

(No Model.)

3 Sheets—Sheet 1.

T. O. PERRY.
DEVICE FOR COMPRESSING AIR.

No. 498,989.

Patented June 6, 1893.

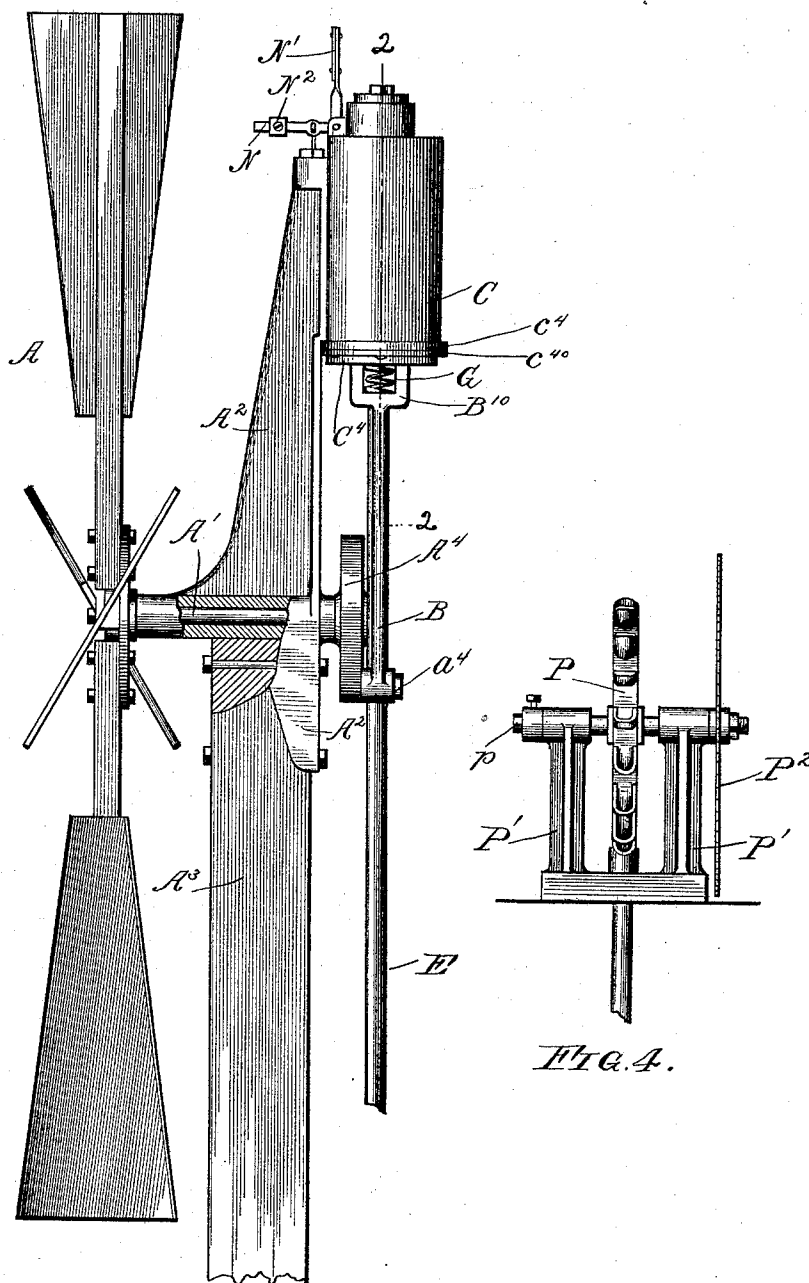


FIG. 4.

FIG. 1.

WITNESSES.
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Thos. O. Perry
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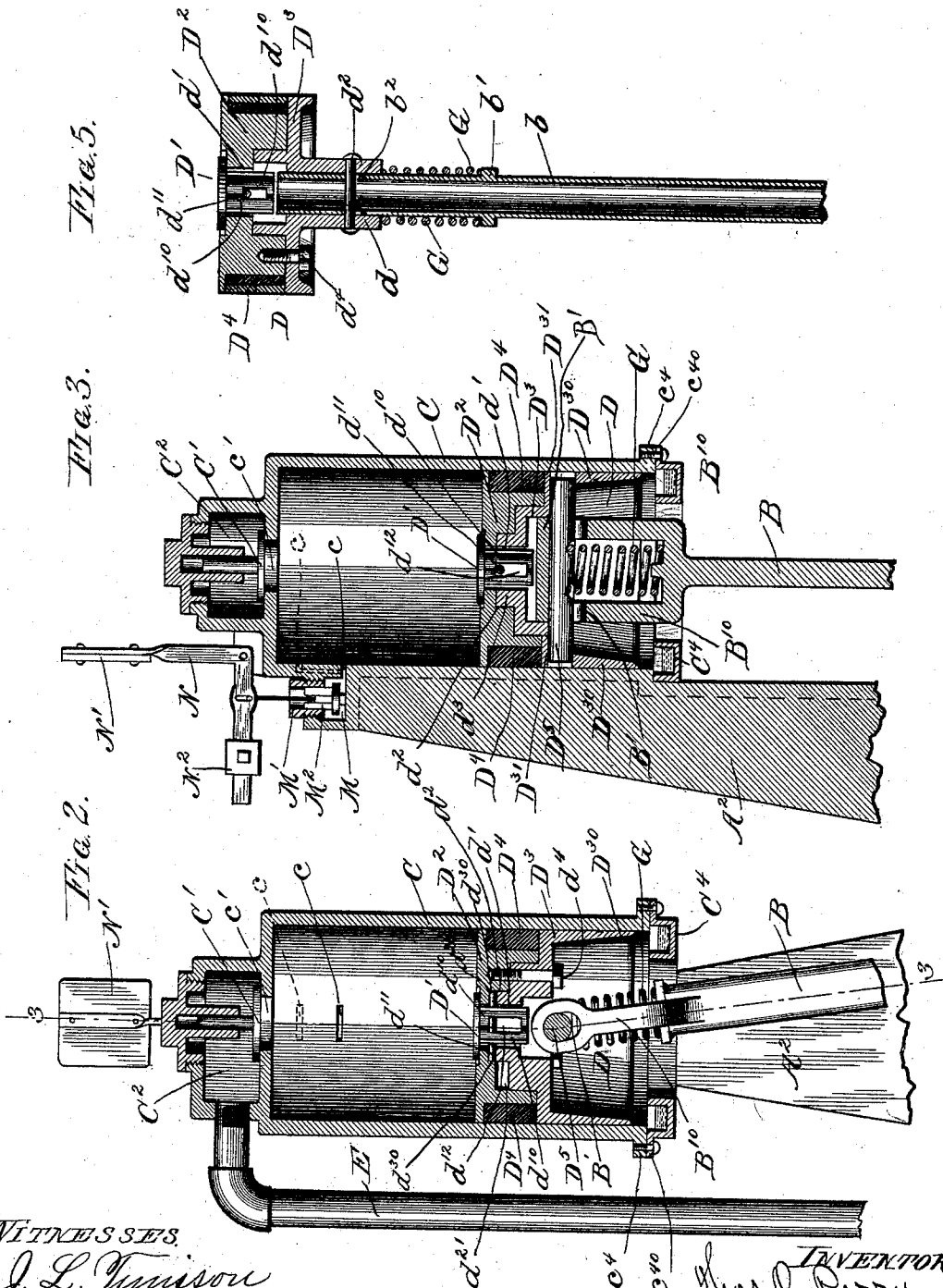
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WITNESSES

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INVENTOR

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(No Model.)

3 Sheets—Sheet 3.

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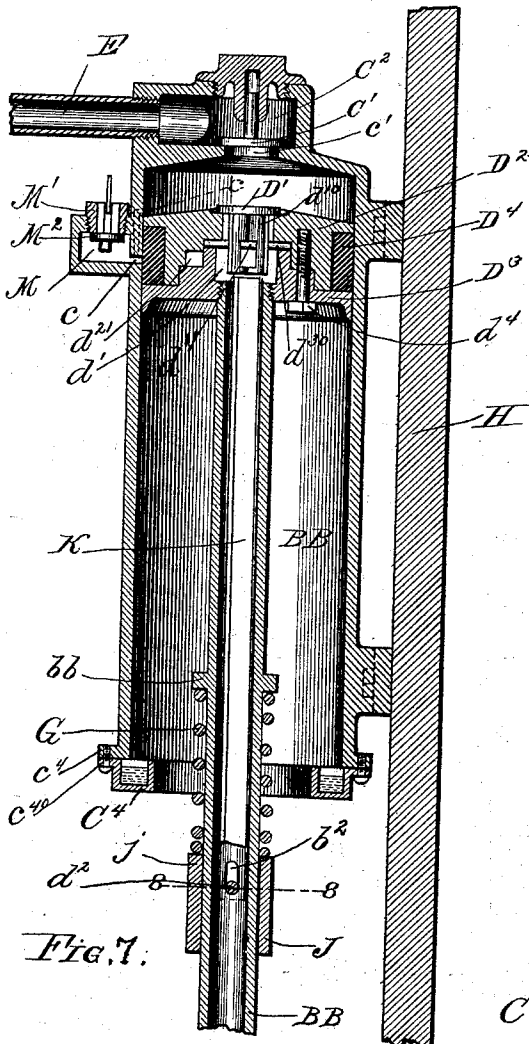


Fig. 7.

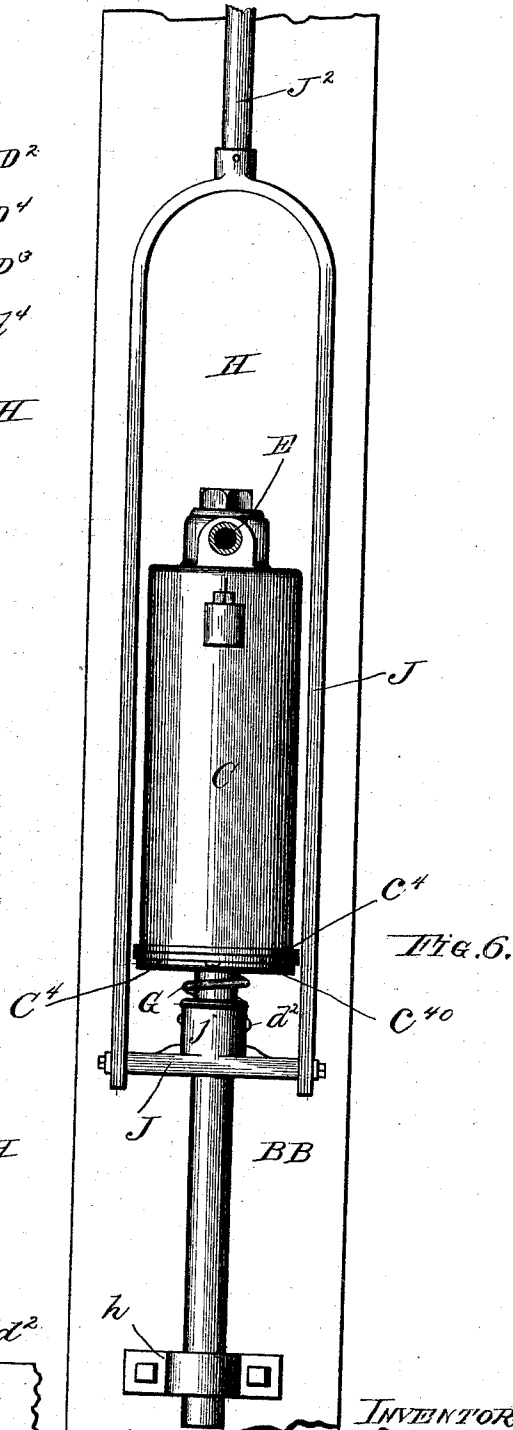


Fig. 6.

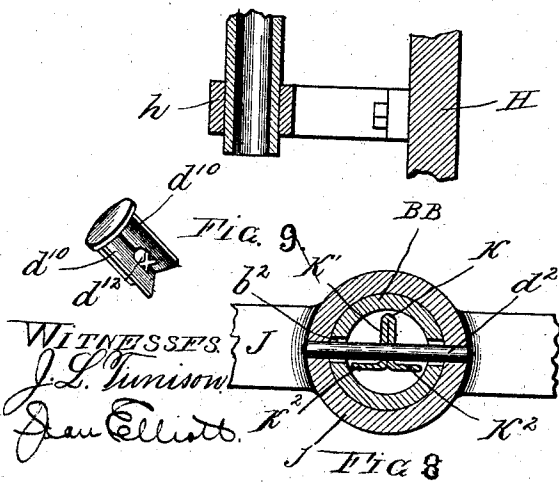


Fig. 9

Fig. 8

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UNITED STATES PATENT OFFICE

THOMAS O. PERRY, OF CHICAGO, ILLINOIS.

DEVICE FOR COMPRESSING AIR.

SPECIFICATION forming part of Letters Patent No. 498,989, dated June 6, 1893.

Application filed September 5, 1891. Serial No. 404,853. (No model.)

To all whom it may concern:

Be it known that I, THOMAS O. PERRY, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Devices for Compressing Air, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part hereof.

The principal or central feature of this invention relates to air-compressing mechanism, and this may be used by being operated by a windmill or any other suitable motor; but, specifically, it is adapted to and is most useful in connection with a windmill, and its connection therewith constitutes a specific feature of my invention.

In the drawings, Figure 1 is a sectional side elevation of a windmill having my said invention connected therewith. Fig. 2 is an enlarged section of the air compressor at the line 2 2 on Fig. 1. Fig. 3 is an enlarged section of the same at the line 3 3 on Fig. 2. Fig. 4 is a detail edge elevation of the wheel designed to be operated by the air blast. Fig. 5 is a detail section of a portion of the air compressor piston and operating connection, thus illustrating a modified form of the devices in the connections for preventing over pressure. Fig. 6 is a side elevation of the compressor of a form which may be used at a distance from the windmill or other source of power, and showing, therefore, a different form of connection to its piston rod from that in the other figures, wherein the compressor is mounted on the windmill frame. Fig. 7 is an axial section through the compressor shown in Fig. 6. Fig. 8 is a section at the line 8—8 on Fig. 7. Fig. 9 is a detail perspective of a special form of piston intake valve which I employ.

A represents conventionally a windmill, of which A' is the shaft, which is mounted in a bearing frame A², which is shown secured on the top of a support conventionally represented at A³.

A⁴ represents a crank wheel rigid with the shaft A' of the windmill. a⁴ is the crank wrist on said wheel. B is a pitman connected to said crank wrist and operating the piston of the compressor.

C is the compressor cylinder. D is the piston in said cylinder. The cylinder is open at

the lower end, and discharges at its upper end through the port c', which is controlled by the check valve C', which seats downward over said port in the vestibule C² of the education pipe E.

D' is the intake check valve of the piston, which closes the intake port d', seating downward over said port. The particular construction of this valve and mode of retaining it in its place will be hereinafter described.

The piston in the form illustrated and preferred is made up of two principal parts, the disk or head plate D², and the bottom plate D³, which has a cylindrical extension D³⁰, which forms an extended bearing and guide for the piston in the cylinder. These parts are rabbeted around their proximate edges, forming a peripheral channel to receive packing material D⁴. They are suitably bound together by screw bolts d⁴.

D⁵ is a short shaft or bolt which extends diametrically across the piston a short distance below the head within the cylindrical extension D³⁰, and having its ends seated or lodged loosely in bosses D³¹ D³¹, formed at diametrically opposite points on the inner surface of the cylindrical extension D³⁰. This bolt or shaft serves as the pivot at which the pitman B is connected to the piston. Said pitman has at its end designed for such connection the eye B', elongated in the direction of the length of the pitman, so that it has longitudinal play on the pivot D⁵. The intake valve D', being central with respect to the piston head, is directly over the pivot bolt D⁵, and therefore directly above the end of the pitman eye B' when the pitman is connected; and the stem of the valve is extended downward far enough so that when the pitman is hanging on the pivot,—that is to say, when the pivot bolt is at the upper end of the opening in the elongated eye B',—said stem, when the valve is on its seat, reaches almost to the pitman; in practice, a sixteenth of an inch interval between the end of the valve stem and the end of the pitman in the position described is sufficient for the purpose which will hereinafter appear. The pitman is expanded laterally toward its upper end for a distance below the eye B', and apertured at its said expanded part, or, to describe the construction otherwise, the pitman is forked at its upper

end, the two forked arms B^{10} B^{10} being connected across their ends by the eye B' , an opening being made into the said eye on the under side corresponding to and at the end of the space between the forked arms B^{10} . In this space there is lodged the coiled spring G , which reacts at its lower end against the pitman and at its upper end against the pivot D^5 , tending, therefore, to hold the pitman in such position with respect to the pivot that the latter will be at the upper end of the opening in the elongated eye. The purpose of this construction of the piston and its connection to the pitman I will describe before proceeding with the description of the remainder of the mechanism.

The ordinary operation of the pump is obvious. When the piston is depressed, air enters through the port d' in the piston past the intake valve D' , and fills the cylinder above the piston. When the piston is raised,—that is, is given its forcing stroke,—the intake valve is seated by the interior pressure and the air is forced out past the check valve C' into the eduction pipe E , and thence to whatever device or chambers said pipe leads to. Obviously, if said pipe leads to a closed chamber,—as to the chamber of a water-elevating-appliance operated by compressed air,—that being one of the uses to which this construction is adapted,—and the outlet or pipe from such chamber should be accidentally obstructed or if there should be an obstruction in the pipe E , the continued action of the pump would eventually burst the cylinder or the chamber to which the compressed air was conducted by the pipe or would force the packing of the piston or otherwise find a vent. To prevent such a result is the purpose of the specific construction above described. The effect of this construction is that when the resistance to the discharge of air, by reason of any obstruction beyond the check valve C' , is such as to produce in the cylinder above the piston such a compressed condition of air therein as to resist the upward movement of the piston with force enough to compress the spring G , an amount equal to the distance between the end of the stem of the valve D' and the end of the pitman,—say a sixteenth of an inch,—the pitman will encounter the end of the valve stem and any further compression of the spring which will result from any further attempted movement of the pitman against the interior pressure, will cause the pitman to lift the valve D' , and thereby relieve the pressure in the cylinder so that the piston may move freely notwithstanding any obstruction beyond the cylinder. The maximum degree of compression that a compressor fitted with this appliance will produce in a closed chamber will therefore be measured accurately by the resistance of the spring G , and this may be made as desired according to the work to be done. I have not shown any device for adjusting the tension of this spring, but such devices will occur to any mechanic,

and the mode of their application will be obvious.

It will be apparent that it is not essential that the valve D' should be actuated in the manner described directly by the pitman, or, treating the pitman as representing merely any part which actuates the piston, it is not necessary that the valve should be actuated directly by the piston-actuating part. It is only essential that it should receive its actuation ultimately from such movement as the piston-actuating part obtains with respect to the piston by reason of the resistance in the cylinder to the piston's movement being greater than the resistance of the spring which is interposed somewhere between the piston-actuating part and the piston, so that the resistance to the piston's movement in the forcing stroke is transmitted through the spring to the actuating part.

Fig. 6 represents a modification in which the piston is actuated directly by a stem b , and not by the pitman proper. It will be understood that the stem may be actuated in any manner. In the construction shown in this figure, also, the stem is hollow and constitutes the induction passage to the intake valve, and the spring G is interposed between the hub d on the piston at one end and the boss b' on the stem at the other end of the spring. The tubular stem b , extending up through the hub d to within the required distance of the stem of the valve D' , a pin or bolt d^2 , set through the hub d and passing through an elongated opening b^2 in the stem b , serves as the connection by which the piston stem retracts the piston, the forcing stroke being communicated, as in the construction shown in the principal figures, by the spring G .

In Figs. 7 and 8, I have shown the same feature of invention applied to a compressor which is adapted to be mounted at a position distant from the mill which operates it,—as upon a fixed support H ,—the stem $B B$ being rigid with the piston and having a guide-bearing h outside of the cylinder and being actuated by the cross-head J , connected by the yoke J' to the rod J^2 , which may or may not be the pitman,—that is, which has the necessary reciprocating movement, with or without the oscillating movement of a pitman. In this construction, the stem has the boss $b b$ at a short distance above the point where the cross-head stands, and the spring is interposed between the hub j of the cross-head and the said boss $b b$, the pin or bolt d^2 , as in the form shown in Fig. 6, serving to connect the cross-head to the stem, passing through the slots b^2 in said stem, as seen in Fig. 8. The stem in this construction, being rigid with the piston and thereby incapable of longitudinal movement with respect to the same, the movement of the piston-actuating part,—to-wit: the cross-head J ,—with respect to the piston when the spring G yields, is made to actuate the valve D' by means of the rod K , located within the tubular stem $B B$, said rod resting upon or being

held in position by the pin d^3 (the pin may pass through the rod or the rod may merely rest upon the pin when the cylinder is vertical and the forcing stroke is upward, but in any other position the pin should pass through the rod as illustrated.) The rod terminates at its upper end at the same short distance from the end of the stem of the valve D' as explained in respect to the other constructions. The rod will move with the cross-head when the latter moves with respect to the piston stem, and will therefore communicate such relative movement to the valve D' under the same circumstances as such movement would be communicated by the stem in the construction shown in Fig. 6, or by the pitman in the construction shown in the principal figures. These three constructions are illustrated to indicate what I regard as the scope of this feature of my invention, which is not limited to either one but broadly includes them all, though that which I have shown in the principal figures is generally possible, and when possible is most desirable.

I will now describe another important feature of my invention,—first, explaining the necessity or desirability of it. It is useful chiefly when an air-compressing device is associated with and operated by a windmill, but has utility whenever the motive power is variable. The speed of wind which must be taken into account in a practical device for utilizing it varies from the gentlest breeze that will produce any movement of the mill, to the most violent gale that the mill can withstand. The potential energy of wind,—that is, the work which it may accomplish with proper appliances,—varies as the cube of its velocity; but the speed of a windmill, except as effected by the work it is doing and the resistance which it thus encounters, can only vary as the velocity of the wind. When, therefore, the mechanism to be driven is connected directly to the mill, the speed, and, consequently, ordinarily, the work of that mechanism will vary only as the velocity of the wind varies. Thus, if a wind of a given velocity a causes a given mechanism attached to a mill driven by such wind to perform an amount of work b , the same mechanism driven by the same mill, when the velocity is 2^a could perform only work represented by 2^b , whereas the potential energy of the wind of double velocity would be 8^b , the difference between the work performed and the work which might be performed, 6^b , being lost for lack of adaptation in the appliances to utilize it. This same loss would occur whether the connection from the mill to the work were mechanical, in the ordinary sense of that term, as by pitman, gear or chain, or such as might be afforded by an air duct from the compressor operated by the mill, the air in that case merely serving as the connection by which the power is transmitted. But the feature of my invention which I am about to describe enables me when employing such compressor and air duct as means of trans-

mitting the power from the mill to the work, to utilize substantially the entire potential energy of the wind which drives the mill between any minimum and maximum limit which may be determined upon in the construction of the apparatus.

It will be obvious that the work done by each stroke of the piston in the air compressor, making no allowance for leakage, will vary as the cross-areas of the cylinder,—that is to say, as the square of its diameter. If, therefore, the diameter of the cylinder could be increased as the velocity of the wind increases, the work done could be made to vary as the cube of the velocity, thereby utilizing the whole potential energy. Or, if the length of the compressing stroke of the piston in the cylinder could be made to vary as the square of the velocity, the same result might be attained. What I accomplish is equivalent to varying the length of the compressing stroke, and I have suggested these two impracticable methods of utilizing the whole energy of the wind merely to make clear the result which I attain by the practicable method which I will now describe. Assuming, for example, that the minimum speed of wind which can be made or which it is worth while to make available for the accomplishment of work is eight miles an hour, and that the maximum wind which the mill and its supports is adapted to withstand with safety is one which has a velocity of twenty-four miles per hour, so that the maximum work which can be accomplished is twenty-seven times the minimum, I provide the cylinder C with an aperture c at a distance from the upper end of the cylinder equal to one-ninth the entire stroke of the piston, and I make the diameter of the cylinder such that the minimum velocity of wind which it is designed to utilize,—viz: eight miles an hour,—will afford sufficient power to compress to the minimum tension which will perform useful work the air which will be confined by the piston after it passes the aperture c in its upward stroke. It will be observed that at that portion of the stroke, the leverage of the crank wheel on the pitman is greatest, for the crank wrist is just then approaching and about to pass the center, so that at that position a given velocity of the wheel will be capable of producing the greatest compression that can be produced at any part of the stroke, and much greater than that which can be produced midway in the stroke where the leverage is least. In a mild wind, tending to give the piston a slow movement, the air moved before the piston in its upward stroke may find free escape through the aperture c until the piston passes that aperture, and the piston will therefore experience substantially no resistance and the mill will therefore do no work until that point is passed. Since the mill itself operates as a balance wheel and tends to store up energy, nearly the entire potential energy developed by so much of the

rotation as occurs from the time the piston commences its down stroke until it reaches the aperture c in its up-stroke,—about eight-ninths of its revolution,—will be stored up
 5 by such balance wheel and by the momentum of the wheel rendered available in the last part of the revolution of the last ninth of the forcing stroke of the piston. If now the speed
 10 of the wind and consequent rotary speed of the mill increases so that the movement of the piston forces the air before it more rapidly than it can escape freely,—that is, without appreciable compression,—through the aperture c , a degree of compression will be
 15 produced before the piston reaches that aperture, and a correspondingly increased quantity of air will be compressed in the remaining ninth of the stroke after the piston passes the aperture. The degree of tension which
 20 occurs before the aperture is passed will increase more rapidly than the increase in velocity. For the purpose of the present explanation, it is not necessary to consider just what the rate of variation may be; but it will be ob-
 25 vious that even with this simple construction,—that is, with a mere aperture located as described, an approach will be made toward the result sought,—viz: increasing the working capacity of the appliance as the potential
 30 energy of the wind increases; but for more perfectly attaining the result, I cause the aperture c to lead into a small supplemental chamber M , which discharges to the outer air through the port M' , which is closed by an
 35 upwardly seating valve M^2 , located within said supplemental chamber. I describe and illustrate this as an upwardly seating valve, but the essential characteristic which is involved in that description is that it is normally open and requires some force to close it.
 40 The position of the valve in respect to the aperture c is such that the jet of air discharged through c is experienced by the valve and tends to seat it. As illustrated, this is accomplished by providing the valve with a
 45 projection on the side opposite its seat, which stops against the bottom of the chamber, and making the aperture c enter the chamber at the bottom, so that the jet of air discharged
 50 through the aperture is discharged under the valve, and it may be discharged upward under and therefore against the valve, but this is not essential to practical results, though it might tend to make the valve more sensitive.
 55 Now, when the speed of the piston is such as to force the air through the aperture c without any appreciable compression, it will also pass out around the valve M^2 without any appreciable tendency to lift it, but when the
 60 air is discharged after being somewhat compressed, it will tend in passing around the valve to lift it, and, after a certain degree of compression is reached, it will lift and seat it. This will occur at a greater or less interval
 65 after the commencement of the forcing stroke of the piston, according as that stroke is less or more rapid, and after it occurs, the

piston will operate throughout the remainder of its stroke as though there were no aperture—that is, the remainder of its stroke after
 70 the valve thus seats will be as completely or unqualifiedly a forcing or compressing stroke as is the portion of its stroke which it makes after the aperture c is passed when it moves
 75 slowly. Since the movement of the piston in the cylinder is most rapid at the time the crank wrist is ninety degrees from its lowest position, it will be evident that as the speed of the mill rises, the longitudinal speed of
 80 the piston in the cylinder will first become sufficient to produce compression of the air; at that middle point of some forcing stroke, and, therefore, that the valve M^2 will be first
 85 seated as the speed rises, when the piston is at some point between that middle point and the aperture c ;—(that is, unless the change of speed should be so sudden as to be very widely different at two consecutive strokes), and it is evident that as the speed continues
 90 to rise, the valve will close with the piston successively at a lower and lower position in its forcing stroke, until finally, at the maximum speed, it will close almost instantly upon the commencement of that stroke.
 95 Thus, the effective length of the forcing stroke, which, at the first, is only the distance from the aperture c to the top of the cylinder, will increase as the velocity of the wind increases, until, at the maximum velocity, it is the entire stroke of the piston. By prop-
 100 erly relating the size of the aperture c to the capacity of the cylinder, and the weight of the valve to both the cylinder and aperture, I find that I can cause the length of this forcing
 105 stroke,—that is, the portion of the entire stroke which is effective in compressing the air, to vary approximately as the square of the velocity; and, comparing the two limits,—that is, the minimum and maximum com-
 110 pressing stroke,—that result is perfectly attained at those limits by making the distance of the aperture c from the upper end of the cylinder proportioned to the entire stroke of
 115 the piston in the cylinder as the squares of the minimum and maximum velocities of wind which it is designated to utilize,—that is, the maximum wind being double the minimum,—locating the aperture one-fourth the way
 120 down from the top, or, the maximum wind being three times the minimum, locating it one-ninth the way down, and so on. I have shown in the drawings this aperture in full lines at the former position and in dotted lines at the latter. It will be observed that
 125 to some extent the aperture c may serve as an intake aperture, and that, when it is present, it is not impossible to dispense with the ordinary intake aperture and valve in the piston head. The wind may be made to actuate the
 130 vent valve directly to cause it to close when a given velocity of wind is attained even though the resulting speed of the piston in the cylinder may through any retarding cause be insufficient to seat that valve in the man-

ner described. For such a purpose the bell-crank-lever N, pivoted outside the cylinder and having one arm connected to the stem of the valve M², carries upon its other arm a vane N', exposed to the wind,—that is, facing the same direction as the windmill. The arm to which the stem of the valve M² is connected may be provided with a weight N², adjustable toward and from the fulcrum of the lever to vary its counteracting force against the wind pressure experienced by the vane. The connection of the valve stem to the lever should be made by a pin through a vertically slotted aperture in either the lever or the stem, so that the vent valve may be free to rise to its seat whether the lever moves or not, but so that the rising of the lever will, in any event, lift the valve. It will be understood that a weight being adjusted on the lever arm, so that a given velocity of wind will rock the lever, the vent valve will be seated whenever this velocity is attained, and will be held thus seated throughout the entire stroke of the piston and so long as the velocity of the wind does not fall below that to which the weight is adjusted. This appendage is occasionally useful when the work being done is such that the quantity of air forced out of the cylinder rather than the tension produced is material, or to prevent any loss of air through the vent valve when the wind reaches or exceeds the maximum limit.

Before proceeding to the description of the third essential feature of my invention, I will describe certain details of the construction illustrated, which I deem of some practical importance.

The intake valve D' in the piston is cast with the intersecting guide webs d¹⁰ forming its stem integrally with the head or body of the valve which seats downward upon the upper side of the piston head. This valve is retained in its place in the piston head by means of the pin d¹¹, which is inserted through an elongated aperture or slot d¹², made through both the webs d¹⁰ at their intersection, the elongation of said slot being sufficient to allow for the proper opening of the valve. A seat is formed for the ends of the pin d¹¹ in the following manner:—The piston head being formed of two members D² and D³, as described, for convenience of binding between them the packing D⁴, the upper member D² is chambered out at d², around the eduction aperture d', forming the shoulder d²⁰, and the lower member D³ is formed with an annular boss d³, which fits the chamber d², and at diametrically opposite points in said boss are formed two notches d³⁰, adapted to admit and afford lodgment for the ends of the pin d¹¹. The wall of the chamber d² is cut away at one side at d²¹, and the valve is put into place by having its stem, which is made up of the intersecting webs d¹⁰, passed down from above through the eduction aperture d', and the pin d¹¹ is inserted from below through the slot d¹²

from the side at which the recess d²¹ is cut, said recess forming a path for the end of the pin until it reaches its lodgment on the shoulder d²⁰, and the lower member of the head being put into place, the notches d³⁰ engage the ends of the pin and fix it permanently in place. By this construction, I avoid all screw connections for the valve D', and am able to make it of one piece, which is of some importance in view of the fact that this valve is in constant action while the pump is operating and if made in two pieces or with screw joints would be quite liable to get out of order.

When I employ the construction shown in Fig. 8, wherein a rod within the tubular stem serves to communicate the motion from the piston-actuating part to the intake valve, it is essential, of course, that such rod should not obstruct the induction passage to such tubular stem, and at the same time, that it should itself be guided with reasonable accuracy in its longitudinal movement within the stem, and to meet these conditions, I make said rod to consist of three diverging webs, which contact with the inner wall of the stem and thereby guide the rod longitudinally therein without closing it. As a specific form, which is convenient and cheap, such rod may be made of sheet metal by folding a strip of such metal upon itself forming the double web K', then spreading apart each of the folds to form the two webs K²K². I make the web K' enough wider than the radius of the pipe or tubular stem so that the pin d², which passes transversely through the center of the pipe, need penetrate only this one web.

For the purpose of lubricating the piston and cylinder, I provide the annular oil cup C⁴, which is upwardly open within the cylinder at the lower end of the latter, so that the piston dips its downwardly flanged or extended edge into the cup at the lowest limit of its stroke, and that each dip takes up oil to lubricate its path. The cup C⁴ is preferably made separable from the cylinder and may be secured thereto by bolts through the corresponding horizontal flanges c⁴ c⁴⁰ on the cylinder and cup respectively.

I claim—

1. In an air compressor, in combination with the cylinder and the piston reciprocating therein, said cylinder having a vent aperture, a valve which controls such vent adapted to be normally open and to be closed by outward movement of air through the vent passage; whereby such vent is closed earlier or later in the forcing stroke according to the speed of the piston in said stroke: substantially as set forth.

2. In combination with a windmill, an air compressor comprising a cylinder and piston reciprocating therein; and connections from the piston to the windmill, whereby the rotation of the latter reciprocates the former; the cylinder having a vent aperture located

at a short distance from the limit of the path of the piston in its forcing stroke but in position to be covered by the piston before it reaches said limit; whereby the cylinder may obtain vent during the earlier portion of the forcing stroke of the piston but not during the final portion: substantially as set forth.

3. In combination with a windmill, an air compressor whose piston is actuated by the windmill; the cylinder of said compressor having a vent aperture located at a short distance from the limit of the forcing stroke of the piston, but in such position that it is covered by the piston before the latter reaches said limit; and a valve which controls said vent adapted to be normally open and to be closed by outward movement of air through the vent passage, whereby such vent is closed earlier or later in the forcing stroke according to the speed of the piston in said stroke: substantially as set forth.

4. In an air compressor, in combination substantially as set forth, a cylinder and the piston playing therein, the cylinder having a vent aperture at a short distance from the limit of the path of the piston in its forcing stroke, leading to the outer air, but at such position as to be covered by the piston before it reaches that limit; whereby the minimum amount of air compressed by the forcing stroke is that which is confined by the piston beyond said vent, and the maximum amount depends upon the speed of the piston in said stroke.

5. In an air compressor, the cylinder and piston playing therein, the cylinder having a vent aperture at a short distance from the limit of the path of the piston in its forcing stroke, combined with a valve which controls said vent aperture and is normally open, and adapted to be closed by discharge through such aperture; whereby the minimum amount of air compressed by the piston in its forcing stroke is that which is confined by the piston after it passes the vent aperture, and the maximum is that which is confined by it after its

movement has seated the vent valve: substantially as set forth.

6. In an air compressor, in combination with the piston and the piston-actuator, a spring which transmits motion from said piston-actuator to the piston in the forcing stroke of the latter, and the piston intake valve actuated by the piston-actuator when the latter part is moved longitudinally relatively to the piston; whereby such intake valve is opened when the spring yields to permit such relative movement of said piston-actuator: substantially as set forth.

7. In an air compressor, in combination with the piston a pitman loosely pivoted thereto to reciprocate it, a spring reacting between the pitman and piston to force the latter away from the former in the direction of the forcing stroke of the piston to the limit permitted by said loose pivotal connection; and the piston intake valve near enough to the pitman to be actuated thereby when the pitman moves relatively to the piston in the direction of the forcing stroke of the latter as far as said loose pivotal connection permits: substantially as and for the purpose set forth.

8. The compressor cylinder, the piston therein having the pivot D^5 , the pitman having the elongated eye B' , by which it is connected to the piston at said pivot; the intake valve D' being adapted to be encountered by the pitman when the latter moves longitudinally on the pivot to the limit of said elongated eye, combined with the spring G , reacting between the pivot and the pitman to hold the latter back from said intake valve: substantially as set forth.

In testimony whereof I have hereunto set my hand, at Chicago, Illinois, in the presence of two witnesses, this 1st day of September, A. D. 1891.

THOMAS O. PERRY.

Witnesses:

OSCAR LAEDERACH,
FRED E. SMITH.