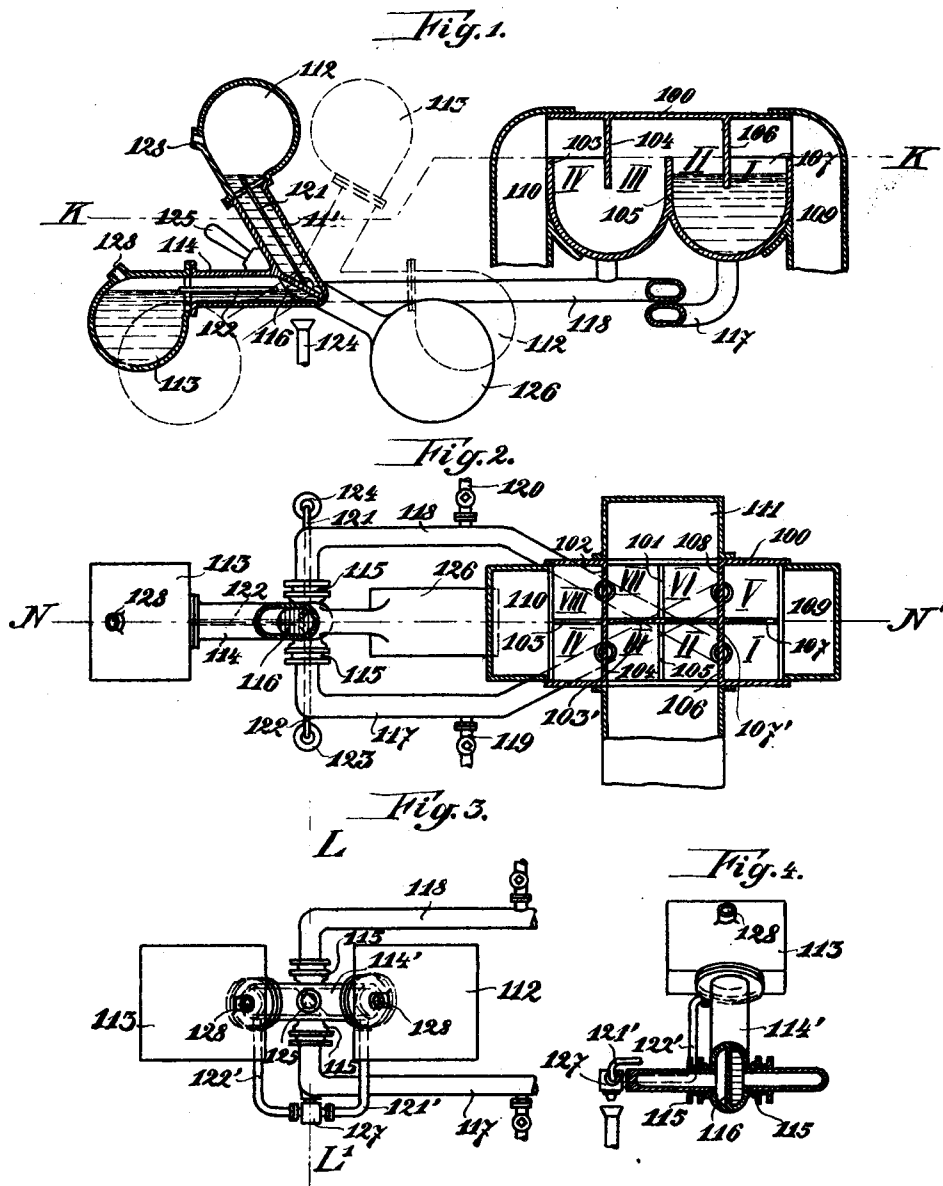


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 REGULATING AND REVERSING APPARATUS FOR REGENERATIVE GAS FURNACES.
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1,065,690.

Patented June 24, 1913.

2 SHEETS—SHEET 1.

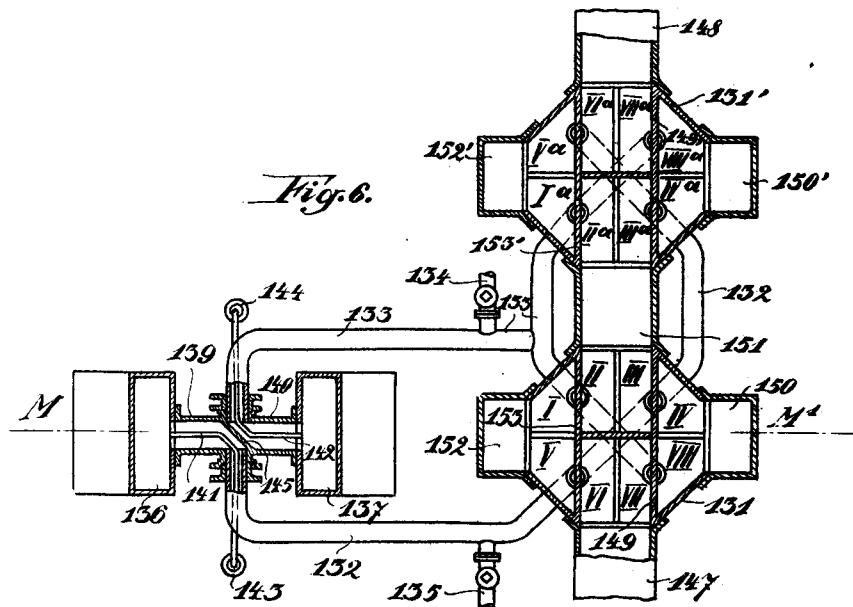


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2 SHEETS—SHEET 2.



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REGULATING AND REVERSING APPARATUS FOR REGENERATIVE GAS-FURNACES.

1,065,690.

Specification of Letters Patent.

Patented June 24, 1913.

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To all whom it may concern:

Be it known that I, HEINRICH KOPPER, a subject of the German Emperor, residing at Mülheim-on-the-Ruhr, Germany, have invented certain new and useful Improvements in Regulating and Reversing Apparatus for Regenerative Gas-Furnaces, of which the following is a specification.

My invention has for its object the introduction of various improvements whereby the construction of the apparatus and its action and management are essentially simplified.

The present improvements are directed toward the positioning of the parts of the rocking member relatively to one another as also to the water inflow and outflow.

A further improvement serves for the utilization of the variable water supply for the control of not only the gas valve but also of the air supply to the regenerative furnace. This is attained by connecting the water supply pipes for the chambers of the gas valve with the similarly arranged air valve. The latter has chambers in which different water levels can be provided by suitably operating the rocking member in the manner previously described with reference to the gas valve. This control is simultaneously effected for both valves and consequently only a single reversing member is required where previously two reversing members had to be used. The arrangement of one reversing member for both valves (gas and air valve) provides a simplification in the control-mechanism and greater reliability in the working of the furnace without loss in the gas and air supply. At the same time considerable economy in labor and expense is insured.

The invention is shown in the accompanying drawings, in which:

Figure 1 is a vertical section taken on the line N—N' of Fig. 2. Fig. 2 is a horizontal section taken on the line K—K' of Fig. 1. Fig. 3, is a plan of a slightly modified form of the rocking member. Fig. 4, is a section taken on the line L—L' of Fig. 3. Fig. 5, is a vertical section of a modification of the apparatus taken on the line M—M' of Fig. 6. Fig. 6 is a horizontal sectional view of a modification of the complete regulating and reversing system taken on the line E—E' and H—H' of Fig. 5.

The valve casing 100 is divided similarly

to that shown in my specifications Letters Patent 956106, 1029696 and 1036366, by walls 101, 103, 105 and 107 which extend from the floor not quite to the cover and further divided by walls 102, 104, 106 and 108 which reach from the cover to nearly the floor, and again by walls 103' and 107' which reach to the floor and the cover, the chambers formed being numbered I to VIII. At the sides of the valve casing there are provided furnace flues 109 and 110, while at the rear is a chimney flue 111 which leads from the chambers VI and VII.

The water supply to the chambers I—VIII is obtained from the containers 112 and 113 which are carried by a V-shaped pipe 114 adapted to turn on tubular sockets 115. In the apex of the pipe there is a wall 116 for separating the contents of the two containers. The sockets 115 are in communication with stationary pipes 117 and 118, the first of which leads to the chambers III, IV, V, and VI, while the last-named pipe leads to the chambers I, II, VII and VIII.

The chambers I, II, VII and VIII communicate with the container 112, while in the chambers III, IV, V and VI the same water level prevails as in the container 113. The supply of water is derived through pipes 119 and 120 connected with the pipes 117 and 118 respectively. The discharge of water from the containers takes place through pipes 121 and 122, the former of which extends into container 112, while the latter extends into the container 113. The pipes 121 and 122 are disposed in the interior of the V-shaped pipes 114 against the sides of the division wall 116 so that they turn with the pipes 114. The ends of the pipes 121 and 122 project into open space into drains 123 and 124 respectively. A handle 125 serves for reversing the pipe 114, while a weight 126 counterbalances the variable load of the water in the containers 112 and 113.

In the arrangement described in my specification Letters Patent No. 1029696 the two arms of the pipe 114 form a right angle with each other and in reversing the position of the pipe, the water level falls immediately in one arm thereof while it rises in the other arm. The water levels in the communicating chambers of the valve casing are immediately affected in the same manner. For the depending walls between two

chambers of the valve casing there must therefore be an elevation which forms a small safety distance from the point at which the rising and falling water levels encounter each other. This elevation determines the height of the walls of the valve casing. It has been found that the said height can be lessened by altering the rectangular disposition of the arms to one of an acute angle as shown in the accompanying drawings, the most advantageous angle being one of 60 degrees. In the Figs. 2 and 3 of these drawings, the containers 112 and 113 are turned to the left. Consequently the water of the chambers I, II, VII and VIII, communicating with the container 112, is at high level, and at low level in the chambers III, IV, V and VI owing to their communication with the container 113.

In reversing the position of the containers 112, 113, the former moves first into its vertical position and then to the other side until, after passing through an angle of 60°, it reaches the same inclination at the right as it previously had at the left. During this movement, the container 113 passes from its lowest position to that previously occupied by the container 112. While now the container 113 has already reached the position for the highest water level, which has also been communicated to the chambers III, IV, V and VI, the container 112 has not been relatively lowered so that the water has remained in the chambers I, II, VII and VIII. The water level in the last named chamber has first slightly increased during the movement through an angle of 60° and has subsequently fallen to its former level. Only after the water level in the chambers III, IV, V and VI has reached the highest point (middle position of the arms) can, with the continued motion of the handle 125, the water fall in the remaining chambers. Consequently the meeting between the water levels has taken place at a point much nearer the cover of the valve casing than that occurring in the arrangement described in the specification Letters Patent No. 1029696. As a result, the walls of the valve casing can be made lower and with the original passage-opening for the gas, the total height of said casing can be reduced so that a smaller volume of water will be required for the reversing operation, thereby enabling the parts which conduct the water to be of smaller size than heretofore.

Figs. 3 and 4, show a constructional form in which the discharge pipes 121' and 122' arranged external of the V-shaped pipe 114' to which the upper ends of said pipes are connected below the containers 112 and 113 respectively and with which they rock. The lower ends of the discharge pipes 121' and 122' are secured in a single turning head 127

concentrically arranged to the sockets 115 of the pipe 114', the water escaping from said head 127 into a drain pipe.

To enable air to enter readily the containers while the water is being discharged, or to escape therefrom while water enters such containers, and the movement of the water be facilitated, openings 128 are provided in the upper portions of the containers 112 and 113.

It is not absolutely necessary to have an angle of 60° between the arms of the pipe 114, but it will not allow the water level in the full chambers to fall before the empty chambers are filled with water.

With the third example of construction as shown in Figs. 5 and 6, the reversing of the flows of the gas and the air in the regenerative furnace is regulated by two valves constructed and operating in the same manner as the one hereinbefore described. The valve casing 131 and 131' are divided into chambers I to VIII and I^a to VIII^a respectively. The chambers III, IV, V and VI of the casing 131 communicate with a water inlet pipe 132 which also branches off into the chambers III^a, IV^a, V^a and VI^a of the casing 131'. Another inlet pipe 133 communicates with the chambers I, II, VII, and VIII of the casing 131 and with the chambers I^a, II^a, VII^a and VIII^a of the casing 131'. The pipes 132 and 133 are fitted with a pipe connection 134 and 135 respectively through which the water is supplied. The pipes 132 and 133 leading to the containers 136 and 137 respectively through the intervention of the V-shaped rocking pipe 138, the arms 139 and 140 of which form an angle of about 60° with one another. Within the arms are placed the outlet pipes 141 and 142 respectively, the outwardly projecting ends of which discharge into drains 143 and 144 respectively. The containers 136 and 137 are separated from each other by division wall 145 provided in the apex of the arms 139 and 140. To counteract the weight of the water and the containers the pipe 138 is fitted with a weight 146. The action is much the same as previously described with reference to the other constructional forms. In the drawing, the pipe 138 is shown in its middle position. By turning the latter for about 60° toward the right so as to bring the arm 140 into a horizontal position and the arm 139 into the position at present occupied by the arm 140, the water will flow away from the container 137 without altering the level in the container 136. According to the principle of communicating vessels the level of the water in the chambers I, II, VII, VIII and I^a, II^a, VII^a, and VIII^a, which are in communication with the container 137, will also fall to the lowest point. The generator gas passes constantly through

the conduit 147 into casing 131, while the air passes through the conduit 148 and the casing 131'. With the said position of the V-shaped pipe 138, the gas passes first into the chamber VII, then below the wall 149 into the chamber VIII and through the flue 150 into the regenerative furnace. The return from the latter takes place through the flue 152 into the chamber I, then under the wall 153 into the chamber II and thence into the chimney flue 151 between the two casings 131 and 131'. The air enters first into the chamber VII^a and flows beneath the wall 149' into the chamber VIII^a and thence through the flue 150' into the regenerative furnace. The return takes place through the flue 152' into the chamber I^a and beneath the wall 153' into the chamber II^a and finally into the chimney flue 151. By turning the V-shaped pipe 138 through 120° to the left so as to bring the arm 139 into a horizontal position, the container 136 and the communicating chambers, III, IV, V, VI and III^a, IV^a, V^a, and VI^a will attain the lowest water level, while the water level in the other chambers and the container 137 rises. Both gas and air will now flow through the chambers III, IV, and so forth as also through the chambers III^a, IV^a and so forth so that the gas enters the regenerative furnace through the flue 152 while air passes through the flue 152', the return taking place through the flues 150 and 150' respectively. The regulation of the water levels in the gas valve and in the air valve is thus controlled by one and the same mechanism namely the reversing device 136, 137, and 138.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. A regulating and reversing apparatus comprising in combination, a rocking device having tubular arms disposed at an angle of less than 90° to each other and having containers at one extremity of each of said arms, said arms being rigidly connected together at their other extremities and swingingly pivoted to a third tubular member, so that in reversing the position of the containers, the container which is being lowered will have to pass its highest position before

reaching its final position and shall keep approximately its highest position until the container which is being lifted shall have reached its highest position.

2. A regulating and reversing apparatus comprising in combination, a rocking device having tubular arms disposed at an angle of 60° and having containers at one extremity of each of said arms and being rigidly connected together at their other extremities, swingingly pivoted to a third tubular member, so that in reversing the position of the containers, the container which is being lowered will have to pass its highest position before reaching its final position, and shall keep approximately its highest position until the container which is being lifted shall have reached its highest position, and means for controlling the level of the liquid in the containers.

3. A regulating and reversing apparatus comprising in combination, a rocking device having tubular arms disposed at an angle of less than 90° and having containers at one end of each of said arms, means contained within said arms for controlling the level of the liquid in the containers, said arms being swingingly pivoted to a third tubular member so that in reversing the position of the containers, the container which is being lowered will have to pass its highest position before reaching its final position, and shall keep approximately its highest position until the container which is being lowered shall have reached its highest position.

4. A regulating and reversing apparatus comprising in combination, a rocking device having tubular arms disposed at an angle of less than 90° to each other and interconnected with the reversing valve and chamber, said tubular arms being connected with containers and containing means for regulating the level of the liquid within the containers, means for changing the position of said containers, and means for leading the discharge fluid away from the valve chamber.

In testimony whereof I affix my signature in presence of two witnesses.

HEINRICH KÖPPER.

Witnesses:

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BESSIE F. DUNLAP.