A. HEIN.

HEATING PLANT.

APPLICATION FILED APR. 11, 1912.

1,198,220.

Patented Sept. 12, 1916.

2 SHEETS—SHEET 1.

FIG. 1

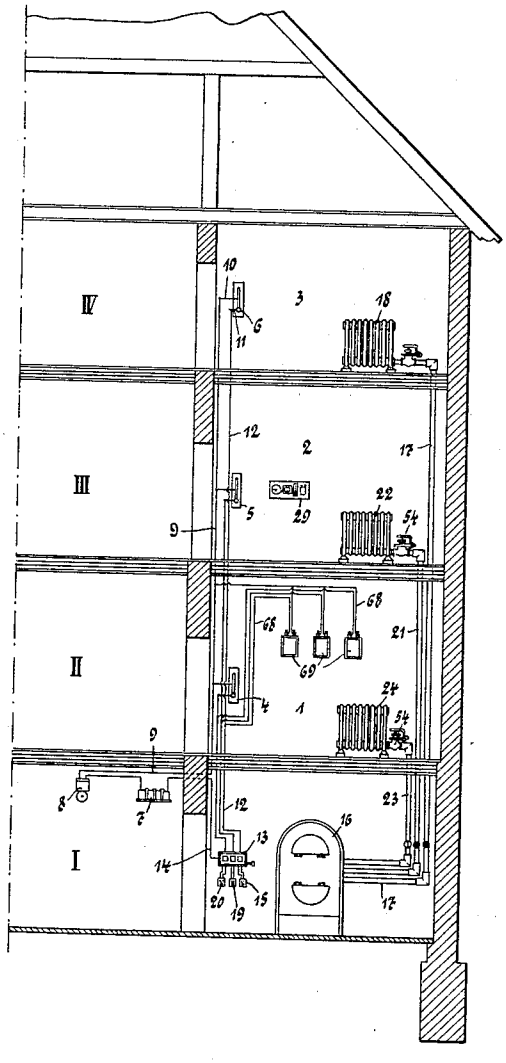


FIG. 5

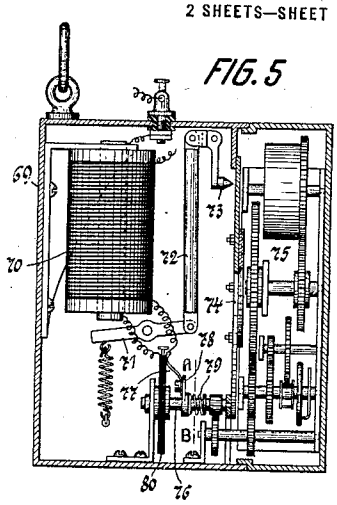


FIG. 6

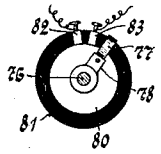
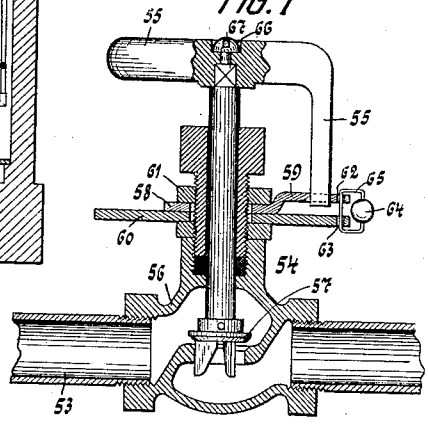


FIG. 7



WITNESSES

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2 SHEETS—SHEET 2.

FIG. 2

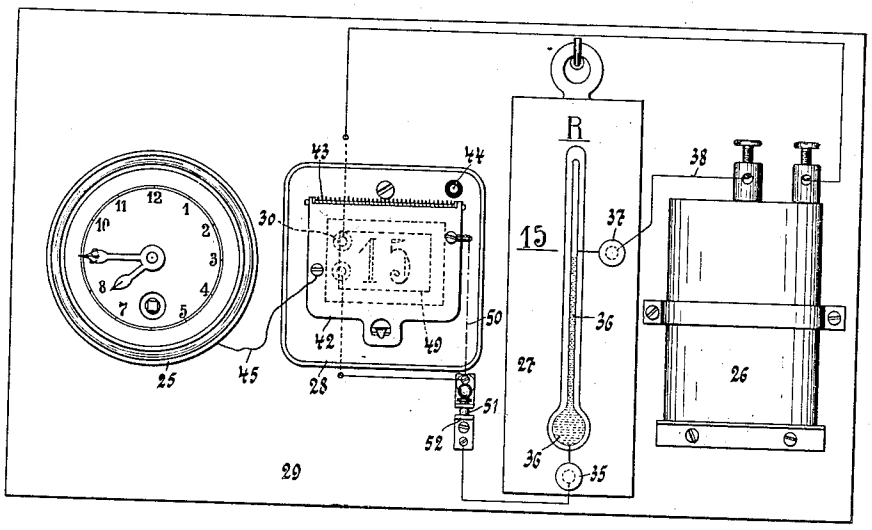


FIG. 4

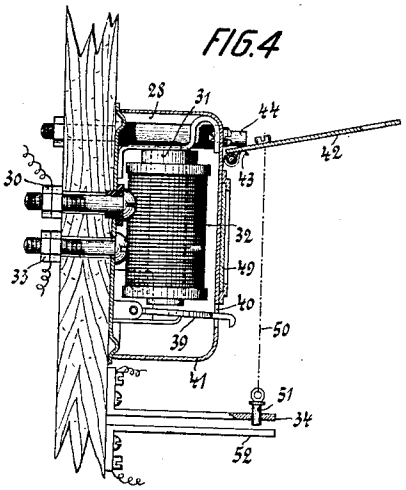
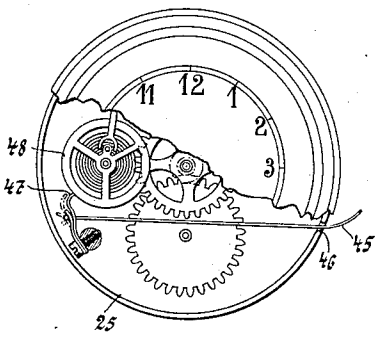


FIG. 3



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HEATING PLANT.

1,198,220. Specification of Letters Patent. Patented Sept. 12, 1916.

Application filed April 11, 1912. Serial No. 690,211.

To all whom it may concern:

Be it known that I, ADOLF HEIN, a subject of the King of Prussia, residing at No. 12 Zimmerstrasse, Berlin, Kingdom of Prussia, Germany, have invented new and useful Improvements in Heating Plants; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in heating plants of the kind in which a number of rooms are heated from a central boiler station. For this purpose a single rising pipe is mostly used, which is provided with branches that lead to the separate radiators and has a common return pipe which conducts the cooled heating agent back to the boiler. Such plants have also been provided with a special pipe leading to each story of the building or the like to be heated. It was then possible to heat each story according to requirements, thus independent of the other stories. Such arrangements are however very expensive to make and difficult to control. Further, apparatus have been designed which are adapted to control from the central station the temperature in the various rooms to be heated. For this purpose thermometers were provided in said rooms, which, as soon as a definite temperature is obtained, for example, the temperature of 15° C. (59° F.), hereinafter called the normal temperature, give a sign which can be noticed in the boiler room. In spite of these apparatus an enormous waste of fuel in such heating plants, as used at the present time, has not been avoided.

Whereas formerly the work of the stoker was restricted to the attendance of the boiler alone, without his having any knowledge of the temperature in the separate stories and rooms, still, on using the above mentioned controlling apparatus, he could at least obtain some acquaintance with the temperature in the rooms heated and operate accordingly, so that he could regulate or cut off the supply of the heating material to the system of pipes. An excessive heating of the rooms could therefore be avoided, at least within certain limits, if the stoker did his duty. Perfect success could not however be obtained in this way. Apart from the fact that this system required, for each story, or for a number of rooms mechanically united for heating, a special pipe circuit, that is a rising pipe and a return pipe, it would also have been necessary to provide a signal circuit from each room to be heated to the boiler room. The provision of such a special heating pipe for each separate story, with means to cut off the supply, is practically very complicated and expensive. It also easily occasions confusion on the part of the stoker, who, in view of the large number of the rooms to be heated, loses sight of the temperature in said rooms and is of course still more confused by the various signals which may eventually all come at the same time. Apart from all these defects the drawback could not be avoided that in one room of the story the necessary temperature may have been attained, while perhaps at the same time in other rooms of the same story quite a different temperature may have prevailed for a considerable time, because the stoker could only exercise control over all the rooms of one story and not over the separate rooms. He naturally operated according to the temperature prevailing in those rooms in which the thermometer was situated, while he has no knowledge of the conditions in the other rooms. That did not however meet all requirements.

According to my invention, which relates to a new process and to apparatus for carrying out the same, the rooms of a building are to be so heated that in all rooms the normal temperature is obtained at the same time.

In order to explain my invention I assume, by way of example, that it is required to heat only a single story, which has ten rooms. I divide this series of rooms into two groups of five rooms and choose in each group one room, which, if possible, is in the middle of the other rooms of the group. In each of these two rooms I provide a thermometer, which closes a circuit, when 15° C. is obtained. It is then very easy for the stoker by suitable attendance of the boiler to obtain the normal temperature in these two rooms. Of course it would be possible to choose, instead of two, three or more rooms, and to provide them with the signal apparatus, it being my intention to divide all the rooms in question into smaller groups, in each of which about the same conditions in regard to heating exist.

Now, in order to assure that in the above example the normal temperature is also obtained at the same time in the other eight

rooms of the same story, which have no signal connection with the boiler room I adopt the following method according to my invention: I ascertain firstly by tests how far for this purpose the throttling apparatus of the radiators provided in the eight rooms must be opened. As soon as this position of the throttling organ—hereinafter called "cock"—has been ascertained, a stop is provided on each cock, which will render it impossible to open it further, while of course the possibility still remains to close said cock more or less, if it should be desired to obtain a lower temperature than the normal temperature. Supposing the cocks of all the radiators to be opened as far as possible the normal temperature will be reached in the said eight rooms as soon as it is obtained in the two rooms. Under these circumstances the stoker, as soon as the signal is given in the boiler room, can cut off the supply to the pipe leading to the story and regulate the fire accordingly. Overheating of the rooms and a waste of fuel can therefore be easily avoided in all cases.

I proceed in exactly the same way when there is only a single common rising pipe and a common return pipe for all stories of the entire house. That is, I choose in each story separate rooms, which, owing to their size or good position, are suitable for the purpose and provide a thermometer in each of these rooms connected with a signal circuit, and so adjust the cocks of all the radiators, that, when the normal temperature is obtained in the control rooms, it is reached at the same time in all the other rooms.

The manner, in which the temperature in one of the control rooms is communicated to the boiler room, is immaterial. For this purpose a thermometer can be provided in a control room as above mentioned and this may be done in known manner. This thermometer closes an electric circuit when a certain temperature is attained, whereby any desired signal, for example an optical or acoustical signal or both will be operated in the boiler house. Preferably the arrangement is so chosen that a short time before the desired temperature is reached a preliminary signal is given in the boiler house so that the stoker can take suitable measures before the chief signal shows that the normal temperature has been reached.

For the proper adjustment of the cocks of the radiators, and in order to control at what time of the day the normal temperature has been reached in a room, I use, according to my invention, a device provided with clockwork, which is stopped as soon as the desired temperature is attained. Further, in order to be able to control whether the stoker has noticed the signal and adopted measures to avoid unnecessary heating, I provide, according to my invention, a controlling apparatus to which the stoker cannot obtain access. This apparatus registers automatically when a signal has been given in the boiler room and when the stoker has turned off the same. As the signal is automatic and is always given as soon as the normal temperature is exceeded my invention renders it possible to ascertain whether the stoker has done his duty.

Finally, I use, according to my invention, safety devices in connection with the cocks of the radiators which prevent the cock from being opened beyond the point adjusted as above mentioned.

On the accompanying drawing a heating plant constructed according to my invention, and provided with the necessary auxiliary means, is diagrammatically illustrated by way of example.

Figure 1 is a vertical section through a part of a dwelling-house. Fig. 2 is an elevation of an apparatus which automatically shows when the normal temperature has been attained in a room. Figs. 3 and 4 show details of this device on a larger scale. Fig 5 is a vertical section of a part of the controlling apparatus. Fig. 6 is a section on the line A—B in Fig. 5. Fig. 7 is a vertical section of a cock provided in connection with each radiator.

The part of a building shown in section in Fig. 1 has a ground floor I and above it three stories II, III, IV. On the ground floor is the boiler room. Each of the stories II, III, and IV has a number of rooms, of which the rooms 1, 2 and 3 are supposed to be suitably situated in regard to the other rooms. For this reason they are provided with control thermometers 4, 5 and 6. With the mercury of these thermometers is connected an electric circuit and a contact piece is so disposed that, as soon as the mercury shows the normal temperature of 15° the mercury comes into touch with said contact piece.

Supposing that the normal temperature is reached in the room 3 the current will flow from the battery 7 through the bell 8, wire 9, contact piece 10, mercury of the thermometer 6, contact piece 11, wire 12, annunciator 13, and will return by the wire 14 to the battery. The flap 15 will fall and the stoker can attend to the boiler 16 accordingly, either cutting off or throttling the pipe 17 leading to the story IV or reducing the pressure in the boiler 16 so that all the radiators 18 of the story IV are either not heated at all or but to a small extent. The conditions are the same in the story III. As soon as the normal temperature is attained there the thermometer 5 closes the electric circuit and the flap 19 will fall, so that the stoker can suitably adjust the pipe 21 which leads to the radiator 22. By the thermometer 4 the flap 20 will

be influenced, so that the stoker can correspondingly adjust the pipe 23 and the radiators 24 of the story II.

The various signal circuits are closed as long as the flaps 15, 19 and 20 are in their bottom position. On the other hand the contacts will remain closed in the thermometers 4, 5, and 6, until the mercury sinks, which takes place some time after the heat supply has been diminished. For these reasons it is preferable to provide a separate switch for each circuit in the boiler room, which switch the stoker must use as soon as a signal is given and which he puts into operation again as soon as he can assume that the temperature in the room from which the signal came, has sunk below the normal point.

In addition to the operation of the switch, the stoker, when a signal arrives, must raise the flap 15, 19 or 20 again. Automatic flaps can however be used, which are raised of themselves as soon as the current is interrupted, in a similar manner to the flaps sometimes used at central telephone stations. Of course it is advisable to construct automatically operating devices, which, after the expiry of a certain time, for example, after about five or ten minutes, moves the switch back into such a position that a new current impulse will cause the flap to fall.

In the drawing these devices which do not require any further description, are omitted for the sake of simplicity.

The above description shows that a heating plant in which all the radiators have been once adjusted according to my invention does not require any complicated signal system extending through the whole building. A single apparatus is necessary, which allows of the adjustment being effected, and will enable the control perhaps desirable from time to time, in order to ascertain whether the adjustment of the cocks of the radiators is sufficient. Such an apparatus is shown in the Figs. 2, 3 and 4. In this portable apparatus the arrangement is of such a kind that, as soon as a certain temperature is reached, an electric circuit is closed. As a consequence another part of the apparatus is so moved that the time measuring device, which in the drawing is shown in the form of an ordinary clock 25 driven by a spring is stopped. Of course any other time measuring device may be used.

All essential parts of the apparatus, that is the battery in the form of a dry cell 26, the heat measuring device in the form of a contact thermometer 27, similar to the above described thermometers 4, 5 and 6, a switch 28 adapted to stop the clock, and the clock 25 are provided on a common base plate 29.

The current flows from one of the poles of the dry cell over the binding screw 30, which is insulated in the switch box 28, to the core 31 of an electromagnet. The coil 32 of this electromagnet is in conductive connection with the binding screw 33, through which connection is made over an interrupting device 34 with the mercury 36 of the thermometer.

As soon as the normal temperature is attained in the room in which the device is provided, in place of the thermometer and the circuit leading to the boiler room, the mercury 36 will close the circuit leading to the contact 37, from which the current returns to the second pole 38 of the dry cell.

When the circuit is closed the electromagnet attracts its armature 39, which has a hook shaped end and extends through the opening 40 of the cover 41 of the switch box, and normally holds the flap 42 in the closed position (Fig. 2).

When the armature is attracted the flap is released and springs under the influence of the spring 43 into the open position shown in Fig. 4, which is determined by the flap striking against a stop 44. On the flap 42 is secured a pulling piece, such as a flexible wire or a small chain 45, which passes through an opening 46 in the casing of the clock 25 and is fastened to a spring 47 in the clock casing.

As long as the flap 42 of the switch box is closed, the pulley piece 45 is loose, and the spring 47 is in the position shown in dotted lines in Fig. 3. When the flap opens the pulley piece 45 becomes tight and pulls the spring 47 into the position shown in full lines in Fig. 3, the front end of the spring being pressed against the circumference of the balance 48, so that the clock will be stopped at once.

The clock will show at what time the normal temperature has been attained in the room. The open flap 42, which, on opening, preferably discloses a disk 49 showing the attained temperature of 15°, will indicate that the desired temperature is obtained. In order to avoid waste of the electric current, in the event of this temperature being maintained in the room for a long time, so that the circuit is closed by the mercury 36 being in contact with the contact piece 37, provision should preferably be made for interrupting the circuit when the clockwork is stopped. For this purpose a further pulling piece 50 is shown connected to the flap 42 in the example illustrated, to which pulling device the contact plug 51 of the current interrupting device 52 is connected. As long as the flap is closed the two contact pieces of this device are connected by the plug. When the flap opens the plug is raised so that it does not come into contact with one of the contact pieces and the current is then interrupted. The arrangement of the switch box has been found to be of

special advantage, because the opening flap furnishes a convenient means to stop the clock and interrupt the current.

Of course it is possible to modify the entire apparatus and the essential parts thereof and other suitable means may be provided for stopping the clock when the desired temperature has been attained in the room. In order to mention one of the many modifications possible, a clock may be used which is driven by the electric current and the arrangement may be such that the circuit is closed and the clock stopped thereby, as soon as the desired temperature is reached.

After the cock of each of the radiators has been properly adjusted with the assistance of this apparatus, so that the normal temperature is obtained in all rooms, and at the same time, then it is necessary to provide a safety device which will prevent the adjustment from being altered. Such a safety device is shown in Fig. 7.

On the pipe 53 through which the heating agent enters into the radiator, the cock 54 is provided in the usual manner. This cock consists essentially of a valve body 57 adapted to be adjusted in the casing 56 by turning the handle 55. A disk 58 has the usual stop 59 which prevents the lever 55 from being moved beyond the proper limit. Under this stop the usual indicator disk 60 is provided, which enables the movement of the lever 55 to be read off. The disks 58 and 60 are fastened by a nut 61 and each have a hole 62 or 63, through which a wire 65 having a seal 64 is passed. This arrangement which assures that the opening of the cock 54 cannot exceed the adjusted point is the only new feature of the cock. By this arrangement the disks 58 and 60 can only be turned by destroying the seal 64 or cutting the wire 65. Instead of this arrangement any other rigid connection between the two disks may of course be adopted, which will prevent a relative movement of the disks.

In order to prevent the lever 55 from being taken off—which would also enable the cock to be turned beyond the adjusted point—the screw 66 holding said lever may be provided with a seal or be made unsuitable for being operated by a screw driver by its groove 67 being filled out with an easily melted alloy. As above mentioned all these arrangements alone are suitable to enable the desired result to be obtained. This does not however suffice, because the stoker must also be in the boiler room and properly attend to the signal given. That is, he must firstly interrupt the signal and then reduce or cut off the supply of the heating agent. Heretofore no means were provided to insure that everything is properly done. This is effected according to my invention by the current which gives the signal being caused to produce or alter an electric field in a special controlling apparatus, in such a manner that a displacement or rotation of parts of the apparatus will take place, with the result that the duration of this action of the electric field, and, consequently, also the time at which the signal is given in the boiler room, and received attention by the stoker properly switching off the signal device, will be rendered visible on a paper strip uniformly moved and provided with hour and minute divisions or on a uniformly turned paper disk. Such an apparatus is shown in Figs. 5 and 6 of the drawing.

The thermometers 4, 5 and 6 of the control apparatus, which are distributed throughout the separate rooms of the building, as above explained, are connected in the usual manner by electric circuits with the annunciator 13. In each circuit there is a branch 68 which leads to a control apparatus 69.

As soon as the mercury in a thermometer has reached the normal temperature, the current flows through the apparatus provided in the annunciator 13 and causes the particular flap 15, etc., to fall, which shows in what room the temperature has been attained, and the apparatus must then be brought back into the first position by the stoker, the signal circuit being thus interrupted.

The current acts as long as the flap is in the fallen position. During this time the current also passes through the branch 68 and apparatus 69 in which the time and duration of the operation is registered.

If the stoker is not in the boiler room or is careless this will be shown by the duration of the electric current. For this purpose the apparatus is provided with an electromagnet 70 having a pivoted armature 71 connected by a rod 72 with a writing pencil 73. In front of this pencil there is a round paper disk 74 provided with divisions corresponding to hours and minutes and uniformly rotated. As soon as, and as long as, a current passes through the electromagnet 70 the pencil 73 is pressed against the paper.

In order to avoid waste of current, which may be very considerable, when the stoker does not properly fulfil his duties, provision is made for the clockwork 75, which drives the paper disk 74, to uniformly rotate a shaft 76, on which an arm 78 having a contact piece 77 is secured and is adapted to slide in the direction of the axis of the shaft 76, but cannot rotate in regard thereto. Said arm is pressed by a spring 79 against the fixed disk 80, which is provided with a ring 81 of hard rubber or the like and carries two contact pieces 82 and 83 let into the same. As soon as the contact piece 77 comes simultaneously into contact with 82 and 83, which takes place, for example, in periods of five

minutes, the branch circuit and the electromagnet 70—supposing the signal circuit to be closed—will be passed through by the current and a mark will be made on the paper disk 74.

Of course such an apparatus 69 can also be put into operation in another manner by means of the electric current. For example, the falling of the flap in the annunciator 13 might be used for the purpose.

What I claim and desire to secure by Letters Patent of the United States is:—

In combination with a heating system, a central boiler station, several groups of rooms to be heated, only one room of each group having a signal leading to the boiler room and adapted to give a signal in said boiler room when a certain temperature is attained, means for adjusting the section of the pipes conducting the heating agent to the radiators, and means for preventing the adjusting device from being opened more than the maximum adjusted position, that in all rooms a definite temperature is attained at about the same time, substantially as, and for the purpose, set forth.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

ADOLF HEIN.

Witnesses:
ALFRED DROTH,
WOLDEMAR HAUPT.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."