No. 685,774. Patented Nov. 5, 1901.

F. LIESKE.

WINDMILL.

(Application filed May 28, 1901.)

(No Model.) 2 Sheets—Sheet 1.

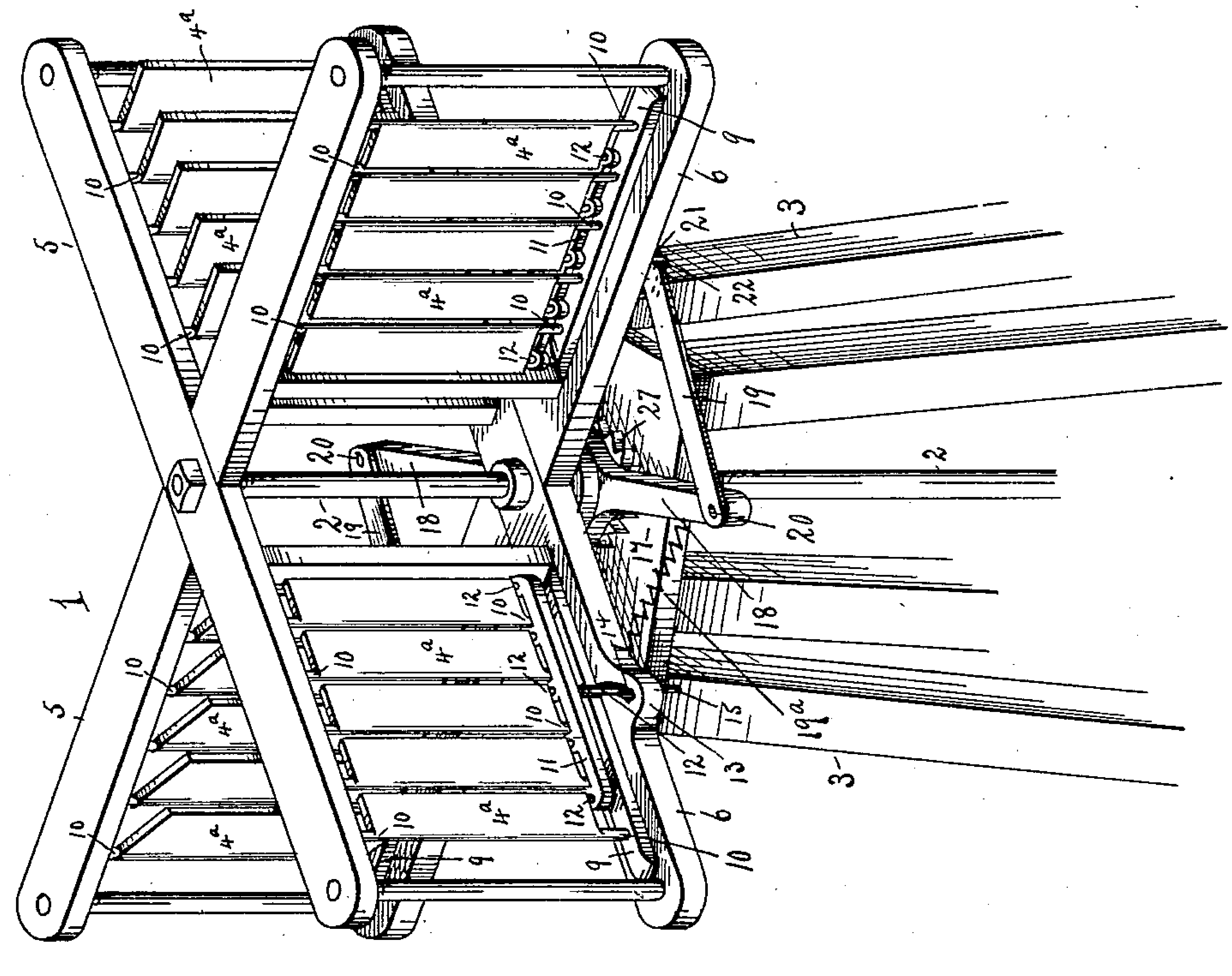

Fig. 1

Witnesses
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Fig. 2

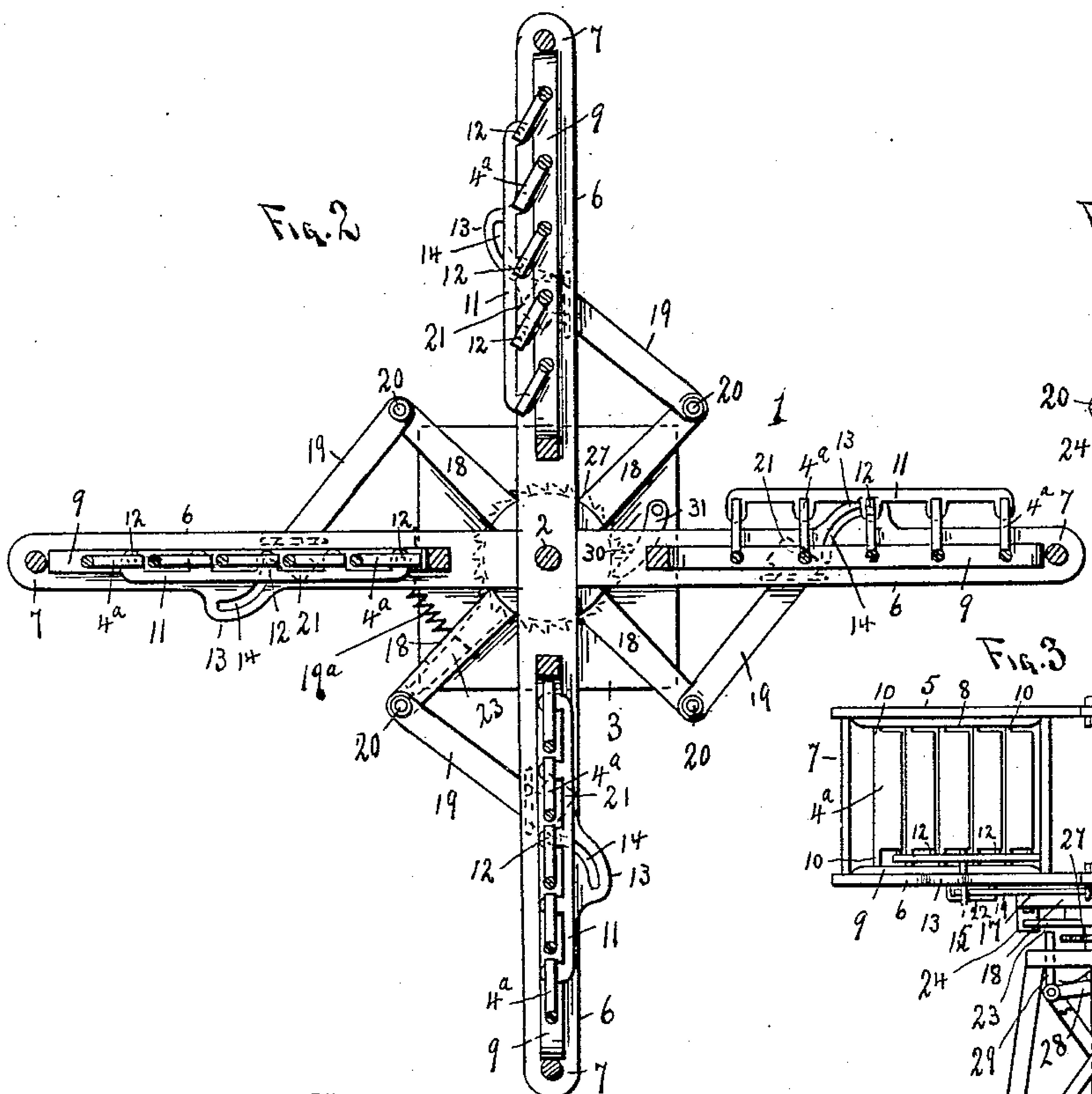


Fig. 8

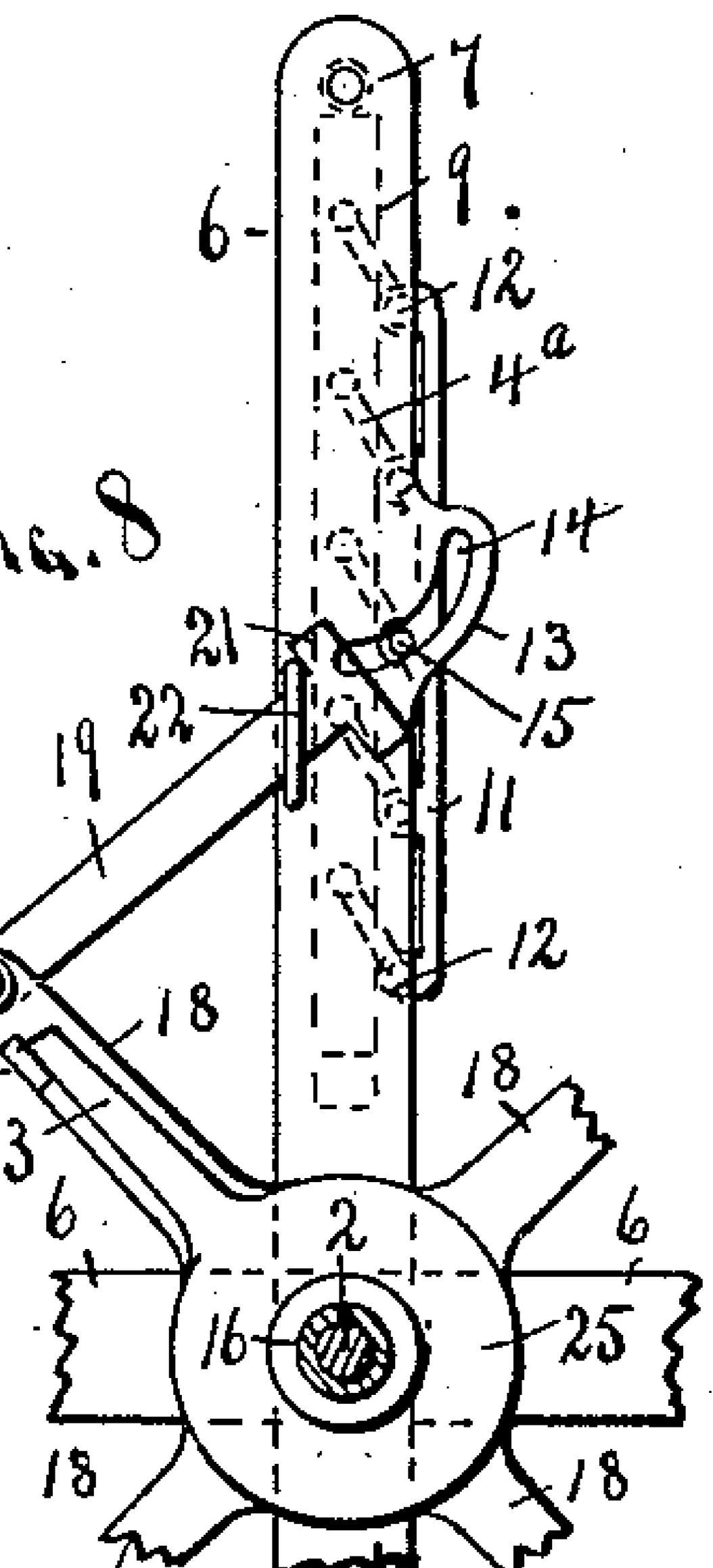


Fig. 3

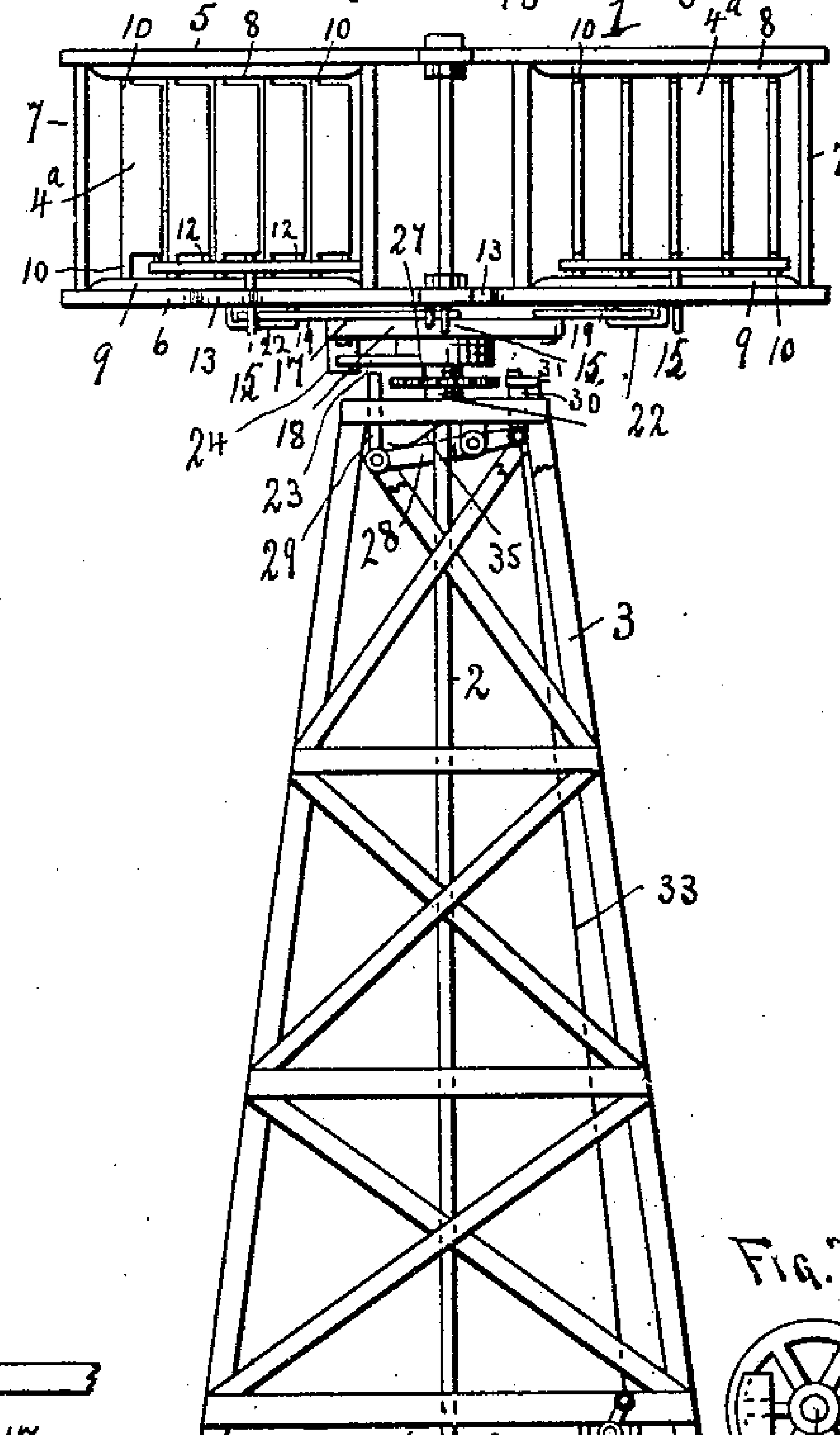


Fig. 4

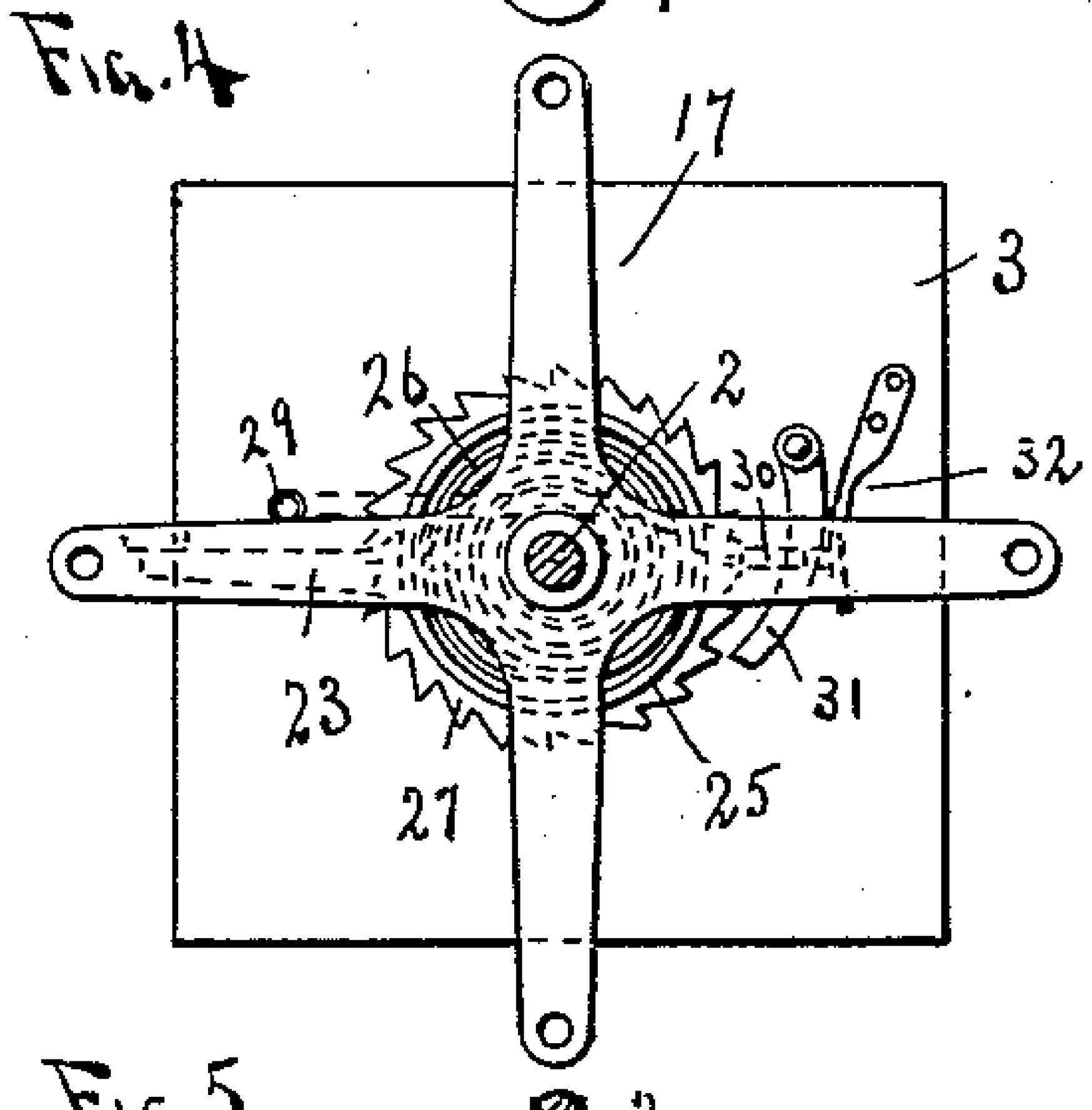


Fig. 6

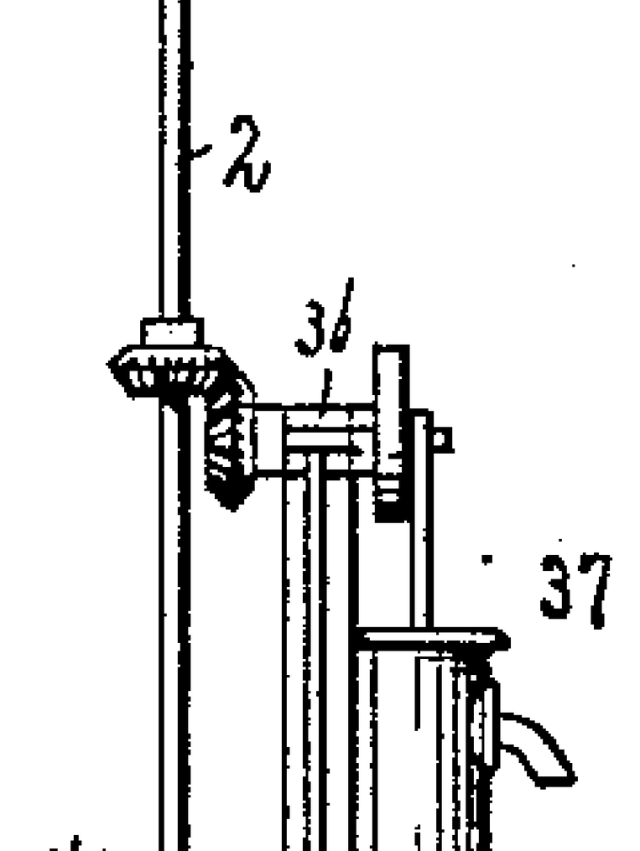


Fig. 5

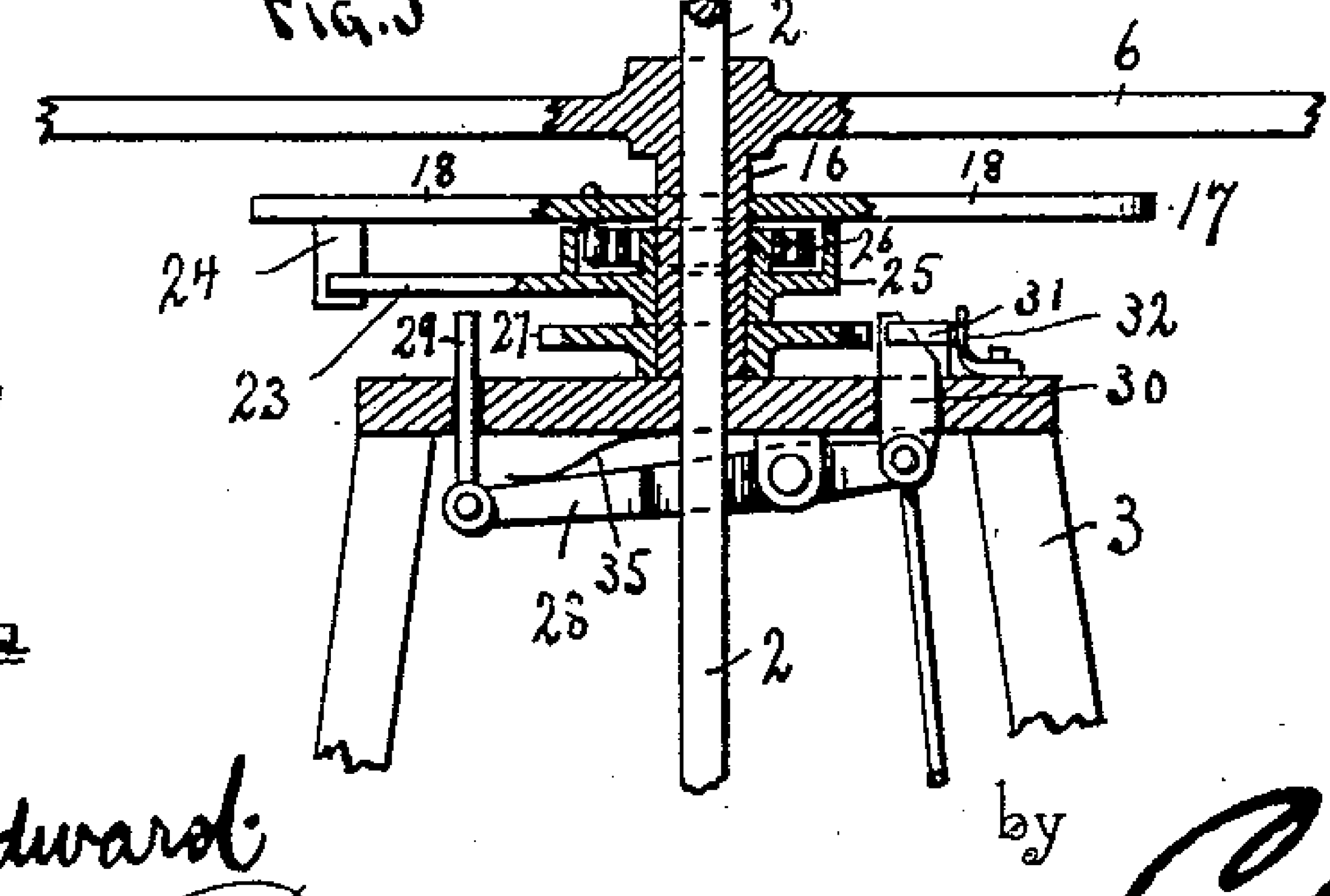
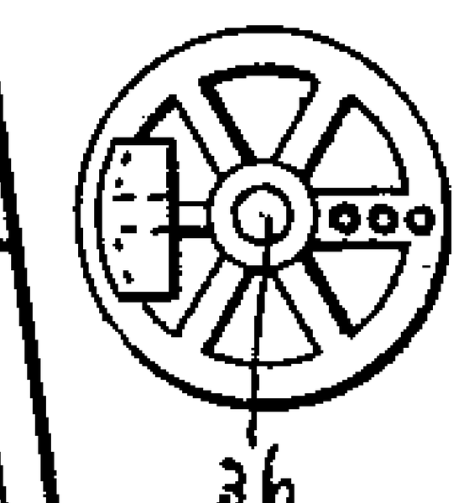


Fig. 7



Witnesses

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UNITED STATES PATENT OFFICE.

FRANK LIESKE, OF MARQUETTE, MICHIGAN.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 685,774, dated November 5, 1901.

Application filed May 28, 1901. Serial No. 62,273. (No model.)

To all whom it may concern:

Be it known that I, FRANK LIESKE, a citizen of the United States, residing at Marquette, in the county of Marquette and State of Michigan, have invented a new and useful Windmill, of which the following is a specification.

The invention relates to improvements in windmills.

The object of the present invention is to improve the construction of windmills and to provide a simple and comparatively inexpensive one having blades adapted to feather automatically to present their side edges to the wind when moving in opposition to the same, whereby the resistance will be reduced to a minimum.

A further object of the invention is to provide simple and efficient means for checking the rotation of the wind-wheel and for opening the blades to permit the wind to pass through the wheel without rotating the latter; and another object of the invention is to lock the wind-wheel against backward rotation to prevent the same from vibrating when the windmill is out of operation.

The invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended.

In the drawings, Figure 1 is a perspective view of the upper portion of the windmill, illustrating the construction of the wind-wheel. Fig. 2 is a horizontal sectional view of the same. Fig. 3 is a side elevation of the windmill. Fig. 4 is a detail horizontal sectional view illustrating the arrangement of the pawl and ratchet. Fig. 5 is an enlarged detail sectional view illustrating the construction for stopping the windmill. Fig. 6 is a detail view illustrating the manner of connecting the vertical wind-wheel shaft with a pump. Fig. 7 is a detail view of the balance-wheel. Fig. 8 is a reverse plan view of a portion of the wind-wheel and the movable frame or spider.

Like numerals of reference designate corresponding parts in all the figures of the drawings.

1 designates a horizontal wind-wheel mounted on a vertical shaft 2, journaled in a suitable bearing of the top of a tower 3 and stepped at its lower end in a suitable bearing 4. The horizontal wind-wheel, which is fixed to the shaft, is provided with blades 4^a, arranged in series and mounted between upper and lower arms or spokes 5 and 6 of the frame of the wheel. The arms or spokes 5 and 6, which are arranged horizontally, extend radially from the vertical wind-wheel shaft and are suitably secured together at that point and are connected at their outer ends by vertical rods 7. The upper and lower arms or spokes are provided at their inner opposite faces with longitudinal ribs or reinforcing-strips 8 and 9 and have suitable bearings for the reception of the journals 10, which extend vertically from the ends of the blades at the inner longitudinal edges thereof. The blades of each series are connected near their outer edges by a bar 11, located at the lower ends of the blades and provided at intervals with eyes for the reception of pivots 12, which extend downward from the blades. By this construction the blades are permitted to feather as they come into the wind, and their inward or closing movement is limited by the longitudinal connecting-bar 11, which engages the adjacent journals and which holds the blades in position for causing the same to present their flat faces to the wind while they are in a position to be operated on by the same. The blades may be of any desired size, and they may be arranged in vertical series to increase the capacity of the windmill, and they may be connected in any other suitable manner. When the blades travel against the wind, they extend rearward from the arms or spokes, as indicated at the right-hand side of Fig. 2 of the accompanying drawings, and they will automatically swing to present their inner longitudinal edges to the wind until they arrive at a point directly in the teeth of the wind. As soon as the blades by the rotation of the wind-wheel are carried to the left of the center in Fig. 2 they will present their flat faces to the wind, which will hold the blades in alinement with the arms or spokes, and they will continue in this position until they arrive at the back of the wind-wheel, and as soon as they pass beyond the center of the wheel at the back they will open automatically to avoid offering any material resistance to the rota-

tion of the wind-wheel. The lower arms or spokes are provided with extensions 13 and have curved slots 14, receiving extended pivots 15 of the adjacent blades. These curved slots, which are disposed transversely of the lower arms or spokes, permit the blades to swing outward to a position at right angles to the arms or spokes, as illustrated at the right-hand side of Fig. 2 of the drawings.

The bottom of the frame of the wind-wheel is provided with a depending tubular extension 16, on which is mounted a rotary spider or frame 17, having radial arms 18, which are pivoted at their outer ends to the inner terminals of the reciprocating bars 19 by pins 20 or other suitable fastening devices. These reciprocating bars, which are provided at their outer ends with heads 21, are arranged in suitable guides 22 and are adapted when reciprocated and moved outward to engage the depending pivots 15 and open the blades to permit the wind to pass through the wind-wheel without rotating the latter. The heads 21 preferably consist of laterally-extending arms, which form stops for limiting the backward or inward movement of the reciprocating bars 19. These bars are normally retracted or held at the limit of their inward movement by a short coiled spring 19^a, secured at one end to one of the radial arms 18 and attached at its other end to one of the lower arms or spokes 6 of the frame of the wind-wheel. This spring 19^a is adapted to be distended to permit the legs to be opened by the means hereinafter described, and it will automatically withdraw the arms.

Located beneath the frame or spider is a spring-controlled arm 23, arranged to be engaged by a depending lug 24, extending downward from one of the arms of the frame or spider, as clearly shown in Fig. 5 of the drawings. The spring-controlled arm is provided at its inner end with a hub or casing 25, loosely arranged on the tubular extension 16 of the frame of the wind-wheel and receiving a coiled spring 26. The coiled spring 26, which is preferably a barrel-spring, is secured at its inner end to the hub or casing of the spring-controlled arm, and its outer end is connected with the frame or spider. By this construction and arrangement the spring-controlled arm is yieldingly connected with the frame or spider, and when it is held by the means hereinafter described to stop the windmill it will permit an independent movement of the frame or spider against the action of the barrel-spring, which will gradually stop the wind-wheel. The frame or spider is loosely arranged on the hub of the extension of the frame of the wind-wheel, and it is adapted to vibrate to reciprocate the bars 19, and the spring-controlled arm, which is also arranged on the hub or extension, is supported by a ratchet-wheel 27, secured to the said hub or extension. The guides 22, which receive the reciprocating bars, depend from the lower arms or spokes of the bottom of the wind-wheel. The windmill is stopped by means of an approximately horizontal lever 28, fulcrumed between its ends at the top of the tower and provided at one side of the fulcrum with a rod or pin 29 and having a wedge-shaped arm 30 at the opposite side of the fulcrum. The rod or pin 29, which is guided on the tower, is arranged to project upward into the path of the arm 23 to stop the same and cause the continued forward rotation of the wind-wheel to actuate the reciprocating bars against the action of the coiled spring and open the blades. This will stop the wind-wheel and permit the wind to pass through the same. The spring connection between the arm 23 and the frame or spider 17 will permit the wind-wheel to rotate one revolution after the pin 29 engages the arm 23 should the force of the wind be sufficient to carry the wind-wheel such distance against the action of the barrel-spring. A complete revolution of the wind-wheel under these conditions will carry the depending lug 24 from the front side of the arm 23 to the rear side of the same to positively stop the wind-wheel against further rotation. The barrel-spring is adapted to gradually check the rotation of the wind-wheel and prevent the parts from being injured when the windmill is stopped, and in practice it will be of sufficient strength to stop a wind-wheel in the highest wind before the wheel has made a complete revolution against the action of the coiled spring. After the windmill has been stopped in this manner and is again started the barrel-spring will return the arm to its normal position at the rear face of the depending lug 24. The wind-wheel is held against backward movement by the coiled spring or from the wind by a spring-actuated pawl 31, arranged to engage the ratchet-wheel 27. The pawl 31, which is pivoted to the top of the tower, is engaged by a spring 32, and when the windmill is in operation it is held out of engagement with the ratchet-wheel by the tapering or wedge-shaped arm 30, which extends upward through the top of the tower, as clearly illustrated in Fig. 5 of the accompanying drawings. When the arm carrying the pin or rod 29 is swung upward to stop the wind-wheel, the tapering or wedge-shaped arm is withdrawn from engagement with the spring-actuated pawl, and the latter automatically engages the ratchet-wheel, whereby the wind-wheel will be rigidly held by the pin or rod and the pawl and ratchet. The horizontal lever 28 is connected by a wire 33 or other suitable flexible connection with a suitable operating-lever 34, arranged at the base of the tower and adapted to be readily oscillated to actuate the lever 28. The lever 28 is thrown back to the position illustrated in Fig. 5 of the drawings by a spring 35 when it is free to move, and as soon as it is released by the operating mechanism it will automatically release the wind-wheel and start the windmill.

The vertical wind-wheel shaft is connected

near its lower end by bevel-gearing with a horizontal shaft 36, upon which is mounted a combined balance-wheel and concentric, and this wheel is connected with and adapted to reciprocate the rod of a pump 37; but any other suitable device or machine may be operated by the windmill. The wheel 36, which is weighted at one side, is provided at the opposite side with a series of perforations adapted to permit the wrist-pin to be adjusted for varying the stroke of the pump.

It will be seen that the windmill is simple, strong, and durable, that the blades of the wind-wheel feather automatically, and that the windmill may be readily stopped when started. It will also be apparent that when the windmill is stopped the wind-wheel will be rigidly held against rotation in either direction and will not strain or injure the mechanism of a pump or other device to which the windmill may be connected.

Instead of employing a spring for withdrawing the pin 29 from engagement with the arm 23 any other means may be used, and I desire it to be understood that various changes in the form, proportion, size, and the minor details of construction within the scope of the appended claims may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

What I claim is—

1. In a windmill, the combination of a wind-wheel frame, the blades arranged in series and hinged to the said frame, bars connecting the blades, the reciprocating bars arranged to open the blades, a frame or spider provided with arms connected with the reciprocating bars, and means for operating the frame or spider and for holding the reciprocating bars normally retracted or out of engagement with the blades, substantially as described.

2. In a windmill, the combination of a wind-wheel frame, feathering-blades arranged in series and hinged to the frame, means for connecting the blades of each series, a series of reciprocating bars mounted on the said frame and arranged to engage the said connecting means to open the blades, and means for operating the reciprocating bars and for holding the same normally retracted or out of engagement with the blades, substantially as described.

3. In a windmill, the combination of a wind-wheel frame, blades arranged in series and hinged to the frame, bars connecting the blades, a series of reciprocating bars guided on the said frame and arranged to actuate the connecting-bars of the blades to hold the latter open, and means for operating the reciprocating bars and for holding the same normally retracted or out of engagement with the blades, substantially as described.

4. In a windmill, the combination of a wind-wheel frame, hinged blades reciprocating bars arranged to open the blades, a frame or spider rotating with the wind-wheel frame and capable of movement independently thereof and provided with arms connected with the reciprocating bars, means for holding the latter normally retracted or out of engagement with the blades, and a stop arranged to engage the frame or spider, substantially as described.

5. In a windmill, the combination of a wind-wheel frame having upper and lower arms or spokes, the blades hinged between the arms or spokes, the connecting-bars pivoted to the blades, pins depending from the connecting-bars, the reciprocating bars guided on the wind-wheel frame and arranged to engage the pins and adapted to open the blades, a frame or spider connected with the reciprocating bars, a spring for holding the reciprocating bars normally retracted, and a stop arranged to engage the frame or spider, substantially as described.

6. In a windmill, the combination of a wind-wheel having hinged blades, a frame or spider connected with the wind-wheel and provided with means for opening the blades, a stop for engaging the frame or spider to lock the wind-wheel against forward rotation and to open the blades, and a pawl and ratchet for holding the wind-wheel against backward movement, substantially as described.

7. In a windmill, the combination of a wind-wheel frame having curved slots, hinged blades, bars connecting the blades and having pins extending through the slots, reciprocating bars arranged to engage the pins, and means for operating the reciprocating bars, substantially as described.

8. In a windmill, the combination of a wind-wheel having hinged blades, a movable frame, reciprocating bars connected with the frame and arranged to open the blades, a ratchet-wheel connected with the wind-wheel, a spring-actuated pawl arranged to engage the ratchet-wheel, a lever 28 fulcrumed between its ends and provided at one of its arms with a pin or rod to stop the movable frame and having a tapering or wedge-shaped device at its other arm for engaging the said pawl, and means for operating the lever, substantially as described.

9. In a windmill, the combination of a wind-wheel having hinged blades, a frame or spider provided with a depending lug, reciprocating bars connected with the frame or spider and arranged to open the blades, an arm located adjacent to the frame or spider and having a hub or casing, a spring connecting the arm and the frame or spider and housed within the said hub or casing, the spring-actuated lever 28 fulcrumed between its ends and provided at one end with a pin or rod, arranged to project into the path of the said arm, the tapering or wedge-shaped arm arranged at the other end of the lever 28, a ratchet-wheel carried by the wind-wheel, a spring-actuated pawl for engaging the ratchet-wheel, said pawl being arranged to be engaged by the tapering or wedge-shaped arm, and means for operating the lever 28, substantially as described.

10. In a windmill, the combination of a wind-wheel having feathering-blades, a frame or spider adapted to open the blades, an arm rotating with the frame or spider, a spring connecting the arm with the frame or spider, and a stop for engaging the arm, substantially as described.

11. In a windmill, the combination of a wind-wheel having feathering-blades, a frame or spider having a lug or projection, an arm, a spring connecting the arm and the frame or spider, and means for holding the arm, substantially as and for the purpose described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

FRANK LIESKE.

Witnesses:
E. D. MOSHER,
A. FOUBERT.