Nov. 11, 1930. J. D. HOUSTON 1,781,062

THERMAL PLANT

Filed Nov. 15, 1926 2 Sheets-Sheet 1

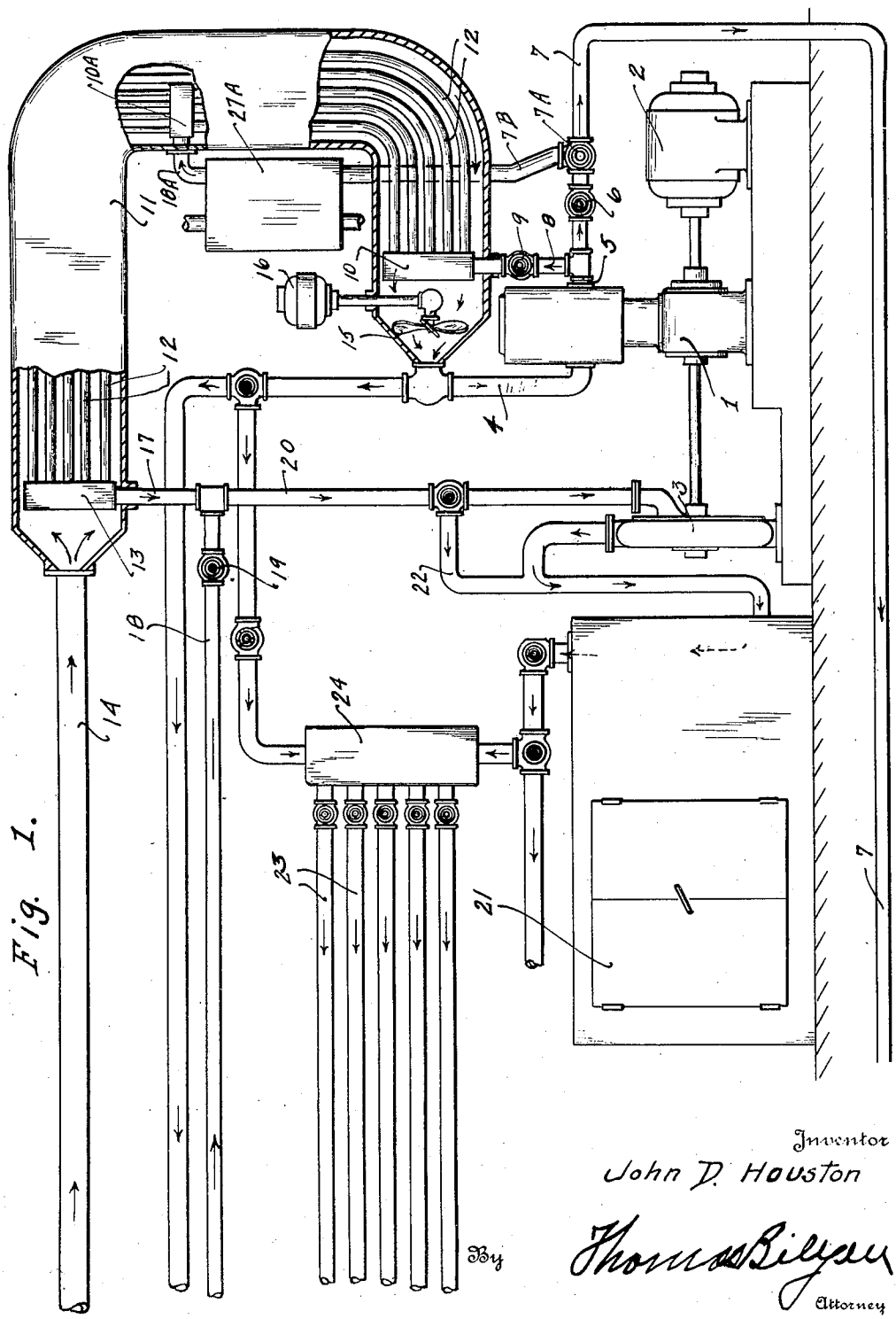


Fig. 1.

Inventor
John D. Houston

By Thomas Bilyeu

Attorney

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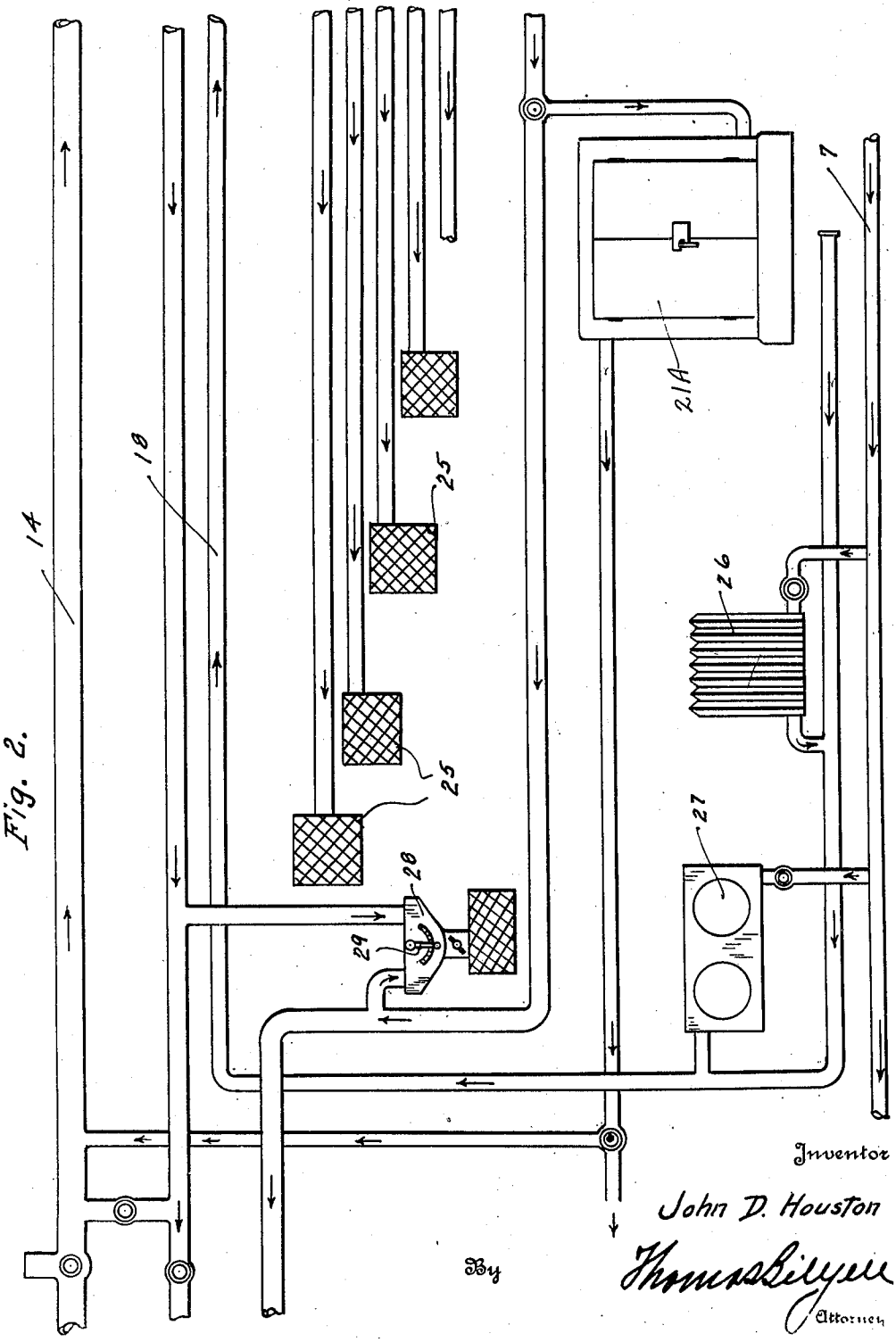


Fig. 2.

Inventor

John D. Houston

By Thomas Billyeu

Attorney

Patented Nov. 11, 1930 1,781,062

UNITED STATES PATENT OFFICE

JOHN D. HOUSTON, OF PRINEVILLE, OREGON

THERMAL PLANT

Application filed November 15, 1926. Serial No. 148,562.

This invention relates to my application in the United States Patent Office for a thermodynamic mechanism, filed March 5, 1925, Serial Number 13,320, and further relates to my present application filed Nov. 15, 1926, for a new and improved process for utilizing latent heat of an elastic fluid, Serial Number 148,561.

The primary object of my present invention consists in providing a mechanism that may be used for the supplying of heat for any purpose and within reasonable ranges of temperature that may be required for domestic use and other purposes.

A further object of this invention consists in providing a mechanism that may be used for furnishing the low temperatures that may be required in domestic use and for other purposes.

A still further object of this invention consists in providing a mechanism that may be used for supplying varying ranges of temperature from hot to cold.

A still further object of my present invention consists in providing a medium, a portion of which may be used for meeting the heat requirements, for domestic and other purposes, and the remaining portion of which medium may be used for the supplying of the low temperatures that may be required for domestic use and other purposes.

Additional objects of my present invention consist in providing a compressor unit for compressing an elastic fluid and in providing means for utilizing the heat made available by the rise in temperature incident to compression for domestic use and other heat requirements and the expanding of the elastic fluid under conditions whereby the fall in temperature caused by the expansion may be used for domestic purposes or for other requirements.

Still additional objects of my present invention consist in the compression and expansion of an elastic medium, as air, as a mechanical means for the achieving or obtaining of relatively high and relatively low and intermediate temperatures, in the same or in other mediums for domestic use and other requirements.

And still additional objects of this invention consist in providing means through the medium of an electric motor or other suitable prime mover to direct toward a common center the heat and make it available for use at a higher temperature than that at which it existed before thus being operated upon, and whereby a lower degree of temperature may simultaneously be provided and made available for any desirable use or purpose.

With these and incidental objects in view, the invention consists in certain novel features of construction and combination, the essential elements of which are set forth in the appended claim, and a preferred form of embodiment for which is hereinafter shown with reference to the drawings which accompany and form a part of this specification.

There has been much thought given to the development of suitable mechanism for the supplying of low temperatures for domestic and other uses by the compression and expansion of various elastic fluids. There has also been much thought given to the development of suitable mechanism for domestic heating and other purposes by the heating of air and other heat transfer mediums, but while there has been some attempts to combine, in one mechanism, suitable means for heating and cooling in the one mechanism and the utilization of the two temperatures to accomplish useful and desirable purposes, yet so far as I know none have accomplished noteworthy results.

Much thought has also been given to the utilization of the electric current for domestic and other heating. Much of this work has been carried along the lines of a direct application of the heated elements, through which the current passes to create the heat, by offering a resistance to the passage of the electric current through the current conducting medium.

In my invention I use any suitable prime mover for the compressing of an elastic fluid, as air, and utilize the heat thus obtained by the compression for heating purposes, I may then extract the remaining heat within the medium for heat purposes, and then expand the medium still under compression for creating the low temperature required.

Highly efficient prime movers have been developed for performing work and it is my purpose to use a prime mover already in use, to drive a fluid compressor. My estimates have led me to believe that the greatest efficiency may be obtained at relatively low pressures,—about fifteen pounds per square inch or lower, though it may be found expedient to increase the compression materially to cut down the sizes of the units employed in the various stages of my operation.

In the drawings:—

Fig. 1 is a diagrammatical layout of a preferred embodiment of my assembled device.

Fig. 2 is a further and continued development of the mechanism illustrated in Fig. 1.

Like reference characters refer to like parts throughout the several views.

1 is the fluid compressor, the same being driven primarily by the prime mover 2, and being driven secondarily by the expansion motor 3. The elastic fluid for compression is received into the compressor 1, through the inlet pipe 4. The exhaust pipe 5, leads from the compressor 1, and has a valve 6, disposed adjacent to the compressor and in the exhaust pipe. If so desired the total of the amount of compressed fluid may be made available to carry the heat to the desired point of use for the same. If a higher temperature, or greater heat concentration is desired, the elastic fluid, or a suitable portion of it, may be made to pass through the pipe 8, and the valve 9, into the header 10, from which suitable passages 12, of a heat transfer unit 11, may conduct the compressed and heated gases. A quantity of the same elastic fluid, before compression, may be carried through the heat transfer chamber 11, and be made to envelop and entirely surround the tubes 12, leading from the header 10, to the header 13. Heat interchanger 11, represents any plurality of passages so related to one another as to facilitate the passage of heat from one body of elastic fluid flowing therein to another such body and especially so that the relative temperatures of the respective bodies of elastic fluid may be substantially reversed. The elastic fluid may be conducted into chamber 11, through the inlet pipe 14, leading from a source of supply not here shown. The elastic fluid may be induced to flow through the chamber 11, and around the tubes carrying the heated and compressed fluid by the action of an induction fan 15, placed at the outlet end of the chamber 11, or elsewhere as desired, the fan being driven by a prime mover, as an electric motor 16. The elastic fluid being passed through the chamber 11, is warmed by coming in contact with the coils 12, carrying the heated and compressed elastic fluid from the compressor. Part of the warmed medium passing through the chamber 11, may be used for heating purposes for domestic use and other purposes, or all of it may be passed through the compressor for increasing the temperature of the compressed fluid, thus all of the heat there concentrated is again passed through the compressor. This will especially be found desirable where relatively high temperatures may be required for some particular purpose. The compressed fluid that has been passed through the chamber 11, which is in reality a heat interchanger unit, may be passed out of the header 13, through the outlet pipe 17, to expansion engine 3. Where high temperatures are required, the compressed fluid is passed through the heat transfer chamber by the aid of the pipe 4, connecting the compressor and the heat transfer chamber. By the closing of the valve 19, disposed in the pipe 18, the warm air still under compression, or after all of the heat of compression has been extracted may then be passed through the fluid motor 3, by being passed through pipe 20 and expanded. The passing of the same through the motor 3 may be made to perform useful work, as by supplying a part of the energy required for the running of the compressor unit 1 or the same may be used in running the fluid motor and the using of the energy thus created for any desired purpose. As the compressed cooled medium passes through the motor it is expanded to create low temperatures and this may be accomplished by expanding the cooled elastic fluid into coils within a refrigerator box 21, or 21A. Or the compressed fluid may be passed directly into the expansion coils by being passed through the pipe 22 and directly into the expansion coils within the refrigerator without being passed through the motor 3. The compressed and partially expanded fluid may be further passed through pipes 23 disposed at the outlet side of the control box 24, and mixed with warm elastic fluid from pipe 31B, in 24 to supply intermediate temperatures of various degrees. If desired the fluid may be passed directly from the outlet side of chamber 11 and into the expansion and cooling pipes 23.

The warmed or cooled medium passing through the piping 23, may be distributed through registers 25, for warming or ventilating and warming purposes, or for cooling purposes.

The compressed medium of the higher temperatures passing through pipe 7, may be utilized for heating by the same being passed through the radiator 26, or through a domestic cooking element 27, or the same may be used for any other form of domestic, or factory requirements or for any other purposes, or it may be passed through valve 7A, and pipe 7B, through heating unit 27A, corresponding to heater 27, or any similar unit, and through header 10A, into the heat transfer unit, before being expanded, so its tem-

perature may be made uniform with that entering through pipe 14.

Should it be found desirable to have a variable temperature, at the point of utilization the same may be obtained within reasonable working limits by the passing of a part of the warm medium and a part of the expanded medium through a mixing chamber and valve. The amount of each medium being passed through the valve and chamber 28, being manually determined through the valve lever 29, disposed in the valve 28, and be maintained at a predetermined temperature by thermostatic or other automatic devices contained within 29, or so placed as to control 29.

While the form of mechanism herein shown and described is admirably adapted to accomplish the objects primarily stated, it is not intended to confine the invention to the specific form herein described as it is susceptible of embodiment in various ways all coming within the scope of the claim which follows.

What I claim is:

In thermal plants, means for compressing the air for raising the temperature thereof, means for utilizing the heated compressed air for heating normal air a portion of which is to be subsequently compressed, thereby causing the temperature of the thereafter compressed air to constantly rise, means for supplying the normal air and for forcing the heated normal air into the compressor, means for expanding the compressed air after providing heat to return a portion of the power required for compression thereof, means for utilizing the expanded air for refrigeration, means for variably mixing the expanded air, after its having been used for refrigerating purposes, with a portion of the normal air warmed by the heated compressed air, for heating and ventilating purposes; and means for utilizing another portion of the normal air heated by the compressed air for heating and ventilating purposes other than heretofore set forth.

JOHN D. HOUSTON.