No. 886,079. PATENTED APR. 28, 1908.

T. F. SCOLLARD.

HEATING SYSTEM.

APPLICATION FILED JUNE 4, 1907.

Fig. 1.

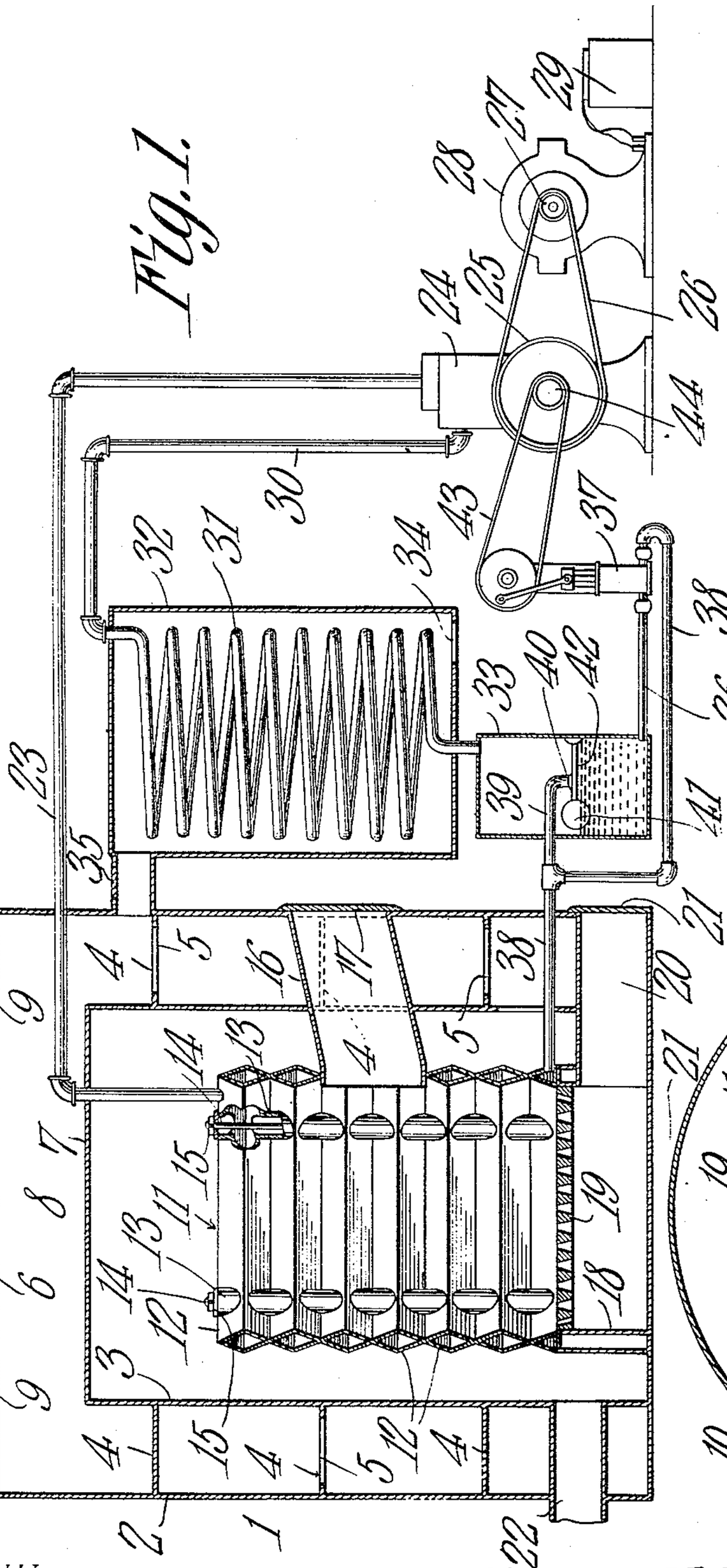
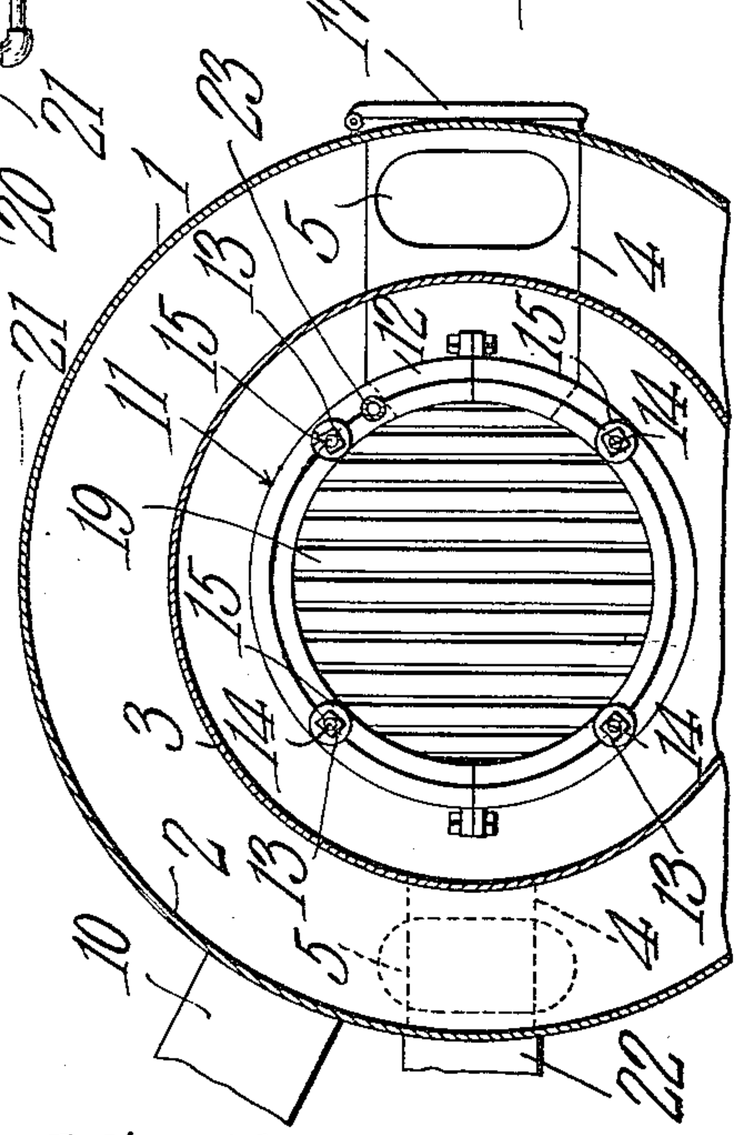


Fig. 2.



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HEATING SYSTEM.

No. 886,079. Specification of Letters Patent. Patented April 28, 1908.

Application filed June 4, 1907. Serial No. 377,167.

To all whom it may concern:

Be it known that I, THOMAS F. SCOLLARD, a citizen of the United States, residing at Warsaw, in the county of Kosciusko and State of Indiana, have invented a new and useful Heating System, of which the following is a specification.

This invention has reference to improvements in heating systems, and is designed to provide means whereby hot air may be furnished for heating purposes and at the same time the fire used to heat the air may likewise be utilized for the heating of water to produce steam for various purposes, which steam, however, is ultimately condensed and returned to the boiler to be again converted into steam, in endless cycles, the engine furnishing the power for returning the water of condensation to the boiler. In this system the power furnished by the steam may likewise be utilized for other purposes. Also, provision is made whereby the exhaust steam from the engine is made to further heat the air supplied to the hot-air circulating system, so that the energy of the steam not utilized for the driving of the engine may be converted into heat units to augment the heat supplied to the air by the hot-air side of the furnace.

The invention will be fully understood from the following detailed description, taken in connection with the accompanying drawings forming part of this specification, in which,—

Figure 1 is a sectional view through the furnace and other parts coacting therewith, with still other coacting parts shown in elevation and in diagrammatic relation to the furnace; Fig. 2 is a cross section of the furnace.

Referring to the drawings, there is shown a furnace 1 composed of an outer drum 2 and an inner drum 3 joined by horizontal partitions 4 extending between the two drums, and these partitions are provided with apertures 5 in alternate diametric relation. The drum 2 is closed at the top by a top plate 6 and the drum 3 is closed by a flat crown 7 located a short distance below the top plate 6, thus forming in the top of the furnace a distributing chamber 8 communicating through hot-air flues 9 with the several points to which the heated air is to be distributed. Cold air is made to enter the lower portion of the space between the drums 2 and 3 through a cold air duct 10, and after reaching the opening 5 in the lowermost partition 4 the air passes to the next chamber formed between the said partition 4 and the next partition 4 above the same. The air must now move half-way around the drum 3 to the opening 5 located in the second partition 4, and thence reach the chamber immediately above the same, and must then move around the drum 3 to the other side thereof until it reaches still another aperture 5 in the next upper partition 4 directly over the first-named aperture 5, and may then pass to the distributing chamber 8 and out through the flues 9.

Within the drum 3 there is located a steam boiler 11 composed of a vertical series of annular, iron tubes 12, diamond shape in cross section. These tubes 12 may each be made of two semi-circular sections joined together at the ends in any suitable manner, and at suitable points may have formed on them hollow bosses 13 through which communication may be had from tube to tube, and through which bosses clamp rods 14 may extend, with nuts 15 applied to the ends, whereby the whole series of tubes may be formed into one interconnected structure. In order that the joints may be steam and water-tight suitable copper gaskets may be used, or, if desired, taper nipples may be employed as is customary for such purposes. A certain number of the tubes 12 may have their continuity broken for the reception of a coal chute 16 passing through both drums 2 and 3 and provided with an ordinary fire-place door 17 on the exterior of the outer drum 2. The tubes 12 constituting the steam boiler are mounted at the lowermost end of the series upon an annular support 18 at the top of which may be located a suitable grate 19, conventionally shown in Fig. 1.

The boiler 11 forms the fire-box and the interior of the support 18 constitutes the ashpit. A suitable passageway 20 may be led through the drums 2 and 3 to the ashpit, and this passageway may be closed by an ashpit door 21. Leading from the interior of the drum 3 near the lower end thereof is a smoke flue 22. Suppose, now, that the boiler 11 is filled with water to a suitable height and that by means of the fuel introduced through the coal chute 16 a fire is started upon the grate 19. The heat of the fire will be communicated through the walls of the tubes 12 to the water therein and the products of combustion will pass up through the upper end of the series of tubes and over the

said upper end and thence downward along their outer faces and against the inner face of the drum 3 until they finally escape through the smoke flue 22, it being understood that a suitable air supply comes through the ashpit door 21, or otherwise. Now, by the passage of the heated gases in the direction described the water in the boiler 11 is ultimately converted into steam and the top and side walls of the drum 3 are highly heated by said hot gases and this heat is communicated to the air between the drums 2 and 3. Thus the air entering through the air duct 10 is subjected to a constantly increasing amount of heat and rises through the tortuous passage around the drum 3 until it ultimately reaches the distributing chamber 8, where it is still further heated by contact with the crown 7, and finally passes out through the flues 9 to the various points of utilization.

Leading up from the top of the boiler 11 through the crown 7 and thence out through the drum 2 is a live steam pipe 23 connected at the other end to a steam engine 24. The engine is provided with a drive wheel 25 from which power is taken by a belt 26 to the drive pulley 27 of a dynamo electric machine 28 furnishing current to a storage battery 29 or to any other suitable translating device desired.

The exhaust from the engine is carried through an exhaust pipe 30 to a condenser coil 31 located within a suitable casing 32, and the condenser coil terminates in a reservoir 33. The casing 32 has at its outer end one or more air inlet openings 34 and at its upper end communicates through a flue 35 with the distributing chamber 8. Now, when steam is generated in the boiler 11 it passes through the steam pipe 23 and engine 24 and the latter is thereby caused to run, driving the dynamo 28 and thereby causing the generation of electric current which may be utilized for the charging of the storage battery 29 or for any other useful purpose; or the steam engine may be otherwise utilized. For the purposes of the present invention the dynamo 28 and the battery 29 may be taken as indicative of any power actuated device which may be driven by the engine 24.

The exhaust steam passing from the pipe 30 to the coil 31 is chilled by the cool air entering the casing 32 through the opening or openings 34 and is thereby condensed, the water of condensation finally finding its way into the reservoir 33, while the air passing into the casing 32 through the inlet opening or openings is ultimately highly heated by the condensing steam and finds its way through the flue 35 into the distributing chamber 8, where it mingles with the hot air coming through the highest opening 5 and is directed to the point of utilization of the heated air.

The reservoir 33 is in communication through a pipe 36 with a pump 37 of any suitable type, such as a simple form of displacement pump, and this pump is connected by a delivery pipe 38 to the lower end of the boiler 11. The delivery pipe 38 is connected by a branch pipe 39 to the interior of the reservoir 33 at a suitable point above the bottom thereof, and the end of this pipe 39 is closed by any type of valve 40 under the control of a float 41 on one end of a lever 42. The pump 37 is driven through a belt 43 coming from a drive pulley 44 on the shaft of the engine 24. Now, when steam is generated in the boiler 11 and the engine 24 is in operation the steam is condensed and in the form of water is finally conducted to the reservoir 33. In the meantime the pump 37 is being continuously operated from the engine and whatever water is deposited in the reservoir 33 is drawn through the pipe 36 and delivered through the pipe 38 into the boiler 11, to be again converted into steam and pass again through the same cycle of operations.

Suppose that the pump delivers water more rapidly than the water is introduced into the reservoir 33 by the condensation of the exhaust steam. In such case the water level in the reservoir 33 is reduced and the float 41, following the reduced level of the water, will cause the opening of the valve 40 and the water instead of being delivered to the boiler 11 will flow back through the branch pipe 39 into the reservoir until the level of the water in the latter has again reached the point where the valve 40 is closed. By this means the pump 37 is always in operation but it is active only when the water level in the boiler is such that there is enough water in the reservoir 33 to close the valve 40. Otherwise the pump simply pumps back into the reservoir 33 what it takes therefrom through the pipe 36.

It will be seen from the foregoing that I am enabled to furnish from one fire the heat necessary to provide hot air for a dwelling commensurate with the size of the hot-air furnace, and at the same time a portion of the heat so generated is, by means of the boiler 11 and engine 24, converted into useful work which may be utilized in various ways. And also, the water which is converted into steam for power purposes is, after performing its work, further utilized to augment the heat of the air supplied by the hot-air furnace for the heating of the dwelling. By this means a large proportion of energy which usually escapes through the smoke flue is saved and converted into useful work, while the energy usually lost by the escape of the exhaust steam is entirely saved and utilized for heating purposes.

Since the heating system is designed more particularly for use in dwellings, the mechan-

ical parts should be of the automatic type so as to require no skilled attention from the householder. For this reason the steam engine should be of the automatic type so as to operate for long periods of time without attention from the householder. Likewise, the dynamo may be of the self-contained type, requiring no attention whatever for months at a time, while the storage battery is provided so that current may be generated in the day time when the furnace fires are kept at a greater heat than at night and the electric current so generated may be utilized at night when the furnace fires are not so energetically burning.

I claim:—

1. A heating system comprising an air-heating furnace, a steam generator contained therein, a steam engine receiving steam from the generator, an air-cooled condenser for the exhaust steam from the engine, a pump driven by the engine for returning the water of condensation to the steam generator, and means for directing the air used to cause the condensation of steam into the air-heating system of the furnace.

2. A heating system comprising a steam generator constituting a fire-pot, a fire chamber surrounding the same, an air-heating chamber exterior to the fire chamber, hot-air ducts leading from the ~~top~~ of the air-heating chamber, a steam engine connected to the steam generator, a steam condensing coil connected to the exhaust side of the steam engine, a water reservoir connected to the water side of the condenser, a pump connected to the reservoir and to the steam generator, connections between the pump and the engine, and an air chamber surrounding the condenser, said air chamber having air inlets at the water end of the condenser and communicating at the other end with the air-heating chamber adjacent to the hot-air ducts leading therefrom.

3. A heating system comprising a tortuous, air-heating chamber terminating in out-going air ducts, a fire chamber interior to the air-heating chamber, a fire-box composed of interconnected, diamond-shaped, metallic, annular tubes constituting a steam boiler, a steam engine, live steam connections between the boiler and engine, an air-cooled condenser, connections between the same and the exhaust side of the engine, a water reservoir connected with the water side of the condenser, a water pump driven by the engine and interposed between the water reservoir and the boiler, and a chamber surrounding the condenser and receiving air at the water side of the condenser and delivering the heated air at the receiving side of the condenser to the air chamber adjacent to the out-going ducts.

4. A heating system comprising a furnace provided with an air-heating chamber, a fire chamber interior thereto, a fire-box constituting a steam boiler, a steam engine, connections between the steam boiler and the engine, an air-cooled condenser connected to the exhaust side of the engine, air connections from the condenser to the air-heating chamber, a water reservoir connected to the water side of the condenser, connections between the water reservoir and the boiler, a pump interposed in said connections and operated by the engine, and a by-pass from the connections between the water reservoir and boiler leading into said reservoir and there provided with a valve controlled by the water level in the said reservoir.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

THOMAS F. SCOLLARD.

Witnesses:

ANDREW J. PARKS,

ROBERT W. SUTCLIFF.