W. M. MELMORE.

AIR COMPRESSOR.

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1,139,991.

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Fig. 1.

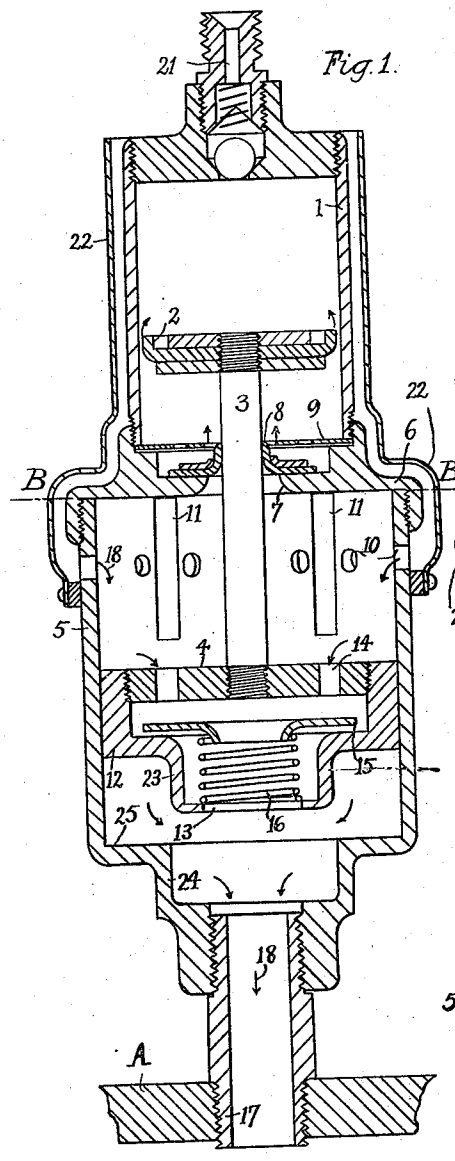


Fig. 2.

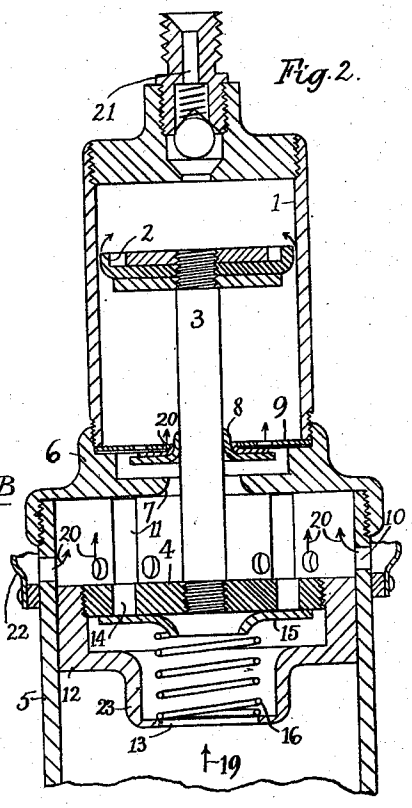
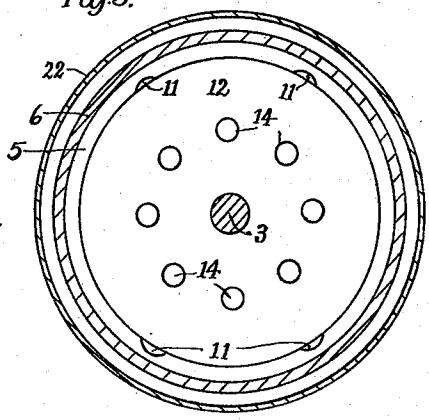


Fig. 3.



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AIR-COMPRESSOR.

1,139,991. Specification of Letters Patent. Patented May 18, 1915.

Application filed November 25, 1913. Serial No. 802,940.

To all whom it may concern:

Be it known that I, WILLIAM MORTIMER MELMORE, a subject of the King of England, residing at London, England, have invented a new and useful Air-Compressor, of which the following is a specification.

This invention relates to automatically operated air pumps of the type used for inflating the pneumatic tires of automobiles and which consist of a double-cylinder apparatus one of which cylinders is connected with the cylinder of an internal combustion engine so as to receive actuating impulses from the latter, while the other cylinder serves as an air compressor for forcing air into the tires of the vehicle-wheels. In one type of pump two pistons of different diameters are connected together by an intervening piston-rod and the large piston draws air in through openings in or near the outer end of the cylinder which air passes into the engine cylinder, and in another type of pump the air drawn in by the large piston is at the outstroke of said piston forced into the pump cylinder where subsequently it passes in front of the pump piston and is compressed so as to serve for the inflation of the tires. These pumps are unsatisfactory because they are noisy in operation and become over-heated and I have previously provided cushioning means in a pump forming a combination of the aforementioned two types of pumps. I find that these pumps lose power to compress after a certain stage and then simply move to and fro for a very small fraction of the normal stroke.

In order to avoid over-heating and noise according to my present invention and also to provide for a more effective compression of the air for inflation of the tires than has been attainable with pumps of the aforesaid types, I provide intermittent communication between the engine cylinder and the pump cylinder by causing the large piston of the pump *i. e.* the operating piston to open and close communications with the atmosphere and from the engine cylinder to the pump respectively. In short, communication is first established between the atmosphere and the operating cylinder of the air-compressor, then between the atmosphere and the rear end of the pump cylinder and finally between the engine cylinder and the pump.

An embodiment of my invention is shown in the annexed drawings, in which:—

Figure 1 is a vertical section of the pump showing the movable parts during the downstroke; Fig. 2, a similar section of a part of the pump with the movable parts arranged as during delivery stroke; and Fig. 3, a horizontal section on line A—A of Fig. 1.

The pump cylinder 1 has a cup-piston 2 of leather or the like which moves loosely in the cylinder and allows air to pass from the rear to the front of the pump-piston 2 during its instroke in the well known manner. During the outstroke tightness is insured by the action of the compressed air on the cup-leather. The piston 2 is fixed to the upper end of a solid piston rod 3 to the lower end of which is fixed a larger piston 4 within a cylinder 5. The two cylinders 1 and 5 are joined together by an annular connecting piece 6 formed with a central bore 7 of larger diameter than the rod 3, said bore being in some arrangements closed by a leather valve 8 confined within a limited traveling space between the connection 6 and a superposed grid 9. All these parts are known and they form merely a convenient combination with the present invention which consists in the novel principle of operating as previously stated and in the arrangement and construction of the large acting piston 4 and its cylinder 5 forming part of the air compressor.

The cylinder 5 has peripheral air-inlets 10 near the forward end so positioned as to be closed by the piston 4 at a certain time as hereinafter explained and held closed thereafter while the piston completes its outstroke. In addition to the inlets 10 there are intervening longitudinal grooves 11 formed in the interior of the cylinder 5 which extends from the forward end thereof sufficiently far down to open at the rear of piston 4 when the latter has only just closed the inlets.

The piston comprises the top plate 4 and a cup-shaped body 12 with a permanently open passage 13. The top plate has perforations 14 normally closed by an internal suction valve 15 held up by a spring 16. Any other kind of non-return valve may be used. The pump may advantageously be fitted with an air jacket 22. When the

lower portion 23 of the piston-body 12 enters a corresponding recess 24 in the cylinder 5 an air-buffer will be created in the space 25 so that knocking will be avoided.

The action is as follows: Presuming the lower end plug 17 of the pump to be secured in the spark-plug aperture of an engine cylinder A of a multiple cylinder engine in the well known manner. When the operating piston 4 arrives near the end of its out-stroke, it covers the peripheral air-inlets 10 while the aforementioned longitudinal grooves 11 begin to open toward both ends of the cylinder 5 *i. e.* front and back of the operating piston 4. At the beginning of the suction stroke of the engine cylinder the piston 4 can freely move inward, and as soon as the latter has moved back far enough to unmask the peripheral air-inlets 10 in the cylinder 5, the inrush of atmospheric air allows the non-return valve 15 in the said piston to open so as to pass into the engine cylinder as indicated by arrows 18, see Fig. 1. At the compression stroke, the valve 15 in the operating piston 4 closes as shown in Fig. 2 and the said piston is driven outward by compressed air from the engine cylinder A, this being indicated by arrows 19, Fig. 2. The piston will at first expel the air in front of it, while at the same time the valve 8 leading into the pump is opened by the movement of the piston rod 3 so that atmospheric air enters the rear end of the pump cylinder 1 as indicated by arrows 20. The piston 2 drives air from the front end of the pump through the valve-checked outlet 21 into the pneumatic tires as is well known. Toward the end of the out-stroke, the operating piston 4 closes the peripheral air-inlets 10 and opens the longitudinal grooves 11. This causes a sudden rush of compressed air from the engine cylinder to pass with full pressure through the now open longitudinal grooves 11 into the rear of the pump through the communication valve 8 opened by the piston rod 3. Immediately afterward the out-stroke of the operating piston is completed. During the instroke cup-leather of the piston 2 allows the partially compressed air in the rear of the pump cylinder 1 to pass to the front end for further compression.

It should be mentioned that no contaminated air passes from the pump into the tires because the pump is practically filled with atmospheric air which also fills the rear of cylinder 5 during the suction stroke. It is this pure air which is driven through the grooves 11 by the compressed air from the engine cylinder.

I claim:

1. In an air-compressor comprising a pump cylinder seated on the end of an operating cylinder to be connected with one of the cylinders of a motor vehicle, the combination with a pump piston, a rod depending from the piston, a disk-valve frictionally mounted on the piston rod, and means for limiting the travel of said valve, of an operating piston fast to said piston rod and comprising a perforated top plate, a centrally perforated cup-shaped piston body, a non-return valve at the inner face of said plate, and a spring for supporting the non-return valve, as described.

2. An air-compressor comprising in combination with one another a lower large cylinder, peripheral air-inlets, internal longitudinal grooves extending from the forward end of the cylinder to the rear of said inlets, a hollow piston capable of covering simultaneously the inlets and the rear end of said grooves, a suction valve covering a passage in said piston, a piston rod fast to the latter, a connecting disk at the forward end of the cylinder, a valve applied to the upper face of said disk, a grid fast to the latter, a small pump cylinder fast to said disk, a pump piston at the end of said piston rod, a valve-checked delivery at the front end of the pump cylinder, and a jacket fast on the large cylinder and extending with its open end to the front end of the pump, as and for the purpose described.

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Witnesses:
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