G. J. SPOHRER.

AIR PUMP.

APPLICATION FILED JUNE 2, 1910.

975,473. Patented Nov. 15, 1910.

2 SHEETS—SHEET 1.

FIG. 1

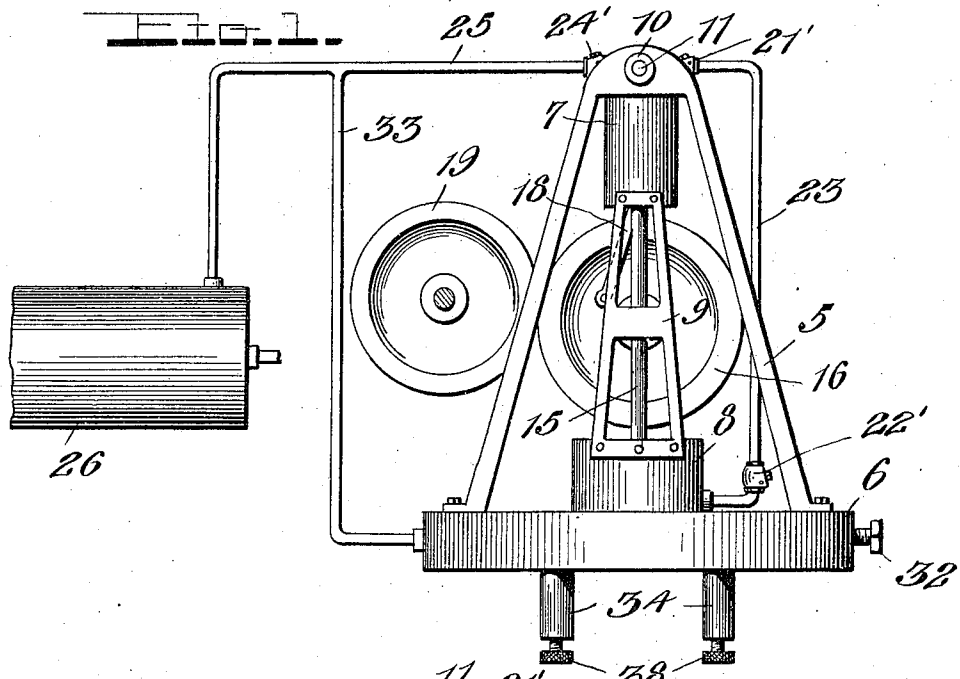
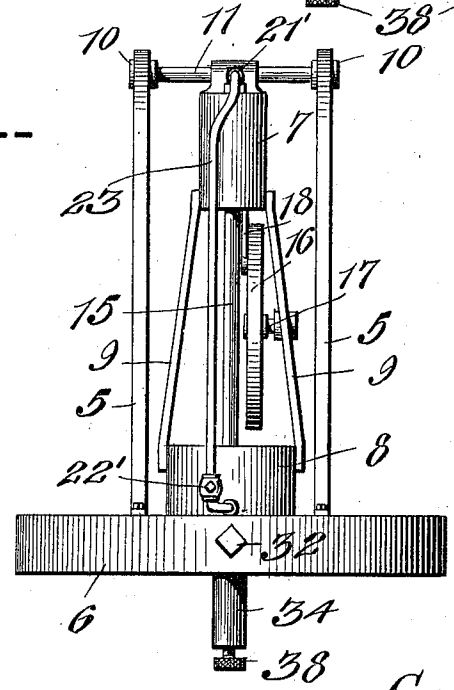


FIG. 2



Witnesses

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2 SHEETS—SHEET 2.

FIG. 3

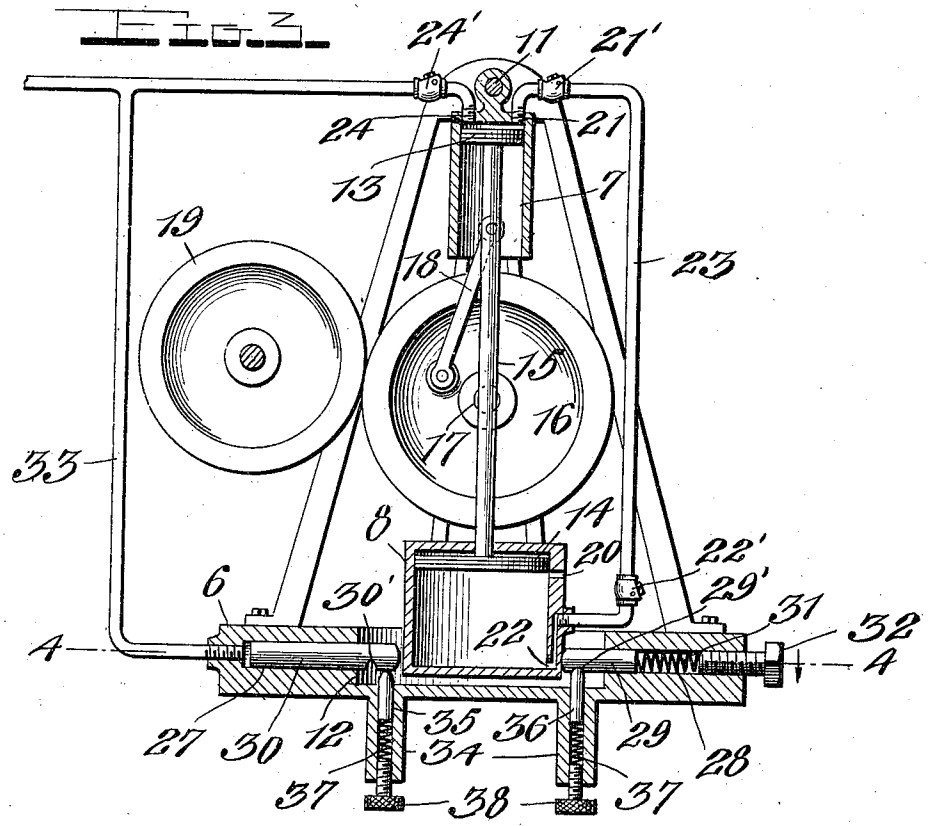
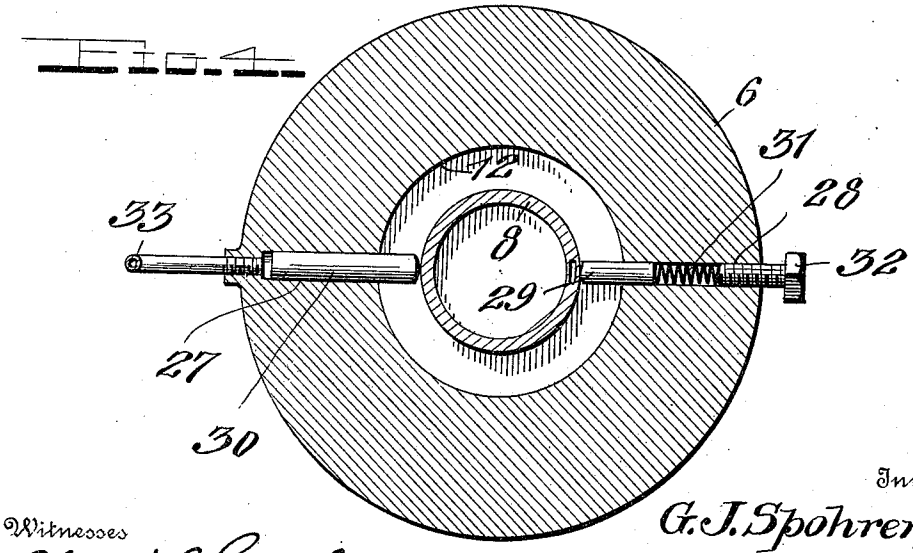


FIG. 4



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UNITED STATES PATENT OFFICE.

GREGORY J. SPOHRER, OF FRANKLIN, PENNSYLVANIA.

AIR-PUMP.

975,473. Specification of Letters Patent. Patented Nov. 15, 1910.

Application filed June 2, 1910. Serial No. 564,576.

To all whom it may concern:

Be it known that I, GREGORY J. SPOHRER, a citizen of the United States, residing at Franklin, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Air-Pumps, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates to improvements in air pumps and has for its object to provide a very novel and efficient air pump which is adapted to be automatically thrown into and out of operation by the decrease and increase of air pressure.

Another object is to provide a pump of the above character comprising a plurality of air cylinders swingingly mounted and having a reciprocating piston therein to supply air to a storage tank, and means connected to said storage tank operated by the increase of air pressure therein to automatically stop the supply of air to the tank.

A further object of the invention is to provide means for producing a very high pressure of air whereby a maximum amount of power may be obtained from a minimum air supply.

A still further object of the invention resides in the provision of two cylinders having a double reciprocating piston therein and a driven wheel for actuating said piston, said wheel being adapted to engage with a driving wheel, means for automatically moving said driven wheel into and out of contact with the driving wheel by decrease and increase of air pressure, and means for regulating the pressure necessary to effect said operation.

With these and other objects in view, the invention consists of the novel features of construction, combination and arrangement of parts hereinafter fully described and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of an air pump constructed in accordance with the present invention; Fig. 2 is an edge elevation thereof; Fig. 3 is a section taken on the line 3—3 of Fig. 2; and Fig. 4 is a section taken on the line 4—4 of Fig. 3.

The present invention is devised with a view to providing a simple and efficient pump for compressed air engine starting mechanism of that character set forth in my co-pending application filed coincident herewith wherein there is shown an air supply tank for connection to one or more cylinders of the engine carried by a motor vehicle. In some instances, however, the gas supply is insufficient to actuate the starting mechanism and in order to insure the operation of the starting mechanism in such instances, I utilize the air pump shown in the accompanying drawings and which will now be set forth in detail.

5 indicates the vertical parallel arms or standards of the main frame which are integrally formed with a base 6. This frame may be suitably arranged upon any part of the automobile frame structure but is preferably disposed adjacent to the fly wheel of the engine which is utilized as the driving medium of the pump. Between the arms 5 of the main frame the pump mechanism is arranged to oscillate. This mechanism comprises the upper and lower cylinders 7 and 8 respectively which are connected by means of the frame bars 9. The cylinder 7 is formed upon its upper end with a bearing 10 which is mounted to oscillate upon a transverse shaft 11 which connects the upper ends of the arms 5 of the main frame. The central portion of the base 6 is recessed as shown at 12 to receive the lower cylinder 8. This cylinder it will be noted is closed at both ends while the lower end of the upper cylinder 7 is open. Pistons 13 and 14 are mounted to reciprocate in the upper and lower cylinders 7 and 8 respectively and are connected by the piston rod 15. A driven wheel 16 is mounted to rotate upon a trunnion 17 centrally secured to one of the frame bars 9 connecting the cylinders 7 and 8. A connecting arm 18 is pivoted at one end to the piston rod 15 and has its other end eccentrically connected to the wheel 16. As shown in Fig. 3 the pumping mechanism is in operative position and the periphery of the wheel 16 is frictionally engaged with the driving wheel 19, which, as before stated is preferably the fly wheel of the engine although it will be understood that an independent driving means may be employed if desired.

The lower cylinder 8 is provided adjacent to its upper end with an air intake port 20 and the upper cylinder 7 is provided at its upper end with a similar port 21. An outlet port 22 is also formed in the cylinder 8 adjacent to its lower end and a pipe 23 connects this outlet port with the inlet port 21

of the cylinder 7. A check valve 22′ is arranged in the pipe 23 adjacent to the outlet 22 and another check valve 21′ is also arranged in said pipe adjacent to the intake port 21 of the upper cylinder 7. Thus back pressure of the air into the lower cylinder or into the pipe from the upper cylinder is prevented. The upper cylinder 7 is also provided with an outlet port 24 to which a pipe 25 is connected, a check valve 24′ being arranged in said pipe adjacent to the outlet port. The pipe 25 is connected to a suitable air pressure supply tank 26 into which the air is pumped and from which it is adapted to be withdrawn and utilized for any desired purpose.

In the operation of the pumping mechanism, when the driving wheel 19 is engaged with the wheel 16 as shown in Fig. 3, the pistons 13 and 14 will be reciprocated in their respective cylinders and it will be obvious that as the piston rod 15 is forced downward the air in the lower cylinder 8 is compressed. This air is admitted to the cylinder 8 through the port 20 when the piston 14 is at the highest point of its stroke. It is compressed to about 60 or 70 pounds pressure before discharging through the outlet 22 and the check valve 22′. During this downward movement of the piston 14 the air which is thus compressed is being conducted through the pipe 23 to the upper end of the cylinder 7 into which it is discharged through the port 21. The cylinder 7 is about one-fourth of the area of the cylinder 8 and upon the reverse movement of the pistons, the air which is compressed in the cylinder 8 is again compressed to a still higher pressure in the cylinder 7 before it is discharged through the pipe 25 into the air tank 26. The intake of the cylinder 7 upon the discharge from the cylinder 8 may be about 4 atmospheres or 60 pounds. This compression and discharge of the air is continuously repeated as long as the pumping mechanism is in operation.

In order to provide suitable means for automatically moving the pumping mechanism to an inoperative position by the increased pressure of air in the tank and for again moving it into operation upon sufficient decrease of the pressure, the following mechanism is employed. The base 6 of the main frame is provided at diametrically opposite points with the radially extending recesses or chambers 27 and 28. The chamber 28 is in the form of a cylindrical opening which extends entirely through the outer body portion of the base and has arranged therein a plunger 29, which extends into the central recessed portion 12 of the base. The opposite chamber 27 has its outer end closed but also opens into the recessed portion of the base and has arranged therein a movable plunger 30. A coiled spring 31 is disposed in the chamber 28 and normally acts to force the plunger 29 outwardly. An adjusting screw 32 is threaded into the end of the chamber 28 and is adapted to regulate the tension of the spring 31 so as to cause greater or less pressure of the same upon the plunger. The outer end of the plunger 29 bears against the lower cylinder 8 and owing to the tension of the spring tends to force or swing the air cylinders and the driven wheel mounted between the same to the left as shown in Fig. 3 and into engagement with the periphery of the driving wheel 19. When in this position the plunger 30 is disposed entirely within the chamber 27, being moved to such position by the cylinder 8. A pipe 33 connects the outer end of the chamber 27 to the pipe 25 and is adapted to discharge air into the same when the pressure into the supply tank 26 has reached a desired point. The base 6 is formed upon opposite sides of its center with the downwardly extending tubular extensions 34 in which the pins 35 and 36 are arranged for vertical movement. A coiled spring 37 in each of the extensions 34 bears upon the lower end of the pin therein and acts to force the same upwardly into contact with the plungers 29 and 30. These plungers are provided with the notches 29′ and 30′ to receive the ends of the pins 35 and 36. An adjusting screw 38 is also threaded into the lower ends of the tubular extensions 34 whereby the tension spring 37 therein may be regulated to cause greater or less pressure of the pins 35 and 36 upon the plungers 29 and 30.

When the air pressure in the supply tank becomes sufficiently great, it will move through the pipe 33 and be discharged therefrom into the chamber 27 against the plunger 30. This air pressure is sufficiently great to force or swing the cylinders to the right and overcome the tension of the spring 31 behind the plunger 29, unseating the pin 36 from the notch 29′ in the plunger and forcing the same downwardly in the tubular extension 34. This longitudinal inward movement of the plunger 30 continues until the upper end of the pin 35 engages in the notch 30′ thereof when the tension of the spring 37 upon the pin will be sufficient to overcome the air pressure and the driven wheel 16 will thus be held out of contact with the driving wheel 19 thereby discontinuing the supply of air to the tank. The decrease of air pressure necessary to permit the movement of the pumping mechanism into its operative position through the medium of the plunger 29 is regulated by adjusting the screw 38 which regulates the tension of the spring 37 upon the pin 35 engaged with the plunger 30. In a similar manner the pressure of air in the tank is

regulated by adjusting the tension of the spring 37 behind the pin 36 thus requiring a greater or less pressure of the plunger 30 upon the lower cylinder 8 before the pin 36 is unseated from the notch in the plunger 29.

From the above description it is believed that the construction and operation of my improved air pump will be readily understood. The device is of very simple construction and may be advantageously employed for many other purposes than that specified. The means devised for automatically rendering the pumping mechanism inoperative is particularly desirable as it obviates all liability of the bursting of the supply tank and relieves the operator of considerable anxiety. The pump also requires but little attention and is so constructed that it may be conveniently arranged in a very small space which is a particularly desirable feature when the pump is to be employed for the purpose hereinbefore noted. Furthermore, the device may be constructed at a very low cost and is extremely durable owing to the fact that no complicated parts are utilized in its construction. It will of course be obvious that the wheels 16 and 19 may be gear wheels instead of friction wheels as shown in the accompanying drawings.

While I have specifically described the preferred embodiment of my invention, it will be obvious that the same is susceptible of a great many minor modifications in the form, proportion and arrangement of the various parts without departing from the essential feature or sacrificing any of the advantages of the invention.

Having thus described the invention, what is claimed is:—

1. In an air pump, the combination with a frame, of spaced cylinders rigidly connected together, said cylinders being pivotally mounted in the frame for oscillatory movement, a piston in each of said cylinders, a piston rod connecting said pistons, means for reciprocating said piston rod and operating means therefor, a pipe connecting said cylinders, an air conducting pipe extending from one of said cylinders to a supply tank, and means for automatically moving the pumping mechanism to its operative and inoperative positions upon variation in air pressure in the tank to a predetermined point.

2. In an air pump, the combination with a frame comprising a base having parallel standards rising therefrom, of rigidly connected spaced cylinders pivotally mounted between the upper ends of said standards for oscillatory movement, a piston arranged to reciprocate in each of the cylinders, a piston rod connecting said pistons, means arranged between the cylinders and connected to the piston rod for reciprocating the same, operating means for said piston actuating means, an air conducting pipe connected to one of said cylinders and extending to the pressure supply tank, a pipe connecting said cylinders to conduct air under pressure from one to the other, and means arranged in said base for automatically oscillating said cylinders and the piston actuating means to move the latter into and out of operative position upon variation in the air pressure in the tank.

3. In an air pump, the combination with a frame comprising parallel standards, of rigidly connected cylinders of different capacity pivoted between the upper ends of the standards for oscillatory movement, a driven wheel rotatably mounted between the cylinders and movable therewith, pistons in said cylinders, means connecting the pistons and said driven wheel, a driving wheel to frictionally engage the driven wheel and actuate the pistons, an air conducting pipe between one of the cylinders and a pressure supply tank, a pipe connecting said cylinders to conduct air under pressure from one to the other, and means for automatically moving said cylinders and the piston actuating wheel into and out of contact with the driving wheel upon variation of air pressure in the supply tank to a predetermined point.

4. In an air pump, the combination with a base and parallel standards rising therefrom, of cylinders of different capacity arranged in longitudinal alinement and rigidly connected together, said cylinders being pivotally mounted in said frame for oscillatory movement, a driven wheel rotatably mounted between the cylinders and movable therewith, reciprocatory pistons in said cylinders, means connecting said pistons and the driven wheel whereby the pistons are actuated, a driving wheel to engage said driven wheel and rotate the same, an air conducting pipe between one of said cylinders, and a pressure supply tank, a pipe connecting said cylinders, and opposed plungers movably arranged in the base to engage one of said cylinders and move the driven wheel into and out of contact with the driving wheel upon variation of air pressure in the tank to a predetermined point.

5. In an air pump, the combination with a base and parallel standards rising therefrom, of a pumping mechanism mounted between said standards for oscillatory movement, said mechanism comprising upper and lower cylinders rigidly connected together, a piston in each of said cylinders, and a piston rod connecting said pistons, a driven wheel rotatably mounted intermediate of the cylinders and connected to the piston rod to actuate the same, operating means for said pumping mechanism, an air conducting pipe between the upper cylinder and the pressure

supply tank, a pipe connecting said cylinders, an air actuated plunger mounted in the base to engage with the other cylinder and oscillate said cylinders and the driven wheel to move the same to an inoperative position upon the rise of pressure in the tank to a predetermined point, and a spring pressed plunger mounted in said base opposite to the first named plunger to return the pumping mechanism to its operative position upon decrease of air pressure in the tank to a predetermined point.

6. In an air pump, the combination with a base and standards rising therefrom, of rigidly connected cylinders of different capacities pivotally mounted between the standards for oscillatory movement, a driven wheel mounted between said cylinders, pistons in said cylinders, and a piston rod connecting the same, a connection between said rod and the driven wheel, a driving wheel to rotate said driven wheel, an air conducting pipe connecting one of the cylinders with a pressure supply tank, a pipe connecting said cylinders to conduct air under pressure from one to the other, an air actuated plunger mounted in the base to engage one of said cylinders whereby said cylinders and the driven wheel are moved to an inoperative position, a spring pressed plunger mounted in said base upon the opposite side of the cylinder adapted to return the cylinders to their operative positions and engage the driven wheel with the driving wheel, and means adjustable in the base disposed at right angles to the plungers and engaging the same for normally holding said plungers against movement.

7. In an air pump, the combination with a frame, of a pumping mechanism comprising two cylinders rigidly connected together and mounted in said frame for oscillatory movement, a piston arranged to reciprocate in each of the cylinders, a rod connecting said pistons, a driven wheel rotatably mounted between the cylinders, an eccentric connection between the piston rod and the wheel, said wheel being movable into and out of frictional engagement with the periphery of a driving wheel, each of said cylinders having an inlet and outlet port, an air conducting pipe connecting the outlet of one cylinder to the inlet of the other, a connecting pipe between the outlet of the last named cylinder and a pressure supply tank, and means for automatically moving the driven wheel of the pumping mechanism out of contact with the driving wheel when the air pressure in the supply tank has reached a desired point.

8. In an air pump, the combination with a frame consisting of parallel standards rising from a base, said base having a central recess, of a pumping mechanism mounted between said standards for oscillatory movement, said mechanism comprising upper and lower cylinders of different diameters, said lower cylinder extending into the recess of the base, a piston arranged to reciprocate in each of the cylinders, a piston rod connecting said pistons, a driven wheel connected to the rod for reciprocating the pistons adapted for frictional contact with the periphery of the driving wheel, each of said cylinders having an inlet and an outlet, a pipe connecting the outlet of the lower cylinder to the inlet of the upper cylinder, an air pipe connecting the outlet of the upper cylinder to an air supply tank to charge the same, an air actuated plunger mounted in the base for engagement with the lower cylinder to move the pumping mechanism to an inoperative position when the pressure of air in the tank has reached a desired point, and means arranged in the base on the opposite side of the cylinder for moving the pumping mechanism to an operative position upon a decrease of air pressure in the cylinder to a certain point.

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

GREGORY J. SPOHRER.

Witnesses:
FAYETTE E. SMITH,
WALTER F. ROSS.