No. 629,510. Patented July 25, 1899.

A. LAUGHLIN.

ANNEALING FURNACE.

(Application filed Mar. 11, 1899.)

(No Model.) 4 Sheets—Sheet 1.

FIG. 1.

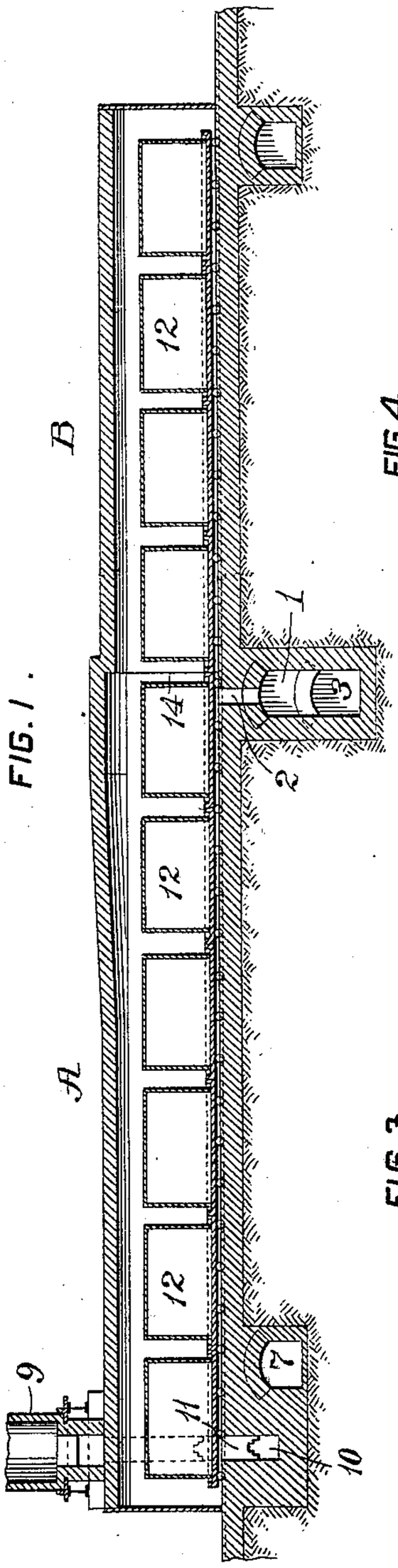


FIG. 4.

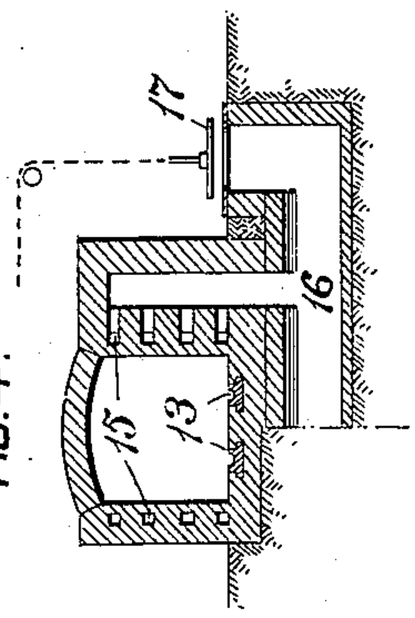
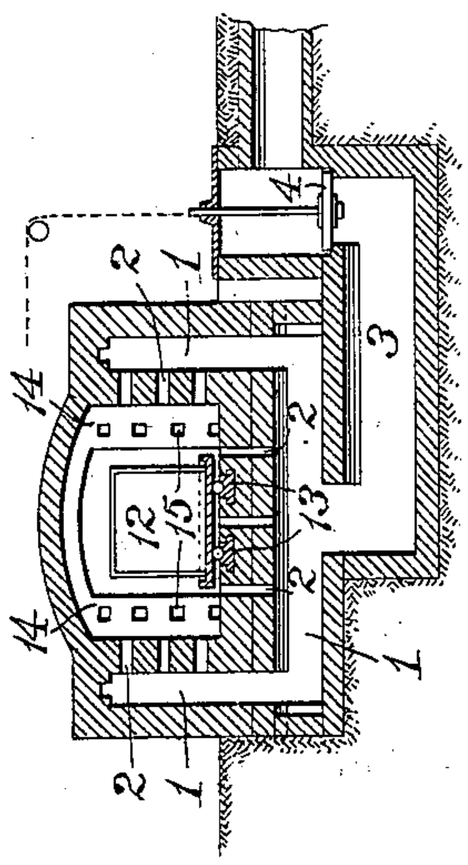


FIG. 3.



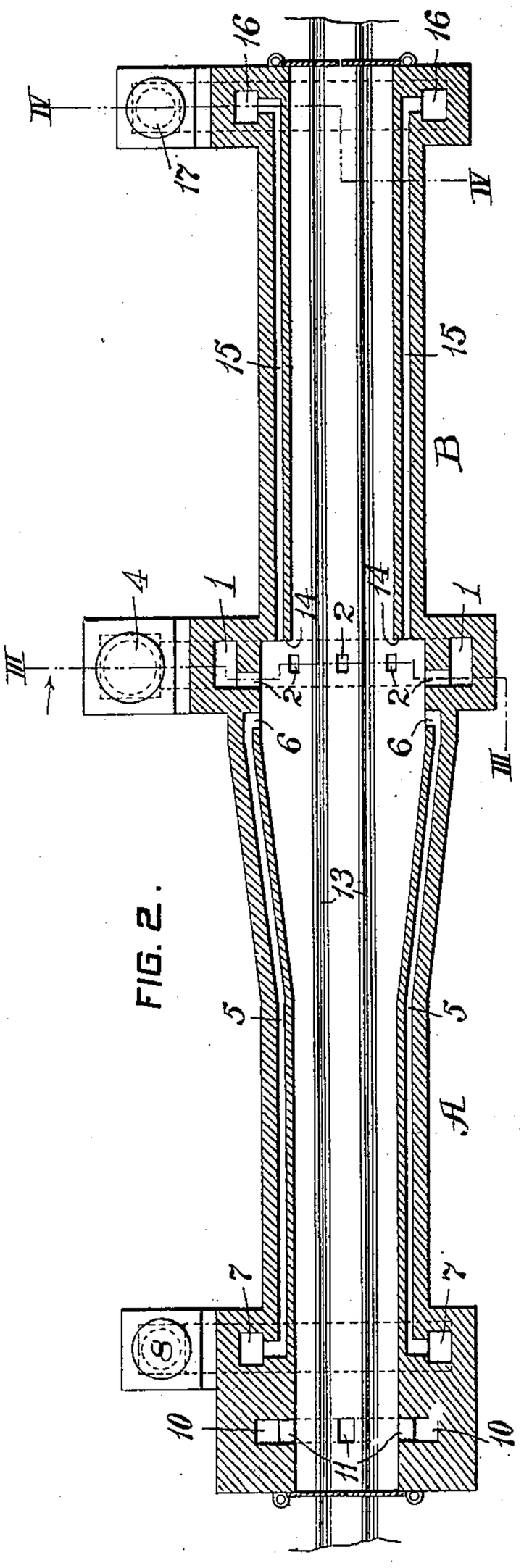


FIG. 2.

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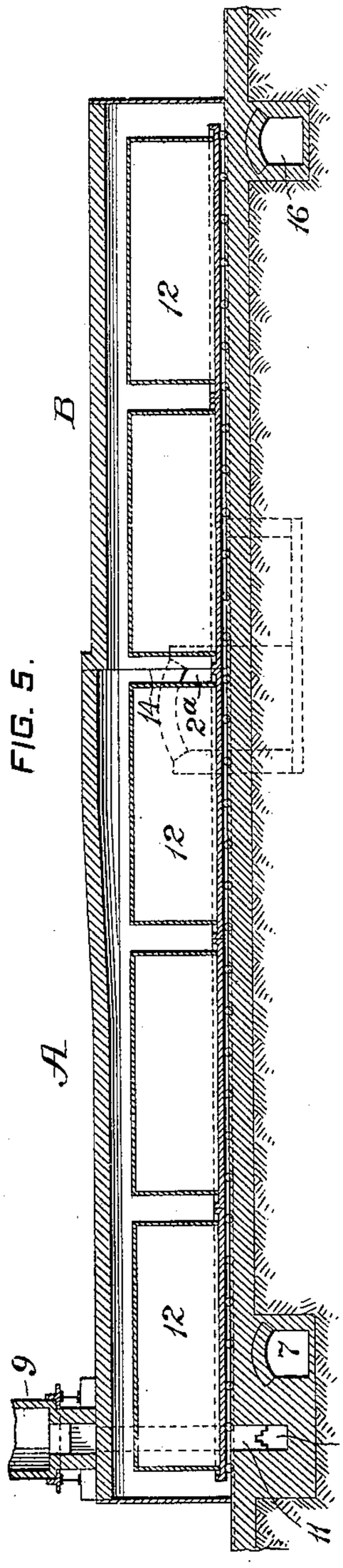

FIG. 5.

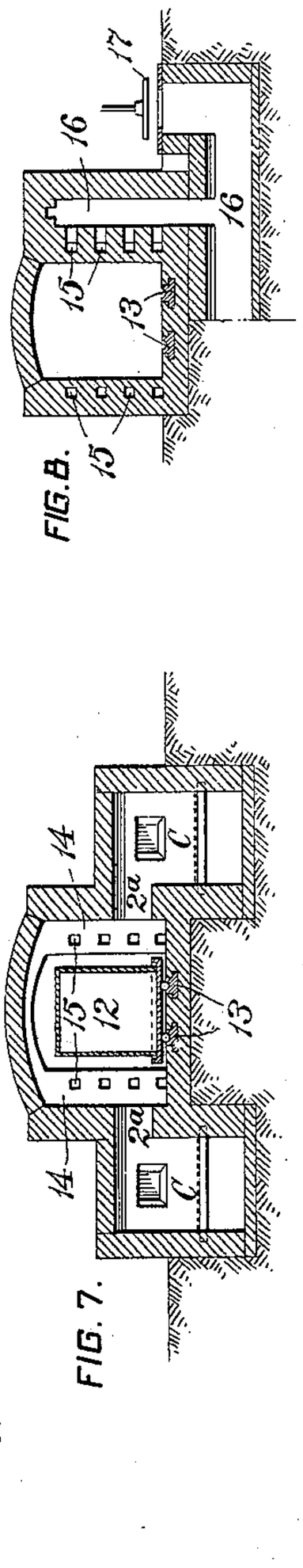

FIG. B.

FIG. 7.

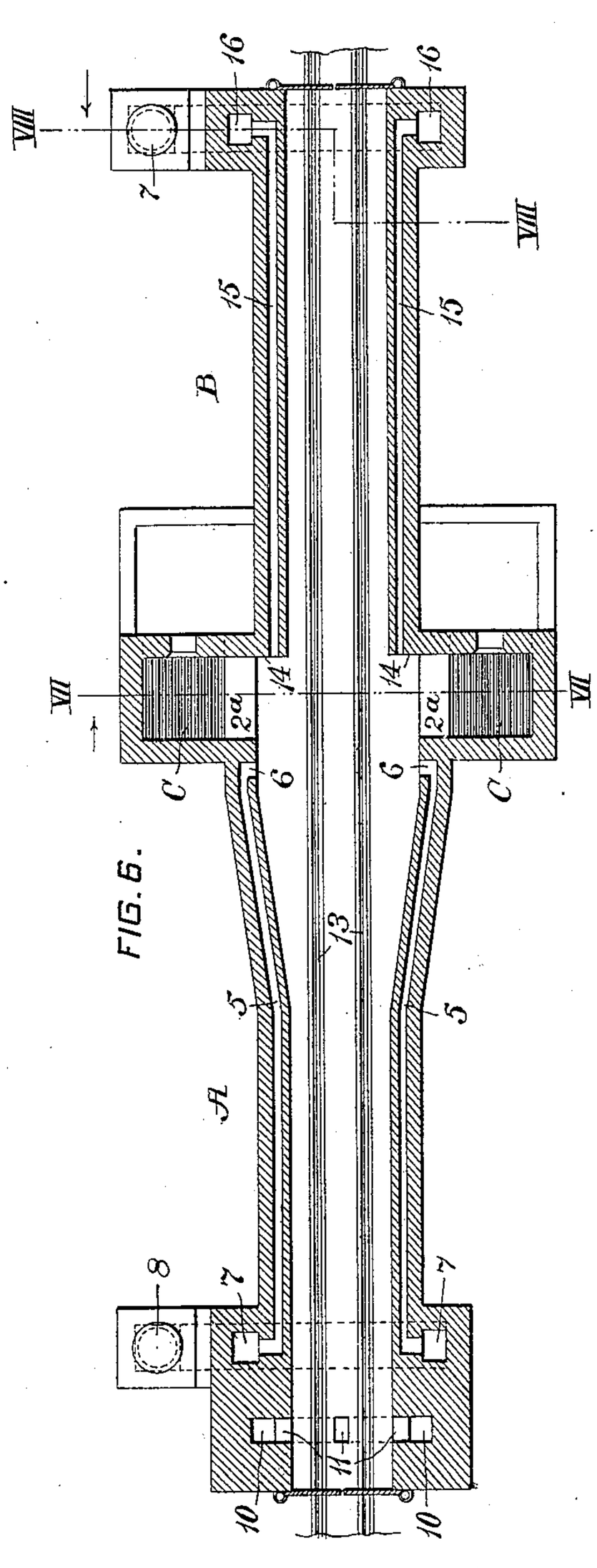

FIG. 6.

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(No Model.) 4 Sheets—Sheet 3.

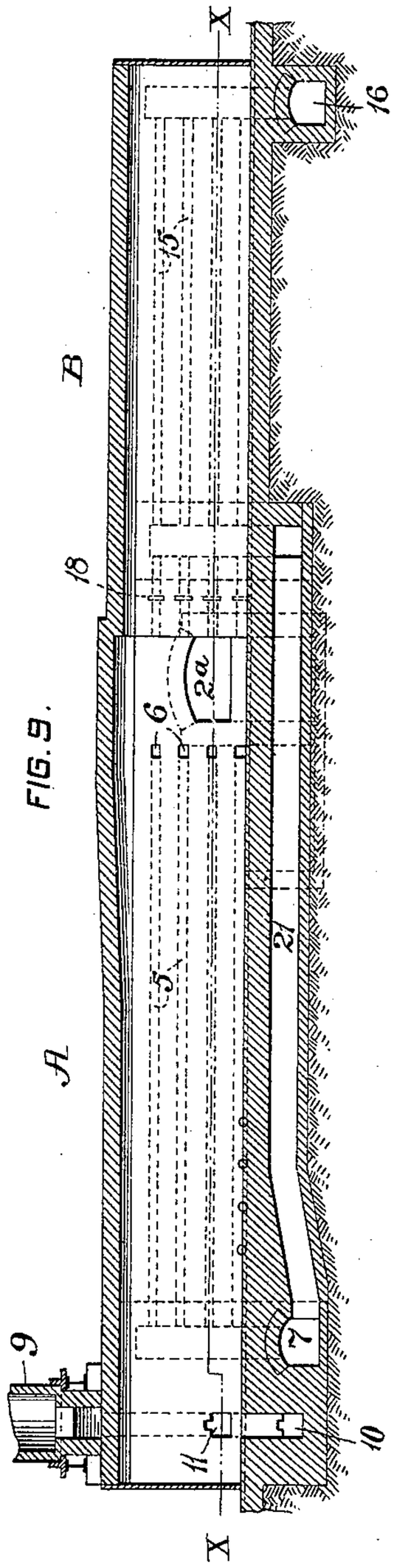

FIG. 9.

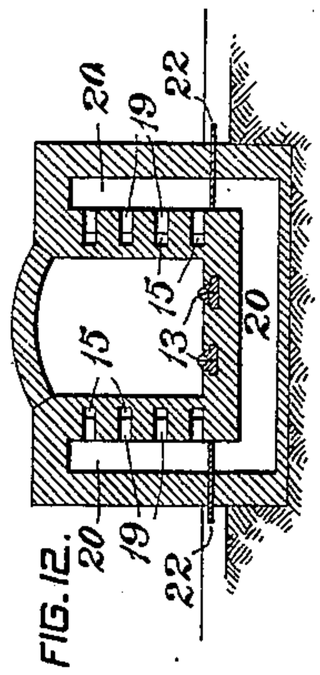

FIG. 12.

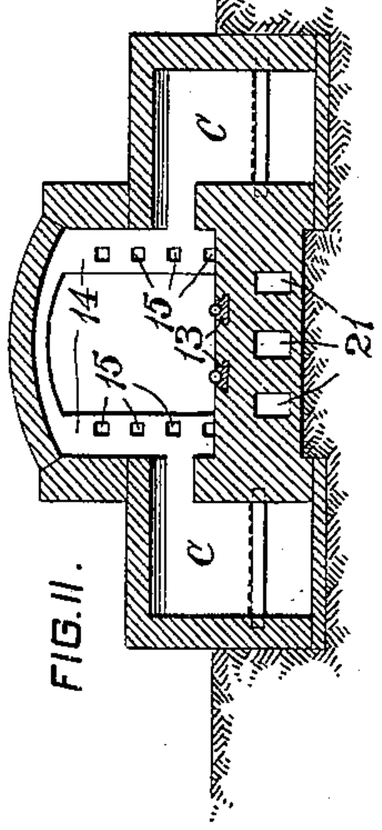

FIG. 11.

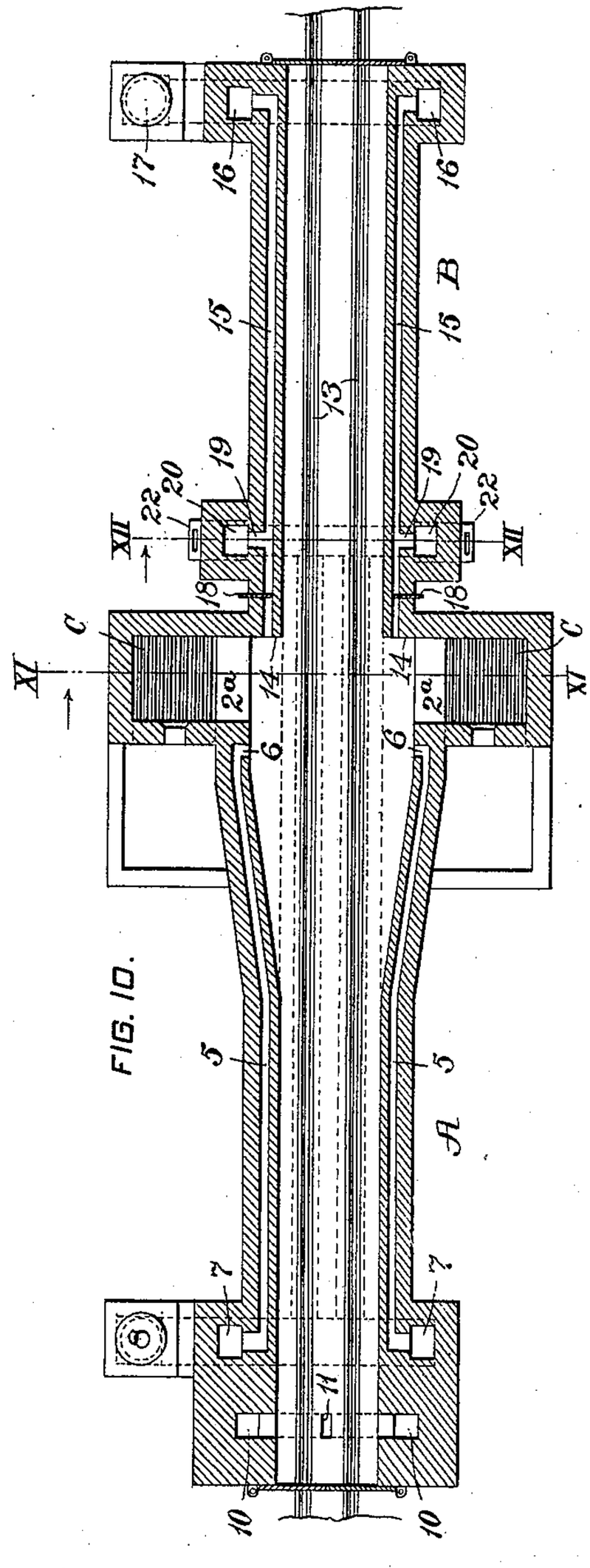

FIG. 10.

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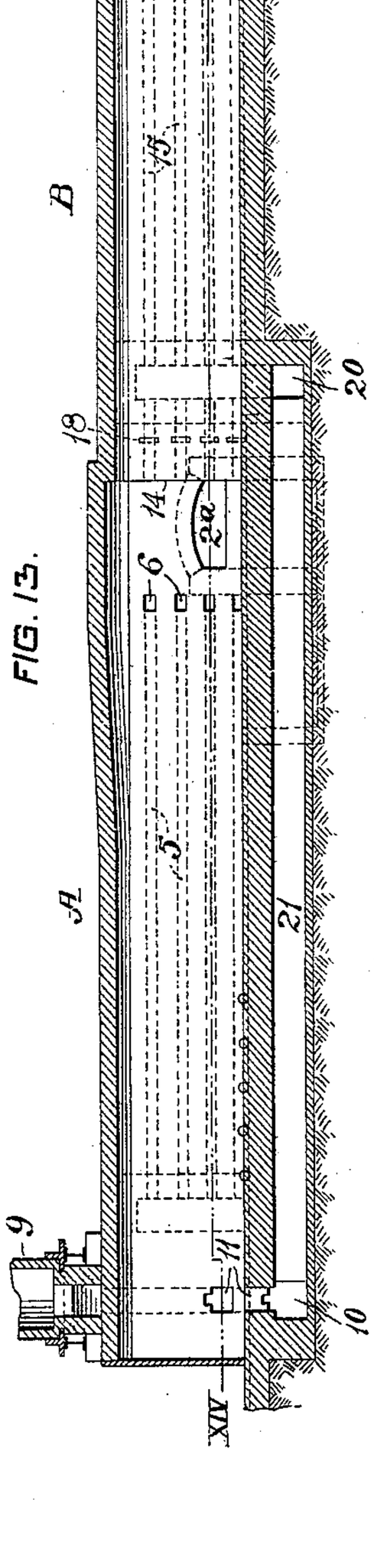

FIG. 13.

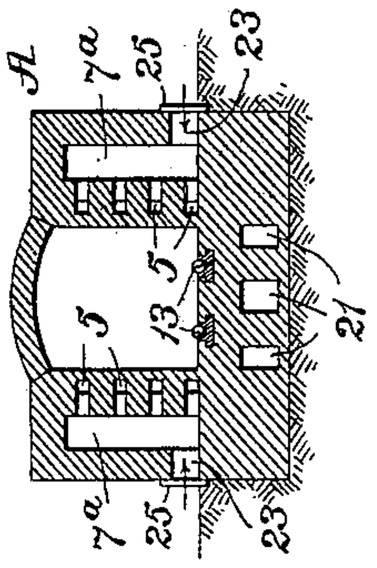

FIG. 16.

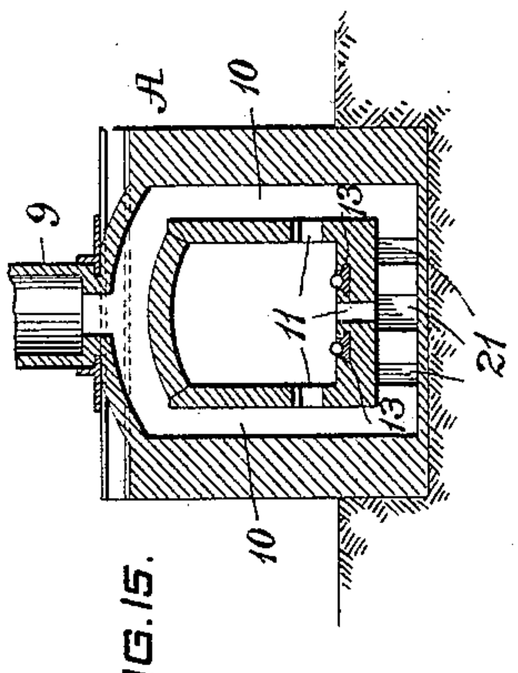

FIG. 15.

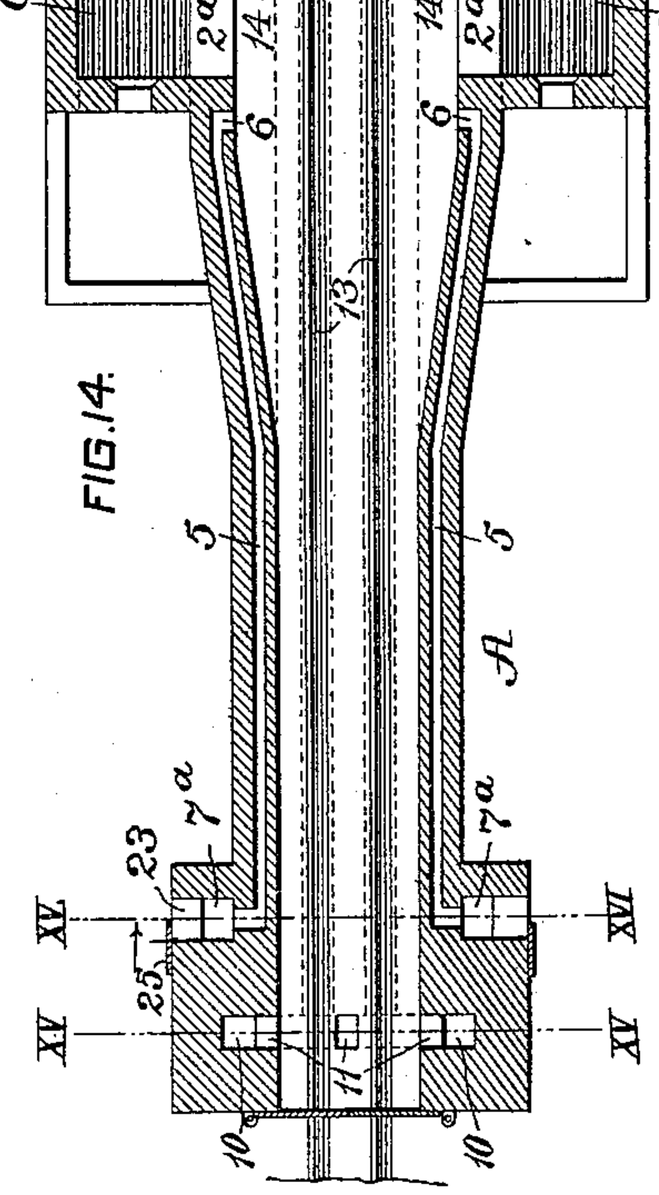

FIG. 14.

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UNITED STATES PATENT OFFICE.

ALEXANDER LAUGHLIN, OF SEWICKLEY, PENNSYLVANIA.

ANNEALING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 629,510, dated July 25, 1899.

Application filed March 11, 1899. Serial No. 708,752. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER LAUGHLIN, a citizen of the United States, residing at Sewickley, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Annealing-Furnaces, of which improvements the following is a specification.

The invention described herein relates to certain improvements in annealing-furnaces, the improvements being more especially applicable to that class or kind in which the material to be treated is moved progressively through the furnace. The object of the invention is to provide for the progressive heating and cooling of the material as it moves through the furnace and also for the regulation of the heating and cooling in accordance with the requirements of annealing.

The invention is hereinafter more fully described and claimed.

In the accompanying drawings, forming a part of this specification, Figure 1 is a sectional elevation of my improved annealing-furnace. Fig. 2 is a sectional plan view of the same. Figs. 3 and 4 are transverse sections, the respective planes of section being indicated by the lines III III and IV IV, Fig. 2. Figs. 5 and 6 are views respectively similar to Figs. 1 and 2, showing the furnace as adapted to be heated by the combustion of solid fuel. Figs. 7 and 8 are transverse sections on planes indicated by the lines VII VII and VIII VIII, Fig. 6. Figs. 9, 10, 13, and 14 are sectional plan views similar to Figs. 4 and 5 and illustrate certain modifications. Figs. 11 and 12 are transverse sections, the respective planes of section being indicated by lines XI XI and XII XII, Fig. 10. Figs. 15 and 16 are transverse sections on planes indicated by lines XV XV and XVI XVI, Fig. 14.

My improved furnace consists of two sections, chambers A and B, arranged end to end, so as to form a straight continuous passage for the material. Provision is made for heating the furnace at or near the junction of the two sections by means of gaseous or solid fuel. When gaseous fuel is employed, a transverse flue or passage 1 is formed at the point at which the fuel is to be introduced, as shown in Figs. 1, 2, and 3. This flue or passage is preferably extended across the bottom and up the sides of the furnace, as shown in Fig. 3, and is connected with the interior of the furnace by ports 2 and with a generator by the conduit 3. The flow of gas to the furnace is controlled by a valve 4.

In case it is desired to employ solid fuel for heating, fire-chambers C C are constructed on opposite sides of the furnace at or near the rear end of the section or chamber A, as shown in Figs. 5, 6, and 7. The heat and products of combustion pass from the fire-chamber or openings 2^a into the chamber A.

In order to introduce air into the furnace for the combustion of the gases, a series of longitudinal passages 5 are formed along the walls of the section or chamber A and have their outlet-ports 6 located adjacent to the openings or ports 2 or 2^a. The opposite ends of these passages connect with a transverse flue 7, located at or near the front or charging end of the chamber A. The flow of air through the flue 7 and passages 5 is controlled by a valve 8. The stack 9 is connected near its lower end with a transverse flue 10, which in turn connects by ports 11 with the interior of the chamber at or near its front charging end.

The heating-chamber A is preferably enlarged at or near its rear end, so as to form a combustion-chamber in which the highest heating effect will be obtained. This enlargement is produced by an outward flaring or inclination of the side walls and an upward inclination of the roof, as clearly shown in Figs. 1, 2, 5, and 6. The front portion of the heating-chamber is made of uniform transverse dimensions, which are so proportioned relative to the height and width of the boxes 12, carrying the articles to be annealed, that sufficient space will be left around the boxes for the free flow of the products of combustion to the stack. These boxes are held up from the bottom of the furnace by any suitable construction of longitudinal supports—such, for example, as those shown—consisting of rails 13, having grooves for the reception of antifriction-balls on which the boxes rest.

The rear section or cooling-chamber B, which is practically a continuation of the chamber A, is preferably contracted, as regards transverse dimensions, similar to the front or main portion of the chamber A, so that the portion 14 of the walls connecting

the rear end of chamber A and the front end of chamber B will form a partial transverse partition or baffle-wall to obstruct the flow of heat and products of combustion into chamber B. This chamber is made of sufficient length to insure the required reduction of temperature of the articles while traversing the chamber at the speed at which the articles are moved through chamber A. The reduction of temperature may be hastened by causing air to flow along passages 15 in the walls of the chamber. These passages connect near the rear end of the chamber B with a transverse passage 16, having an inlet controlled by the valve 17. These passages are continued at their front ends through the walls 14, so that air which has been heated in the passages 15 will be caused to mingle with the gases and products of combustion as they enter the rear or combustion end of chamber A.

As the quantity of air entering the chamber A through the passages 5 may be sufficient to effect the desired combustion, a series of slides 18 are arranged transverse of the passages 15, near their front ends, so that the passages may be closed by pushing said slides in, as shown in Fig. 10. In order to maintain a circulation of air through the passages 15 when the slides are pushed in, the passages are connected by ports 19 with a transverse flue 20, which in turn is connected by conduits 21 with the transverse flue 7, as shown in Figs. 9 to 12, inclusive. By this construction air which has been partially heated in the passages 15 is conducted to the front end of the furnace and then flows through passages 5, where it is further heated, and into the rear end of chamber A. In case the air flowing through the passages 15 is not sufficient to effect proper combustion the valve 8 can be raised, thereby admitting additional quantities of air into the flue 7 and passages 5.

In lieu of connecting the conduits 21 to the flue 7, as described, they may be connected to the transverse stack-flue 10, as shown in Figs. 13 to 16. The transverse flue 20 is provided with slide-valves 22, which are pushed in to close communication between the passages 15 and the conduits 21, when the slides 18 are pulled out to allow the air to flow directly from the passages 15 into the furnace. In lieu of extending the flues 7 and 16 across the bottom of the furnace independent flues 7^a and 16^a may be formed in the side walls of the furnace, as shown in Figs. 13, 14, and 16. These side flues are provided with inlet-ports 23 and 24, controlled by valves 25 and 26 for regulating the flow of air through the passages 5 and 15. This construction is in some cases desirable, as permitting a better control of the combustion and temperature in the furnace.

It will be readily understood by those skilled in the art that by my improved construction I am enabled to regulate the heat in the different parts of the furnace as circumstances may require. If the chamber A becomes too hot, it may be cooled by admitting more air through the passages 5 and 15 than is necessary for combustion. If it is desired to accelerate the cooling of the material, increased quantities of air are permitted or caused to flow through the passages 15. Ordinarily the draft of the stack will effect a sufficiently-rapid movement of air through the passages 5 and 15; but if such natural action is not sufficient air may be forced into said passages by any suitable means. It will be observed that when the slides 18 are open the air in the passages 15 will be directly affected by the draft of the stack, as will also be the case in the construction shown in Figs. 13 to 16 when the slides 18 are closed, as the by-pass 21 is connected directly to the stack-flue. In the construction shown in Figs. 9 to 12 the by-pass 21 is connected to the air-flue 7, so that the draft of the stack will operate indirectly through the passages 5 and chamber A in causing the air to flow through the passages 15 when slides 18 are closed.

I claim herein as my invention—

1. An annealing-furnace having in combination heating and cooling chambers arranged in line with each other, the heating-chamber being provided at or near its rear end with ports or openings for the admission of heating-gases, the walls of both chambers being provided with longitudinal passages extending from opposite ends of the chambers, the inlet-openings thereof being outside the furnace and the outlet-openings being arranged adjacent to the ports or openings for the admission of gases, substantially as set forth.

2. An annealing-furnace having in combination heating and cooling chambers arranged in line with each other, the heating-chamber being provided at or near its rear end with ports or openings for the admission of heating-gases, the side walls of the cooling-chamber being provided with passages provided with inlets outside the furnace and with outlets adjacent to the ports or openings for the admission of gases, substantially as set forth.

3. An annealing-furnace having in combination heating and cooling chambers arranged in line with each other, the heating-chamber being provided at or near its rear end with ports or openings for the admission of heating-gases, the side walls of the cooling-chamber being provided with passages having outlets arranged adjacent to the ports or openings for the admission of heating-gases, valves for closing such outlets and a by-pass from the passages to the stack, and a valve for closing such by-pass, substantially as set forth.

4. An annealing-furnace having in combination heating and cooling chambers arranged in line with each other, the heating-chamber being provided at or near its rear

end with ports or openings for the admission of heating-gases, the walls of the heating and cooling chambers being provided with passages having outlets arranged adjacent to the ports or openings for the admission of heating-gases, valves for closing the passages in the walls of the cooling-chamber, a by-pass connecting the passages in the walls of the cooling-chamber with the passages in the walls of the heating-chamber, and a valve for controlling the by-pass, substantially as set forth.

In testimony whereof I have hereunto set my hand.

ALEXANDER LAUGHLIN.

Witnesses:
DARWIN S. WOLCOTT,
F. E. GAITHER.