(No Model.) 2 Sheets—Sheet 1.

L. BALLBACH.

WINDMILL.

No. 566,961. Patented Sept. 1, 1896.

Fig. 1.

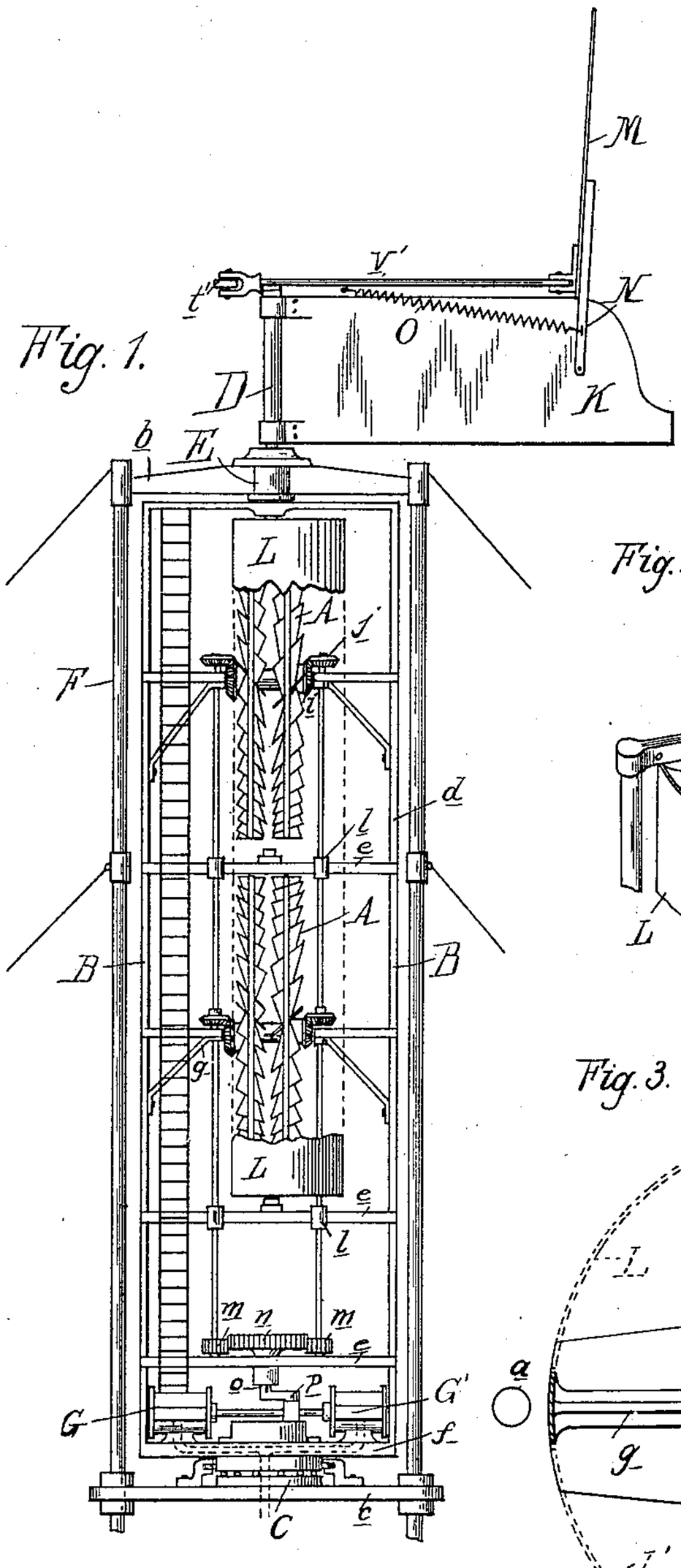


Fig. 2.

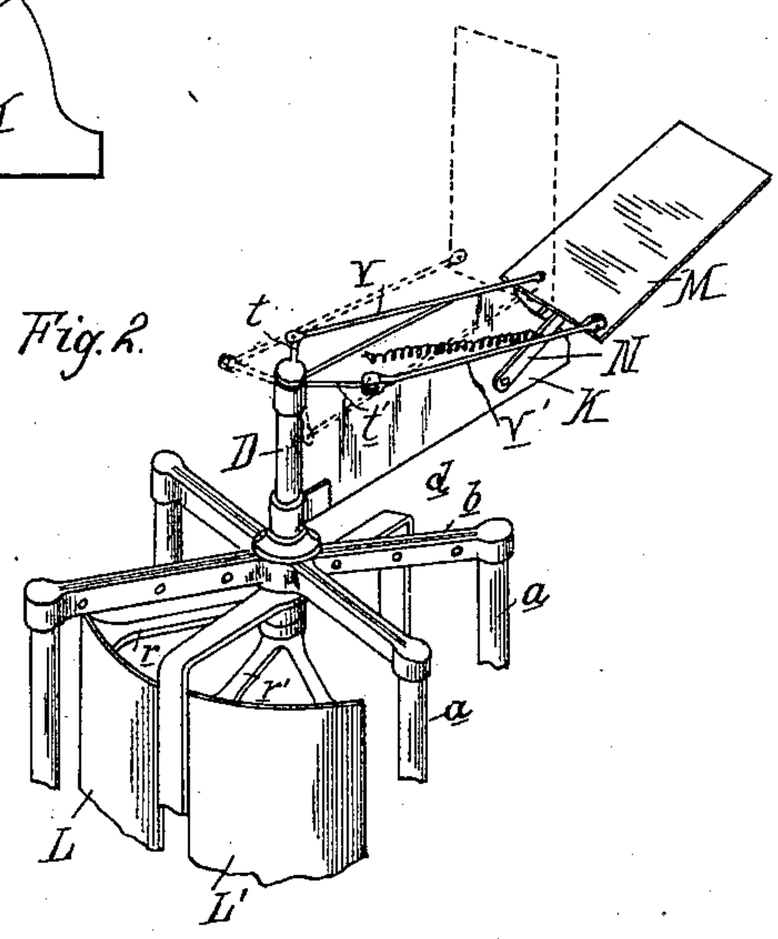
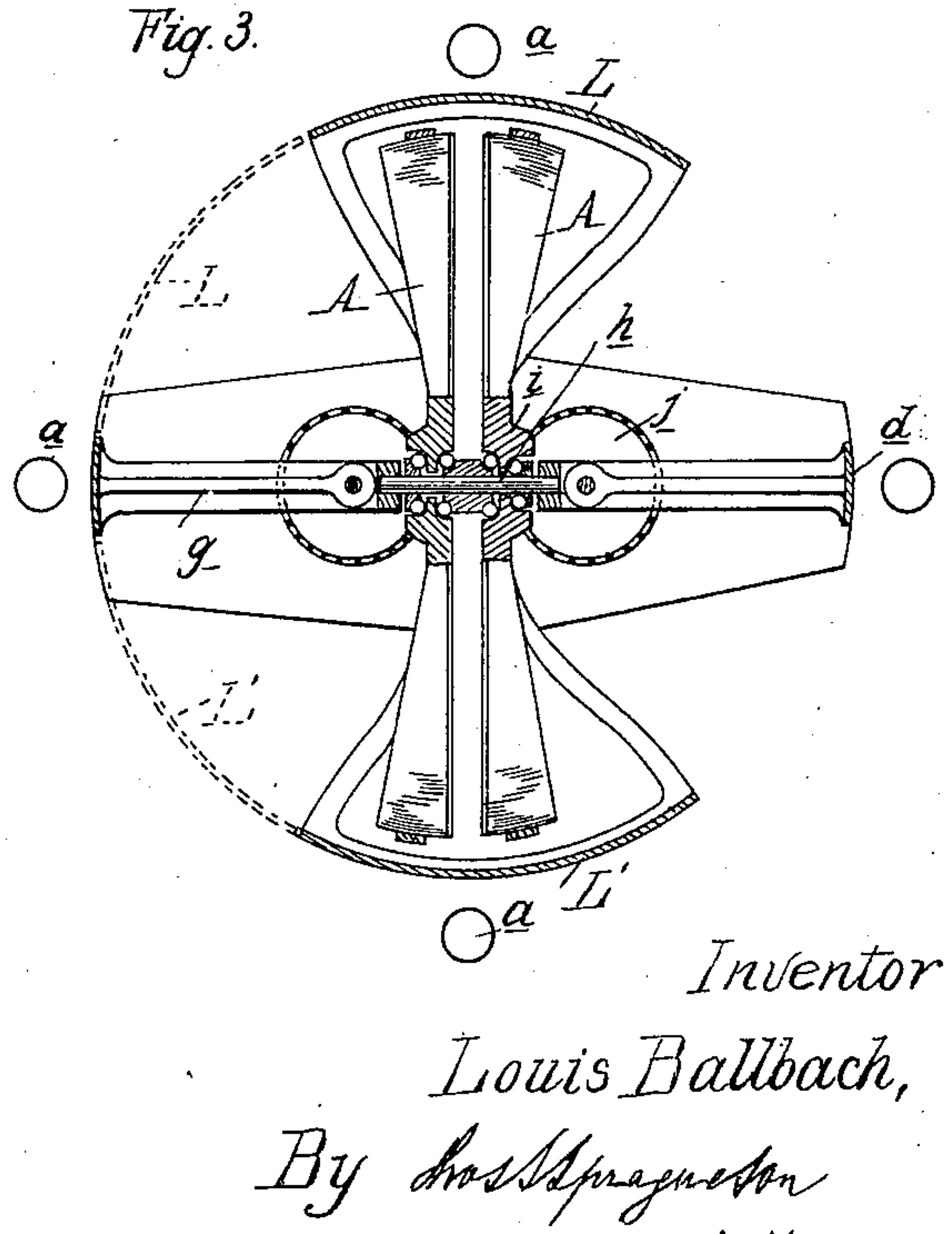


Fig. 3.



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(No Model.) 2 Sheets—Sheet 2.

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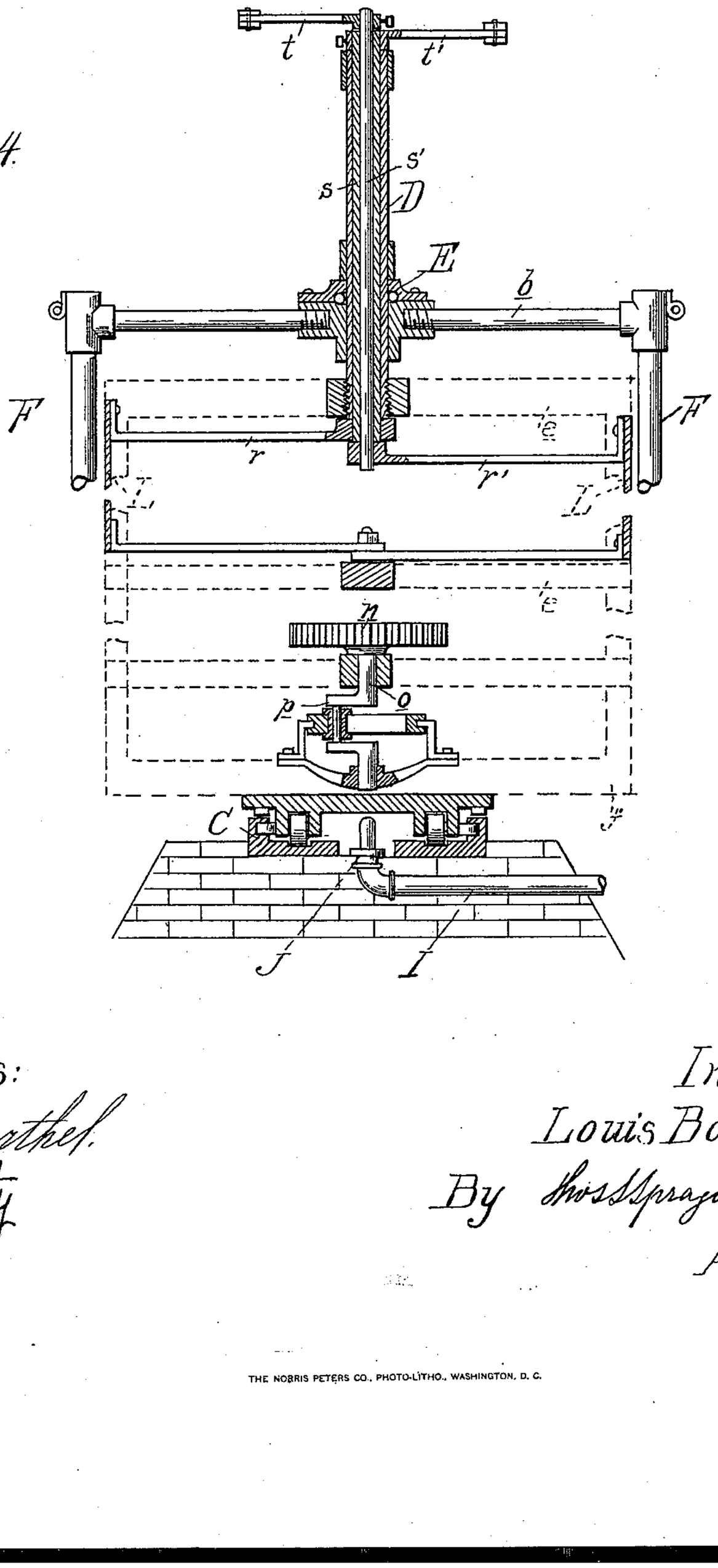
Fig. 4.



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UNITED STATES PATENT OFFICE.

LOUIS BALLBACH, OF DETROIT, MICHIGAN.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 566,961, dated September 1, 1896.

Application filed July 30, 1895. Serial No. 557,562. (No model.)

To all whom it may concern:

Be it known that I, LOUIS BALLBACH, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Windmills, of which the following is a specification, reference being had therein to the accompanying drawings.

The object of this invention is to combine in one mill the power of several wind-wheels; and to this end my invention consists in the particular arrangement and construction of a mill comprising any desired number of wheels arranged in pairs and in a manner which is safe and economical and capable of producing great power, all as more fully hereinafter set forth, and shown in the accompanying drawings, in which—

Figure 1 is a general elevation of a mill embodying my invention with the deflectors partly broken away. Fig. 2 is a perspective of the top portion of the mill, showing the rudder for keeping the wheels in the wind and the vane for operating the deflectors which cut off the wind from the wheels. Fig. 3 is a horizontal section through the axis of one pair of wind-wheels. Fig. 4 is a vertical central section on the axis of the revolving tower with parts broken out.

A are the wheels, arranged in pairs vertically above each other in a rotary tower B, which is supported at or near the ground upon a central antifriction step-bearing C of any suitable construction, and the upper end of which is provided with an upwardly-extending hollow spindle D, which passes through a vertical antifriction guide-bearing E, which latter is supported by the stationary outer tower F. The sole purpose of the outer tower is to hold the revolving tower in its vertical position against all the contingent pressures of the wind, and a skeleton structure of any kind may be used, as in the construction of the various kinds of windmill-towers, and if desired guy-ropes may be used for a tower of great height.

In the drawings, the outer tower is represented by four tubular iron posts *a a*, secured in the ground in any convenient way and connected at top by the spider-frame *b*, which holds the guide-bearing E in place. The step-bearing C, which supports the inner tower may either rest upon a separate foundation or be mounted upon a bed-plate *c*, secured to the corner-posts at the base of the outer tower.

The inner rotary tower is represented in the drawings by the two vertical uprights *d*, connected diametrically opposite each other on top and intermediately by the cross-girths *e* and by the bottom girth *f*, which latter forms a bed-plate for the air-compressing device, as hereinafter more fully described.

Between the cross-girths of the rotary tower are supported the wind-wheels A, which are arranged in pairs vertically above each other, the manner of securing them being alike for each pair, and is as follows: Suitable brackets *g* are secured to the uprights *d* of the rotary tower to form with their inner ends suitable supports for the fixed shaft *h*, upon which the wheels are journaled. These wheels A are of the type known as "solid" wheels, and the sails of each pair are inversely inclined, all so arranged that if one wheel is exposed to the wind the other wheel is directly behind it and is driven by the wind which passes through the first wheel in the opposite direction. As shown, the wheels are suitably journaled on antifriction ball-bearings. To the outer face of the hub of each wheel is secured a bevel gear-wheel *i*, which meshes with the horizontal bevel gear-wheels *j*, the latter being secured to vertical shafts *k*, which are journaled in vertical guide-bearings *l* in the cross-girths *e*, and are provided at their lower end with a pinion *m*. The two pinions *m* engage upon opposite sides of the central master-wheel *n*, which revolves the shaft *o*, provided with the crank *p*.

G G′ are two air-compressing cylinders mounted opposite each other upon the bed-plate *f* of the rotary tower, and the pistons of these air-compressing cylinders are geared with the crank *p* in any known manner to operate the air-compressing cylinders through the crank *p*.

I is a pipe through which the compressed air is conducted to the outside into any suitable tank (not shown) for storing. This pipe passes through the center of the step-bearing C, and is provided with a suitable rotary joint connection J between the fixed and movable portion. To the upper end of the spindle D

of the rotary tower is secured the rudder K, of suitable size to freely revolve the rotary tower by the force of the wind and thereby hold the front wheel of each pair of wheels directly into the path of the wind.

L L′ are two vertical wind-deflectors, preferably of segmental cylindrical shape, and extending the distance required to screen the wheels when placed in front thereof. To this end the deflectors L L′ are secured to radially-swinging arms *r r′*, pivotally supported in the axis of the rotary tower. The rotary arms *r r′* at the upper end of the deflectors are secured to the spindles *s s′*, which extend upward through the hollow spindle D, and are provided at the upper end with arms *t t′*, corresponding with the arms *r r′*. Near the rear end of the rudder K and astride the same is located a vane M, pivotally secured by means of an arm N to the rudder, all so arranged as to oppose the force of the wind to the tension of a pair of springs O, which tend to hold the vane in vertical position in the wind. The vane M is pivotally connected by means of links *v v′* with the arms *t t′*, respectively, all so arranged that the movement of the vane is communicated by means of the connection described to the deflectors L L′, and thereby cause them to turn in a circular path, the adjustment being such that by a wind of ordinary force the vane M remains upright or nearly so, and thereby through the connection hold the deflectors L L′ diametrically opposite each other near the rim of the wheels, as shown in Fig. 3, and thereby admitting the full force of the wind to the wheels. By the increased wind force, the vane M becoming depressed, the deflectors L L′ move into the path of the wind, thereby shutting off part of the wind and moving completely into the path of the wind when the wind becomes too strong, thereby deflecting the wind entirely from the wheels.

By using the power of the windmill in the manner described for compressing air and storing the same it is obvious that the compressed air thus obtained will at all times furnish a ready source of power, whether the wind is blowing or not, and can be used for raising water or for all other purposes for which power is required.

I do not want to limit myself to any specific device for storing or transmitting power, as it is obvious the wind-power may be used directly for driving machinery, if desired.

My device, as will be seen, is not limited in the amount of wheels which can be used, and thus great power may be obtained. At the same time the expedient of placing the wheels in pairs saves in the height of the structure and prevents creeping.

What I claim as my invention is—

1. In a windmill, the combination with a fixed outer supporting frame or tower, of a movable frame adapted to rotate in said tower, a vertical wind-wheel carried by said movable frame, a rudder carried by and adapted to rotate said movable frame a plurality of wind-deflectors carried by and adapted to move with the movable frame, a vane, and connections between said vane and the deflectors for automatically moving each of said deflectors, independently of the movement of the rudder, upon an abnormal condition of the wind, substantially as described.

2. In a windmill, the combination with a fixed frame or tower, of an inner rotating frame, a vertical wind-wheel carried by said rotating frame, a rudder carried by and adapted to turn the rotating frame to hold the wheel continuously into the wind, a pair of wind-deflectors pivotally mounted in said rotating frame, a pivotal vane carried by said rudder having its surface opposed to the wind, a spring for holding the vane in its normal position, and connections between each deflector and said vane whereby the deflectors are moved in front of the wind-wheel on an abnormal condition of the wind, substantially as described.

3. In a windmill, the combination of a fixed outer supporting-frame provided with the guide-bearing E, and the turn-table C, a rotary frame provided with a hollow spindle passing through the guide-bearing E, a wind-wheel carried by said rotary frame, a rudder mounted on said hollow spindle, a vane pivotally astride the rudder, deflectors provided with spindles passing through the hollow spindle, an arm on each of said spindles, links connecting each arm with the vane, and a spring between the rudder and the vane, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

LOUIS BALLBACH.

Witnesses:
O. F. BARTHEL,
M. B. O'DOGHERTY.