PUBLISHED	C. C. ALVIZO	**Serial No.**
APRIL 27, 1943.	AUTO-WINDING-AERO MACHINE	**378,652**
BY A. P. C.	Filed Feb. 12, 1941	2 Sheets-Sheet 1

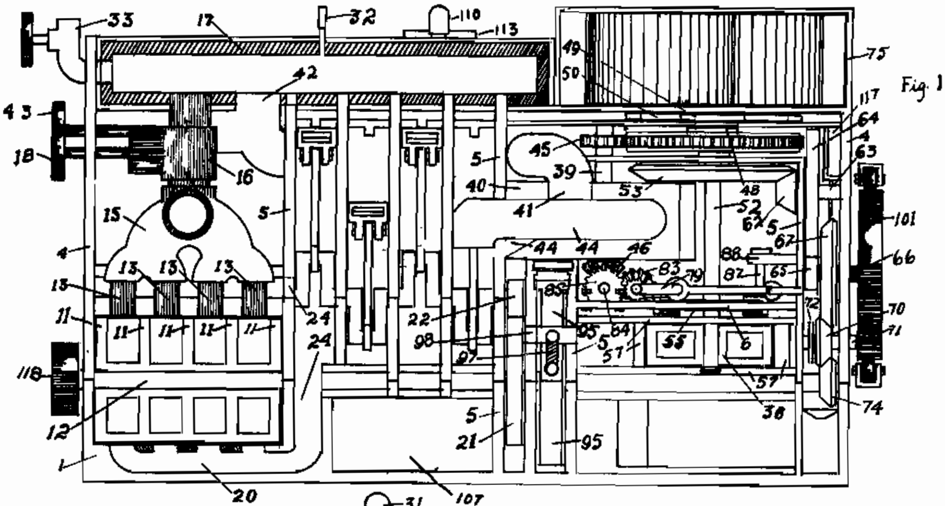


Fig. 1

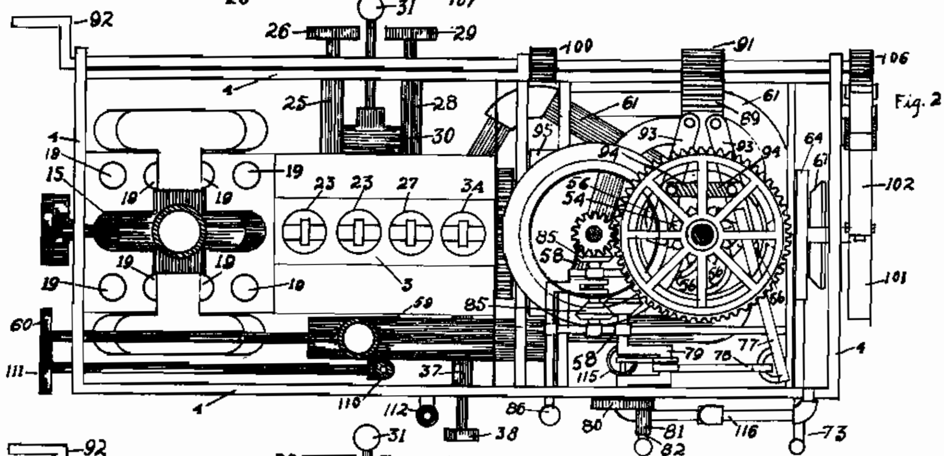


Fig. 2

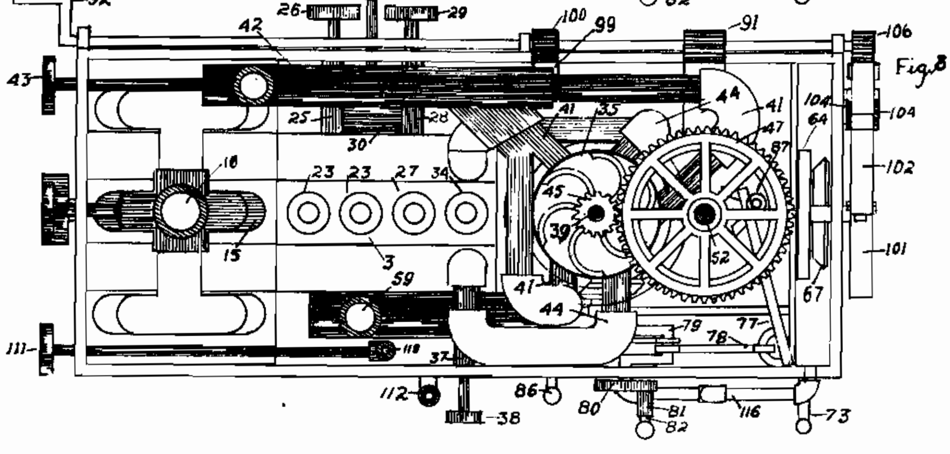


Fig. 3

Inventor
Cipriano C. Alvizo

PUBLISHED **C. C. ALVIZO** **Serial No.**

APRIL 27, 1943. AUTO-WINDING-AERO MACHINE **378,652**

BY A. P. C. Filed Feb. 12, 1941 2 Sheets—Sheet 2

Fig. 4

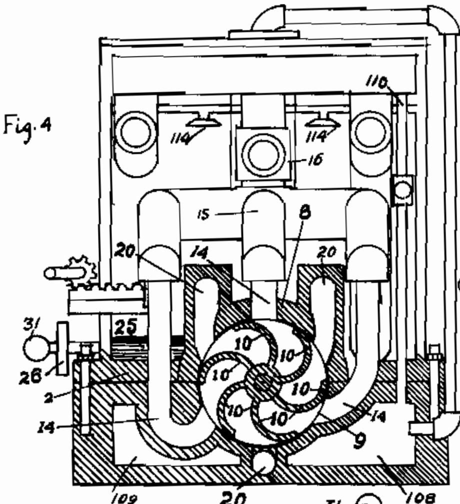


Fig. 5

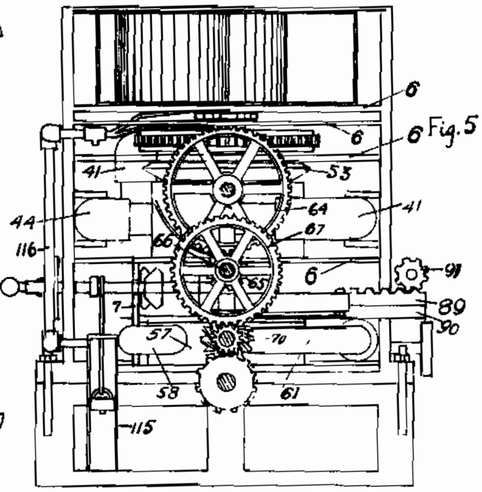


Fig. 6

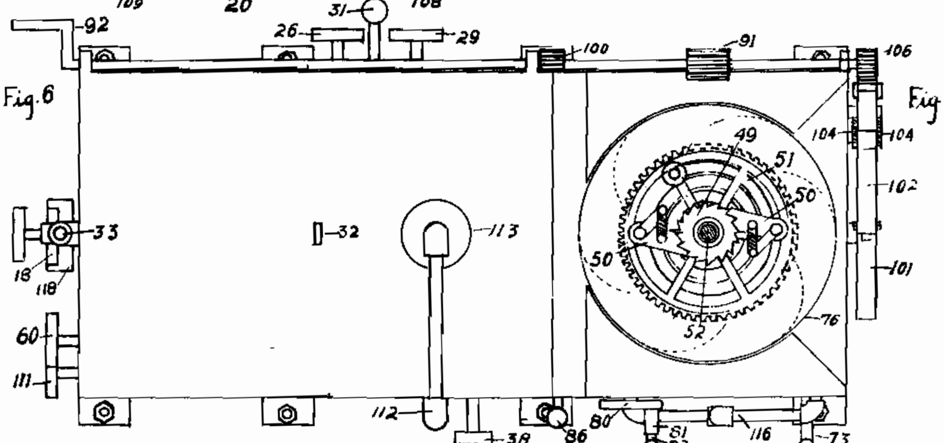


Fig. 7

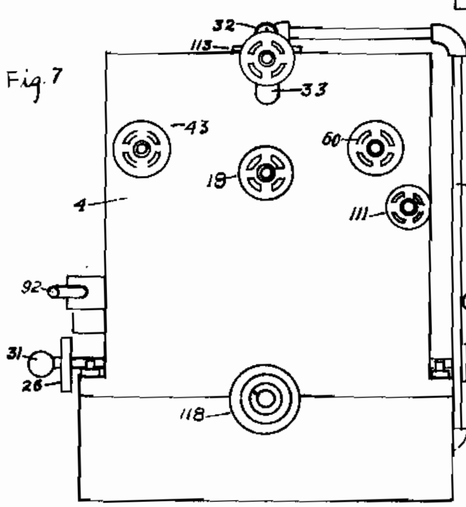
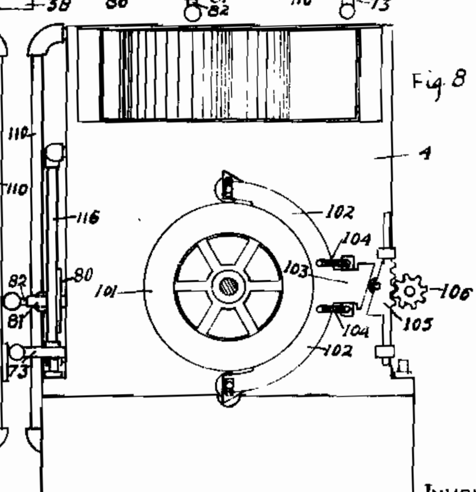


Fig. 8



INVENTOR

Cipriano C. Alvizo

Published Apr. 27, 1943 Serial No. 378,652

ALIEN PROPERTY CUSTODIAN

AUTO-WINDING-AERO MACHINE

Cipriano C. Alvizo, Cebu, P. I.; vested in the Alien Property Custodian

Application filed February 12, 1941

The invention relates to combinations of known elements enumerated hereunder; and the objects of the combinations are, first, to provide with an automatic winder a coil spring, secured to a cogwheel case and to a vertical shaft holding a secondary power wheel, a crown gear which is in mesh with a pinion, a balance-wheel which operates in conjunction with a lever, controlled by a miter gear, attached to the lower end of the said vertical shaft, a winder driving gear which is in mesh with the cogwheel case, and a control and brake pulley, so that, by means of a combination connecting the pinion shaft to the differential shaft of a primary power wheel, it will determine the horsepower developing capacity of the machine; second, to compress air in an air-tank by means of pumps, secured to the bottom thereof, so that without fuel whatsoever, it will turn the primary and secondary power wheels and winder wheel; third, to make the compressed air, coming from the air-tank, return thereto with the least possible leakage; fourth, to replace, during the operation of the machine, any leakage of compressed air, and at the same time, to compress more air; fifth, to utilize natural, especially a contrary, wind to generate more power in order to counteract friction; sixth, to provide a circulatory cooling and lubrication systems; and seventh, to provide a very economical machine which may be operated without any fuel and danger of explosion arising either from combustion or ignition.

I attain these objects of my invention by the mechanism illustrated in the accompanying drawings, made to scale of one inch to twelve inches (Scale=1'':12''), in which Figure 1 is a sectional side view of the entire machine; Figure 2, a plan view of the machine, without the air-tank, winder wheel with its power and exit tubes, slide lug for the interior flywheel, coil-spring and lock gear; Figure 3, a plan view of the machine, without the coil-spring, lock gear and balance-wheel; Figure 4, a sectional rear view of the machine; Figure 5, a sectional front view of the machine; Figure 6, a plan view of the machine showing the coil-spring, lock gear, curved vanes of a windmill with its casing having dovetail front opening and an exit opening; Figure 7, the rear view of the machine; and Figure 8, the front view of the machine.

The lower block, 1, middle block, 2, upper block, 3, exterior walls, 4, 4, 4, 4, and division walls, 5, 5, 5, 5, 5, constitute the framework of the machine. The cross beams, 6, 6, 6, 6, and straps, 7, 7, constitute the supports and props of the shafts, winder wheel and slide lugs. Openings, provided with shutters, are made on the exterior walls to facilitate the cleaning, examination and repair that may be made inside the framework of the machine.

Inclosed by a cylindrical casing, 8, consisting of a cylindrical hollow made in the lower block, 1, and middle block, 2, and hermetically closed on the rear by the exterior wall and on the front by the division wall is a primary power wheel, 9. This primary power wheel has four chambers, each of which has six (6) vanes 10, 10, 10, 10, 10, 10, separated by partition walls, 11, 11, 11, 11, 11, and curved leftward so that, when compressed air will enter their cavities, the primary power wheel will turn rightward from its horizontal differential shaft, 12, which is furnished with bushings, placed at the joint of the lower and middle blocks, above referred to. The cylindrical casing, 8, is air-tight and is adapted to contain the primary power wheel and allow it to radiate freely from its spindle. It is fastened by means of bolts from outside.

Primary power tubes, 13, 13, 13, 13, arranged in three rows of four (4) tubes each equidistantly from one another, are secured to the said cylindrical casing, the first row being placed at the center on the top, the second row at the right side and the third row at the left side. Each of the four (4) primary power tubes communicate, respectively, by means of cylindrical holes, 14, 14, 14, made in the lower and middle blocks, with the four (4) chambers of the aforesaid primary power wheel, 9, as shown in Figure 4 of the accompanying drawing (see Fig. 4). The three rows of primary power tubes, placed in this manner, communicate, respectively, with the three rows of curved vane cavities which directly front the cylindrical holes, 14, 14, 14. The remaining three rows of curved vane cavities always alternate with those three rows that directly face the aforesaid cylindrical holes.

These four primary power tubes, 13, 13, 13, 13, forming each row, are joined by a crosshead tube. The crosshead tubes of the right and left rows link with the crosshead tube, 15, of the central row. The central crosshead tube, 15, joins with the mainhead tube, 16, which is connected and secured to the bottom of the air-tank, 17, and is furnished with a valve, provided with a lever and handle, 18. The compressed air, coming from the air-tank to turn the primary power wheel, 9, can enter the curved vane cavities passing first through the mainhead tube, 16, and because of the latter's valve, it can be regulated by increasing or reducing the volume of compressed air passing through it for the purpose of increasing or diminishing, as the case may be, the compressed air force. It can be completely shut off also to stop it from turning the primary power wheel.

Alternating with the three rows of cylindrical holes, 14, 14, 14, three (3) rows of four (4) primary exit holes, 19, 19, 19, 19, each are placed equidistantly in the lower and middle blocks.

These primary exit holes directly communicate to the curved vane cavities of the primary power wheel and are joined together by discharge canals, 20, 20, 20, through which compressed air can immediately flow out as soon as the curved vane cavities containing it will pass in front of the said primary exit holes which are so placed as to alternate with the three rows of cylindrical holes. Because of the alternate situation of the said cylindrical holes, 14, 14, 14, and primary exit holes, 19, 19, 19, 19, the curved vane cavities, upon becoming empty, will immediately become reloaded with compressed air upon reaching the next cylindrical holes. This action will continue during operation of the machine and will cease only if the mainhead tube, 18, is completely closed to shut off the compressed air coming from the air-tank.

To the differential shaft, 12, of the primary power wheel, 9, is attached a big gear, 21. It is contained in a chamber inclosed with division walls and intersects with another small gear, 22, held above it by a crank shaft, the ratio between the big gear, 21, and small gear, 22, being one to six (Ratio=1:6). The chamber contains oil used for lubricating said gears and the bushings of the differential shaft.

To the crank shaft holding the small gear, 22, are attached four (4) rods, each of which controls pistons for four (4) pumps, each piston being provided with its corresponding valve. The said four pumps are secured to the bottom of the air-tank, 17, and are each furnished with a valve at the upper part to prevent compressed air from flowing out of the air-tank through them. Below the first two pumps contiguous to the primary power wheel and also below each of the other two remaining pumps are air-tight cavities containing the elbows of the crank shaft.

Said first two (2) pumps, 23, 23, are called primary restorer pumps. They are connected to the discharge canals, 20, 20, 20, by means of disemboguements, 24, 24, 24, through which the compressed air going out of the primary exit holes, during the operation of the machine, can enter the air-tight cavity of the primary restorer pumps which will force it to re-enter the air-tank. In this manner the compressed air will continuously circulate with the least amount of leakage, if any at all, and will continue turning the primary power wheel until it is shut off completely by closing the valve of the mainhead tube, 16.

An inlet pipe, 25, provided with a cap having a handle, 26, with which said inlet pipe can be closed, is connected to the air-tight cavity of the primary restorer pumps, 23, 23. With this inlet pipe, compression of air, in case the air-tank, 17, is already empty, can be done by using the primary restorer pumps.

Next to the primary restorer pumps is a compressor pump, 27, used for compressing air not only to fully replaced any leakage but also to add more pressure during operation of the machine. An inlet pipe, 28, provided with a cap having a handle, 29, with which said inlet pipe can be closed, is connected to the air-tight cavity of the compressor pump serving as air-passage. By adding more pressure by means of the compressor pump, the horse-power developing capacity of the machine can be progressively increased during its operation.

The primary restorer pumps, 23, 23, and the compressor pump, 27, are connected together by a communication tube, 30, which is furnished with a valve, having a handle, 31. This communication tube should be closed during operation of the machine when the compressor pump is used for compressing more air.

The compression of air can be effectively done not only to reach the maximum limit, of which the air-tank, 17, will be capable of resisting without bursting, but also to exceed it. For this reason, the air-tank is provided with air pressure gauge, 32 and safety valve, 33. It is also inclosed with a casing, intended to contain water for cooling it while it may hold compressed air.

To avoid explosion of the air-tank, the inlet pipe, 28, of the compressor pump cavity may be closed like the inlet pipe, 25, of the primary restorer pumps' cavity. The communication tube, 30, should be opened, so that, instead of compressing more air, the compressor pump, 27, may be used like the primary restorer pumps to force the compressed air to re-enter the air-tank. In this manner, the compressed air circulation can be greatly accelerated and the horsepower developing capacity of the machine can be consequently increased.

The explosion of the air-tank due to excessive air-pressure may be avoided also by opening the safety valve, 33, to release so much compressed air as may be necessary in order to reduce the air-pressure to any desired limit. After reaching it, the safety valve, 33, and the inlet pipe, 28, may be closed, and the communication tube, 30, may be opened.

The pump, 34, contiguous to the compressor pump, is called secondary restorer pump. It is used for returning to the air-tank, 17, the compressed air turning the winder wheel, 35, and the secondary power wheel, 36. An inlet pipe, 37, provided with a cap having a handle, 38, with which said inlet pipe can be closed, is connected to the air-tight cavity of the secondary restorer pump cavity. This inlet pipe, 37, should be closed during operation of the machine and may be opened only when used like the inlet pipe, 25, to admit air to be compressed in case the air-tank is already empty.

Like the primary power wheel, the winder wheel, 35, has six (6) vanes, curved leftward and inclosed with a casing. It is held by a vertical shaft, 39, and is contained in an air-tight casing, 40, secured by screws to the division walls and supported by crossbeams and straps.

Three (3) winding power tubes, 41, 41, 41, are attached to the winder wheel casing, 40, in such a manner as to directly communicate with three curved vane cavities. The remaining other three curved vane cavities alternate with said winding power tubes which are joined by a main-winding power tube, 42. This main-winding power tube is attached to the bottom of the air-tank and is provided with a valve, having a lever arm, 43, with which it can be closed and the volume of compressed air passing through it can be increased or decreased in order to accelerate or retard, as the case may be, the turning of the winder-wheel, 35.

Alternating with the said winding power tubes, 41, 41, 41, three (3) exit tubes, 44, 44, 44, are attached to the winder-wheel casing, 40, in such a way that the three other curved vane cavities will be situated in front of the said exit tubes. These exit tubes, 44, 44, 44, disembogue into the air-tight cavity of the secondary restorer pump, so that the compressed air, coming from the air-tank through the main-winding power tube, 42, can escape out immediately as soon as the curved vane cavities containing it will pass directly in front of said exit tubes. The secondary restorer pump will thereupon force said compressed air to return to the air-tank. While the valve of the main-winding power tube is opened, the compressed air will continue circulating in this manner, thereby turning the winder wheel.

The vertical shaft, 39, previously mentioned, holds at its upper part a driving winder gear, 45, and at its lower end a horizontal miter gear, 46, the upper end of said vertical shaft, 39, being furnished with a bushing attached to the crossbeam.

The driving winder gear, 45, is in mesh with the cogwheel case, 47, which has top and bottom having hubs and spokes and attached by means of screws to the cogwheel case, the ratio between the driving winder gear and the cogwheel case being four to one (Ratio=4:1), so that for every four (4) complete turns of the former, the latter will make one (1) complete turn. The driving winder gear, the winder wheel and the horizontal miter gear being held by the same vertical shaft, 39, they will therefore turn at the same time, number and direction.

To the hub of the top of the cogwheel case is attached a hollow shaft, 48, to the upper end of which is screwed a lock gear, 49, having sixteen (16) teeth which engage two levers, 50, 50, which are held by studs, attached to the crossbeams, and are furnished with spiral springs which pull said levers to prevent the cogwheel case from reversing. The said top hub is furnished with ball bearings.

A coil-spring, 51, is placed inside the cogwheel case, 47, its outer end being secured by a pin, held by the top and bottom of the cogwheel case, and its inner end being screwed to a vertical shaft, 52, which passes through the hollow shaft, 48, and through the hub of the bottom of the cogwheel case. The said vertical shaft, 52, can freely turn and the coil-spring, screwed to it, is placed in such a way that it will relax or expand rightward like the cogwheel case. The bottom hub or said cogwheel case has ball bearings.

Below the cogwheel case, a hollow crown gear, 53, is attached to the vertical shaft, 52, and below the hollow crow gear, the said vertical shaft holds a balance-wheel, 54, having eight (8) teeth, and below the balance-wheel, a control and brake pulley, 55, below which it holds also a secondary power wheel, 36.

Like the winder wheel, the secondary power wheel, 36, has six (6) vanes, 56, 56, 56, 56, 56 curved rightward and inclosed with a casing. It is contained in an air-tight casing, 57, secured by means of bolts to the crossbeams.

Three (3) secondary power tubes, 58, 58, 58, are attached to the secondary power wheel casing, 57, in such a manner as to directly communicate with three curved vane cavities. The remaining other three curved vane cavities of the secondary power wheel alternate with the said secondary power tubes which are joined by a secondary main power tube, 59, provided with a valve having a lever arm, 60, with which it can be closed. By means of this valve, the compressed air, coming from the air-tank, 17, through the secondary main power tube, 59, can be regulated by increasing or decreasing its volume in order to accelerate or retard, as the case may be, the turning of the secondary power wheel, 36, as well as the crown gear, 53, and the balance-wheel, 54.

Alternating with the three secondary power tubes, three (3) secondary exit tubes, 61, 61, 61, are attached to the secondary power wheel casing, 57, in such a manner as to directly communicate with the curved vane cavities not situated in front of the secondary power tubes. The secondary exit tubes disembogue into the cavity of the secondary restorer pump, 34, so that the compressed air, coming from the air-tank, 17, through the secondary main power tube, 59, can escape out immediately as soon as the curved vane cavities containing it will pass in front of the secondary exit tubes and will be forced by the secondary restorer pump to re-enter the air-tank. While the valve of the secondary main power tube, 59, is open, the compressed air will continue circulating in this manner, thereby turning the secondary power wheel, 36.

The crown gear, 53, intersects with a pinion, 62, held by a horizontal shaft, 63, which is furnished with bushings, attached to the division and exterior walls, the ratio between the crown gear and the pinion being one to four (Ratio=1:4), and said horizontal shaft, 63, being connected to the differential shaft, 12, of the primary power wheel, 9, by a combination consisting of an initial transmitter gear, 64, which is in mesh with an initial receptor gear, 65, held by a horizontal shaft, 66, which is furnished with bushings, attached to the division and exterior walls, the ratio between the initial transmitter and receptor gears being one to four (Ratio=1:4). To the horizontal shaft, 66, is attached a final transmitter gear, 67, which has inclined and which, in case of sprocket or pulley combination, should be held by a horizontal shaft, 68, holding a final receptor sprocket or pulley, 69, both not herein shown. In the accompanying drawings, this final transmitter gear, 67, is in mesh with a connector gear, 70, which is held by a horizontal shaft, 71, furnished with bushings, attached to the division and exterior walls, the ratio between the said final transmitting gear and the said connector gear being one to two and one-half (Ratio=1:2½). Behind the connector gear, the horizontal shaft, 71, holds a pulley, 72. Between this pulley, 72, and the said connector gear is inserted a roller, held by a pin, attached to two jaws of a push and pull lever arm, 73, the pin being adapted to the holes in said jaws so as to enable it to turn freely in order to avoid friction.

Below the connector gear, 70, is a differential driving gear, 74, having the same size and number of teeth as the final receptor, 68, and connector gear.

The combination connecting the pinion shaft, 63, and the differential shaft, 12, may consist of gears, as above described, or of sprockets linked with pitch chains, or of pulleys connected with belts, and the number of gears, sprockets or pulleys, which may be called intermediary, and their ratios may be increased or decreased, for the purpose of increasing or decreasing, as the case may be, the number of turns, per minute, of the primary power wheel, 9, and consequently, the horsepower developing capacity of the machine.

The number of chambers of the primary and secondary power and winder wheels may also be increased so that the machine may possess a high horsepower developing capacity; the power and exit tubes, provided with proper crossheads, should correspondingly be increased.

Above the lock gear, 49, a windmill, 75, is attached to the vertical shaft, 52. It has six (6) vanes, curved rightward and inclosed with a casing. A casing, 76, having a dovetail front opening for wind entrance, and a rear opening for wind exit, contains the windmill. When the machine is installed in any vehicle or means of transportation, the windmill will be moved by natural wind, especially by a contrary wind, thereby increasing the horsepower developing capacity of the machine.

The balance-wheel, 54, previously referred to, operates in conjunction with a lever, 77, having two (2) jaws which engage the teeth of said balance-wheel and which allow only two of the latter's teeth to escape to every complete to-and-fro slide of the former. Thus, to every four (4) complete to-and-fro slides of the said lever, the balance-wheel can make one (1) complete turn rightward, thereby allowing at the same time the coil-spring, 51, to relax or expand rightward making one (1) complete circular motion of the vertical shaft, 52. As the windmill, 75, coil-spring, 51, crown gear, 53, balance-wheel, 54, and secondary power wheel, 56, are all held by the same vertical shaft, 52, it will result, therefore, that they all will turn at the same time and direction. We may say, consequently, that the differential shaft, 12, which is connected to the pinion, 82, with which the said crown gear, 53, is in mesh, will be turned by the combined forces of the coil-spring, 51, secondary power wheel, 36, and windmill, 75, and above all, by the primary power wheel, 9.

The other end of the lever, 77, is joined by means of rings to one end of a rod, 78, the other end of which is held by the elbow of a crank shaft, 79, which is furnished with bushings, attached to the crossbeam and exterior wall. The exterior end of the crank shaft, 79, holds a pulley, 80, which is provided with a hollow handle, 81, into which is inserted a peg, 82, furnished with spiral spring which pulls it inward. This peg is inserted, in order to lock the crank shaft, into holes bored on the outside surfaee of the lateral wall in circular form coinciding exactly with the circular line which the peg imaginrily draws. The interior end of the said crank shaft, 78, holds a gear, 83, having inclined teeth which face toward the pulley, 80, and equal size to that of the miter gear, 46, with which the said gear, 83, is at level.

Parallel to and at the same level with, the said crank shaft, 79, is a horizontal shaft, 84, which holds at its both ends two gears, 85, 85, having inclined teeth which face toward the miter gear, 46, and equal size to that of same, said gears, 85, 85, being so placed that, when the horizontal shaft, 84, which is provided with a push and pull lever arm, 86, is pushed, one of them will intersect with gear, 83, and the other one will intersect with the miter gear, 46, and when the said horizontal shaft, 84, is pulled, they will disengage.

The size of the miter gear, 46, being equal to that of gears, 83 and 85, 85, four (4) complete turns of said miter gear will make the lever, 77, perform four (4) complete to-and-fro slides, thereby making the balance-wheel, 54, turn completely one (1) time. The above-stated lever, 77, is hanged by a pin, 87, supported by a lug, 88, attached to the division wall.

The pulley, 55, serves as control and brake. It is furnished with a slide lug, 89, having on the bottom a dovetail rib which is adapted to a dovetail groove of the slide lug frame, 90, fastened to and supported by, crossbeams. On the upper surface, it has teeth which engage a gear, 91, held by a horizontal shaft, 92, which is furnished with bushings, attached to ears, placed at the side of the machine framework. The slide lug, 89, has a concave end which exactly fits the semi-circumference of the control and brake pulley, 55. Attached by pins to its both sides, are two jaws, 93, 93, which are clasped together by two sets of spiral springs, 94, 94, and which hold, respectively, at their ends, rollers by means of pins. When the slide lug is pushed toward the control and brake pulley, the said rollers, before the concave end of the former will engulf the semi-circumference of the latter, will graze first with said semi-circumference as preparatory to a dead stop braking.

Contiguous to the chamber containing the gears, 21, 22, is another chamber inclosed by division walls. This chamber contains an interior flywheel, 95, attached to the differential shaft, 12. Over it, two jaws, 96, curved in such a way as to fit exactly the upper semi-circumference of the interior flywheel, are placed and are hanged by two sets of spiral springs, 97, fastened to lugs, 99, held by the division walls. The spiral springs raise the said jaws in such a way that the interior flywheel can turn freely. These two jaws are joined by a crosshead which slopes toward the shaft, 92.

A slide lug, 98, having on the upper surface teeth which engage a gear, 100, of equal size as gear, 91, attached also to the horizontal crank shaft, 92, is placed directly above the crosshead of jaws, 96. On the lower surface, the slide lug, 99, has a transversal cut, having a groove which contains a roller, held by a pin, the said transversal cut being situated close to the sloping cross-head so as to make the roller graze with said slope when the slide lug is pushed toward the center, thereby making the jaws, 98, lower and grip the interior flywheel for the purpose of braking it, the slide lug being furnished with bushings, attached to lugs, fastened to the division wall.

To the exterior end of the horizontal shaft, 68, is attached a front flywheel, 101. Curved in such a way as to fit exactly the right semi-circumference of said front flywheel, two jaws, 102, 102, joined by a mainhead block, 103, the end of which is transversally cut, are placed to its right side. The mainhead block is provided with a frame which permits it to slide, and with two sets of spiral springs, 104, 104, which pull the said jaws to allow the front flywheel to turn freely. The transversal cut of the mainhead block inclines from the center externally.

A slide lug, 105, having on the external side teeth which engage a gear, 106, equal in size to that of gears, 91, 100, attached also to the same crank shaft, 92, is placed vertically and is furnished with bushings, held by ears, attached to the exterior wall. The inner side of said slide lug, 105, has a transversal cut, parallel to that of the main head block, 103. In its transversal cut is a groove in which a roller, held by a pin, is placed in such a manner that, when the slide lug is pushed upward, the said roller will graze with the transversal cut of the said mainhead block, thereby pushing horizontally the jaws, 102, 102, and making them grip the right lateral semi-circumference of the front flywheel, thus braking the latter.

By turning leftwardly the crank shaft, 92, the interior flywheel, 95, the control and brake pulley, 55, and the front flywheel, 101, can be braked at the same time. By turning it rightwardly, they can be released uniformly too.

The machine has a circulatory cooling system, consisting of a middle watertank, 107, a right front watertank, **108**, and a left front watertank, **109**, the right and left front watertanks being connected at the bottom to the middle watertank by means of canals. A pressure tube, **110**, having a valve, provided with a lever arm, **111**, connects the said middle watertank to the air-tank, **17**.

Another tube, **112**, attached to the external right side of the middle watertank, connects the latter to the central hub, **113**, on the upper surface, of the air-tank casing. Through this tube, **112**, the water from the middle water-tank, due to the pressure of compressed air, coming from the air-tank through the pressure tube, **110**, will ascend and enter the central hub of the air-tank casing to cool the air-tank. The water entering the air-tank casing will flow down through the shower heads, **114**, **114**, to cool the primary power crosshead tubes and the discharge canals. It will afterwards enter the right and left front watertanks through holes connecting the middle block, **2**, to them. From the right and left front watertanks, the water will pass to the middle watertank and ascend again to the airtank casing through the aforesaid tube, **112**. It will circulate in this manner while there is air pressure in the air-tank and will stop only when the valve of the pressure tube is completely closed.

The winding power and exit tubes as well as the secondary power and exit tubes are cooled also by the water from the air-tank casing dropping through small holes made on the bottom of the air-tank casing and through small cooling pipes, attached to the said bottom.

The machine is also provided with a circulatory lubrication system consisting of a pump, **115**. The rod of the piston, provided with an appropriate valve, is held by the elbow of the crank shaft, **79**. The pump, **115**, is placed inside a lower oil tank and is connected by a tube, **116**, to an upper oil tank, **117**, to the bottom of which is attached a main distributing pipe, having branch pipes distributing oil to the gears and bushings, the cogwheel case, lock gear and driving winder gear being also lubricated with oil pumped to them through small pipes, joined to the tube, **116**. The top of the lower oil tank is provided with a filter so that the oil lubricating the gears and bushings which will drop may be collected on the top of said lower oil tank and filtered therein before it can enter said lower oil tank and be pumped again to the upper oil tank. The lubricating oil will circulate in this manner only during operation of the machine, thereby insuring effective lubrication. When the operation of the machine ceases, the oil circulation will stop also.

The machine may be operated in the following manner: Release the control and brake pulley, **55**, interior flywheel, **95**, and front flywheel, **101**, by turning the crank shaft, **92**, rightwardly.

Disengage the connector gear, **70**, by pulling the lever arm, **73**. Close the mainhead tube, **16**, the main winding power tube, **42**, and the secondary main power tube, **59**, by turning rightwardly their respective handles, **18**, **43** and **60**. Close also the safety valve, **33**, and the pressure tube, **110**, by turning its lever arm, **111**. Then crank the differential shaft, **12**, at the differential pulley, **118**, after opening the inlet pipes, **25**, **28**, and **37**, by turning leftwardly their respective handles, **26**, **29**, and **38**. By cranking said differential shaft, **12**, the crank shaft, holding gear, **22**, will make the primary restorer pumps, **23**, **23**, the compressor pump, **27** and the secondary restorer pump, **34**, compress air in the air-tank, **17**, until the air-pressure therein will reach a point in which it is already too resisting for one man alone to crank the said differential shaft, **12**. At this time, close the inlet pipe, **25**, by turning its handle, **26**, rightwardly, and crank also the above-mentioned differential shaft until the desired air-pressure, as may be indicated by the air pressure gauge, **32**, is reached. Once it is reached, disengage the gears, **85**, **85**, by pulling the lever arm, **86**, and lock the vertical shaft, **52**, by inserting the peg, **82**, into one of the holes on the external side of the lateral wall, and then close the inlet pipe, **37**, by turning rightwardly its handle, **38**. After this, open the main winding power tube, **42**, by turning leftwardly its handle, **43**. By opening said main winding power tube, the compressed air, passing through it from the air-tank, will turn the winder wheel, thereby winding the coil-spring. Once it is already winded, close the main winding power tube and the mainhead tube, **16**, and release the vertical shaft, **52**, by pulling the peg, **82**. Connect gears, **85**, **85**, to the miter gear, **46** and to the crank shaft gear, **83**, by pushing the lever arm, **86**. Connect also the connector gear, **70**, by pushing the lever arm, **73**. At this time, the machine is ready for operation. To make it function, open the main winding power tube, **42**, the secondary main power tube, **59**, and the mainhead tube, **18**. By so doing, the differential shaft, **12**, will turn because of the combined forces of the primary power wheel, **8**, winder wheel, **35**, coil-spring, **51**, secondary power wheel, **36**, and windmill, **75**, together with the inertia motion of the interior flywheel, **95**, and of the front flywheel, **101**.

Taking into account the ratio between the crown gear and the pinion as well as the number and the respective ratios of the gears which make up the combination connecting the said pinion and the differential shaft, above referred to, and basing upon ten (10) complete turns and upon the multiples of ten, as the minimum number of turns, per minute, of the crown gear, **53**, resulting from the combined forces of the winder wheel, coil-spring, secondary power wheel and windmill, said combined forces, aided by the primary power wheel and by the interior flywheel and front flywheel, will turn the differential shaft which holds the differential pulley, **118**, as shown in the following tables:

TABLE I

Number of turns per minute

Crown gear	10	20	30	40	50	60	70	80
Differential pulley	400	800	1200	1, 600	2, 000	2, 400	2, 800	3, 200

TABLE II

Number of turns per minute

Crown gear	90	100	150	200	250	300	350
Differential pulley	3, 600	4, 000	6, 000	8, 000	10, 000	12, 000	14, 000

TABLE III

Number of turns per minute

Crown gear	400	500	1, 000	2, 000	3, 000	4, 000
Differential pulley	16, 000	20, 000	40, 000	80, 000	120, 000	160, 000

It is believed that the faster a vehicle in which the machine may be installed will run per minute, the more feasible will it be for said machine to realize, per minute, the number of turns shown in the above tables.

I am aware that prior to my invention compressed air has been used in starting some types of engines and that coil-spring has been used in operating some mechanical devices. I therefore do not claim such devices, engines and/or combinations involving the use of compressed air and coil-spring broadly.

CIPRIANO C. ALVIZO.