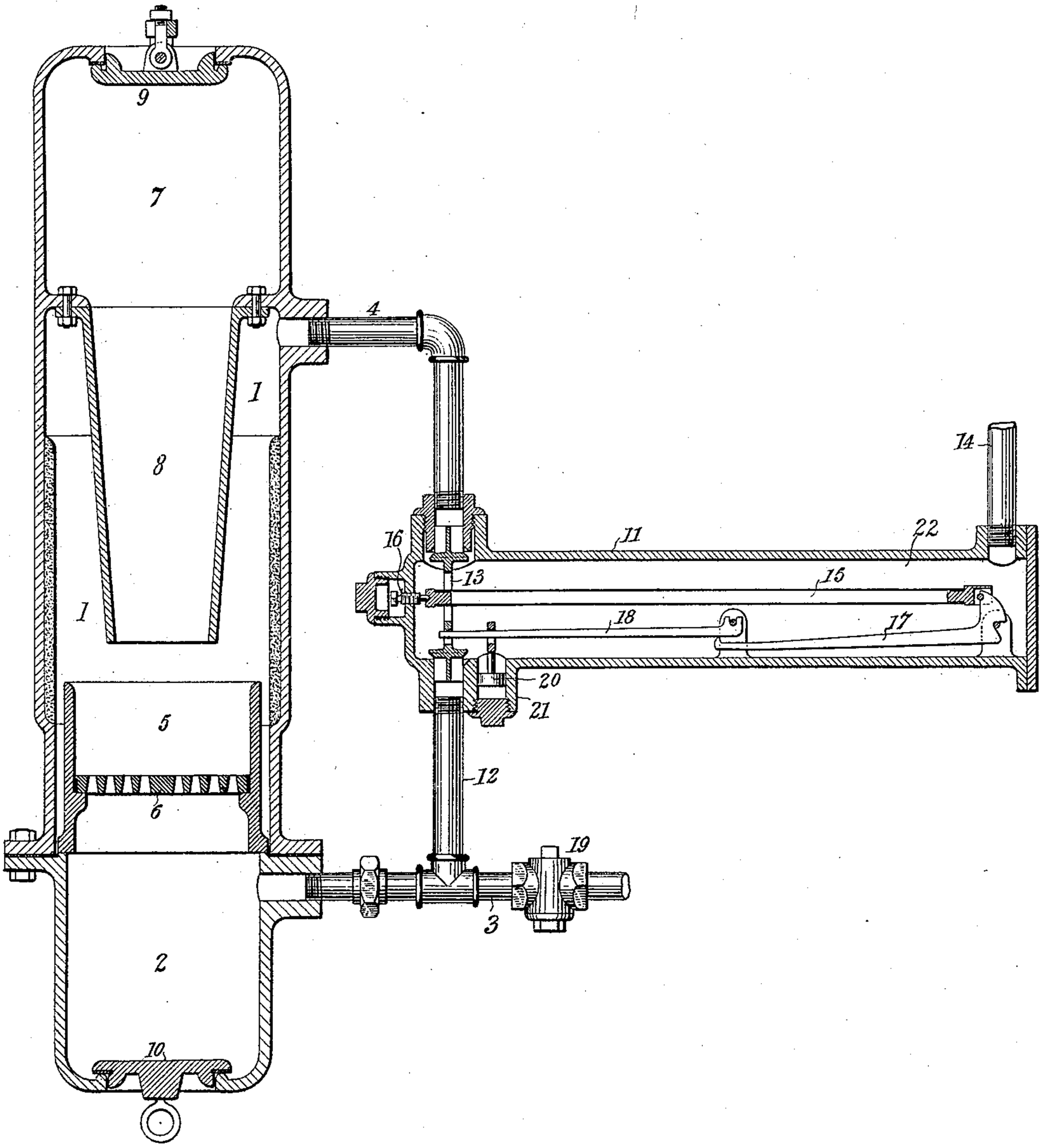
(No Model.)

R. A. PARKE.

APPARATUS FOR HEATING COMPRESSED AIR FOR POWER PURPOSES.

No. 513,053. Patented Jan. 16, 1894.



Witnesses
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ROBERT A. PARKE, OF NEW YORK, ASSIGNOR OF ONE-HALF TO JOHN BOYD THACHER, OF ALBANY, NEW YORK.

APPARATUS FOR HEATING COMPRESSED AIR FOR POWER PURPOSES.

SPECIFICATION forming part of Letters Patent No. 513,053, dated January 16, 1894.

Application filed March 9, 1892. Serial No. 424,274. (No model.)

To all whom it may concern:

Be it known that I, ROBERT A. PARKE, a citizen of the United States, residing at New York, in the county and State of New York, have invented a new and useful Improvement in Apparatus for Heating Compressed Air for Power Purposes, of which the following is a specification.

It is very important in the expansive use of compressed air for power purposes that the temperature of the compressed air delivered to the motor shall be quite uniform, regardless of the rate at which such delivery takes place; as too high a temperature would be injurious to the motor and too low a temperature would cause the subsequent expansion to be accompanied by the complicating and harmful effects of refrigeration.

My present invention therefore, consists of an improved apparatus for heating the air and automatically maintaining it at a practically uniform temperature; and also of an improved construction of temperature regulator.

To enable others skilled in the art to make and use my invention, I will now describe it by reference to the accompanying drawing, which represents a vertical section of the heating device.

The vertical chamber 1, contains a fire pot 5, in which is located the fire grate 6. Below the fire pot 5 is an ash chamber 2, which is secured to the chamber 1. The compressed air is led from the source of supply to the chamber 2 by means of the tube 3, and the heated air is conducted away from the chamber 1 through the tube 4. Above the chamber 1 is a fuel reservoir or chamber 7, having an opening at the top for the introduction of the fuel, which opening is normally closed by the removable door 9 to prevent the escape of the compressed air. A feeding cylinder 8 extends from the lower end of the reservoir 7 nearly to the fire pot 5 and serves to direct the fuel to the fire pot, so that, as the fuel is consumed upon the grate 6, the supply is replenished from the reservoir 7 and cylinder 8, so long as any fuel remains within them. A valve or door 10 is placed at the lower end of chamber 2 to provide for the discharge of ashes therefrom. When this valve is raised from below, the ashes within the chamber 2 are allowed to pass out of the opening thus afforded, the discharge being materially assisted by the air pressure within the chamber.

To insure a uniform temperature of the compressed air delivered to the motor, the tube 4 conducts the heated air from the chamber 1 to a temperature regulating device. This device consists of a casing 11 forming or inclosing a chamber 22, into one end of which the heated compressed air is conducted by the tube 4, and unheated compressed air by the tube 15 which leads from the tube 3. Connected to the other end of the casing 11 is a tube 12 which leads to the motor. In the chamber 22 is a double valve 13 seating against the ends of the tubes 4 and 12 and having a vertical movement such that, when in its upward position, it prevents the admission of the heated air from the tube 4 to the chamber 22, and permits free influx of cold air from the tube 12; and when in its lower position it prevents the admission of cold air from the tube 12 to the chamber 22, and permits the free influx of heated air from the tube 4. Intermediate positions of the valve 13, between its extreme upper and lower positions, will permit the influx of both the heated and the cold compressed air, in varying proportions, depending upon the relative openings thus provided for the respective tubes 4 and 12.

Passing through the slotted stem of the double valve 13 is a thin metal bar, strip or tube 15, abutting at one end against the adjusting screw 16 and at the other end against the vertical arm of the bell crank lever 17. The lever 17 is pivoted to the casing 11 and its horizontal arm engages the lever 18, which latter is also pivoted to the casing 11, and by its projecting end engages the stem of the double valve 13. The tube 15 is made of a metal having a higher coefficient of expansion and contraction than that of the casing 11, so that an elevation of temperature of the air in the chamber 22 will cause the tube 15 to expand more than the casing 11, and its length to be correspondingly increased with respect to the length of the casing 11. A decrease of temperature in the chamber 22 will cause the parts to act in the same way, but in the opposite direction. The adjustment

of this temperature regulating device is so made, by means of the screw 16, that when the temperature of the compressed air in the chamber 22 is that which it is desired to maintain at the motor, the double valve 13 is held by the tube 15, through the levers 17 and 18, at a position midway between its extreme upper and lower positions; while if the temperature should increase or decrease, the expansion or contraction of the tube 15 operating through the levers 17, 18, would move the valve 13 so as to decrease or increase the temperature to the normal point. I prefer to use a tube for the expansion device 15 instead of a strip or bar, because it has great size and stiffness combined with great susceptibility to changes of temperature.

The operation of my improvement is as follows: The reservoir 7 and cylinder 8 having been filled with charcoal or other suitable solid fuel and the fuel ignited upon the grate 6, the compressed air being admitted to the chamber 2 by the tube 3, passes up through the grate 6, producing combustion of the fuel thereon, and thereby heats the compressed air in chamber 1. The heated air passes from the chamber 1, through tube 4 into the chamber 22 and thence by tube 14 to the motor. When, however, the temperature of the air in the chamber 22 begins to exceed that for which the device is adjusted the lengthening of the tube 15, with respect to the casing 11, causes the horizontal arm of the lever 17 to lift the lever 18 and with it the double valve 13, constricting the opening which admits the heated air from tube 4 and enlarging the opening for the supply of unheated compressed air through tube12. The mingling of a larger supply of unheated air with the reduced supply of the heated air in the chamber 22, reduces the temperature within the chamber 22, causing the tube 15 to contract and shorten, with respect to the casing 11, and thus permitting the double valve 13 to again move to a lower position, increasing the supply of the heated air and reducing the supply of the unheated. In this manner, the relative supplies of the heated and the unheated air are automatically regulated so that a nearly uniform temperature is maintained in the mingling chamber 22 and, consequently, in the supply of compressed air through the tube 14 to the motor. By suitably proportioning the levers 17 and 18, the length of the tube 15 and the vertical movement of the double valve 13, the variation of temperature of the compressed air delivered to the motor may be confined within any desired limits.

As the fuel upon the grate 6 is consumed, the ashes drop through the same into the chamber 2, permitting fresh fuel to fall upon the grate 6 from the cylinder 8, thus maintaining a uniform combustion, so long as the chamber 7 and cylinder 8 continue to furnish a supply of fuel.

When the apparatus is used on a car or in other places in which it is subject to shocks or vibrations, I make use of a dash pot consisting of a cylinder 20 and piston 21, located at any desired point in or on the casing 11 or any other suitable part of the apparatus, with reference to the lever 18, so as to steady its motions and prevent the valve 13 from being affected by such shocks and vibrations; or I make use of any other well known device for that purpose.

It will be evident that the use of the chamber 7 and cylinder 8 is for the purpose of maintaining a continued fuel supply. The chamber 7 may be of such proportions as the conditions may require, or the chamber 7 and cylinder 8 may be dispensed with where such a supply of fuel as could be accumulated upon the grate would be sufficient for the purpose for which it is required. It is also apparent that other forms of automatic thermostatic device, for regulating the temperature of the compressed air supplied to the motor, may be used in place of the one shown.

It is apparent that the air may be heated by means of a gas or oil burner, for instance, as shown in my Patent No. 481,623, dated August 30, 1892, instead of by means of the solid fuel burner herein shown and described. I prefer the solid fuel burner, however, because thereby I am able to dispense with devices for igniting the oil or gas from time to time, when the apparatus is used with motors for intermittent service, as the mass of solid fuel constitutes a reservoir of heat by which combustion may from time to time be re-established, when interrupted by the stoppage of the current of air, caused by the intermittent use of the compressed air.

It will be obvious to the person skilled in the art, that instead of the double valve 13 I can use two separate valves, connected by suitable mechanism and operated automatically by the expansible member, to regulate the admission of hot and cold air.

So far as I am aware I am the first to use in combination with a source of compressed air supply, an air heater and a motor; an automatic temperature regulator, actuated by the temperature of the air itself and regulating the temperature at which the air is supplied to the motor, by simultaneously restricting the supply of heated air while increasing the supply of cold air or vice versa, and I therefore desire in this application to cover such combination broadly, regardless of the particular construction of the separate elements of such combination, so long as they have the same purpose in the combination and effect that purpose in substantially the same manner as the elements described.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. In an apparatus for utilizing compressed air for power purposes, the combination of a source of compressed air supply, a motor and an intermediate air-heating chamber; with an automatic temperature regulator, actuated

by the temperature of the air itself, having valves controlling the admission of hot and cold air to the regulator by simultaneously restricting the supply of hot air while increasing the supply of cold air and vice versa; substantially as and for the purposes described.

2. In a temperature regulator for an air heating apparatus, the combination of a mingling chamber having an inlet for heated air, an inlet for unheated air and an outlet for the mixture; with a double valve which by moving in one direction decreases the supply of heated air and increases the supply of unheated air, and vice versa, and an expansion rod which actuates the valve according to the temperature of the air; substantially as and for the purposes described.

3. The combination of a casing or chamber, hot and cold air inlets, a double valve regulating the supply of hot and cold air to the chamber, a metallic rod having a higher coefficient of expansion than the casing, and devices connecting the rod to the valve, whereby the valve is operated by the expansion and contraction of the rod to vary the relative admission of hot and cold air to the chamber; substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 4th day of March, 1892.

ROBERT A. PARKE.

Witnesses:
ROBT. F. GAYLORD,
THOMAS B. KERR.

Corrections in Letters Patent No. 513,053.

It is hereby certified that in Letters Patent No. 513,053, granted January 16, 1894, upon the application of Robert A. Parke, of New York, N. Y., for an improvement in "Apparatus for Heating Compressed Air for Power Purposes," errors appear in the printed specification requiring correction, as follows: On page 1, in line 63, the reference-numeral "15" should be *12*, and in line 65, same page, the reference-numeral "12" should be *14;* and that said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 30th day of January, 1894.

[SEAL.]

JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:

JOHN S. SEYMOUR,
Commissioner of Patents.