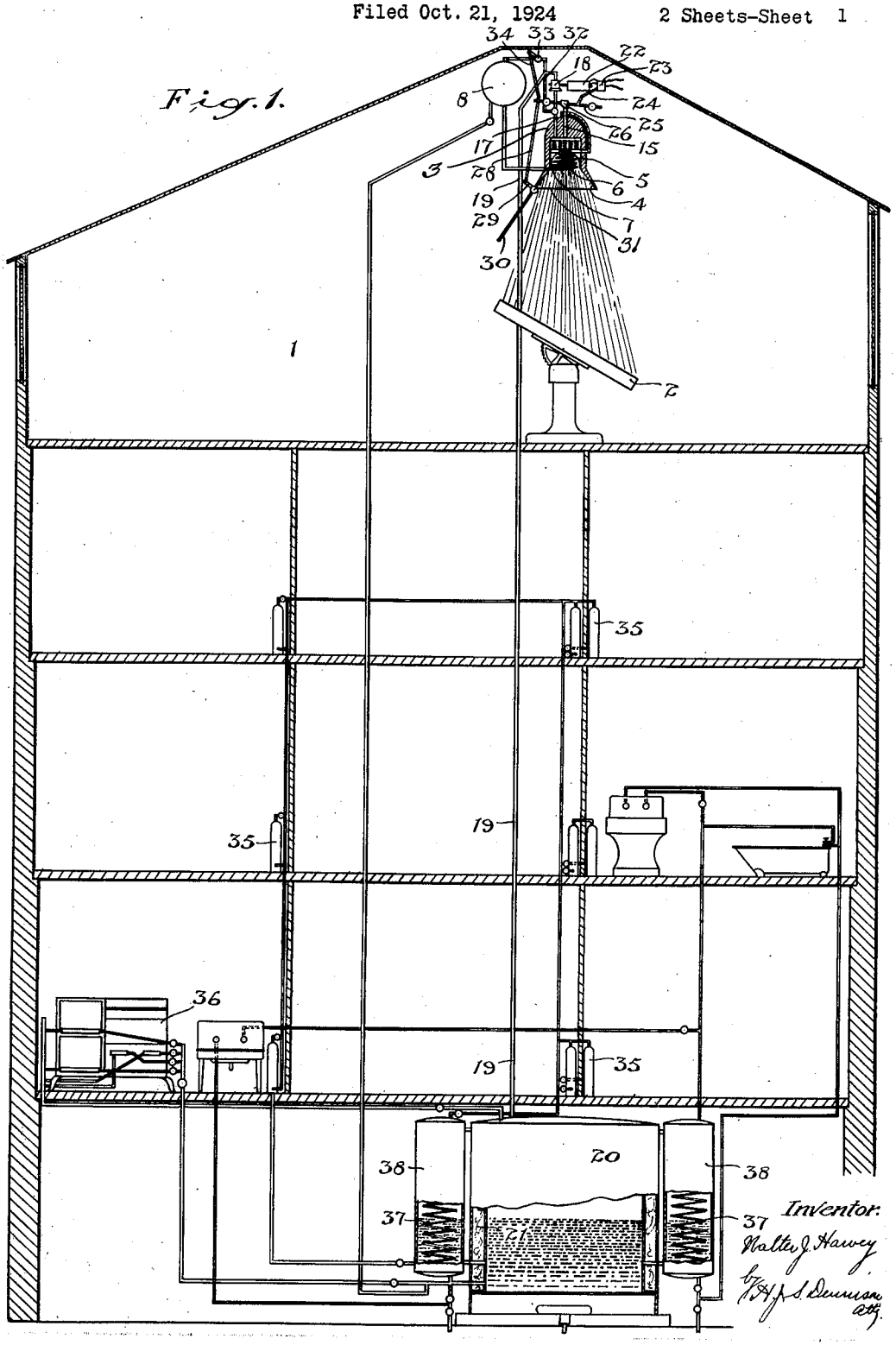
Dec. 18, 1928. 1,696,003

W. J. HARVEY

SOLAR HEAT ACCUMULATING SYSTEM

Filed Oct. 21, 1924 2 Sheets-Sheet 1

Fig. 1.



Inventor:
Walter J. Harvey
by Wright, Brown, Quinby & Dennison
Atty.

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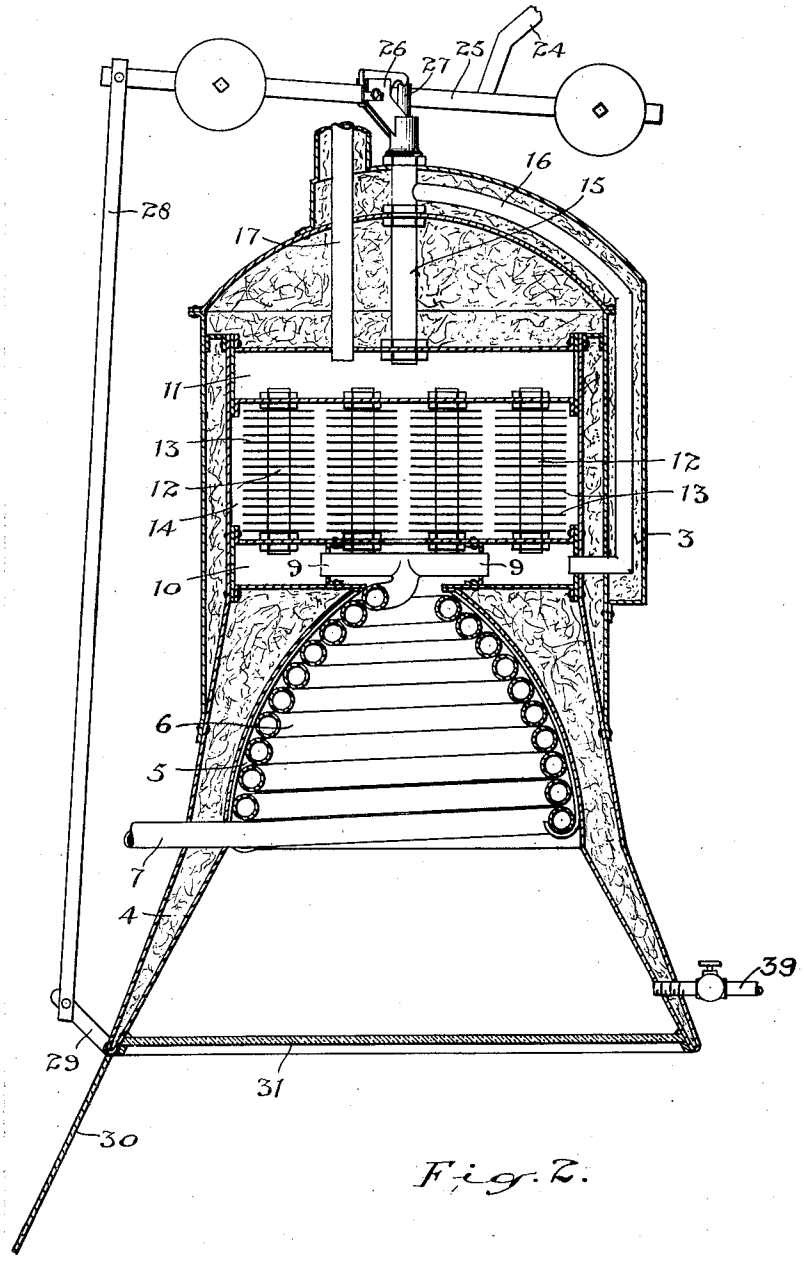

Fig. 2.

Inventor.
Walter J. Harvey,
by H. J. D. Dennison, atty.

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UNITED STATES PATENT OFFICE.

WALTER J. HARVEY, OF TORONTO, ONTARIO, CANADA.

SOLAR-HEAT-ACCUMULATING SYSTEM.

Application filed October 21, 1924. Serial No. 744,997.

The principal objects of this invention are, to accumulate and store the heat of the sun's rays for commercial heating purposes, and to devise a simple and economical form of automatic device for accomplishing the desired object.

The principal features of the invention consist in the novel arrangement of means for concentrating the sun's rays with a means for transferring the heat energy of the rays to a circulating storage fluid.

In the accompanying drawings, Figure 1 is a vertical sectional diagram of a heating installation for a house.

Figure 2 is an enlarged vertical sectional view through the concentrating heater.

The active heat of the sun's rays is of course a well known fact and many devices have been conceived for concentrating the rays so that the heat may be utilized for instance, by the direct application of the rays to heating a boiler.

The present invention contemplates the utilization of the heat of the rays to heat a medium which will retain a high temperature for a considerable period of time and which will dispense the accumulated heat as may be desired for various purposes.

In the method of utilizing the sun's heat illustrated herein, the diagram shown in Figure 1 illustrates a house equipment. On the upper floor of the house is arranged a room 1 which is open to receive the rays of the sun through glazed walls and roof and within this room is arranged a suitable form of reflecting device 2 which is so constructed as to reflect the sun's rays to a fixed point throughout the day. The construction of this reflecting device is not herein shown as different forms may be devised and such construction does not form part of the present invention.

Arranged above the reflecting device 2 is the heat receiving and transmitting device 3, which is here shown in the form of a hood having its walls formed of heat insulating or refractory material. This hood is formed with a circular converging apron 4 leading to a chamber 5 of concave form. Opening downwardly and within the chamber 5 is arranged a tubular spiral coil 6 having its inlet end 7 at the bottom connected with a tank 8 arranged above the device 3.

The upper end of the coil 6 is preferably branched with laterally arranged leads 9 connected with an annular chamber 10 and this chamber is connected with a chamber 11 arranged thereabove by a plurality of tubes 12.

The tubes 12 are shown provided with a plurality of heat absorbing discs 13 within the chamber 14 enclosing the tubes and the heat reflected into the transmitting device after heating the coil 6 is further absorbed by the discs 13 and the tubes 12.

A tube 15 leads upwardly from the top of the chamber 11 and contains a thermostat. A circulating tube 16 leads from the top of the tube 15 back to the chamber 10 so that there will be a constant circulation of the fluid medium for transmitting the heat through the tube 15 carrying the thermostat.

An outflow tube 17 leads from the upper chamber 11 and is connected to a circulating pump 18 which forces the heated fluid medium through a conduit 19 to a storage receiver 20 which is here shown arranged in the basement of the building and which is enclosed within an insulating casing 21.

The pump 18 is of any suitable design operated by any suitable form of motor indicated in Figure 1 by the numeral 22. This motor can be controlled by any desirable form of switch mechanism and the switch 23, the details of which are not shown, is connected with an arm 24 extending from the pivoted bar 25 carried on the bracket 26 mounted on the top of the transmitting device and which is actuated by the thermostat rod 27.

The bar 25 has connected to its outer end a rod 28, the lower end of the rod being connected to the arm 29 of the shutter 30, which is pivotally supported at the lower rim of the apron 4.

The apron 4 is preferably provided with a shield 31 of quartz through which the reflected rays from the reflector 2 are directed and the shutter is adapted to close over the quartz plate in the event of the heat becoming too intense.

When the thermostat rod expands it tilts the bar 25 on its pivot and through the rod 28 its swings the shutter.

A branch pipe 32 is connected to the outflow pipe 17 and leads to the top tank 8 and is provided with a valve 33. The valve 33 is connected by a link 34 with the bar 25 and is so adjusted that when the thermostat expands to a predetermined point it will open the valve 33 and allow the flow of the fluid

medium to the tank 8 and thus provide a local relief.

Oil of a high flash point is the preferred fluid medium for receiving and storing the heat and as the sun's rays are reflected from the surface of the reflector 2 into the concave chamber 5 they are absorbed by the coil 6 and the oil contained therein flows upwardly into the chamber 10 through the tubes 12 into the chamber 14 and from thence through the outflow tube 17 from which it is pumped to the storage receiver 20.

A temperature in the neighborhood of 700° F. may be attained by the oil but in the event of the heat being so intense as to raise the temperature of the oil in the heater coil above a predetermined point the shutter 30 is operated by the thermostat to deflect the rays from the reflector and also to open the local relief through the branch pipe 32.

In the diagram illustrated in Figure 1, various pipes are connected to the receiver 20 and oil may be taken therefrom at high temperature to the various heating appliances throughout the house, such as the radiators 35 or the stove 36.

The return circulation carries the oil back to the receiver at a low point.

Water heaters 37 are shown in the form of coils passing through tanks 38 through which the hot oil is circulated and the water from these coils is carried to the various heating appliances throughout the building.

It may be found desirable to exhaust the air from the chamber 5 and a pipe 39 is provided for this purpose.

In the use of this device the storage medium will retain a high temperature for a considerable period but in the event of protracted dull weather when the sun's rays are obscured a supplementary heating means is provided beneath the storage receiver 20 which means may be in the form of an oil burner, a gas burner or an electric heater.

The equipment shown is of course merely diagrammatic and the construction of the apparatus is also largely diagrammatic as it may be altered in details to a considerable extent without departing from the spirit of the invention.

What I claim as my invention is:—

1. In a solar heat accumulating system, a diurnal reflector adapted to direct the sun's rays to a fixed point, a receiver adapted to contain a fluid heat absorbing medium, a circulating conduit connected with said receiver, a helically shaped tubular coil introduced in said conduit and arranged at said fixed point, a chamber connected with the upper end of said coil, tubes leading upwardly from said chamber, an annular chamber connected with the upper ends of said tubes, a pipe leading from the upper chamber and forming part of the circulating conduit, a pump arranged in said upper pipe, and means for operating said pump to effect the circulation of said heat absorbing fluid.

2. In a solar heat accumulating system, an insulated receiver adapted to contain a fluid heat absorbing medium, a circulating conduit connected with said receiver, a heat exchange device connected with said circulating conduit, a diurnal reflector adapted to concentrate the sun's rays on said heat exchange device, a shutter adapted to be interposed between the reflector and said heat exchange device for controlling the reflected rays, a thermostat arranged in said heat exchange device, means operatively connecting said thermostat with said shutter for operating the latter, and means for circulating the fluid medium through said conduit and receiver.

WALTER J. HARVEY.