No. 764,920. PATENTED JULY 12, 1904.

J. W. CURRIE.

WINDMILL.

APPLICATION FILED JAN. 16, 1904.

NO MODEL. 5 SHEETS—SHEET 1.

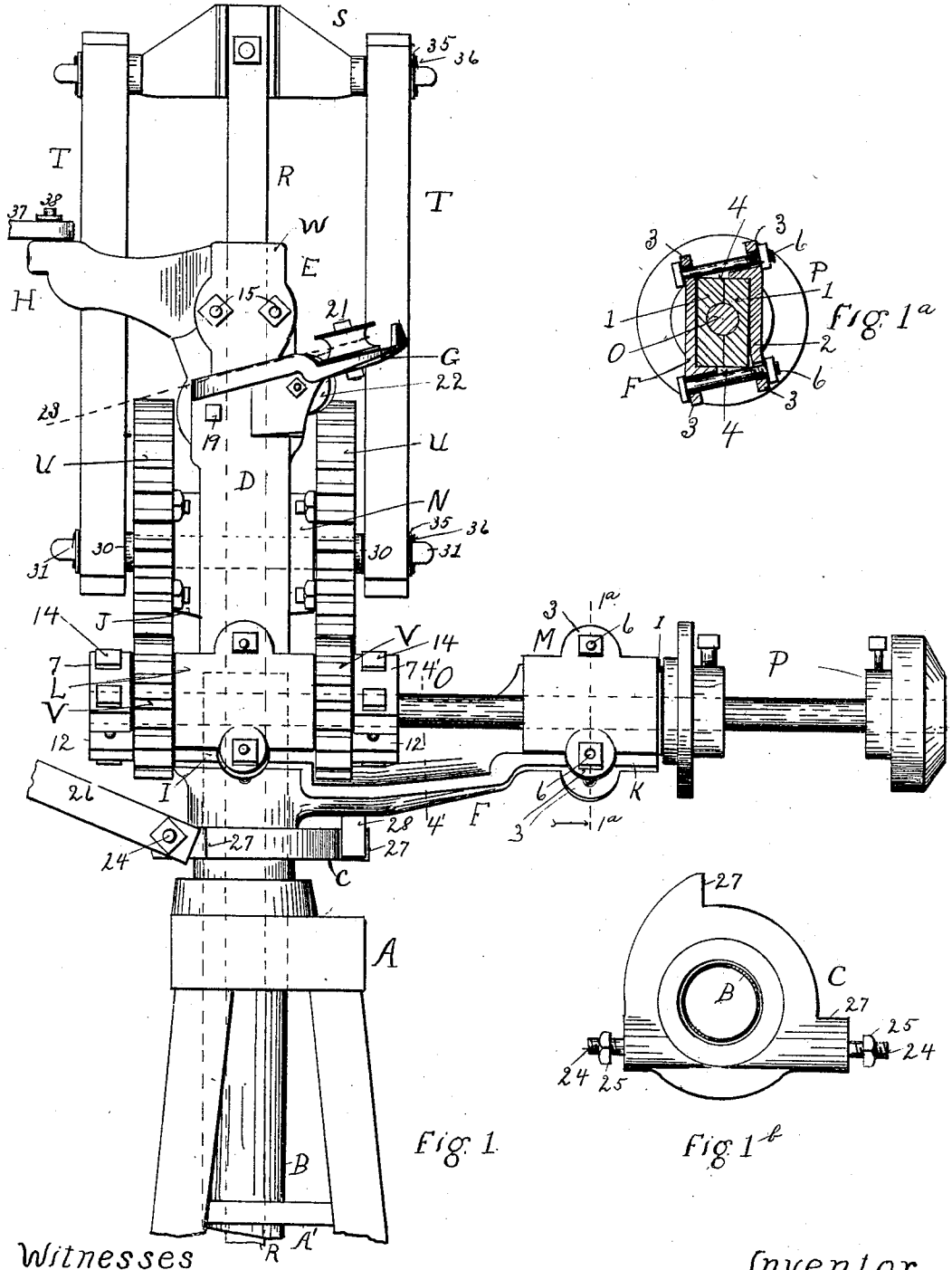

Fig. 1.

Fig. 1a

Fig. 1b

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NO MODEL. 5 SHEETS—SHEET 2.

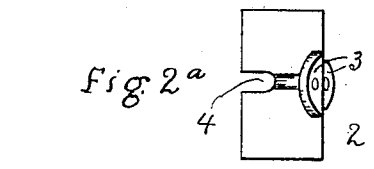

Fig. 2a

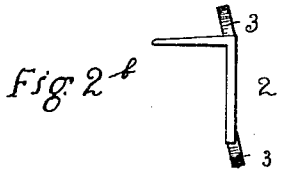

Fig. 2b

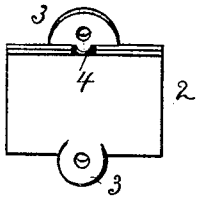

Fig. 2c

Fig. 2

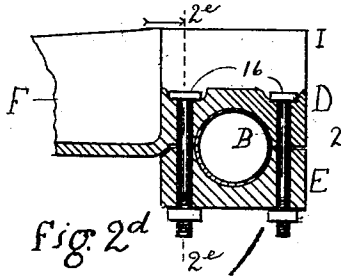

Fig. 2d

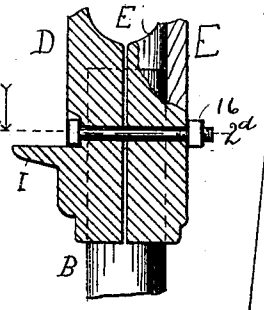

Fig. 2e

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No. 764,920. PATENTED JULY 12, 1904.

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APPLICATION FILED JAN. 16, 1904.

NO MODEL. 5 SHEETS—SHEET 3.

Fig. 3

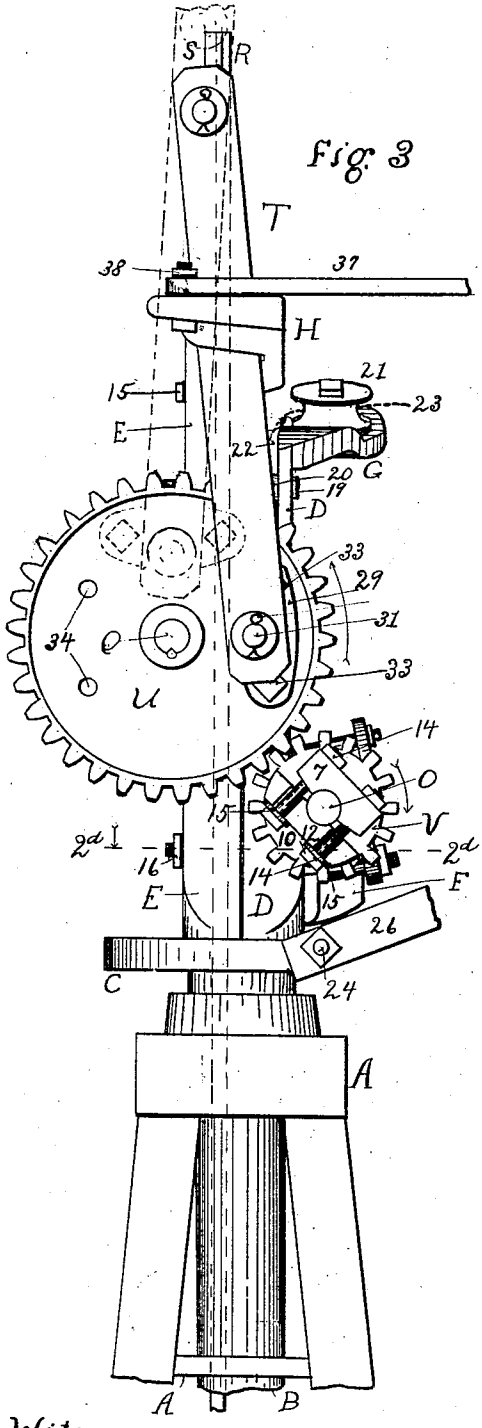
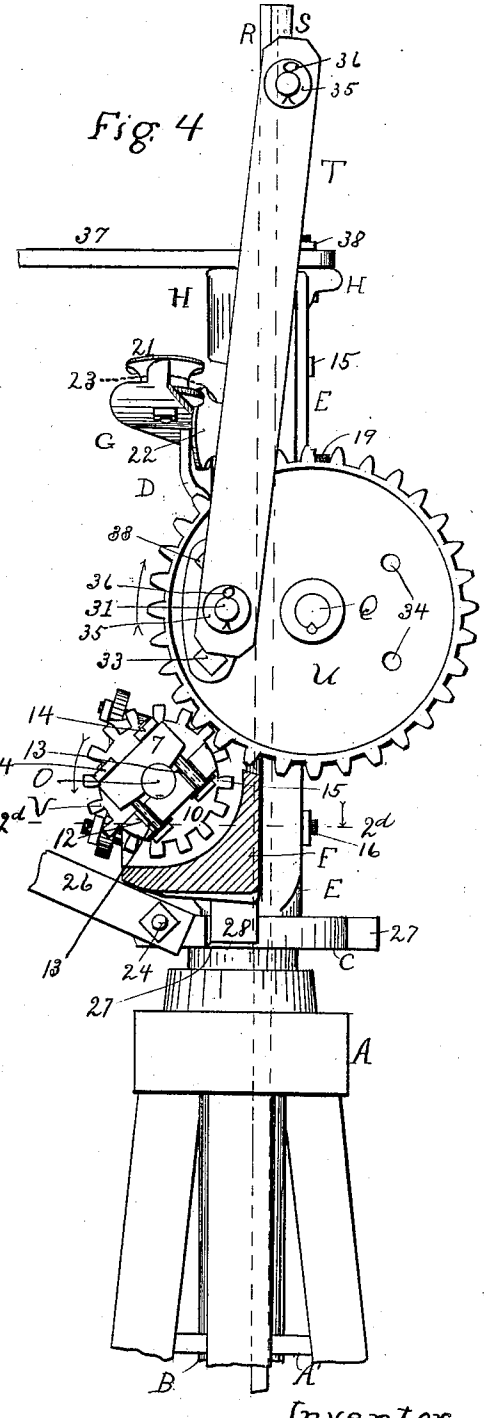


Fig. 4



Witnesses
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NO MODEL. 5 SHEETS—SHEET 4.

Fig. 5

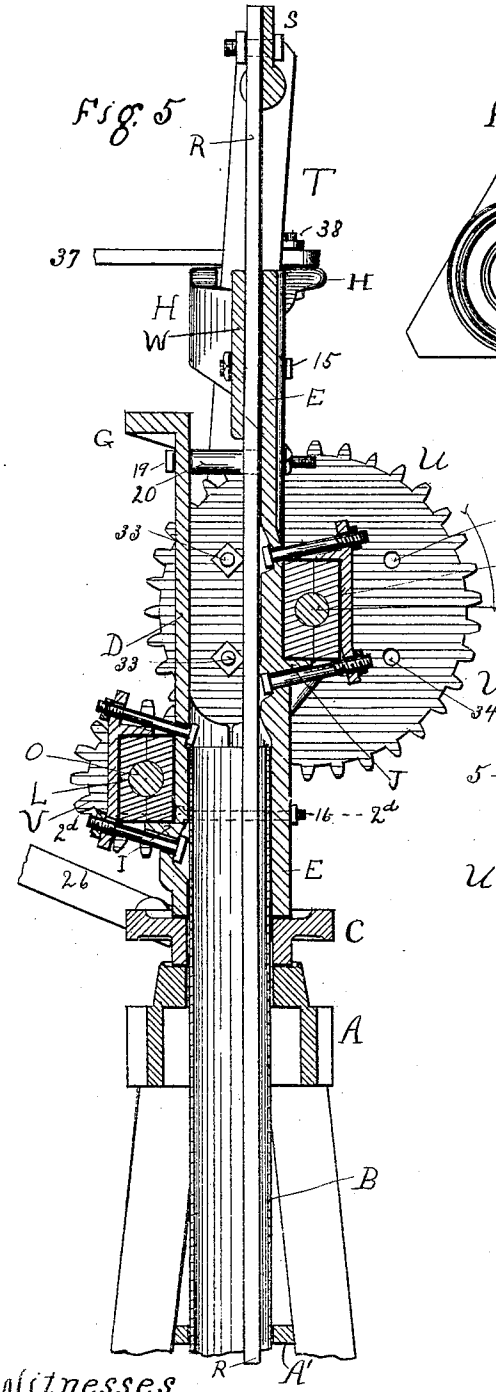

Fig. 7

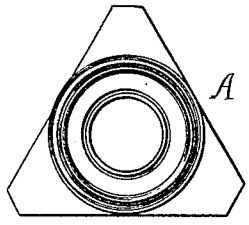

Fig. 6

Witnesses

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APPLICATION FILED JAN. 16, 1904.

NO MODEL. 5 SHEETS—SHEET 5.

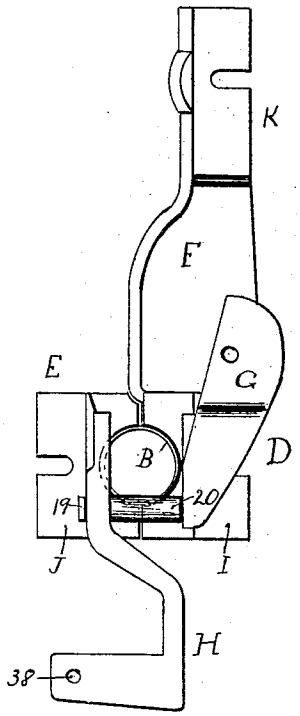

Fig. 8

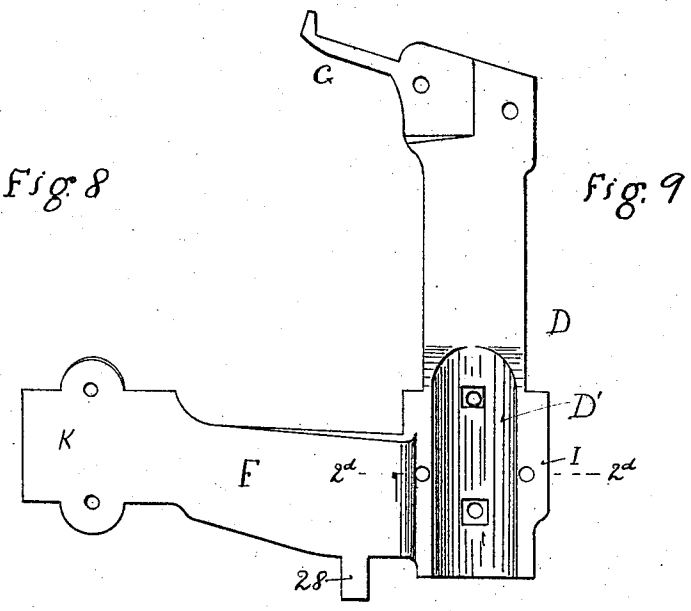

Fig. 9

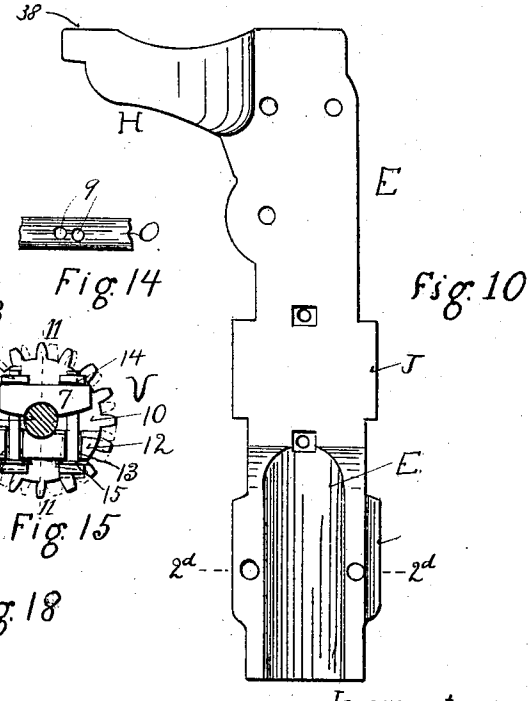

Fig. 10

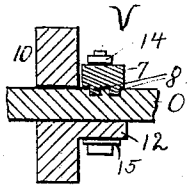

Fig. 11

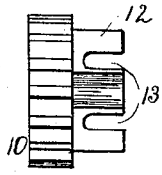

Fig. 12

Fig. 13

Fig. 14

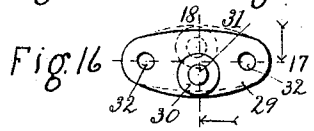

Fig. 16

Fig. 15

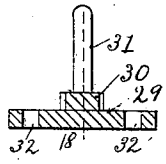

Fig. 17

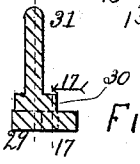

Fig. 18

Witnesses

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No. 764,920. Patented July 12, 1904.

UNITED STATES PATENT OFFICE.

JOHN W. CURRIE, OF TOPEKA, KANSAS, ASSIGNOR OF ONE-THIRD TO MARK A. CURRIE, OF TOPEKA, KANSAS.

WINDMILL.

SPECIFICATION forming part of Letters Patent No. 764,920, dated July 12, 1904.

Application filed January 16, 1904. Serial No. 189,291. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. CURRIE, a citizen of the United States of America, residing at Topeka, in the county of Shawnee and State of Kansas, have invented new and useful Improvements in Windmills, of which the following is a specification.

The invention relates to the windmill-head and associated parts, with special reference to the details comprising the head-frame castings, the gear construction, the vane-hinge, the bearings for the shaft, the adjustable key for securing the pinions to the shaft, and the wrist-pin. Although some of the features are essentially limited to the ordinary type of windmill having the vertical solid wheel, yet it will be seen from the following explanations that other features may also be used in other types and in conjunction with other forms and arrangements than those herein shown.

General objects of the invention are to simplify the construction rather than to introduce additional elements, to make the parts interchangeable, detachable, and adjustable to as great an extent as possible, so as to reduce the cost of and simplify the manufacture, and so as to make it possible for the ordinary user or dealer to readily and easily set the mill up himself with such tools, such as a wrench, as are to be found about the store, farm, or home, and to adjust the various parts, as well as to make it possible for him to replace any worn out or broken parts.

Further objects are to provide a windmill in which all the shafts and pintles have simple and efficient oil-boiled wood bearings, so as to avoid the necessity of frequently lubricating the same, and to avoid the disastrous consequences resulting ordinarily from the failure to lubricate, and to arrange the elements comprising the head, so that all the shafts will be quite evenly balanced in their bearings.

Further objects are to simplify the head-frame castings and the manner of securing the same to the gas-pipe, to provide an adjustable key whereby the double pinions may be quickly and easily attached to and detached from the shaft, and whereby they may be brought into perfect alinement with each other, this being essential in order that the double pitmen may operate in perfect accord and without binding or jerking.

A further object is to arrange the gears, pitmen, and plunger-rod, so as to avoid the necessity of the ordinary walking-beam, rocker-arm, or like element, and at the same time avoid the ordinary torsional strain and any appreciable side strain on the plunger-rod—in other words, to obtain a direct lift on said plunger-rod without the use of the walking-beam or corresponding element, and without any torsional or appreciable side strain on the plunger-rod, and yet retaining the windmill-shaft and gears at the base of the head, so as to avoid the "top-heaviness" which results from placing the said shaft and gears in the upper portion of the head and high above the turn-table.

Further objects are to provide a new, simple, and efficient vane-hinge which is operated without the use of springs or guy or stay ropes, to provide interchangeable oil-boiled wood bearings and boxing therefor, and to provide a simple and efficient means for adjusting the length of the stroke of the plunger-rod.

To these ends the invention consists of the combinations, arrangements, and dispositions of the parts, the preferred form of the embodiment whereof is set forth and claimed herein and is illustrated in the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a side elevation of the head of the windmill constructed in accordance with the invention. Only a portion of the tower, only the hub of the wind-wheel, and only the vane-arms and supporting-truss of the vane are shown. It will be readily understood that I do not claim any particular form of wheel or of tower, or other mounting or of vane, and as these parts are well known in the art and are not claimed herein it is not deemed necessary to illustrate them further than as indicated in the drawings. Fig. 1ª is a vertical cross-section of the new form of boxing for the shaft-bearings, applied to the shaft and bearings and taken through the line 1ª 1ª,

Fig. 1. Fig. 1^b is a plan view of the collar, comprising the lower vane-hinge, with a section of the gas-pipe about which it revolves. Fig. 2 is an elevation of the head taken from the opposite side. Figs. 2^a, 2^b, and 2^c are respectively top, end, and side views of the box-cap. Figs. 2^d and 2^e are intended to exhibit the manner of clamping the gas-pipe between the two head-frame castings and are respectively a horizontal cross-section taken through the line 2^d 2^d, Figs. 2^e,3,4,5,9, and 10, and a vertical section taken through the line 2^e 2^e, Fig. 2^d. In both views portions not involved in the clamping feature are broken away or removed. Fig. 3 is an end elevation showing the rear of the head. Fig. 4 is a front view thereof, the wind-wheel shaft and supporting-arm being shown in section as through the line 4 4, Figs. 1 and 2. Fig. 5 is a central vertical section of the windmill-head and parts taken through the line 5 5, Figs. 2 and 6. Fig. 6 is a top or plan view of the windmill-head. Fig. 7 is a top or plan view of the top tower-casting. Fig. 8 is a top or plan view showing the form and manner of securing together the gas-pipe and two head frame-castings and showing said parts stripped of all other parts. Figs. 9 and 10 are inside elevation views, respectively, of the two head-frame castings. Figs. 11, 12, 13, 14, and 15 relate to the key for adjustably and detachably securing the pinion to its shaft, Fig. 11 being a longitudinal vertical section taken through the line 11 11, Fig. 15; Fig. 12, a top view of the pinion; Fig. 13, a view of the inside face of the key-block; Fig. 14, a view of the shaft with the holes drilled therein for securing the pinion thereto by means of the key, and Fig. 15 an end elevation of the various parts assembled, the shaft being in section. Figs. 16, 17, and 18 are details of the adjustable wrist-pin, Fig. 16 being a top or plan view thereof, Figs. 17 and 18 being sectional views, respectively, through the line 17 17, Figs. 16 and 18, and through the line 18 18, Figs. 16 and 17.

The vane is shown as turned with the wind, so as to throw the wind-wheel broadside to the air-current to cause it to be operated thereby, in Figs. 1 and 6. It is shown as turned against the wind, or at right angles to the wind-wheel shaft or parallel to the face of the wheel, so as to bring the wheel out of operation, in Figs. 2, 3, 4, and 5.

Like reference letters and numerals indicate like or corresponding parts throughout the several views.

The tower may be of any kind, or the windmill may otherwise suitably mounted.

The collar C, comprising the lower vane-hinge, as will be hereinafter described, is rotatably supported on the top tower-casting A, and the windmill-head proper as a whole is supported on the collar C. The head-frame is composed of the two castings D and E, the lower portions of each of which are semicylindrical, as indicated at D′ and E′, Figs. 9 and 10, respectively, so as to be adapted together to embrace the gas-pipe B. At the top of the casting D is the sheave-supporting bracket G, and at its base is the wind-wheel-shaft supporting-arm F, while at the top of the casting E is the bracket or arm H, to which the supporting-truss 37 of the vane is pivoted at 38 to form the upper vane-hinge, as will also be more fully described hereinafter. Extending laterally from the side of the casting D and at the base thereof is the bracket I, which is intended to support one of the bearings for the wind-wheel shaft, and extending from the other casting, E, a little higher up is the bracket J, which is intended to support the bearings for the shaft for the double gears. The two castings are clamped around the gas-pipe and secured firmly thereto by the bolts 16 16, one on each side of the gas-pipe, while to hold the upper portion of the castings firmly and immovably and properably separated the little piece of gas-pipe 20 and bolt 19 are used as a separator. The gas-pipe extends down through the collar C, top tower-casting A, and brace-plate A′ and forms the usual tubular extension of the head, through which the plunger-rod and controlling wire or chain may operate and which serves to hold the head rotatably in erect position.

In relation to the simple and efficient boxing for the wood bearings, the two pieces 1 1 of the wood bearings preferably oil-boiled, are supported on a bracket which supports the side and bottom of one of the members and the bottom of the other member. This bracket may be either one of the brackets K, I, or J. The box-cap 2 is similar to the bracket in its relation to the wood bearings, the bracket and cap embracing opposite sides thereof. In other words, the bracket and cap are alike, except that the cap is the removable member, while the bracket is formed as part of the head-frame casting. The two box members may be provided with lugs 3 3 3 3, and the bolts 6 6 serve to secure the parts together, the bracket and cap being grooved and recessed, 4 4, to accommodate the bolts and bring all the parts into compact engagement. The bolts 6 6 are diagonally disposed, so as to prevent not only the bearings from pulling apart, but also to prevent "chucking" up and down. Also by diagonally-disposed bolts it is easy to closely fit the bearings to the shaft. There are three such bearings L, M, and N. They are all alike, by reason whereof the parts for any one will be suitable for any other, making it a simple matter to replace worn-out or broken parts.

P is the wind-wheel hub, keyed or otherwise suitably secured to the wind-wheel shaft O, which has two bearings, one, M, at the outer end of the supporting-arm F on the bracket

K, and one, L, at the base of the casting on the bracket I, above described. The shaft is set a little to one side of the middle of the head, the object being to form thereby an automatic regulator. This type of automatic regulator, however, is not now claimed broadly by me, it being well known in the art. The pinions V V are keyed to the shaft O, preferably by the detachable keys hereinafter to be described, one pinion on each side of the bearing L, gas-pipe, and middle of the head, and they mesh, respectively, with the double gears U U, which are similarly mounted on each side of the bearing N, gas-pipe, and middle of the head, and on the opposite side thereof from the wind-wheel shaft. These gears are keyed to the shaft Q, which is journaled in suitable bearings N in bracket J, between the double gears. This shaft Q must not be located at the middle of the head, but at one side of the middle. The plunger-rod R extends, reciprocatingly, as usual, up through the gas-pipe and middle of the head and above it, where it is bolted to the crosstree S, the opposite ends of which are formed into pintles, to which the pitmen T T, respectively, are attached. The lower ends of the pitmen are connected, respectively, to the wrist-pins, secured to the gears. The plunger-rod may be guided by the guide-block W, bolted, 15 15, to the casting E. It will be observed by reference to Figs. 3, 4, and 5 that by mounting the shaft Q of the double gears at one side of the middle of the head, so as to bring the wrist-pins during their upward stroke into approximate vertical alinement with the crosstree S the pitmen T T are in approximate vertical position when lifting the plunger. In other words, by this arrangement of the shaft Q gears and pitmen, and plunger-rod a direct lift of the plunger-rod is obtained, whereas if the shaft Q were in the middle of the head and in vertical alinement with the crosstree S no direct lift of the plunger-rod would be obtained at any point, and the shaft Q would interfere with the plunger-rod, necessitating the placing of the shafts and gears at the top of the head, causing top-heaviness thereof, making it impracticable. Furthermore, by this arrangement we are enabled to connect the double gears by a shaft journaled between the gears, so as to balance the strain on the gearings, shaft, and gears, which is much easier on all the parts mentioned than where each gear is separately mounted on an unbalanced shaft. Furthermore, there is absolutely no torsional strain on the plunger-rod or any of the parts nor any appreciable side strain. I am aware that there are other mills having a single upwardly-extending pitmen and eccentrically-disposed gear-shaft, but in these there is a torsional strain; and I am also aware that there may be other double-geared windmills, but in these the gears, shafts, and other parts are located at the top of the head and high above the turn-table, making them top-heavy and impracticable, or else the gears are separately mounted on "unbalanced" shafts, causing great wear on the parts and also causing the objectionable torsional strain or else necessitating the use of the walking-beam or like intermediate mechanism by reason of the interference of the parts and the torsional strain. I am not aware, however, of the existence of any windmill in which all the objectionable features just enumerated have been removed, although I am fully aware of the great desire to remove all of them. In other words, I am not aware of any windmill having the eccentrically-disposed double gears and shaft operating the plunger-rod with a direct-connected double pitman having an approximately vertical upward stroke wherein there is no torsional strain and no appreciable side strain on the plunger-rod and other parts and where the shafts and gears are located at the base of the head to avoid top-heaviness and where no walking-beam or like intermediate mechanism is used.

The adjustable key for securing the pinions to the shaft is illustrated in detail in Figs. 11, 12, 13, 14, and 15. The block 8 is adapted to engage one side of the shaft O or of any other shaft and has lugs 8 8, which fit into the corresponding recesses or holes 9 9, drilled in the shaft. There may be one or more of these recesses or holes and lugs, and they may be of any desirable size and shape, their object being to key the block firmly and positively (as distinguishable from frictionally) to the shaft when the block is held thereto in the manner about to be described. The pinion 10 has a lateral extension 12, which is slotted, as shown at 13 13. These slots correspond to the bolt-holes in the block, so that a bolt may pass from the block to the extension on each side of the shaft, as clearly shown in Fig. 15. A washer 15 is applied on each bolt between the extension-surface and the nut or bolt-head to form a suitable bearing over the slot. The slots are of sufficient width to allow a little play to the bolts. The holes are first drilled in the shaft at the desired place and the block 8 is applied thereto, so that the lugs engage the corresponding recesses, and held there. The pinion may then be brought adjacent to the block and the bolts slipped through the holes and slots and tightened. It is understood that the pinion is adapted to fit loosely on the shaft. Now whatever form of lugs or recesses are used in keying a pinion to a shaft it is well known that with such machinery as is ordinarily used in forming these lugs and recesses it is impossible to get all the holes or lugs on the same shaft in perfect alinement, and it is also true that in a double-geared windmill of the kind illustrated herein or operated by double pitmen attached to the double gears it is absolutely essential that the pitmen operate in perfect harmony, so that

the stroke is exactly the same as made by both pitmen, and consequently it is as essential that the pinions be in perfect alinement as to their teeth; but, as heretofore stated, this rarely results in actual practice from the ordinary method and means for keying the pinion to the shaft. With the present adjustable and detachable key the pinions may be brought into alinement by loosening one of the bolts and tightening the other until the pinion is deflected on the shaft sufficiently, when both bolts may be drawn down evenly and tightly to secure all the elements together. Another advantage and feature of this key is that the pinion may be readily attached to and detached from the shaft, as is desirable in the case of shipping and as is necessary in case of repairing or replacing the pinion or the shaft or other of the associated parts by the use of an ordinary wrench, such as may be found around any store, farm, or home, or other place where a windmill would be erected, whereas with the ordinary key other and special tools are necessary for the assembling of the shaft, pinion, and key, while it is almost impossible for the ordinary farmer or other person not a mechanic and not supplied with a number of special and uncommon tools to detach the pinion from the shaft, especially after it has become worn or rusted. Thus if one of the teeth on the pinion is broken the user of the ordinary key must take down shaft and all, while with the present invention he may quickly remove the pinion by loosening the bolts and slipping the pinion from the shaft. It may be as easily and readily replaced.

The wrist-pin (illustrated in Figs. 16, 17, and 18) consists of the base 29, having the bolt-holes 32 32, the shoulder 30, and the pintle 31, said pintle being out of alinement with the bolt-holes. Corresponding bolt-holes 34 34 are cored or drilled in the web of the gear, and the wrist-pin as a whole is secured to the gear by the bolts 33 33. The length of stroke may be adjusted by reversing the wrist-pin—that is, by attaching it to the web, with the pintle near the shaft or the periphery, as may be desired, so that each pair of bolt-holes in the web permits two adjustments of the length of stroke—and there may be as many pairs of bolt-holes in the web as may be wanted, although for ordinary purposes not more than two pairs would be required, as illustrated in the drawings.

Referring now to the vane-hinges, from each side of the collar C extends a lug, rod, or bolt 24 24, to each of which is secured one of the lower vane-arms 26 26 by means of the nut 25 25. Pendent from the wind-wheel-shaft-supporting arm F is the lug 28, adapted to engage the shoulders 27 27 on the collar C. These shoulders are approximately ninety degrees apart, so as to permit the head-frame and collar to turn not more than ninety degrees with relation to each other. The vane-supporting truss 37 is pivoted to the arm H at 38, and this pivotal point is out of vertical alinement with the center of the collar C, so that the weight of the vane tends to hold it at right angles to the wind-wheel and parallel to the wind-wheel shaft, it being prevented from turning beyond this point by the lug 28 and one shoulder 27, while the other shoulder 27, in conjunction with the lug 28, prevents the vane and wheel from coming entirely together, but holds them about parallel. The wheel and vane tend to come parallel either when the wind is strong, in the usual manner of such automatic regulators, or when drawn together by the wire, chain, or cord 23, which passes over the sheaves 21 22 and thence down through the gas-pipe to the ground, where it may be controlled by hand. It will be understood that by arranging the vane-hinges in the manner shown and providing the lug and shoulders I do away with the ordinary springs heretofore used in like automatic regulators or throw-offs and also do away with guy or stay ropes and the like. While the windmill-head as a whole, including the collar, is free to rotate upon the top tower-casting, according to the direction of the wind, the collar and head-frame rotate only ninety degrees with relation to each other, and they are so limited without the use of springs or guy or stay ropes or the like.

The pitmen T T are preferably of wood, oil-boiled, and are secured to the crosstree and wrist-pins by means of the washers 35 35 and spring-cotters 36 36.

What I claim is—

1. In windmills, the combination with the gas-pipe forming the tubular extension for pivoting the head to the tower, of the two head-frame castings adapted to embrace the pipe and extending upwardly to form supporting-brackets, and the bolts at the base and the separator in the upper portion of said head-frame to hold said pipe and castings firmly and rigidly together.

2. In windmills, the combination of the gas-pipe forming the tubular extension for pivoting the head to the top of the tower; the two head-frame castings each having a bearing-supporting bracket and whose bases embrace the upper end of the gas-pipe, and extending upwardly therefrom, one of said castings having at the base the wind-wheel-shaft-supporting arm provided at its outer end with a bearing-supporting bracket, and at the top a sheave-supporting bracket, and the other casting having at the top a laterally-extending arm to which the vane-supporting truss may be pivoted to form the upper vane-hinge; and the bolts at the base and the separator at the top for clamping the castings around the gas-pipe and holding said parts immovably together.

3. In windmills, the combination with the block adapted to engage one side of the shaft

and having lugs to engage corresponding recesses in the shaft; of the pinion adapted to be loosely mounted on the shaft adjacent to the block; and a bolt on each side of the shaft engaging the block and the pinion, whereby the shaft and the pinion may be rigidly, adjustably, and detachably secured together.

4. In windmills, the combination with the block adapted to engage one side of the shaft and having lugs to engage corresponding recesses in the shaft, of the pinion adapted to be loosely mounted on the shaft adjacent to the block and having an extension on the opposite side of the shaft, and the bolts on opposite sides of the shaft connecting the block and the extension, whereby the pinion may be rigidly, adjustably, and detachably keyed to the shaft, substantially as set forth.

5. In windmills, a device to adjust the length of stroke of the plunger-rod, consisting of the combination of the gear; the pitman; and the wrist-pin for connecting the gear and pitman and comprising the base bolted to the gear by two bolts, and the pintle out of alinement with said bolts.

6. In windmills, the combination with the top tower-casting and the brace-plate suitably mounted; of the collar rotatably supported on the top tower-casting and comprising the lower vane-hinge; the head-frame rotatably supported on the collar, having the gas-pipe extending rotatably through the collar, top tower-casting and brace-plate, having at the base the wind-wheel-shaft-supporting arm and at the top the sheave-supporting bracket and the laterally-extending arm to which the vane-supporting truss is pivoted to form the upper vane-hinge; the vane having the supporting truss and arms hinged as set forth, said hinges being out of perpendicular alinement so as to cause the vane to return to its normal position by gravity, and the means for throwing the vane away from its normal position, with lugs to limit the rotation of the head upon the collar to approximately one-fourth of a revolution; the wind-wheel shaft having the double pinions detachably and adjustably secured thereto; the double gears meshing with said double pinions respectively; the plunger-rod reciprocatingly extending through the gas-pipe, and the crosstree secured to the top thereof; the double pitmen adjustably connecting the gears and crosstree, the crosstree being above the gears; the shaft to which the gears are keyed at opposite sides respectively of its journal-bearings; the said two shafts being journaled on wood bearings in the head near the base thereof and at opposite sides respectively of the middle thereof; all substantially as set forth.

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

JOHN W. CURRIE.

Witnesses:
JOSEPH GROLL,
Z. T. FISHER.