R. TEMPLE.

AIR COMPRESSOR.

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995,815.

Patented June 20, 1911.

Fig. 1.

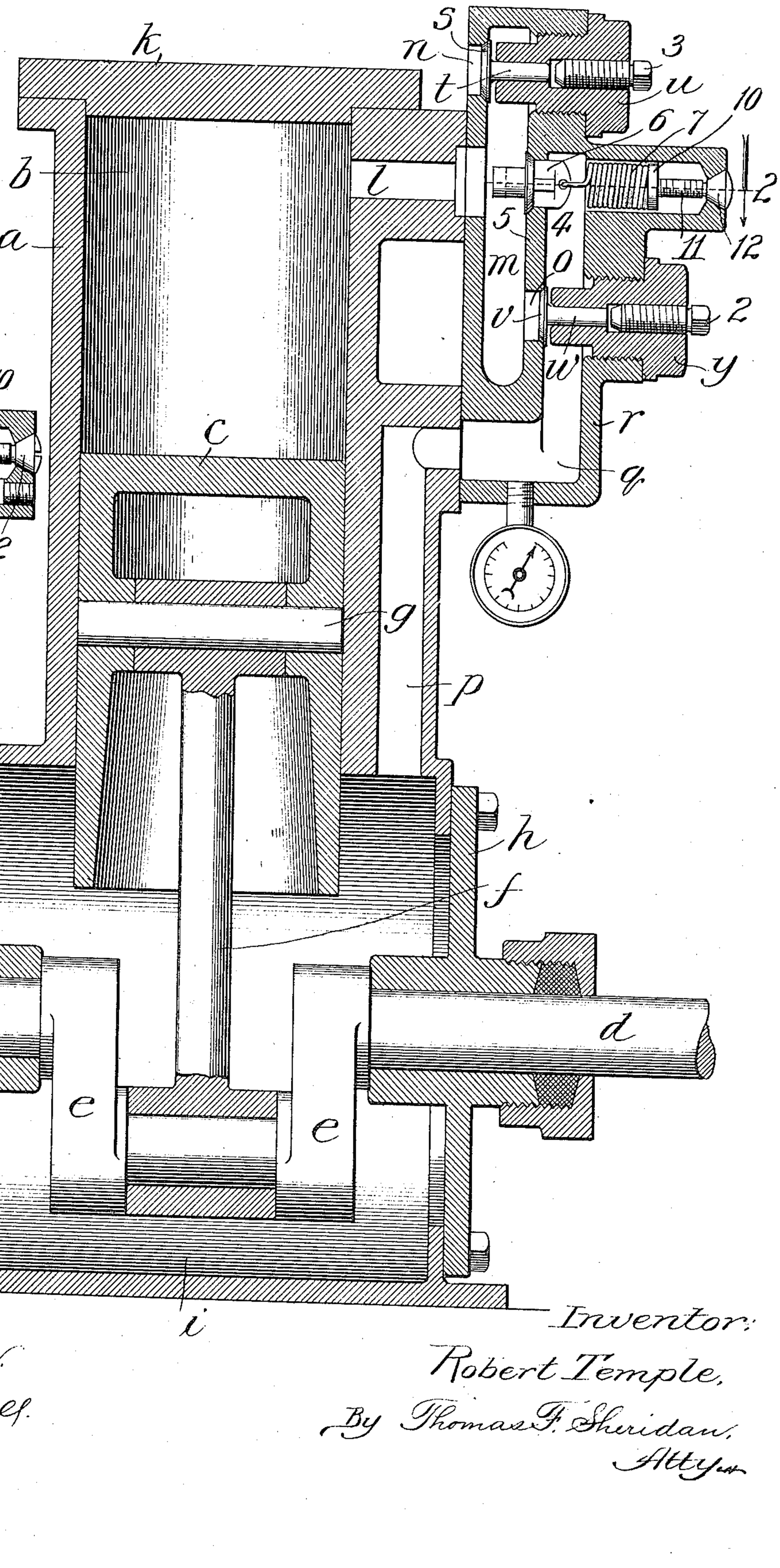
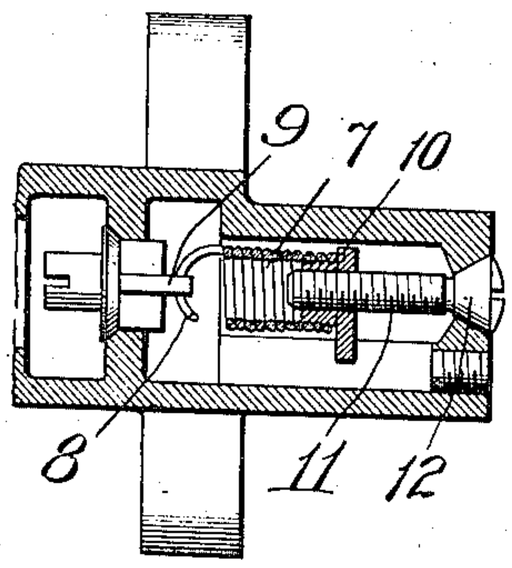


Fig. 2.



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AIR-COMPRESSOR.

995,815. Specification of Letters Patent. Patented June 20, 1911.

Application filed September 5, 1905. Serial No. 277,091.

To all whom it may concern:

Be it known that I, ROBERT TEMPLE, a citizen of the United States, residing in the city and county of Denver, State of Colorado, have invented certain new and useful Improvements in Air-Compressors, of which the following is a specification.

This invention relates to that class of compressors adapted to compress and maintain fluid, such as air or a gas, or air intermixed with another fluid or fluids, under pressure.

It relates particularly to the means for regulating or controlling the pressure of the fluid in such a manner as to enable the desired pressure to be maintained without allowing the compressed fluid to escape and be wasted, either in order to prevent an excessive pressure or maintain a uniform or other desired pressure.

The principal object of my invention is to provide a simple, economical and efficient fluid compressor.

A further object of the invention is to provide a fluid compressor with means for regulating the pressure of the fluid in such a manner as to avoid the necessity of wasting the fluid in order to prevent an excess of pressure or maintain a uniform or desired pressure.

A further object is to provide, in a fluid compressor, a suitable valve chest and valve mechanisms contained therein, adapted to be secured to the compressor and removed therefrom when desired and adapted to be readily cleaned, repaired or replaced.

Other and further objects of the invention will appear from an examination of the drawings and the following description and claims.

The invention consists principally in a fluid compressor having a compressing chamber provided with inlet and discharge ports communicating therewith, inlet and discharge valves for such ports respectively, a compressing piston, a chamber, passage or reservoir for containing fluid under pressure provided with a return or pressure controlling port communicating with the compressing chamber, and a pressure controlling valve mounted in such port adapted to permit fluid under pressure to pass from the reservoir to the compressing chamber when and only when a desired predetermined pressure is reached.

It consists further, and finally, in the features, combinations and details of construction hereinafter described and claimed.

In the accompanying drawings—Figure 1 is a sectional elevation of an air compressor provided with my improvements; and Fig. 2 a detail sectional view of the pressure controlling valve mechanism, taken on line 2 of Fig. 1, looking in the direction of the arrow.

In constructing an air compressor and valve chest in accordance with my improvements, I provide a compressing cylinder *a* provided with a compressing chamber *b* and a reciprocating compressing or pulsating piston *c* slidably mounted and adapted to compress fluid therein, such piston being connected with a suitable source of power by means of a main driving shaft *d* having a crank portion *e*,—a piston rod *f* being secured at one end to the crank shaft and at the other end to the piston by means of a connecting pin *g*. A casing *h* forms a reservoir *i* for containing fluid under pressure, such reservoir being adapted to be connected with a system to be supplied with fluid under pressure by means of a pipe *j*, or in any ordinary and well known manner.

The compressing chamber is closed at one end by means of a cylinder head *k* and is formed of a main portion and branch portions *l* and *m*. It has an inlet port *n* and a discharge port *o* communicating with the compressing chamber through the branch portions or passages *l* and *m*. The discharge port of the compressing chamber communicates with a discharge chamber *q*, which forms a branch portion of the reservoir *i*. In other words, the discharge chamber portion *q*, in the valve casing, is connected with the main reservoir *i* by means of the passage *p*, so that the discharge chamber *q*, the passage *p* and the reservoir *i* may be said to form a discharge chamber into which compressed fluid is discharged from the compressing chamber through discharge port *o*.

Suitable valves for controlling the inlet and discharge ports *n* and *o* of the compressing chamber are mounted in a valve casing *r*, which contains the discharge chamber *q* communicating with and forming part of the reservoir and the branch or passage *m* communicating with and which may be said to form a part of the compressing chamber. Mounted in this valve chest or casing is an inlet check valve *s*, which is seated in the

inlet port *n* and provided with a valve stem *t* slidably mounted in a suitable perforated plug *u*,—such plug being in turn mounted in threaded engagement with the valve casing. A discharge check valve *v* is seated in the discharge port *o* in a similar manner, being provided with a valve stem *u* slidably mounted in a valve plug *y* which is in threaded engagement with the valve casing. Set screws 2 and 3 mounted in such plugs respectively, are adapted to be adjusted so as to control the extent of movement of the check valves. The inlet valve is movable in the direction necessary to admit fluid from the atmosphere to the compressing chamber, and the outlet valve is movable in the direction necessary to permit fluid to pass from the compressing chamber into the reservoir, both of such valves serving to prevent the fluid from passing in the opposite directions.

A pressure controlling or return passage or port 4 communicates on one side of the separating wall or partition 5 with the compressing chamber and on the other side of such wall or partition with the discharge chamber, and in this passage or port 4 is mounted a pressure controlling valve 6. This valve is so seated as to form a positive resistance to the discharge of fluid from the compressing chamber through such port to the discharge chamber and is held yieldingly in place against the pressure of the fluid contained in the discharge chamber by means of a spring 7. One end portion 8 of this spring is secured to the pressure controlling valve by being hooked into a perforated lug portion 9 thereof, and the opposite end of the spring is secured to a nut 10, which is in threaded engagement with a controlling screw 11 having its headed end 12 rotatably mounted in the casing, so that the rotation of the screw in one direction will increase the tension of the spring, and its rotation in the opposite direction will decrease the tension thereof. By the above arrangement it will be seen that the movement of the compressing piston downward or to the position shown in Fig. 1 will produce a partial vacuum in the compressing chamber *b* including its branch portions *l* and *m*, causing air to pass through the inlet port *n* into the compressing chamber. The upward stroke of the piston will compress the air and force it through the outlet port *o* into the reservoir, wherein it may be intermixed with oil or other desirable liquid or fluid, as required. When the pressure in the discharge chamber reservoir has become sufficient to overcome the tension of the spring 7, so as to unseat the pressure regulating valve 6, the air will pass through the passage controlled by such pressure controlling valve in the direction of the compressing chamber. When the pressure in the reservoir is sufficient to cause this to take place, no air will be admitted to the compressing chamber through the inlet valve with the downward stroke of the piston, but instead the compressing chamber will receive fluid from the reservoir through the return passage,—which is controlled by the pressure controlling valve,—and from no other source until the pressure is reduced to a predetermined degree corresponding to the pressure required to unseat or open the pressure controlling valve. Thus the reciprocating movements of the piston will only cause a circulation of air under pressure without the admission of an additional quantity until the pressure has been reduced and an additional quantity is required in order to cause the pressure to reach the desired point. This renders it possible to control the pressure of the fluid without allowing it to escape and be wasted, either to prevent the pressure from increasing beyond a predetermined point or to maintain a uniform or any desired pressure. This is particularly desirable when the air is mixed with other fluids of value, such, for instance, as oil or other fluid or fluids for any purpose where it is desirable to maintain such fluids under pressure. The oil or other fluid or fluids to be intermixed with the compressed air may be introduced into the discharge chamber or reservoir in any ordinary manner by means of a pipe or passage leading to such discharge chamber or the reservoir.

It is to be observed that in the operation of my air compressor the connecting rod *f* is always or nearly always on a tension. At the beginning of the upstroke of the piston *c* its under surface is subjected to the full pressure in the storage chamber *i*, while its upper surface is subjected to atmospheric pressure, thus the balance of pressure will be up. As the air above the piston becomes compressed its pressure increases until it opens the check valve *v*. Then and thereafter until the end of the upstroke, the pressure above the piston *c* is substantially the same as that below the piston. Although during the upstroke of the piston *c* air is being forced into the storage chamber *i* through the passage *p*, yet the storage chamber itself is being enlarged by the upward movement of the piston *c*, so as to increase the volume of the chamber and thereby decrease the pressure therein as much as or more than it is increased by the influx of air through the passage *p*.

I claim:

1. In a machine of the class described, the combination of a cylinder, a reciprocatory piston therein, a reservoir, a conduit leading from the said cylinder to the said reservoir, and means for decreasing the pressure in the reservoir at the time fluid is being injected therein through the conduit from the compressing chamber.

2. In a machine of the class described, the

combination of a cylinder, a reciprocatory piston therein, intake and exhaust ports communicating with said cylinder, a reservoir to which the exhaust port leads, and means for increasing the size of the reservoir at the same time fluid is being injected therein through the exhaust port from the compressing chamber.

3. In a machine of the class described, the combination of a cylinder having a compressing compartment, intake and exhaust ports connected therewith, a reservoir, a release pressure valve between the reservoir and the compressing compartment, and means for maintaining the pressure in the reservoir at or below that required to operate the pressure valve.

4. In a machine of the class described, the combination of a chamber, a reciprocating means mounted therein and dividing the chamber into reservoir and compressing compartments, and a valved passage connecting said compartments.

5. In a machine of the class described, the combination of a cylinder having a piston reciprocatingly mounted therein forming a compressing chamber in one end of the cylinder, a crank casing connected with the other end of the cylinder and forming a reservoir and an inclosing means for the piston operating mechanism, and a check valve between the compressing chamber and the reservoir.

6. In a machine of the class described, a compressing chamber, a discharge passage leading therefrom, a storage chamber, and two oppositely disposed check valves connecting the discharge passage to the storage chamber, the valve which opens toward the discharge passage being normally held to its seat by a spring.

7. In a machine of the class described, a compressing cylinder, a closed crank casing connected thereto at one end, a discharge passage leading from the opposite end of the cylinder to the crank casing, and a check valve interposed in said passage and opening toward said crank casing.

8. In a machine of the class described, the combination of a compressing cylinder, a piston adapted to reciprocate therein, a storage chamber connected to both ends of the compressing cylinder, and a one-way valve in the connection between one end of the cylinder and the said storage chamber.

9. In a machine of the class described, a compressing cylinder, a piston adapted to reciprocate therein, a storage chamber connected to both ends of said cylinder, and oppositely disposed check valves in the connection between one end of said cylinder and the storage chamber, the check valve which opens toward the said cylinder being held to its seat by a spring.

10. In a machine of the class described, a compressing cylinder, a single acting piston adapted to reciprocate therein, a storage chamber, and connections from the storage chamber to the back pressure side of the piston.

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