Sept. 14, 1926. 1,600,105

J. FONKIEWICZ

POWER GENERATING DEVICE

Original Filed July 12, 1923 3 Sheets-Sheet 1

FIG. 1.

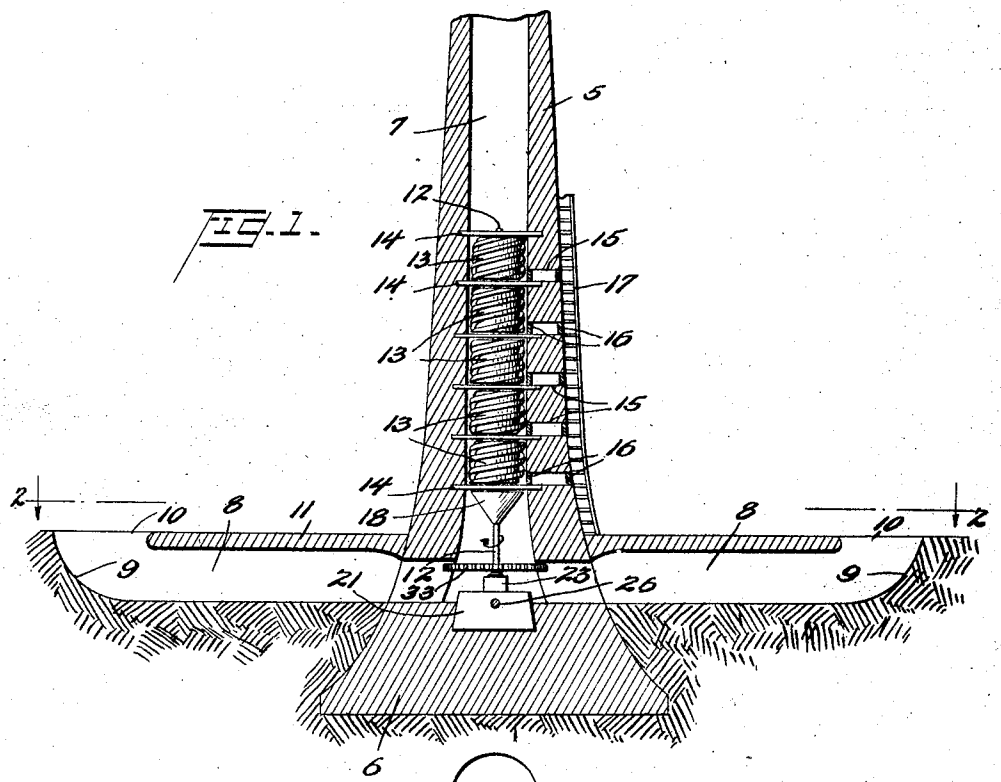
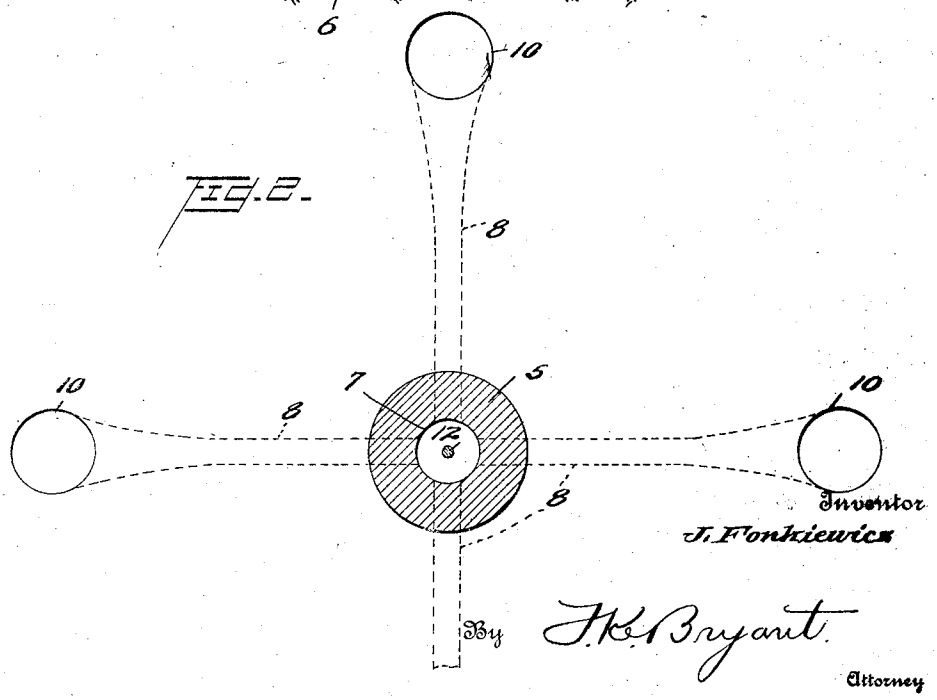


FIG. 2.



Inventor
J. Fonkiewicz

By J. K. Bryant.

Attorney

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J. FONKIEWICZ

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FIG. 3.

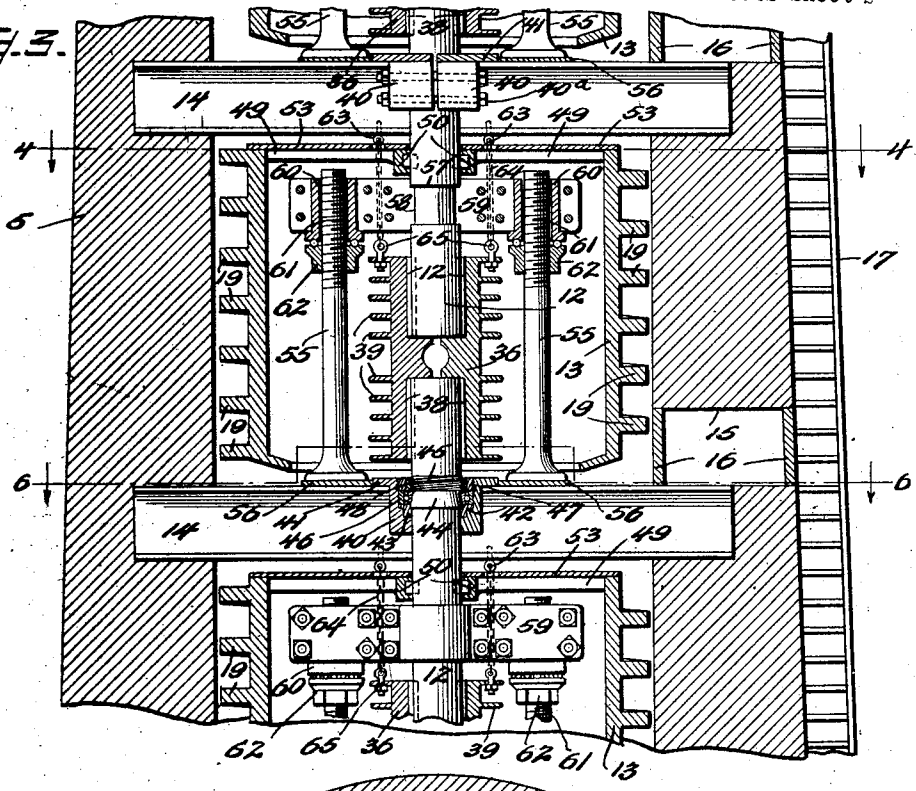
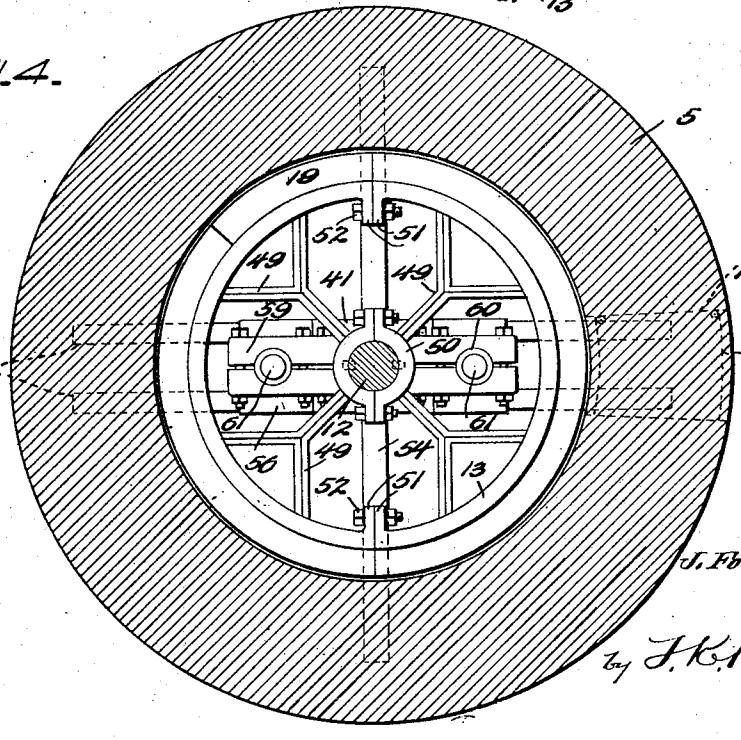


FIG. 4.



Inventor
J. Fonkiewicz
by F. K. Bryant,
Attorney

Sept. 14, 1926. 1,600,105

J. FONKIEWICZ

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FIG. 5.

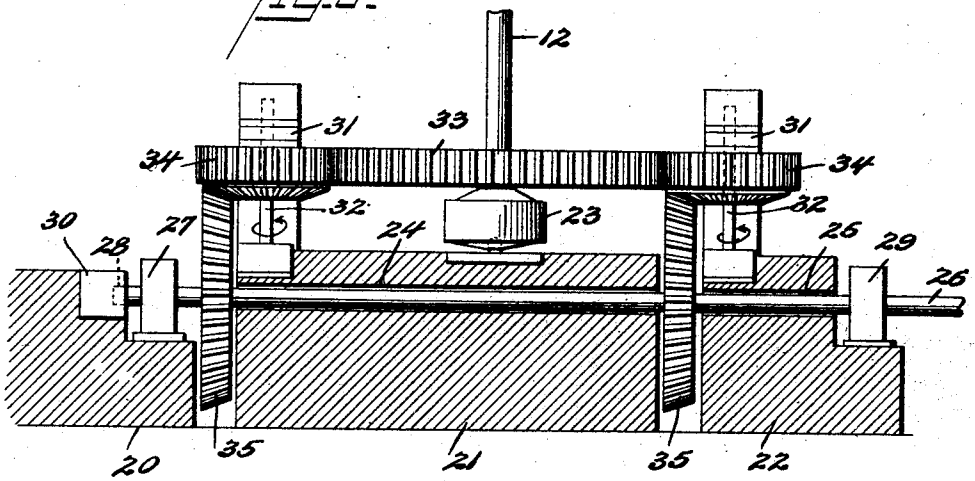
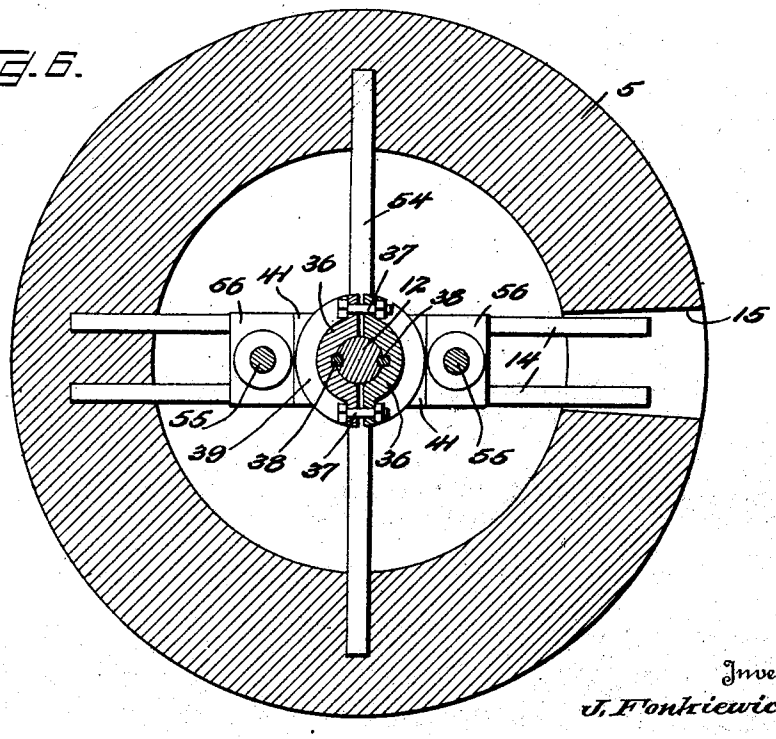


FIG. 6.



Inventor
J. Fonkiewicz

By H. G. Bryant

Attorney

Patented Sept. 14, 1926. 1,600,105

UNITED STATES PATENT OFFICE.

JOSEPH FONKIEWICZ, OF ASNIERES, FRANCE.

POWER-GENERATING DEVICE.

Application filed July 12, 1923, Serial No. 651,062. Renewed May 6, 1926.

This invention relates to new and useful improvements in power generators of the air propelled turbine type.

An important object of this invention is to provide means for making use of the old, well established principle of the upward draft of heated air through a hot stack, for the purpose of generating power.

A further object of the invention is to provide a novel form of turbine wheel and shaft with suitable anti-friction supporting means for the same.

A still further object of the invention is to provide suitable means for relieving the weight of the turbine wheel and shaft from their supporting means when repairs to the latter are necessary.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this specification and in which like numerals are employed to designate like parts throughout the same.

Figure 1 is a central vertical sectional view of the lower portion of a stack with a series of turbine wheels, shown in side elevation, positioned therewithin,

Figure 2 is a horizontal sectional view taken on line II—II of Fig. 1,

Figure 3 is a fragmentary vertical sectional view taken through a portion of the stack shown in Figs. 1 and 2 and shows in detail the supporting means employed for the vertical shaft sections, shown in elevation, and the turbine wheels with suitable means for removing the weight of the shaft sections and turbine wheels from the supporting means just referred to,

Figure 4 is a horizontal sectional view taken on line IV—IV of Fig. 3,

Figure 5 is a partly elevational view and partly sectional view of the lower portion of the vertical shaft and the train of gears employed for transmitting the rotary movement of the vertical shaft to the horizontal shaft positioned therebelow, and

Figure 6 is a horizontal sectional view taken on line VI—VI of Fig. 3.

Referring to the accompanying drawings, and particularly to Figs. 1 and 2, there is shown a vertical stack designated by the numeral 5 which is adapted for being constructed from any suitable material or elements, such as concrete, cement blocks, or bricks. The lower end 6 of this stack is flared as shown in Fig. 1 and is adapted for being embedded a suitable distance into the earth. The bore 7 of this stack communicates at its lower end with radially extending tunnels 8 which are curved upwardly at their outer ends 9 for the purpose of terminating in enlarged openings 10 formed in the ground, as shown. The slab or block 11 may be provided around the base of the stack 5 for the purpose of providing a more solid walk or platform around the same and for aiding in preventing any possible caving in of the upper walls or ceilings of the tunnels 8.

Vertically positioned within the bore 7 of the stack 5 is a shaft 12 which is adapted for having mounted thereon a series of inverted cup-shaped turbine wheels 13 as shown. Extending transversely across the bore 7 and embedded at their opposite ends within the construction of the stack 5 are a series of brace bars 14 that are provided for suitably supporting the vertical shaft 12. These brace bars 14 are also to be employed as skeleton working platforms for making repairs to the anti-friction supporting means employed as mountings for the vertical shaft 12 and for properly lubricating or cleaning the various elements constituting the device. For the purpose of gaining access to these various elements mounted within the bore 7, the stack 5 is provided with a series of transverse passages 15 having hingedly mounted doors 16 which are provided for closing the opposite ends of the said passages 15. Secured to the outer face of the stack 5 is a ladder 17 that is provided for allowing a person to reach the various elevations at which the passages 15 are located.

It is intended that suitable means be employed for heating the air within the lower portion of the bore 7 thereby causing the heated air to rise upwardly through the stack 5 for the purpose of causing rotary movement of the turbine wheels 13. Any desired form of heater may be employed and properly located to accomplish this purpose. This heating means does not form a specific feature of the invention and is, therefore, not illustrated, or described. For the purpose of directing the draft of heated air axially outwardly, a conically-shaped deflector 18 is secured to the shaft 12, as shown in Fig. 1. Each turbine wheel 13 is provided with a continuous spirally extending blade 19 which is formed upon the outer face of the

inverted cup-shaped wheel. It will be seen that a more direct application of this upwardly moving draft or current of air will be guided against the spirally arranged blades 19 by positioning the conically-shaped element 18 therebelow. For the purpose of controlling the speed of the shaft 12 or for entirely stopping its movement, when so desired, suitable valves or doors may be provided for regulating the inward flow of air through the openings 10 which supply air of atmospheric temperature to the tunnels 8.

Referring particularly to Figs. 1 and 5 there are shown mounting blocks 20, 21 and 22, the end blocks 20 and 22 being spaced from the ends of the central block 21. This central block 21 is provided for supporting the lower end of the vertical shaft 12 and is suitably connected thereto by means of the element 23 which is intended to be of suitable construction for providing an anti-friction support for the lower end of the said shaft 12. The specific construction of this supporting element 23 is not shown as any suitable mechanism may be employed and is not intended to form a material part of the invention. Extending through transverse openings or bores 24 and 25 formed in the blocks 21 and 22 respectively is a horizontal driven shaft 26 that is supported at one end by the journal bearing 27 and extending into a recess portion 28 of the end block 20 while the remaining end block 22 is provided with a journal bearing 29 for further supporting the said horizontal driven shaft 26. It is to be understood that the blocks 20, 21 and 22 may be formed from a suitable plastic material, such as concrete, and that the journal bearings 27 and 29 are formed from metal and attached to the blocks 20 and 22 in any desired manner. The recess 28 which receives one end of the shaft 26 is formed of a metallic insert 30 which is mounted in the end block 20. Metallic bracket members 31 are mounted in the blocks 21 and 22 for the purpose of supporting vertical stub shafts 32 as shown.

For the purpose of transmitting the rotary movement of the vertical shaft 12 to the horizontal shaft 26, a plane gear 33 is keyed to the shaft 12 and is constantly in mesh with a pair of compound pinion and bevel gears 34 which are arranged at diametrically opposite sides of the gear 33. Secured to the horizontal driven shaft 26 and occupying the spaces provided between the various blocks 20 to 22 inclusive are a pair of beveled gears 35 which are constantly in mesh with the bevel portion of the compound gears 34.

Referring particularly to Fig. 3, it will be seen that the vertical shaft 12 is divided into a plurality of sections with the adjacent spaced ends of these sections connected by means of the two-part coupler 36 which are shown in cross-section in Fig. 6. The two-parts of each coupler 36 are secured in position around the ends of the shaft sections 12 by means of the bolts 37 and are further secured to these shaft ends by means of the keys 38 which occupy longitudinal grooves formed in both the shaft ends and coupler sections. For the purpose of forming coupler elements of light construction and yet with sufficient strength to perform the work required of the same, circumferentially extending arcuate fins 39 are formed on the outer faces of these coupler sections. For the purpose of providing supporting bearings for this vertical shaft, two-part cup-shaped clamping elements 40 are employed and are retained in their assembled positions by means of the bolts 40a. Each of these inverted cup-shaped members are provided with laterally extending flanges 41 that are adapted for resting upon the top surfaces of the transverse brace rods 14. Each of these sections forming the bearing supports are provided with annular shoulders 42 that are adapted for supporting the split ring 43, as best shown in Fig. 3. The shaft sections are each provided with a conical ring 44 which is secured thereto by any suitable means, such as being shrunk thereupon, and are adapted for being positioned within annular recesses formed by the ring sections 43. The shaft sections 12 are further provided with externally threaded portions 45 that are adapted for being employed in a manner presently to be described. Positioned within the cavity formed in one of the cup-shaped bearing members 40 is a two ring anti-friction bearing member 46 that is provided with a beveled surface upon the inner face of the inner ring which is adapted for engaging the conical ring 44 secured to the shaft section 12. Suitable ball bearings are positioned between the two rings of this bearing member 46. Threadedly connected to the upper edge of the two-part bearing support 40 is a ring 47 which is adapted for retaining the outer ring of the bearing member 46 in position against the ring 43. Threadedly engaging the threads 45 formed on the shaft section 12 is a ring 48 which is adapted for forcing downwardly upon the inner ring of the anti-friction bearing 46 for the purpose of tightly wedging the same upon the conical surface of the ring 44. In view of this structure, it must be considered that the shaft sections 12 each have rigidly associated therewith a ring 44, an inner ring of one of the bearings 46, and a ring 48. In other words, these various elements move with each of the shaft sections. The split rings 43 aid in supporting the vertical shaft by having the lower face of the ring 44 and the lower face of the inner ring of the bearing 46 in engagement therewith. It will be seen by this construction, that the shaft sec-

tions 12 will be properly supported for preventing downward longitudinal movement of the same and for allowing free rotary movement thereof.

The inverted cup-shaped turbine wheels 13 are formed integrally at their upper ends with the web formations 49 that are provided with a split hub section 50 which is suitably keyed to one of the shaft sections 12, as shown in Figs. 3 and 4. By inspecting Fig. 4, it will be seen that each inverted cup-shaped turbine wheel is formed in two parts and is provided with inwardly directed lugs 51 that are adapted for receiving the clamping bolts 52 for the purpose of connecting these two parts together to form a rigid construction. Suitably secured to the upper edge of the two sections forming the inverted cup-shaped turbine wheel 13 are a pair of plate members 53 that are adapted for resting upon the web formations 49 for substantially closing the upper end of the sections forming the turbine wheel 13. By closely inspecting Fig. 4, it will be seen that a transverse bracing rod 54 is provided for coacting with the transverse brace rods 14 and extends at right angles to the same with its opposite ends embedded in the wall of the stack 5.

For the purpose of elevating the shaft sections constituting the vertical shaft 12 to allow the renewal or repairing of the various elements employed for constituting the anti-friction supports for these shaft sections, a pair of screw jack elements 55 are mounted at their lower ends upon plates 56 adapted for bridging the space between the transverse brace rods 14, as shown in Figs. 3, 4 and 6. Located in proximity to the lower end of each shaft section, is an annular groove 57 that is formed in the said shaft sections and is adapted for being engaged by an annular rib 58 formed by the split clamping bars 59. The opposite ends of these clamping bars 59 are suitably recessed for providing vertically extending pockets adapted for receiving the one piece sleeve elements 60 which are provided for loosely encircling the upper threaded ends 61 of the jacks 55, as best shown in Fig. 3. Threadedly engaging the ends 61 of the jacks 55 are collars 62 that are adapted for engaging the lower ends of the sleeves 60 for the purpose of raising upwardly upon the clamping bars 59 when the said collars 62 are rotated in the proper direction. Suitable ball races and ball bearings are interposed between the ends of the sleeves 60 and collars 62 for allowing relative movement between the same.

When it is desired to move the section of shafting shown in the upper portion of Fig. 3 upwardly to relieve the weight from the two part coupler 36, the clamping bars 59 are tightened upon this shaft section for causing the annular rib 58 to occupy the annular groove 57 formed in the said section. Then the collars 62 are properly rotated for causing them to travel upwardly upon the threaded ends 61 of the jacks 55. When the collars 62 have been rotated sufficiently for causing the clamping bars 59 to properly bear the weight of the upper shaft section, the bolts 37 employed for clamping the sections together that form the coupler 36 are loosened slightly for allowing a slight lateral play between the said sections forming the coupler 36. The eye-bolts 63 carried by the upper ends of the chain sections 64 are then threaded into suitable openings formed in the transverse brace rods 14 and the eye-bolts 65 carried by the lower ends of these chain sections are connected to the upper ends of the coupler sections 36 for the purpose of supporting the weight of the same. The clamping bolts 37 may then be further loosened for allowing the sections forming the coupler 36 to be moved laterally to be entirely disengaged from the ends of the shaft sections 12. The movement of these coupler parts will then provide space for allowing the next lower section of the shaft 12 to be elevated in the same manner as just described in connection with the upper section. This upward movement of the next lower shaft section will elevate the various elements employed for constituting the anti-friction support for the said shaft so that the same will be moved upwardly out of transverse alinement with the supporting bars 14. The clamping bolts 40^a may then be loosened for allowing the cup-shaped casing elements 47 to be separated for allowing access to the various elements positioned therewithin. It is believed that the return of these shaft sections, coupler parts, and supporting elements to their normal positions will be understood from the detail description just completed. It is, further, to be understood that when the turbine wheels 13 and vertical shaft 12 are operating for driving the horizontal shaft 26 that the clamping bars 59 are suitably removed from the sections forming the shaft 12 for allowing relative movement between the same, the said clamping bars 59 and jacks 55 only being employed when the vertical shaft 12 is not in operation.

It is thought that the operation of this air propelled generator will be understood from the above detail description, and that the mode of assembling the various elements employed for constituting the same will also be understood. No further explanation of the same is, therefore, deemed necessary.

It is to be understood that the form of this invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in

the shape, size, and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described the invention, I claim:—

1. In a power generator of the class described, a stack having a bore, a plurality of transverse brace rods positioned in said bore arranged in spaced pairs with their ends connected to said stack, an anti-friction support mounted upon each pair of brace rods, a series of shaft sections journaled in said anti-friction supports connected at their adjacent ends to form a continuous shaft, a turbine wheel keyed to each shaft section interposed between adjacent pairs of brace rods, a horizontal shaft journaled at the base of said stack, means for operatively connecting said shafts, and means mounted upon each pair of brace rods and adapted to be connected to each shaft section for raising the same off its corresponding anti-friction support to allow the latter to be replaced or repaired.

2. In a power generator of the class described, a tubular, vertical stack, a vertical shaft positioned within said stack, a plurality of spaced supporting members positioned within the bore of said stack, anti-friction connections between said shaft and the supporting members, and means carried by each of said supporting members for raising said shaft vertically to permit the said anti-friction connecting members to be repaired.

3. In a power generator of the class described, a tubular, vertical stack, a sectional, vertical shaft positioned within said stack, a support carried by said stack for each section of said shaft, an inverted cup-shaped turbine wheel carried by each shaft section, and means carried by each of said supports and positioned within said inverted cup-shaped turbine wheels for elevating said shaft sections to permit alterations to be made to said generator.

4. In a power generator of the class described, a hollow stack, a plurality of transversely extending brace rods positioned within the bore of said stack, said brace rods being arranged in spaced pairs, an anti-friction shaft support removably carried by each pair of brace rods, a vertical, sectional shaft positioned within said stack bore with each section of said shaft journaled, intermediate its ends, in one of said anti-fricton supports, an inverted cup-shaped turbine wheel keyed to each shaft section below the respective supports, and means carried by each pair of brace rods and adapted to be removably connected to one of said shaft sections for elevating the latter to permit the anti-friction shaft support to be repaired.

5. In a power generator of the class described, a hollow stack, a plurality of transversely extending brace rods positioned within the bore of said stack, said brace rods being arranged in spaced pairs, an anti-friction shaft support removably carried by each pair of brace rods, a vertical, sectional shaft positioned within said stack bore with each section of said shaft journaled in one of said anti-friction supports, an inverted cup-shaped turbine wheel keyed to each shaft section below the respective supports, a pair of jacks carried by each pair of brace rods, and means carried by each pair of jacks and adapted to be removably connected to one of said shaft sections for elevating the latter to permit the anti-friction shaft supports to be repaired.

6. In a power generator of the class described, a hollow stack, a plurality of transversely extending brace rods positioned within the bore of said stack, said brace rods being arranged in spaced pairs, an anti-friction shaft support removably carried by each pair of brace rods, a vertical, sectional shaft positioned within said stack bore with each section of said shaft journaled, intermediate its ends, in one of said anti-friction supports, an inverted cup-shaped turbine wheel keyed to each shaft section below its respective support, a pair of jacks carried by each pair of brace rods, and a pair of clamping plates carried by each pair of jacks and adapted to be removably connected to one of said shaft sections for elevating the latter to permit the anti-friction shaft support to be repaired.

7. In a power generator of the class described, a hollow stack, a plurality of brace rods positioned within the bore of said stack and arranged in spaced pairs, an anti-friction shaft support carried by each pair of brace rods, a vertical shaft journaled in said anti-friction support, said shaft consisting of a plurality of sections and split couplers adapted to connect the adjacent ends of said shaft sections, means carried by said pairs of brace rods for elevating the shaft sections for permitting repairs to be made thereto, and means carried by said brace rods and adapted to be removably connected to the split coupler parts for supporting the same while detached from said shaft sections.

In testimony whereof I affix my signature.

JOSEPH FONKIEWICZ.