

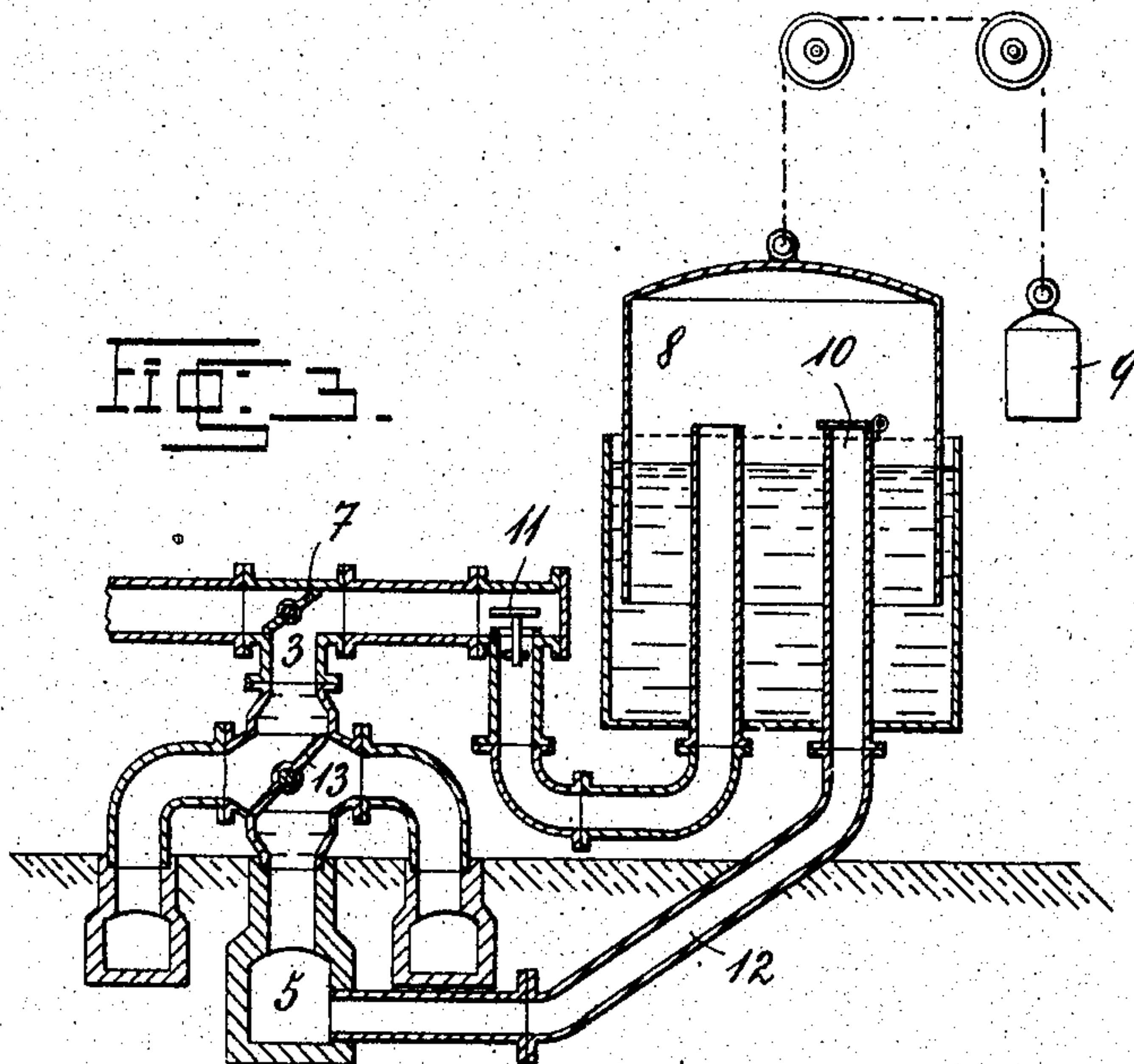
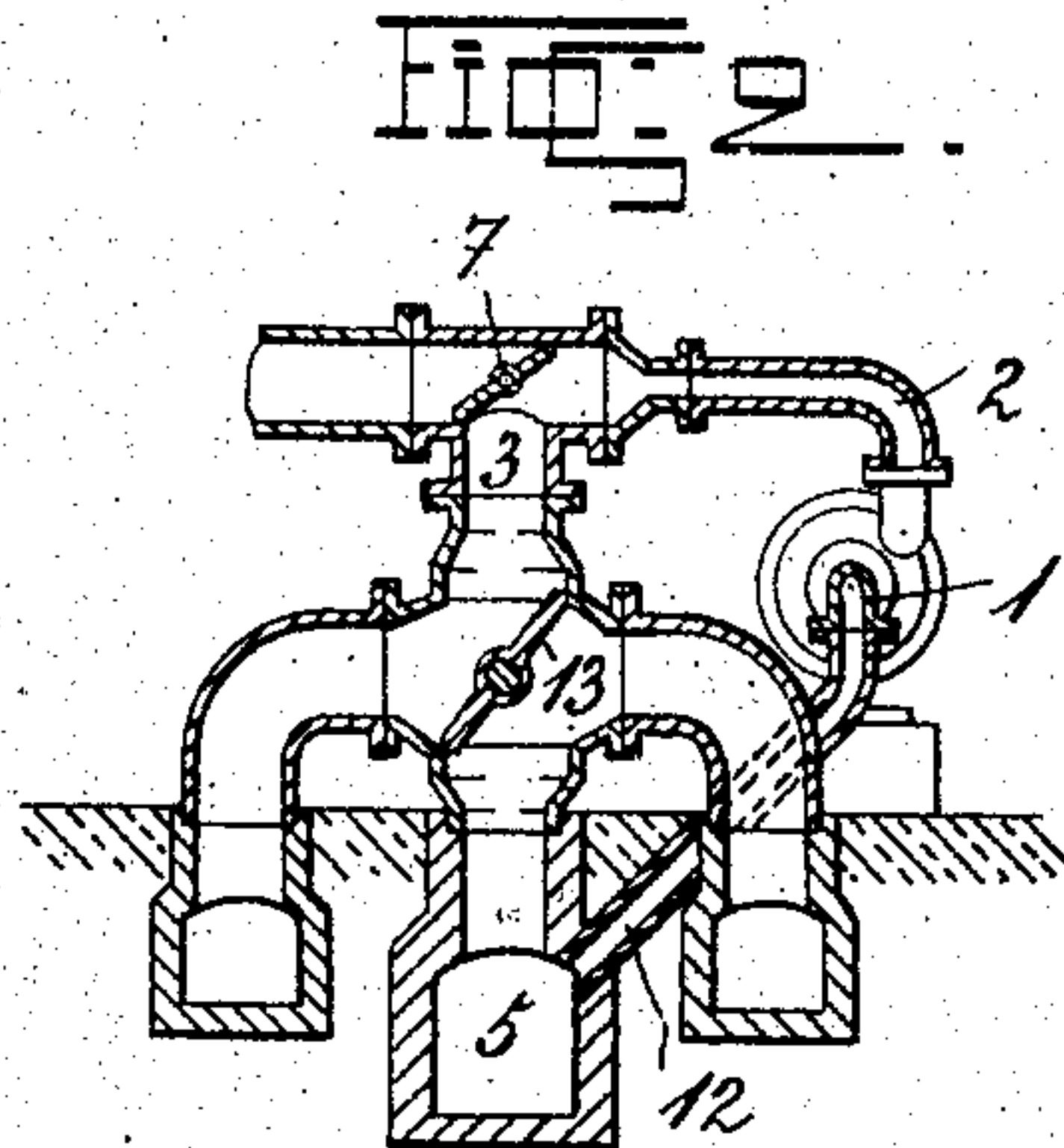
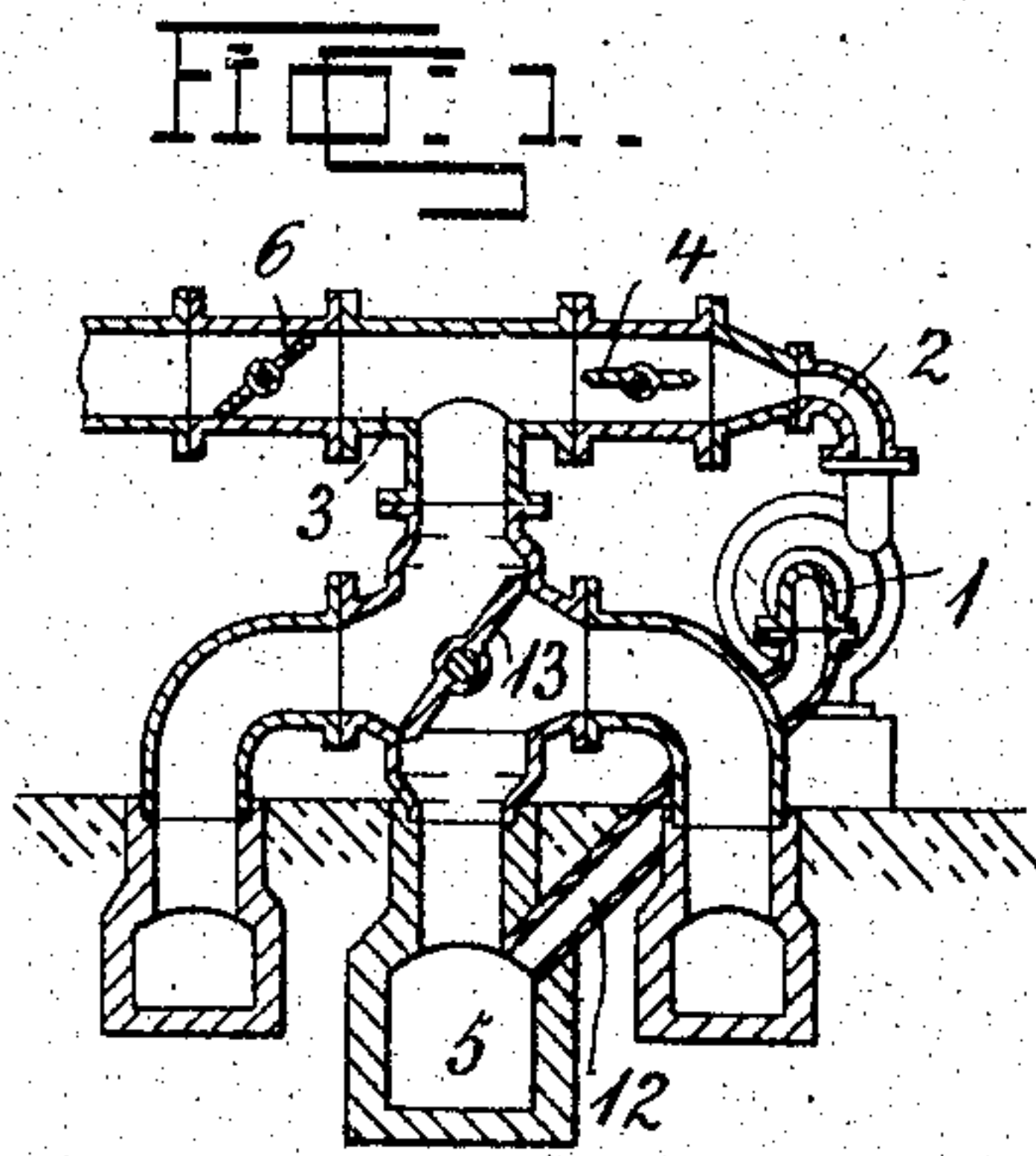
No. 786,770.

PATENTED APR. 4, 1905.

A. KURZWERNHART.
SIEMENS REGENERATIVE FURNACE.

APPLICATION FILED MAY 3, 1904.

2 SHEETS—SHEET 1.



WITNESSES.

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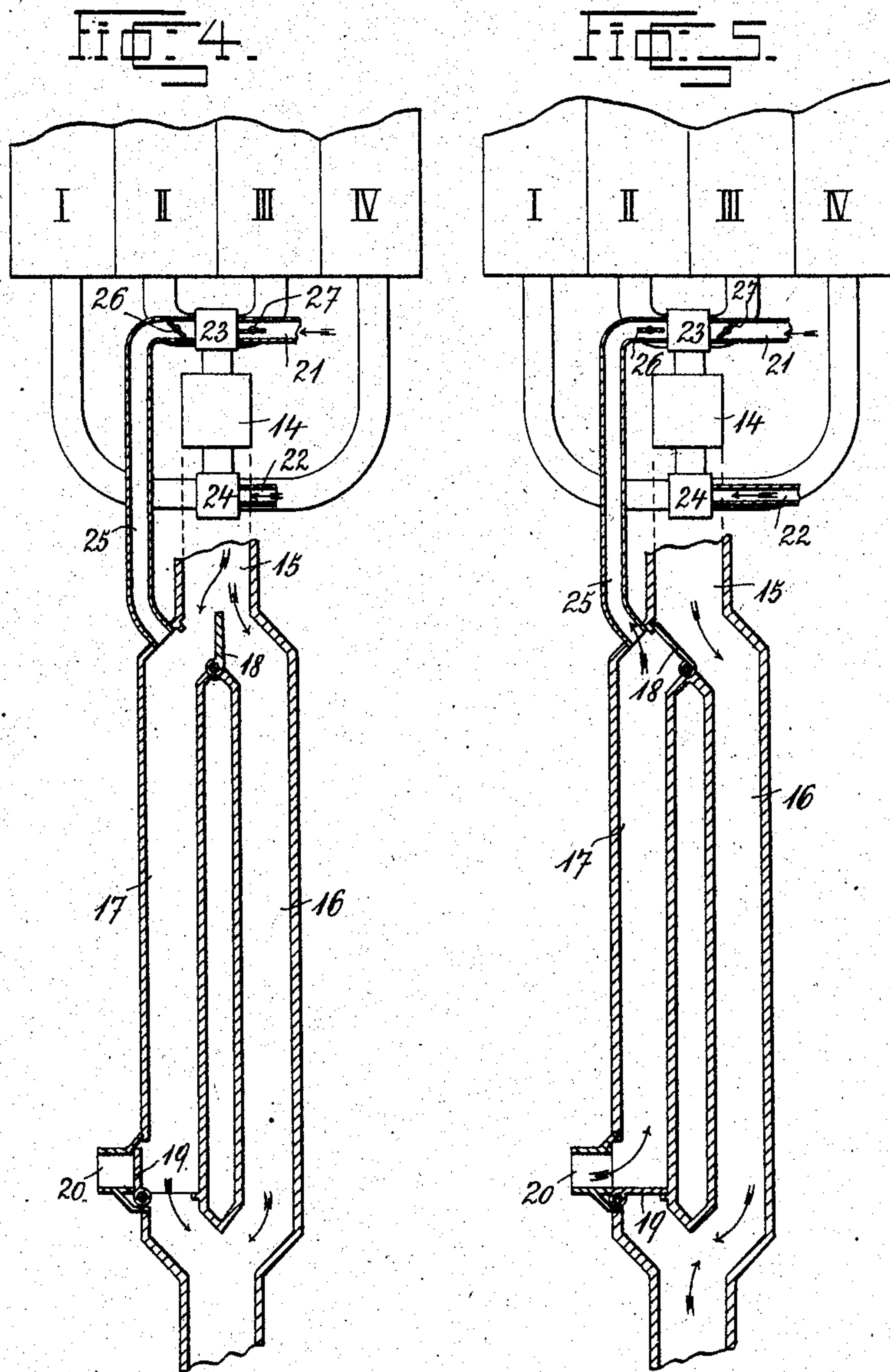
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

ADALBERT KURZWERNHART, OF ZUCKMANTEL, NEAR TEPLITZ, AUSTRIA-HUNGARY.

SIEMENS REGENERATIVE FURNACE.

SPECIFICATION forming part of Letters Patent No. 786,770, dated April 4, 1905.

Application filed May 3, 1904. Serial No. 206,098.

To all whom it may concern:

Be it known that I, ADALBERT KURZWERNHART, a subject of His Imperial Majesty the Emperor of Austria-Hungary, residing at Zuckmantel, near Teplitz, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Siemens Regenerative Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in Siemens regenerative furnaces, and has for its object to provide means for utilizing waste gas or products of combustion or other gases to force the combustible gas into the furnace.

It has already been proposed in Siemens regenerative furnaces to force the gas remaining in the regenerative chamber before the reversal of the gas and air current into the furnace by air, an inlet for which is provided at a suitable point, and to there consume it. Instead, however, of utilizing air to force the combustible gas into the furnace this can advantageously be effected by other gases—such, for instance, as waste gas or products of combustion. To this end the waste gases can be forced into the gas-regenerative chamber by means of a blower or the like, or the incoming air is introduced at such a point that it is compelled to press the waste gas before it into the gas-regenerative chamber and so force out the combustible gas.

In carrying out the present invention the waste gas is withdrawn from the flue of the Siemens furnace itself or from any other flue or from any regenerative chamber filled with flue-gases and pumped or forced in any suitable manner into that regenerative chamber from which the combustible gas is to be pressed into the furnace. The apparatus designed to force forward the waste gases is so used that its suction-pipe is preferably in connection with the flue of the Siemens furnace itself or that of any other furnace and the pressure-

pipe opens directly behind the gas-cut-off device—that is to say, exactly at the point at which in the furnace of the type above described the air is introduced.

To enable the invention to be fully understood, I will describe it by reference to the accompanying drawings, in which—

Figures 1, 2, and 3 are sectional views illustrating three suitable arrangements for carrying out the invention. Fig. 4 is a similar view of a further modification; and Fig. 5 is a view similar to Fig. 4, but showing the valves in a different position.

Referring first to the arrangement shown in Fig. 1, wherein a blower or fan 1 is used, a valve 4 is introduced into the connecting-pipe 2 between the outlet from the blower and the inlet to the gas-supply pipe or the gas-passage 3, the said valve 4 being normally closed, so that during the normal action of the furnace no gas can flow from the supply-pipe 3 through the blower 1 to the flue 5. The valve 4 can be automatic and arranged to open against the gas-pipe 3 when the blower is operated and to close by its own weight when the blowing operation ceases. Before reversing a gas-cut-off valve 6 of any known type is closed in the usual way and the blower started and maintained in operation until the diminution of flame in the furnace indicates that all the gas is consumed.

In the construction shown in Fig. 2 a single throttle-valve 7 is used for controlling the flow of combustible gas and waste gas. Instead of the blower an injector driven by steam, compressed air, or other pressure medium can be employed, the suction and pressure connections of the said injector being arranged in a similar manner to those of the blower, the valves being also disposed as above described.

In Fig. 3 I have illustrated the employment of a gasometer device 8. The weight of the bell is partially counterbalanced by a weight 9 and draws gas from the flue 5 through the valve 10 and compresses it through the valve 11 into the gas-pipe 3. The gasometer-bell is raised during the normal operation of the furnace between the operations of reversing

and is caused to sink immediately before reversing and after the gas-flow has been cut off in the known manner, whereby it forces its contents of waste gas through the valve 11 into the regenerative chamber. Such a gasometer should therefore have a capacity corresponding to the cubical contents of the gas-regenerative chamber exclusive of the space occupied by the bricks and including the passages in connection therewith. In combination with such a gasometer device and in lieu of or in addition to the automatically-opening valve 11 I may employ a cut-off device, throttle-valve, mushroom-valve, or the like, which can be operated by hand and opened immediately before the reversing. Instead of a single gasometer-bell I can employ two such bells, which may be connected by a beam or the like and alternately rise and sink. In this case the gasometers can have a less capacity and the speed of movement must be adapted to requirements. Furthermore, as above mentioned, any other suction or pressure device can be utilized for effecting the desired result.

In the arrangements shown in all three figures, 12 indicates the suction passage or pipe, and 13 the reversing-valve. Furthermore, all the figures are shown with the parts in the position in which the waste gas is being drawn from the passage 5 and forced into the gas-passage 3.

Instead of employing a separate blower or a gasometer or other suction and pressure apparatus for each furnace several furnaces can be in connection with a common apparatus, which must, however, be of such a size that it can cope with all requirements—that is to say, must be capable of dealing with the simultaneous reversal of all the furnaces, or the reversing of the furnaces must be arranged to take place at different times. When I use a blower, injector, or other suction and pressure apparatus common to a number of furnaces and which simultaneously carries out suction and compression operations—that is to say, is always compressing while it is in operation—the said blower or the like can be driven by an electromotor and be provided with switch mechanism whereby it can be put into operation from any one of the furnaces and maintained in operation so long as any furnace is being supplied with flue-gas and only brought to rest when no furnace is in operation or is requiring flue-gas. With such apparatus common to a number of furnaces, however, each of the furnaces must be provided with the above-described valve or its equivalent for the waste gas, the said valve being always maintained closed during the normal heating of the furnace. The blower or other suction and pressure apparatus will then supply waste gas to the point at which the valve 7 for controlling the inlet of the said gas or the valve 4 is arranged. If the

apparatus common to a number of furnaces does not simultaneously act as a suction and compression device—as, for example, is the case with a gasometer, Fig. 3—then the apparatus can be arranged as above described; but the electric switch and motor must be so adapted that the apparatus is compressing and not inducing so long as the inlet for the waste gas is opened in any one of the furnaces.

A further modified arrangement is shown in Figs. 4 and 5. In this arrangement waste or flue gas is forced into the regenerative chamber by air which flows in behind it. The flue 15 is in connection with the down smoke-passage 14, the said flue being divided into two parts 16 and 17. The right-hand portion 16 is of such a size in cross-section that it suffices of itself for the necessary furnace-draft. I and IV are the two air-regenerative chambers, and II and III the two gas-regenerative chambers. At that point at which the flue 15 branches into two parts there is arranged a valve 18 of any suitable description, by which the passage of the flue-gases to the left-hand branch pipe 17 can be cut off. In front of the point at which the two branches of the flue-pipe again unite there is fitted a valve 19 of any suitable kind, by operating which the flow of the gas can be cut off and air allowed to enter through a separate inlet 20. In lieu of the one valve 19 I can obviously make use of two separate valves, one of which cuts off the gas-flow and the other controls the air-inlet 20. Furthermore, instead of the aforesaid valve 19 I can employ a three-way cock or the like. 21 indicates the gas-inlet opening, and 22 the air-inlet opening. At 23 there is arranged the gas reversing device, and at 24 the air-reversing device of any suitable kind. 27 indicates a device for cutting off the gas-flow, and behind the valve 18 is arranged a connecting pipe or passage 25, which places this part of the flue 17 in communication with the part of the delivery-pipe behind or below the gas-cut-off device—that is to say, a part in the neighborhood of the device 23, at which in the known construction of furnace air is introduced through the cut-off device 26. The position of the various cut-off devices during the period of normal operation of the furnace is shown in Fig. 4. In this position of the valves the products of combustion generated in the Siemens furnace flow simultaneously through both flue branches 16 and 17, so that both are filled with waste gas. Before reversing, the valve 27 is closed and the valves 18, 19, and 26 are moved to the positions shown in Fig. 5. Air then enters through the inlet 20 and forces the gas contained in the pipes 17 and 25 into the gas-regenerative chamber and the combustible gas contained therein into the furnace. As soon as the flame is becoming extinguished the valve 26 is closed and the other valves returned to the positions shown in Fig. 4. The

reversing is then effected and the gas-valve 27 again opened. Instead of the valves 26 and 27 I can employ a device, such as the valve 7, for simultaneously cutting off the gas and controlling the air-inlet. The space between the valves 18 and 19 is preferably so chosen that the cubical contents of the same is at least as great as, and preferably somewhat greater than, the volume of gas which is to be forced into the furnace. When this is the case, no air finds its way into the connecting-passage 25 when the valve 26 or the reversing-valve is operated at the proper time, so that this space also is always filled with waste gas. The air which enters the space between the valves 18 and 19 in the above-described operation is subsequently—that is to say, during the normal operation of the furnace—again forced into the flue, so that this part of the passage is continually filled with flue or waste gas. The space between the valves 18 and 19 should not actually form a part of the smoke-passage, but can be arranged as a space of any suitable kind, which in capacity is sufficiently large and is provided at the proper points with valves. Furthermore, in lieu of the passage or flue appertaining to the furnace itself any other passage or space filled with waste gas or products of combustion can be utilized in the above-described manner.

Having now particularly described and as-

certained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

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1. A method of forcing the combustible gas into Siemens regenerative furnaces wherein, before the reversing operation, the gas contained in the regenerative chamber, after being cut off in any known manner from its source of supply, is introduced into the furnace by flue or waste gas, the said flue or waste gas being displaced from any flue or chamber containing such gas and caused to move through the gas-supply passage into the regenerative chamber, substantially as described.

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2. A method of forcing the combustible gas into Siemens regenerative furnaces wherein, before the reversing operation, the gas contained in the regenerative chamber after being cut off in any known manner from its source of supply is introduced into the furnace by flue or waste gas, the said flue or waste gas being withdrawn from any flue or chamber containing such gas and being forced through the gas-supply passage into the regenerative chamber substantially as described.

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In testimony that I claim the foregoing I have hereunto set my hand this 19th day of April, 1904.

ADALBERT KURZWERNHART.

Witnesses:

WENZEL SINKFURG,
ALVESTO S. HOGUE.