to revolve the main frame and shaft 3, the sail hub flange 14 has a lug 27 which engages latch 19 on arm 20. When latch 19 is engaged with lug 27 it normally maintains a position diametrically opposite its particular sail 13, at which time the pressure on the sail is transmitted from lug 27 to latch 19, pivot 18, through spring 17 and cable 16 to unwind the latter from its drum 22. Drum 22 carries a pawl 28 engaging a ratchet-wheel 29, rigid with pinion 30, which is loosely journaled upon spindle 23 and meshes with a non-rotatable annular rack 31 bolted upon the tower 2.

Power is only applied to turn shaft 3 when a latch 19 is engaged with a corresponding lug 27. Thus with latch 19 engaged with a lug 27 on a sail-frame 12, and the wind acting against the sail to turn its frame on its pivot 11 outward or to the right, a pulling force is exerted on cable 16 to wind it upon the grooved hub member 14 and unwind it from its drum 22. When this unwinding of drum 22 is going on by cable 16 the pawl 28 is en-

gaged with its ratchet 29 to lock the drum 22 and pinion 30 together, so that the proper reaction of pinion 30 on the fixed gear or rack 31 takes place to propel the frame and revolve shaft 3 as above indicated. Bearing in mind that lug 27 is diametrically opposite to and is rigid with the sail-frame, and assuming that cable 16 is wound up on drum 22 and that counterweighted cable 24 is unwound therefrom, and that the wind is blowing in the direction of the radial arrow, Fig. 3, and that when the cable 16 is thus wound up and the sail-frame is swung so that the lug 27 has engaged with the latch 19, it will be understood that the position *a* of Fig. 3, or the first position of the sail, will be represented. As the arm 9 revolves to the left, the sail-frames revolve under the force of the wind to the right, and they successively take up the positions represented by *b*, *c*, *d* and *e*, all the while winding up cable 16 on to the hub 14 and unwinding the cable from drum 22. Whenever the drum 22 is unwound the pawl 28 is engaged with its ratchet 29 and shaft 3 is made to revolve by reason of the before described reaction of the pinion 30 against the fixed rack 31. Passing beyond position *e* the sail gradually approaches a position pointing directly into the wind and parallel with the direction thereof, whereupon the latch 19 is released from the lug 27, allowing the sail to swing back into a temporarily inert position, represented at *f*, and preparatory to the commencement of the next cycle. The positive release of the latch from the lug so that the sail can swing in either direction is here accomplished by the following means: The end of each arm 9 carries a cam 32 adapted to intercept at the proper moment a roller 34 on a lever 35 which is pivoted to the radial arm 20. One end of the lever 35 is connected by a link 36 with the latch 19; a spring 37 acts to maintain the roller 34 normally in the path of the cam 32. The lever 35 and link 36 constitute a toggle which when straightened by the action of cam 32 will release the latch 19 from the lug 27, as shown in Fig. 4. The moment this release of the latch from the lug occurs, the counterweight 26 acts on the drum 22 to swing the arm 20 around into initial position contiguous to the lug 27 which is also swung around a half revolution on the release of the sail. This return swing movement of the arm 20 after releasing the latch 19 is limited by suitable means, as the contact of the roller 34 with the fixed stop 38 on the spokes 9. As the spokes 9 continue to revolve the sail-frame passes from the free release position *f* into position *a*, and the operation above described is repeated with each sail.

To prevent injury to or possible wrecking of the machine or its parts in high winds, a safety device is employed by which a sail may automatically release itself from its latch when the pressure on the sail passes a predetermined weight. Ordinarily the spring 17 will have sufficient resiliency and at the same time will be sufficiently stiff to provide for the proper operations of the sails under normal conditions; and the spring will yield to prevent any shock, without releasing the latch. In case the pull on the spring 17 becomes abnormal, a flexible connection, such as a short piece of chain 39, between an angular projection 40 of the latch and the end of cable 16, will be drawn taut, and the latch will be detached from the lug and allow the sail to swing free away from the wind and until such time as the latch is reëngaged with its lug. It is understood that each time a latch 19 is released, this latch and its supporting arm 20 are swung around into initial position again by the action of the corresponding counterweight 26.

If desired, the bottom of the groove in hub 14, in which the cable 13 runs, may be supplied with anti-friction rollers 41.

Suitable means for manually releasing the sails may be provided, and as here shown, comprise hand levers 42, one for each sail, carried in suitable bearings on a collar 43 which is made fast to the lower end of shaft 3. To each lever is connected a cable or wire 44 running up through the shaft and out through openings approximate to the hub flange 5; thence to a band spring 45 having one end secured adjacent to the end of a respective spoke 9 and adapted, when contracted by a manipulation of hand lever 42, to encounter a pin 46 depending from the toggle lever 35. Normally the band spring 45 is outside the path of movement of the pin 46, but by pulling in on the wire 44 to cause the band spring to engage the pin 46 the latch 19 will be released, and release the sail. By operating all the levers 42 the mill may be stopped.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. In a windmill, the combination of a main frame rotatable about a vertical axis, vertically pivoted sail-frames circumferentially arranged on said main frame, a non-rotatable annular rack, a support therefor, pinions on the main frame engageable with said rack, and flexible drive connections between said pinions and said sail-frames, said connections comprising a drum adjacent to a respective pinion, mechanism for locking the drum and pinion together when the drum is turned in one direction, and a cable extending from the drum to a sail-frame.

2. In a windmill, the combination of a main frame rotatable about a vertical axis, vertically pivoted sail-frames circumferentially arranged on said main frame, a non-rotatable annular rack, a support therefor, pin-

ions on the main frame engageable with said rack, and flexible drive connections between said pinions and said sail-frames, said connections comprising a drum adjacent to a respective pinion, mechanism for locking the drum and pinion together when the drum is turned in one direction, a cable extending from the drum to a sail-frame, and a latch mechanism for connecting a cable to a sail-frame.

3. In a windmill, the combination of a main frame rotatable about a vertical axis, vertically pivoted sail-frames circumferentially arranged on said main frame, a non-rotatable annular rack, a support therefor, pinions on the main frame engageable with said rack, flexible drive connections between said pinions and said sail-frames, said connections comprising a drum adjacent to a respective pinion, mechanism for locking the drum and pinion together when the drum is turned in one direction, a cable extending from the drum to a sail-frame and a latch mechanism for connecting a cable to a sail-frame, and means for disconnecting the cable from its respective sail-frame.

4. A windmill comprising a main frame rotatable on a vertical axis, a sail-frame carried by the main frame, a fixed annular rack, a support therefor, a pinion on the main frame engaging the rack, a drum, clutch connections between the drum and pinion, clutch mechanism engageable with the sail-frame, and flexible drive connections between the drum and said last-named clutch mechanism.

5. A windmill comprising a main frame rotatable on a vertical axis, a sail-frame carried by the main frame, a fixed annular rack, a pinion on the main frame engaging the rack, a support for the pinion, a drum, clutch connections between the drum and pinion, clutch mechanism engageable with the sail-frame, flexible drive connections between the drum and said last-named clutch mechanism, and means operative by the rotation of the frame and sail-frame to release said last-named clutch mechanism.

6. In a windmill, the combination of a main frame rotatable upon a vertical axis, a sail-frame pivoted thereon, a fixed annular rack, a pinion on the main frame engaging the rack, a support for the pinion, a drum on the main frame, means detachably connecting the drum and pinion, and connections between the sail-frame and drum to turn the drum and pinion in unison on the rotation of the sail-frame.

7. In a windmill, the combination of a main frame rotatable upon a vertical axis, a sail-frame pivoted thereon, a fixed annular rack, a pinion on the main frame engaging the rack, a support for the pinion, a drum on the main frame, means connecting the drum and pinion, connections between the sail-frame and drum to turn the drum and pinion in unison on the rotation of the sail-frame, means for disconnecting said connections, and means for turning the drum independent of the pinion on the severance of said connections.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOSEPH BARKER.

Witnesses:
CHARLES A. PENFIELD,
M. V. COLLINS.