O. E. SILL.

AIR MOTOR OR WINDMILL.

APPLICATION FILED FEB. 5, 1910.

976,003.

Patented Nov. 15, 1910.

2 SHEETS—SHEET 1.

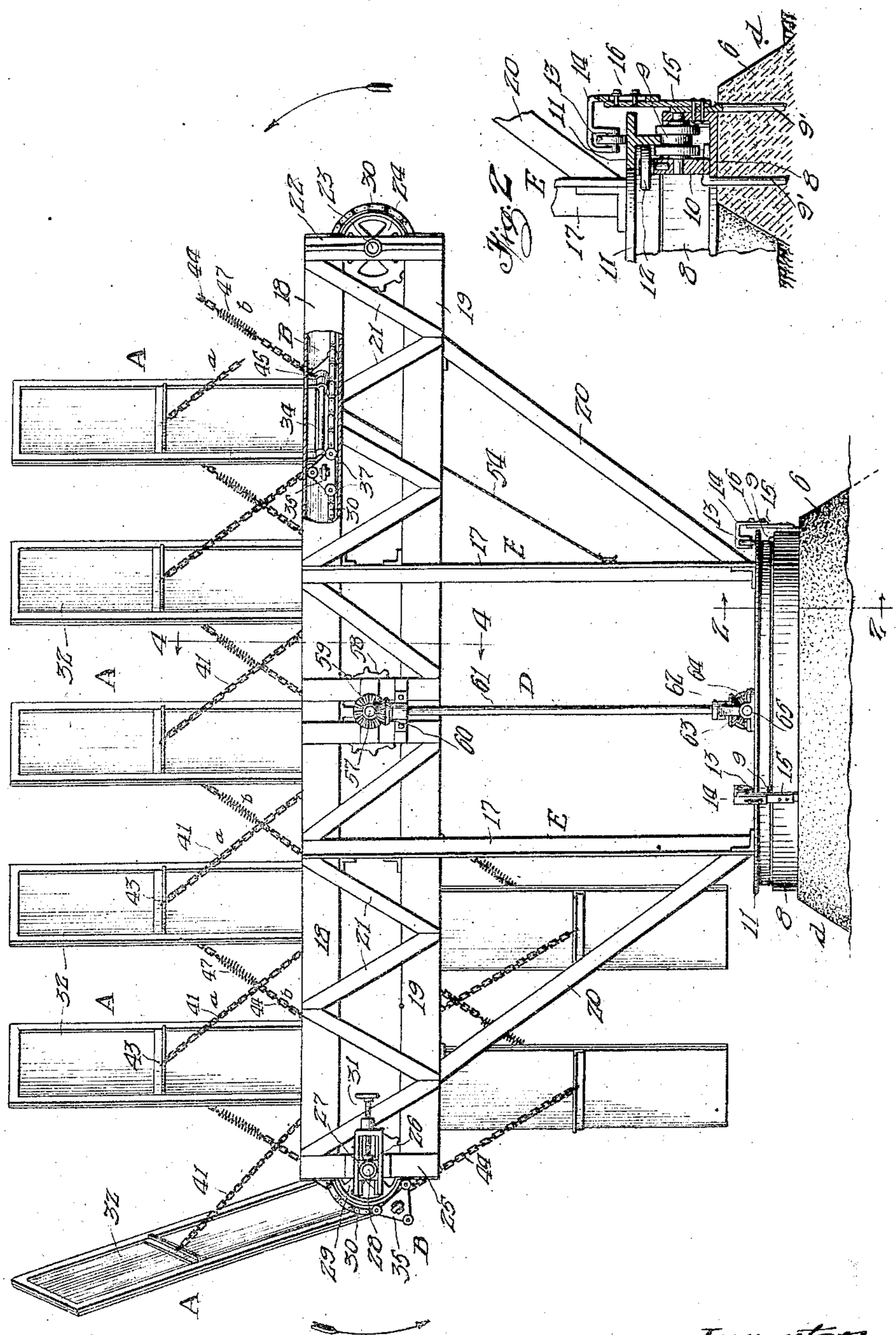

Fig. 1.

Fig. 2.

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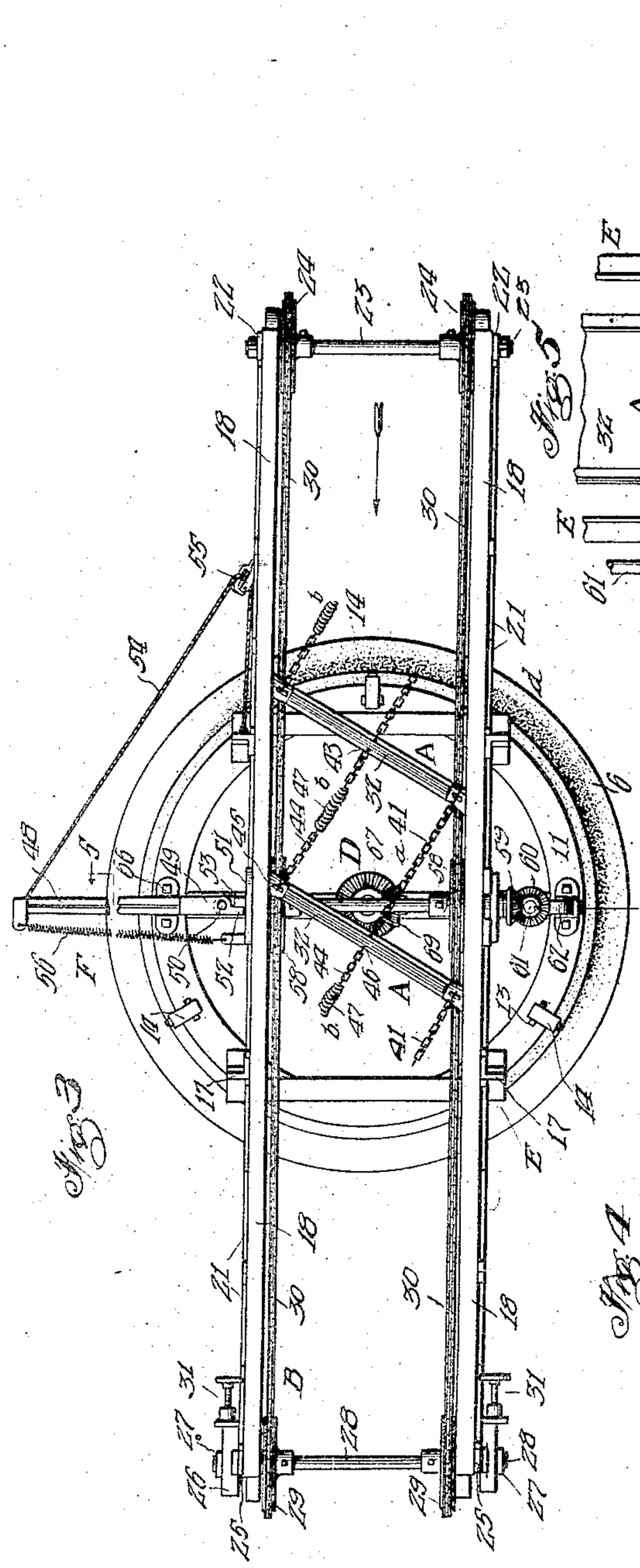

Fig. 3

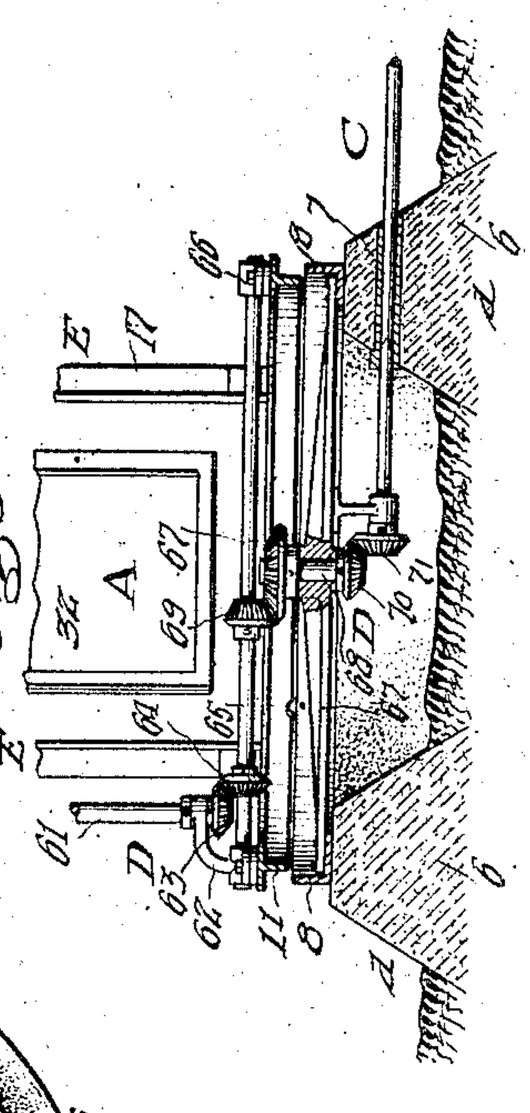

Fig. 2

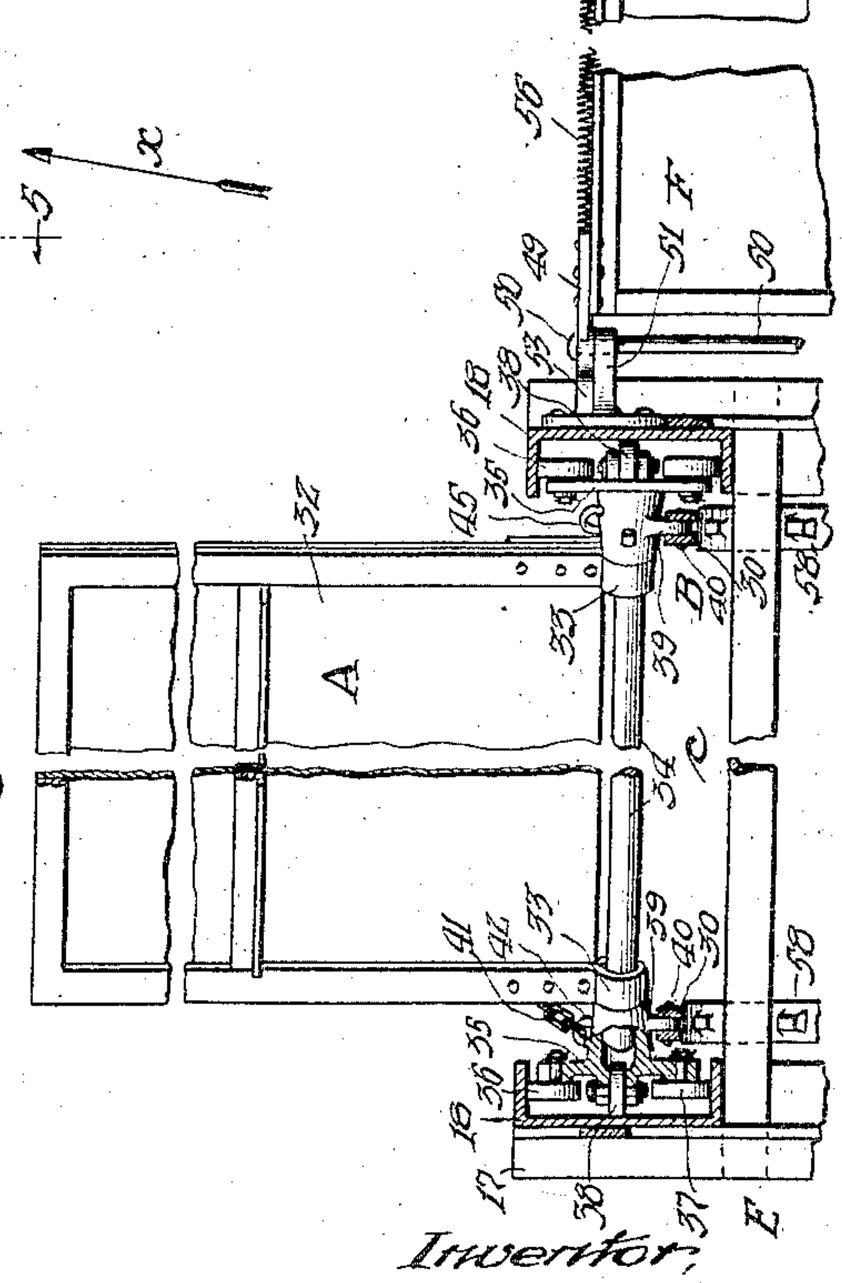

Fig. 4

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UNITED STATES PATENT OFFICE.

OTTE E. SILL, OF LOS ANGELES, CALIFORNIA.

AIR-MOTOR OR WINDMILL.

976,003. Specification of Letters Patent. Patented Nov. 15, 1910.

Application filed February 5, 1910. Serial No. 542,321.

To all whom it may concern:

Be it known that I, OTTE E. SILL, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Air-Motors or Windmills, of which the following is a specification.

This invention relates to air motors or windmills; and it has for its object to provide improvements relating to the organization of windmills, the utilization and employment of which will be attended by superiority in point of durability, efficiency, positiveness of operation and convenience in control, and which will be generally superior in point of serviceability and adaptability to varying conditions of use and service.

With the above and other objects in view, the invention consists in the novel provision, construction, combination and relative arrangement of parts, members and features, all as hereinafter described, shown in the drawings, and finally pointed out in claims.

In the drawings:—Figure 1 is a side elevation of the operative portions of an air motor or windmill organized according to the invention, the same being shown partly broken away and partly in section for clearness of illustration; Fig. 2 is a fragmentary vertical transverse sectional view of the same, taken upon the line 2—2, Fig. 1, and looking in the direction of the appended arrows; the same being upon an enlarged scale; Fig. 3 is a top plan view of the construction shown in Fig. 1; Fig. 4 is a fragmentary enlarged transverse vertical sectional view, taken upon the line 4—4, Fig. 1, and looking in the direction of the appended arrows; and, Fig. 5 is a fragmentary vertical transverse sectional view, taken upon the line 5—5, Fig. 3, and looking in the direction of the appended arrows.

Corresponding parts in all the figures are denoted by the same reference characters.

Referring with particularity to the drawings, the improved windmill shown therein comprises, in the main, a plurality of vanes or sails A which are jointly movably mounted upon a carrier B, the carrier acting to drive a power shaft C through power transmission D extending from the sphere of action of the vanes, at the upper portion of a frame or tower E to the power shaft C which is conveniently located at the lower portion of the tower and mounted in the base *d* thereof. The vanes A are loosely mounted upon the carrier B; and connection means *a* and *b* extend between the vanes and the carrier, acting to sustain the vanes in operative positions of projection from the carrier. The carrier works through two parallel paths or planes of movement, which are arranged one above the other and preferably horizontal in extent; and the vanes therefore alternately traverse upper and lower courses of travel.

A particular preferred form of construction, combination and association of parts and features, as shown in the drawings, is as follows:—The base *d* may consist of an annular concrete wall 6 provided at one side with a horizontal sleeve 7 within which the power shaft C is journaled; said power shaft extending inwardly of the base to a point substantially centrally thereof. Superposed upon the base wall 6 is an annular angle iron 8 which is tied to the base wall 6 by tie rods 9′ located at suitably spaced points. At properly spaced points a plurality of channeled rollers 9 are journaled in blocks 10 resting upon the horizontal portion of the angle iron 8 and also in the vertical portion thereof. An annular T-iron 11 rests upon the channeled rollers 9, being turnably mounted thereon and acting as a turntable for the frame E. Each of the blocks 10 carries a guide roller 12 which bears against the vertical portion of the annular T-iron, which vertical portion rests upon the rollers 9. Above each of the rollers 9 a supplemental guide roller 13 bears upon the top of the horizontal portion of the T-iron 11; each roller 13 being carried by a bracket 14 adjustably connected, as at 16, with an arm 15 bolted to the vertical portion of the angle iron 8. The angle iron 8, the T-iron 11, and the rollers 9, 12 and 13, constitute jointly a turntable base for the frame or tower E which latter comprises a plurality of upright members, preferably structural metal shapes, 17, the lower ends of which are bolted or riveted to the annular T-iron 11, and the upper ends of which support two spaced pairs of channel irons 18, 18, and 19, 19 which pairs respectively accommodate the two courses of travel of the carrier B. Brace frame members 20 extend from the upright frame members 17 to the outer end portions of the channel irons 18 and 19; each pair of said channel irons being ar-

ranged in a horizontal plane and spaced apart, the plane of the channel irons 18 being above that of the channel irons 19. The upright frame members 17 support the said pairs of channel irons 18 and 19 intermediately of their end portions, which latter range in projection laterally of the top portion of the tower E. Each channel iron 19 and its superposed channel iron 18 is connected by cross braces 21 which maintain rigidity of structural formation; and one outer end portion of each of the channel irons 19 and of its spaced channel iron 18 are connected by a cross head 22 within both of which cross heads is journaled a shaft 23 upon which are mounted opposed sprocket wheels 24. The other ends of both pairs of channel irons 18 and 19 are connected by cross heads 25 within ways 26 formed in which are slidably mounted bearings 27 within which latter is journaled a shaft 28 carrying opposed sprocket wheels 29. The sprocket wheel 24 and the sprocket wheel 29 are therefore located adjacent to each pair of channel irons 18 and 19, and immediately inward thereof, the channel formations of both channel irons 18 and 19 being directed toward each other. Mounted upon or trained over each pair of sprocket wheels 24 and 29, is a sprocket chain or link belt 30; the upper course of each link belt is substantially in the same plane as the respective or adjacent channel iron 18; and the lower course of each link belt is substantially in the same plane as the respective or adjacent channel iron 19. A screw belt tightener 31 is applied to each of the bearings 27, whereby the link belts 30 may be separately acted upon to slacken or tauten the same.

Each of the vanes or sails A may consist of a closed sheet metal frame 32 of proper dimensions so as to be capable of accommodation in its movement with the carrier B, at its inner end portion between the members of the housings consisting of pairs of spaced channel irons 18 and 19. The inner end portion of each frame 32 is provided with spaced knuckles 33 which embrace, in each instance, a separate cross rod 34 which is connected with both link belts 30.

c designates operative connections between each vane or sail and both link belts and the housings 18, 18 and 19, 19; such operative connections including the cross rod 34 and two triangular end plates 35 carried at the opposite ends of the cross rod and each carrying an upper guide roller 36 and two spaced lower guide rollers 37 arranged to engage respectively with the opposed flanges of the channel irons 18 and 19, alternately. Each of the plates 35 is also provided with a lateral guide roller 38 which is arranged to engage with the web of the respective channel irons 18 or 19. Each end portion of each cross rod 34 is provided with a depending cheek 39 which is pivotally connected with one of the opposed link belts 30, as at 40; said points of pivotal connection at 40 being staggered transversely of the carrier B whereby each cross rod 34 ranges obliquely transversely of the carrier, as clearly shown in Fig. 3. Each of the connection means *a* consists of a flexible chain or cable 41 which is connected at one end with one of the cross rods 34, by an eye 42 thereon, and is connected at the other end with the next adjacent vane frame 32 substantially centrally thereof, as at 43. Each of the connection means *b* comprises a similar flexible chain or cable 44 which is connected at one end with one of the cross rods 34 at the end thereof opposite that which is provided with the eye 42, by an eye 45, and is connected at the other end, as at 46, substantially centrally of the frame 32 and at the side thereof opposite to that with which one of the chains 41 is connected. Each chain 44 is broken intermediate of its ends and a spring 47 is incorporated therein. The oblique range of the cross rods 34 transversely of the carrier B is such that the carrier and vanes will move in the directions indicated by the arrows in Figs. 1 and 3, the wind playing in the direction indicated by the arrow X adjacent to Fig. 3; and the chains 41 are connected with the rearward sides of the vanes, and the chains 44 with the forward sides of the vanes, with relation to the direction of travel of the vanes and the carrier.

F designates a wind-finder or holding vane for the rotating tower E and the carrier and vanes A mounted thereon; and said holding vane may comprise a closed sheet metal frame 48 depending from an arm 49 which is pivotally supported, as at 50 upon a bracket 51 fixed to one of the channel irons 18. The bracket 51 may be duplicated upon the respective lower channel iron 19, if desired, and a duplicate pivotal connection 50 and arm 49 provided in connection therewith, although this duplication is not shown in the drawings. The arm 49 is provided inwardly of the pivotal point 50 with a head 52 which coacts with a stop 53 upon the bracket 51, when the frame 48 is in rectangular projection from the channel irons 18 and 19 and laterally thereof, having when in such position of projection to dispose of the carrier B athwart of the path of the currents of air so that the wind can drive the staggered vane A. When it is desired to terminate the operation of the windmill, the vane frame 48 is swung out of operative position, which is that shown in the drawings, by a chain or cord 54 which is connected with the outer end of the vane frame and is turned around a pulley 55 upon the adjacent channel iron 18 extending thus, as shown in Fig. 1, to the lower

portion of the frame E. A contractile spring 56 extending from the bracket 51 to the outer end of the vane frame 48 normally maintains the vane frame in operative projecting position.

The power transmission D comprises a shaft 57 suitably journaled between the pairs of channel irons 18, 19 and 18, 19, and provided with spaced sprocket wheels 58 which respectively mesh with the link belts 30 in both the upper and lower courses thereof. At one end the shaft 57 is provided with a beveled gear 59 which meshes with a corresponding beveled gear 60 at the upper end of a vertical shaft 61 suitably journaled at its upper end in connection with one of the channel irons 19, and journaled at its lower end in a bracket 62 supported upon the annular T-iron 11. The lower end of the shaft 61 is provided with a beveled gear 63 which meshes with a corresponding beveled gear 64 fixed to a transverse shaft 65 journaled in the bracket 62 and in a box 66 mounted upon the T-iron 11 at a point opposite the bracket 62. A spider 67 extends across and within the annular angle iron 8; and centrally thereof a beveled gear 67 is mounted upon a short vertical shaft 68, meshing with a beveled gear 69 fixed to the transverse shaft 65 intermediate of the ends thereof. The other end of the short shaft 68 carries a beveled gear 70 which meshes with a beveled gear 71 upon one end of the power shaft C.

The operation, method of use and advantages of the improvements in air motors or windmills constituting the invention will be readily understood from the foregoing description taken in connection with the accompanying drawings and the following statement.

With the rotatable tower so disposed that the sides of the housings of the carrier B are presented to the wind, such position being maintained by the holding vane F, the currents of air impinge upon the rear surfaces of the vanes A, and cause the motion of the carrier in the directions indicated by the arrows. This motion of the carrier is converted into rotary motion of the power shaft C through the power transmission D. The power transmission D and the vanes and the carrier being all mounted upon the tower E which is provided with a turntable base consisting of the roller supported annular T-iron 11; all of said parts and features are free to turn and veer as required by varying directions of motion of the wind. As each vane A reaches the end of the upper course of travel of the carrier, it swings outwardly, as shown in Fig. 1, and takes up a depending position for its movement in connection with the lower course of the carrier, the vanes being alternately presented to the wind in upright and depending positions. The springs 47 in the chains or cables 44 constituting the connection means *b*, being in advance of their respective vanes, take the turns between the upper and lower courses of the carrier in advance of the vanes, which tends to lengthen said connection means. This tendency is permitted by the springs 47. The chains 41 constituting the connection means *a* effectively brace the vanes A, and impart the strain of the wind pressure to the carrier in the same manner as does the sheet rope of a sail. The particular mounting of the vanes upon the link belts 30 of the carrier insures positiveness of action of the parts and members, and the guide rollers 36, 37 and 38 reduce the friction between the ends of the cross rods 34 which carry the vanes and the housings consisting of the spaced pairs of spaced channel irons 18 and 19. These housings confine the carrier to a different course of travel, preventing lost motion and erratic play and movement of the vanes and carrier.

The entire windmill is designed to utilize air currents with high efficiency of power output at the power shaft C; and the organization and construction of the same is conducive to long life of the working parts which latter may be adjusted or removed for repair or replacement with facility.

I do not desire to be understood as limiting myself to the specific provision, construction, combination and relative arrangement of parts, members and features shown and described as embodying the invention; but reserve the right to vary the same in adapting the improvements to varying conditions of use, without departing from the spirit of the invention or the terms of the following claims.

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

1. In mechanism of the character described, a carrier, a plurality of vanes loosely mounted upon the carrier, and operative connections between the carrier and each of the vanes; each of said operative connections comprising a flexible connection and a spring.

2. In mechanism of the character described, a carrier, a vane loosely mounted upon the carrier, and a plurality of operative connections between the vane and the carrier; one of said operative connections being yielding and the other having a yielding portion.

3. In improvements of the character described, a base, an annular angle iron mounted upon the base, a plurality of channeled rollers mounted upon the angle iron, an annular T-iron turnably mounted upon the rollers, and a windmill tower mounted upon the T-iron.

4. In improvements of the character de-

scribed, a base, an annular angle iron mounted upon the base, channeled rollers mounted upon the angle iron, an annular T-iron movably mounted upon the rollers, guide rollers respectively bearing upon the T-iron at the side and the top thereof, and a windmill frame mounted upon the T-iron.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

OTTE E. SILL.

Witnesses:

FRED A. MANSFIELD,

B. F. FLETCHER.