

Jan. 1, 1929.

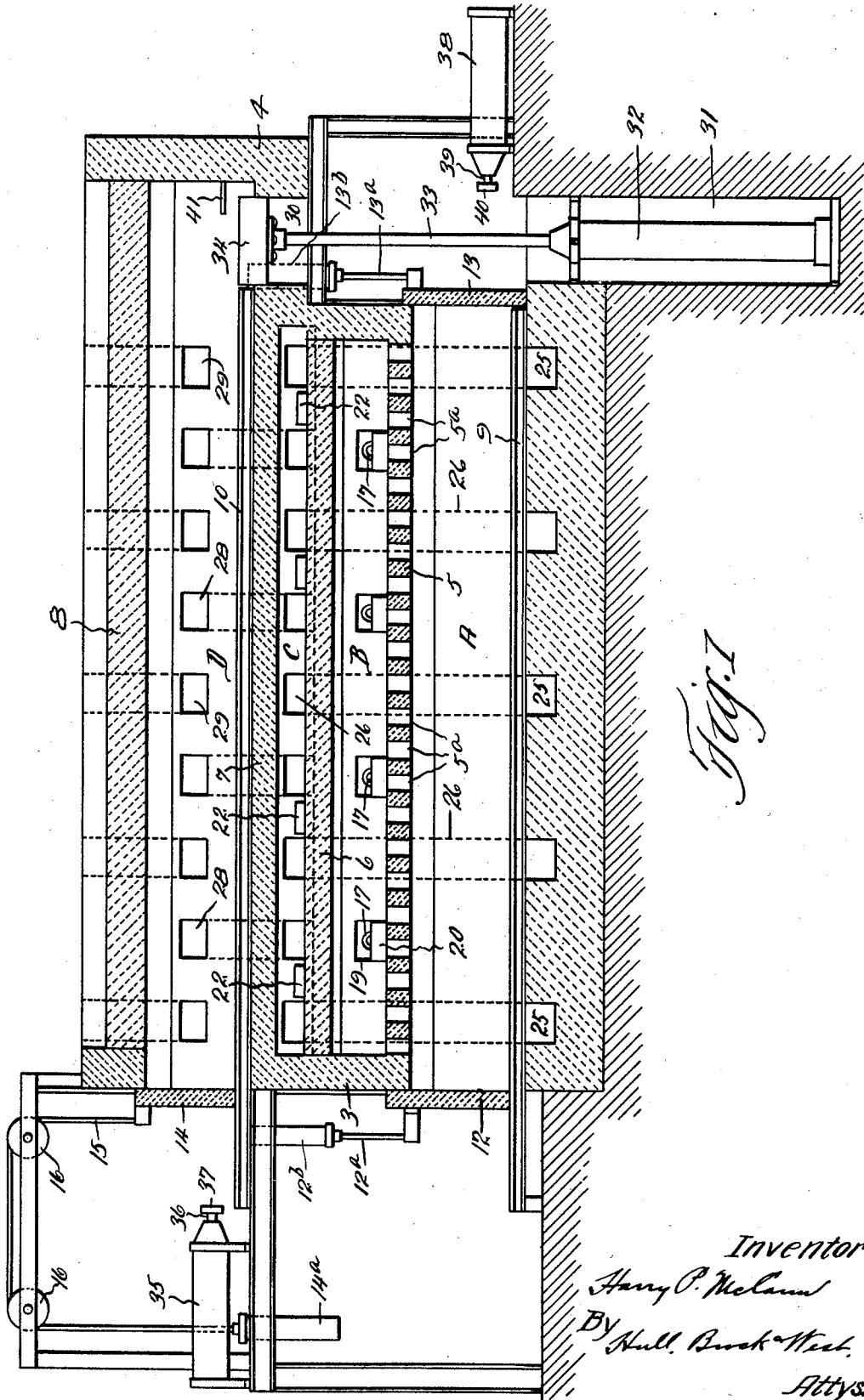
1,697,129

H. P. McCANN

HEAT TREATMENT FURNACE

Filed Feb. 21, 1925

4 Sheets-Sheet 1



Jan. 1, 1929.

1,697,129

H. P. McCANN

HEAT TREATMENT FURNACE

Filed Feb. 21, 1925

4 Sheets-Sheet 2

Fig. 1

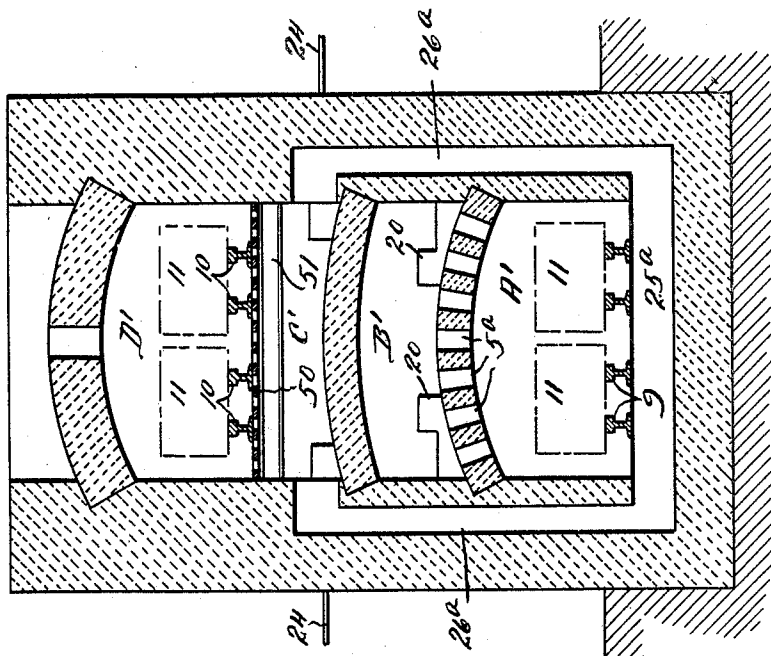
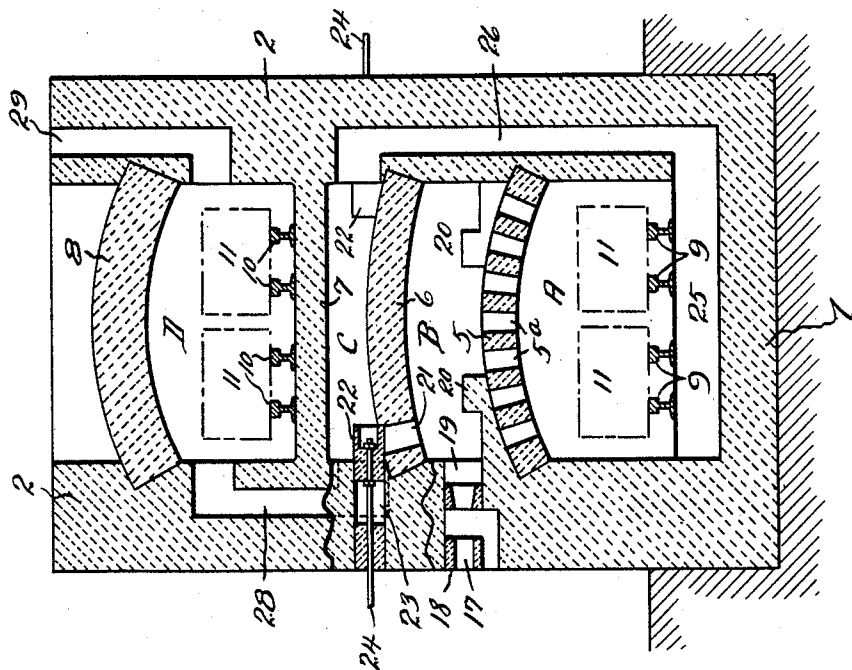


Fig. 2



Inventor
Harry P. McCann,
By *Hull Brock West*,
Attys.

Jan. 1, 1929.

1,697,129

H. P. McCANN

HEAT TREATMENT FURNACE

Filed Feb. 21, 1925

4 Sheets-Sheet 3

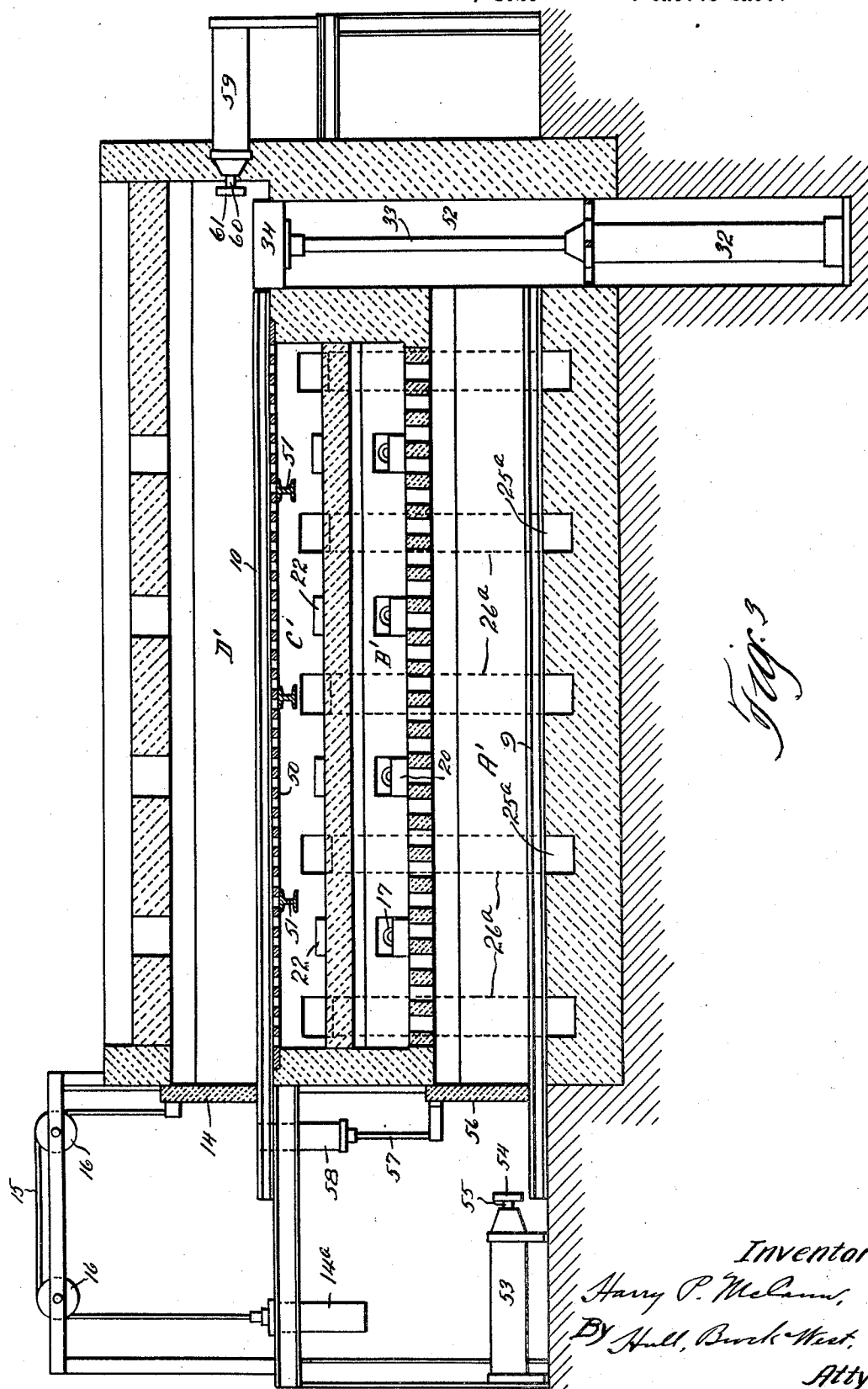


Fig. 3

Inventor
Harry P. McCann,
By Hull, Brock & West,
Attys.

Jan. 1, 1929.

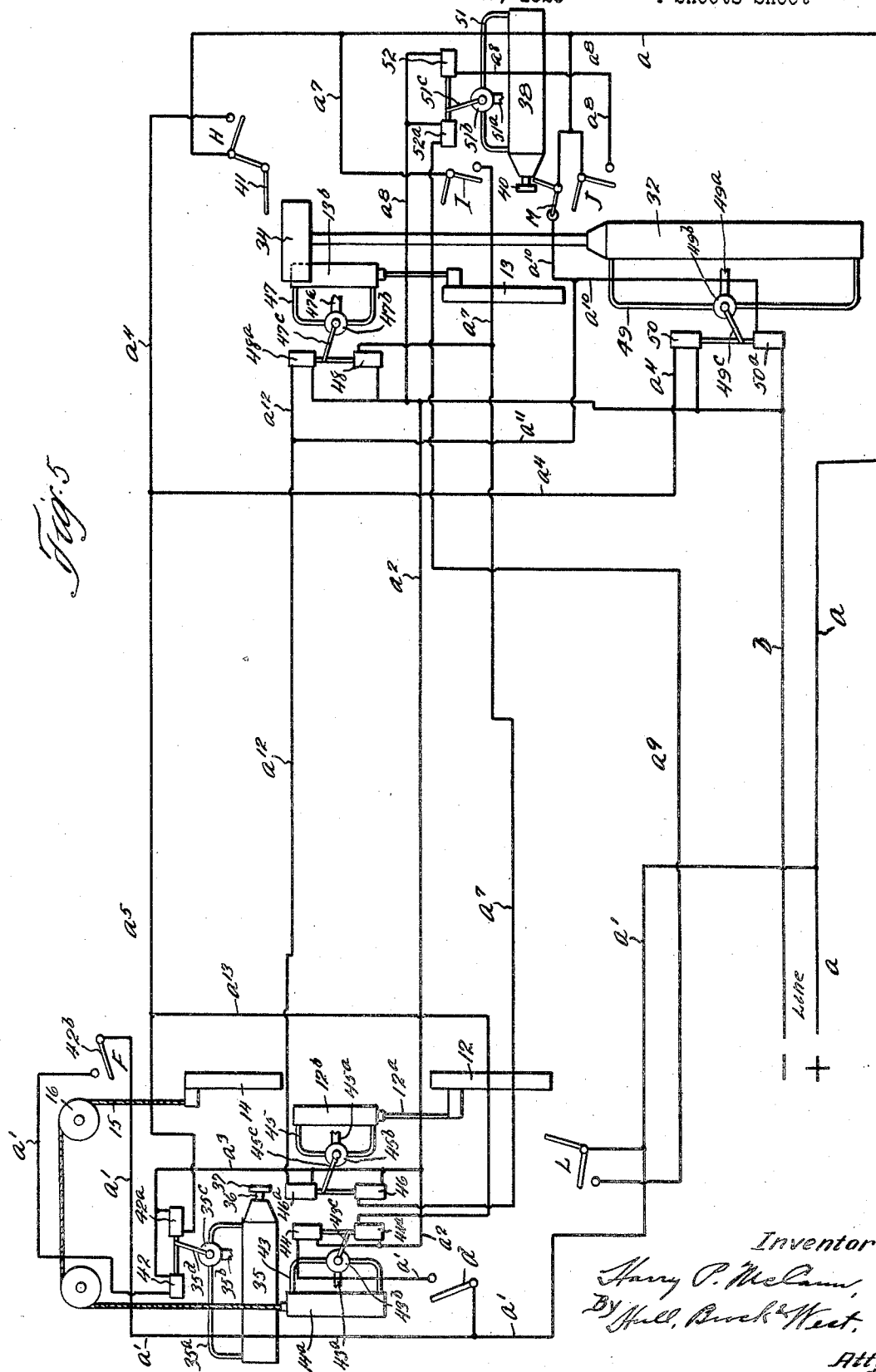
H. P. McCANN

1,697,129

HEAT TREATMENT FURNACE

Filed Feb. 21, 1925

4 Sheets-Sheet 4



Inventor
Harry P. McCann,
By Hull, Brock & West.
Attys.

UNITED STATES PATENT OFFICE.

HARRY P. McCANN, OF CLEVELAND, OHIO.

HEAT-TREATMENT FURNACE.

Application filed February 21, 1925. Serial No. 10,770.

This invention relates to a furnace or apparatus for the heat treatment of various articles for various purposes, such as annealing, tempering, baking, etc. It is the general purpose of the invention to provide an apparatus wherein the articles treated will be conveyed through a chamber of relatively high temperature and be mechanically and automatically transferred from such chamber to a chamber of lower temperature, spaced therefrom, and be conducted or conveyed through the latter chamber. A further object of the invention is to provide an apparatus or furnace, for the purpose set forth, which is compact and simple in construction, and economical in operation. Further and more limited objects will appear hereinafter and will be realized in and through the embodiments of the invention shown in the drawings forming part hereof, wherein Fig. 1 represents a central longitudinal sectional view through one form of furnace or apparatus embodying my invention; Fig. 2 a transverse sectional view through such furnace or apparatus; Fig. 3 a view, similar to Fig. 1, of a modified form of furnace or apparatus; Fig. 4 a transverse sectional view through the apparatus shown in Fig. 3; and Fig. 5 a diagram of the electric circuits and cooperating parts for feeding the material through the high and low temperature chambers shown in Figs. 1 and 2 and for automatically transferring the material from one of such chambers to the other.

Describing the parts by reference characters, and with special reference to Figs. 1, 2, 3 and 4, 1 denotes the foundation, 2 the side walls, 3 the front wall and 4 the rear wall of a furnace or apparatus embodying my invention, the said parts being of any suitable refractory material. The furnace is divided by a lower perforated arch 5, an intermediate arch 6, a floor 7 and a roof arch 8 into four horizontal vertically-spaced longitudinally extending chambers A, B, C and D. The floor of the chamber A supports tracks 9 and the floor 7 supports similar tracks 10, two tracks being shown in each of the chambers A and D and being designed for the support of the articles to be heat-treated, which articles may be conveniently contained within crates 11. The chamber A is provided with doors 12 and 13 at opposite ends thereof, each connected by a piston rod 12^a and 13^a, respectively, with a piston or plunger (not shown) within a cylinder, indicated at 12^b and 13^b respectively. The chamber D is provided with a front door 14 connected by a cable 15, extending over pulleys 16, with a plunger (not shown) in a cylinder 14^a.

The chamber B is a combustion chamber and is provided with burners, indicated generally at 17, the said burners being arranged within refractory sleeves 18 mounted in ports 19 in the opposite side walls 2, the burners in one wall being staggered with respect to those in the opposite wall. In front of each burner there is located a baffle 20, to facilitate the mixture and combustion of the fuel ingredients. The fuel employed may be gas, oil, or pulverized fuel. The arch 6 is provided, above each burner 17, with a port or flue 21 which can be opened and closed, as desired, by means of a damper 22 slidable in a suitable guide 23 in the appropriate wall, each damper having an operating rod 24. Ordinarily the products of combustion in the chamber B will heat the arch 6 but will be delivered into the chamber A through the ports or perforations 5^a provided in the arch 5. As these ports are uniformly distributed throughout the arch 5, the products of combustion will be delivered uniformly into and throughout the chamber A and will be delivered therefrom into the chamber C by means of transverse flues 25, provided in the foundation 1 beneath the tracks 9, and the vertical flues 26 located in the side walls 2, each flue 26 communicating with a flue 25 and the flues 26 in one side wall being staggered with respect to the flues in the other side wall, and each delivering at its upper end into one side of the chamber C. The chamber C and the floor 7 for the chamber D will thus be heated by radiation from the arch 6 as well as by the products of combustion delivered into the chamber C by the flues 26.

From the chamber C, the products of combustion are delivered by flues 28 in the walls 2 into the chamber D, the said flues 28 being staggered in the same manner as are the flues 26. The products in the chamber D, after having heated the articles therein, will be discharged therefrom through flues 29 located in the side walls 2 and being staggered with respect to each other. The arrangement is such that the inwardly extending end of each flue 26 has directly opposite thereto

the receiving end of a flue 28; while the delivery end of each flue 28 has opposite thereto the receiving end of a flue 29.

It will be evident that, by the construction and arrangement of the chambers A, B, C and D and of the ports and flues from the chambers B and C, including the dampers 22, products of combustion from the chamber B may all be delivered from said chamber into the chamber A; also that, by opening the dampers 22 more or less, the products of combustion from the chamber B may be distributed proportionally to the chamber A, and to the chamber D through the chamber C.

At the rear of the tracks 10 in the chamber D there is located a vertical shaft or passageway 30 beneath which is a well 31 in which a cylinder 32 is supported. Within the cylinder is a piston or plunger (not shown) having a piston or plunger rod 33 connected at its upper end to a platform 34, the upper surface of the platform being flush with the tracks 10 when the plunger and platform are elevated.

In front of the door 14 and preferably in line with the space between the tracks 10 is a cylinder 35 having a plunger (not shown) provided with a rod 36 and a transversely extending push plate 37.

Mounted at the rear of the door 13 and preferably in line with the space between the tracks 9 is a cylinder 38 having a plunger (not shown), the rod 39 of which is provided with a transverse push plate 40.

It will be noted that the tracks 9 and 10 project beyond the doors 12 and 14, providing platforms in front of the doors for the reception of crates. The push plate 40, when in retracted position, will accommodate the platform 34 between itself and the door 13.

Projecting through the rear wall 4 of the furnace, above the platform 34, is a rod 41 which is employed for the purpose of closing an electrical circuit, for a purpose to be explained in connection with the diagram shown in Fig. 6.

In the operation of the furnace shown in Figs. 1 and 2, the material to be treated will be placed in crates or boxes on the platform provided by the tracks 9 in front of the door 14 and the door will be opened and these crates or boxes will be pushed in. Assuming that the space between the door 14 and the front of the platform 34 is already occupied by crates or boxes which have been subjected to heat treatment, the pushing in of these boxes or crates by the plunger rod in the cylinder 35 will force the rearmost box or crate on each track 10 upon the platform 34. One of these boxes or crates will engage the rod 41 and will close such electric circuits as will cause the boxes or crates to be lowered by the platform to a position in front of the cylinder 38; will also cause the door 13 to be opened and a circuit, including a valve for

the cylinder 38, will be closed, causing the push plate 40 to shove the boxes or crates into the rear end of the chamber A. The door 12, meanwhile will have been automatically opened, and the entering boxes or crates will discharge the front boxes or crates on the tracks 9 upon the platform formed by the forward extensions thereof, after which the doors 12 and 13 will be closed and the platform 34 will be returned to its receiving position.

In Fig. 5, I have illustrated diagrammatically the means by which the automatic operations may be carried out. In this view, the cylinder 35 is shown as provided with a pipe 35^a communicating with opposite ends thereof and having a supply pipe 35^b and a valve 35^c for supplying air or other fluid under pressure to the pipe 35^a. This valve is provided with an operating arm 35^d which is interposed between a pair of solenoids 42 and 42^a.

The cylinder 14^a is also provided with pipes 43 and 43^a, similar to the pipes 35^a and 35^b respectively; also with a valve 43^b and a valve operating arm 43^c similar to the valve 35^c and the arm 35^d. The arm 43 projects between a pair of solenoids 44 and 44^a.

The cylinder 12^b is provided with the pipes 45, 45^a and the valve 45^b and the valve operating arm 45^c, the parts being similar to the parts 43—43^c and the arm projecting between a pair of solenoids 46, 46^a. The cylinder 13^b is provided with the pipes 47 and 47^a and the valve 47^b and operating arm 47^c, arranged in the same manner as the corresponding parts 45—45^c. The arm projects between a pair of solenoids 48, 48^a. In the same manner, the cylinder 32 is provided with pipes 49, 49^a and with a valve 49^b and the valve operating arm 49^c projecting between the solenoids 50 and 50^a; also the cylinder 38 is provided with the pipes 51, 51^a, with the valve 51^b and the valve operating arm 51^c, said arm extending between the solenoids 52 and 52^a.

With the parts constructed and arranged as described and assuming that the tracks on the chambers A and D are filled with boxes or crates, the door 14 will be opened, preferably by manually closing the switch *d*, which will enable current to be supplied from line *a*, conductor *a'* and switch *d* to the solenoid 44, thereby throwing the arm 43^c of the valve 43^b in the appropriate direction to cause the pressure fluid supplied through the pipe 43^a to be delivered to the upper end of the cylinder 14^a, by the pipe 43, which pushes the plunger downwardly, opening the door 14. The current flows from the solenoid 44 through *a'* back to the line wire *b*. As the door 14 rises, it closes the switch *F*, thereby allowing current from *a*, *a'* to flow to and energize the solenoid 42 thereby throwing the arm 35^d of the valve 35^c in the appropriate direction to cause the pressure fluid supplied through pipe

35^a and pipe 35^b to be delivered to the front end of the cylinder 35, back of the plunger therein, forcing the push plate 37 toward the open end of the chamber D, thereby forcing into said chamber boxes or crates on the platform in front thereof. The feeding of the boxes or crates by the push plate 37 results in forcing the rearmost box or crate on each track 9 upon the platform 34. One of these boxes strikes the arm 41, closing the switch H, which permits current from *a* to flow through *a*⁴ to the solenoid 50, thereby throwing the arms 49^c of the valve 49^b in the appropriate direction to allow pressure fluid supplied through the pipe 49^a to be distributed by the pipe 49 to the upper end of the cylinder 32, which results in lowering the platform 34 to a position with its upper surface in line with the tops of the tracks 9. The current from 50 returns to *b* through conductor *a*². The switch H also permits current to flow through *a*⁴ and *a*⁵ to the solenoid 42^a, reversing the valve 35^c and returning the push plate 37 to its initial position. The current from the solenoid 42^a flows through *a*³ and *a*² to the line *b*.

As the platform G descends, it strikes the projecting lever arm of switch I, closing the latter and supplying current through *a* and *a*⁷ to the solenoid 48 which throws the operating arm 47^c of the valve 47^b in proper direction to supply pressure fluid through pipe 47^a and pipe 47 to the lower end of the cylinder 13^b, thereby to open the door 13. As the platform G descends still further, it closes the switch J, supplying current through *a* and *a*⁸ to the solenoid 52, which throws the operating arm 51^c of the valve 51^b in the appropriate direction to supply pressure fluid from the pipe 51^a and pipe 51 to the rear end of the cylinder 38, thus operating the push plate 40 to transfer the boxes or crates from the platform 34 to the tracks 9. The current flows from 52, through *a*⁸ and *a*² to the line *b*. When the switch I is operated, current also flows through *a*⁷ to the solenoid 46, energizing the latter and throwing the operating arm 45^c for the valve 45^b in the appropriate direction to supply pressure fluid from the pipe 45^a and pipe 45 to the lower end of the cylinder 12^b, thereby to open the door 12. The current flowing through 46^a will return through *a*⁸ and *a*² to *b*.

When the boxes or crates are delivered onto the platform at the front ends of the tracks 9, they strike an arm on the switch L, closing the latter and supplying current through *a*, *a*⁷ and *a*⁹ to the solenoid 52^a, thus reversing the valve 51^b and withdrawing the push plate 40. As the push plate 40 returns, it strikes an arm of a switch M which temporarily closes a circuit through *a*, *a*⁸ and *a*¹⁰ to the solenoid 50^a which reverses the valve 49^b and elevates the platform 34. While the switch M is closed, current also flows through *a*, *a*⁸, *a*¹⁰, *a*¹¹, and *a*¹² to the solenoid 48^a, reversing the valve 47^b and supplying liquid to the top of the cylinder 13^b thereby to close the door 13. Current also flows through *a*¹² to the solenoid 46^a reversing the valve 45^b, thereby closing the door 12. Also, when the switch H is closed, current flows through *a*, *a*⁴ and *a*⁵ to the solenoid 42^a, thereby reversing the valve 35^c and moving the plunger and the push plate 37 away from the front of the chamber D. Current from 42^a returns to *b* through *a*³ and *a*². Closing the switch H also causes current to flow through *a*, *a*⁴, *a*⁵ and *a*¹³ to the solenoid 44^a, reversing the valve 43^b and closing the door 14, current returning to *b* through *a*². The switches F and D are of any of the well known types wherein the circuit in which they are included is closed momentarily, with a momentary energizing of the solenoids 42 and 44, followed by the de-energization thereof until the next operation of the switches.

Summarizing and assuming that both chambers A and D are filled with boxes or crates, the closing of the switch *d* will effect the following operations:—The door 14 will be opened, closing the switch F, which causes boxes or crates on the platform in front of the chamber D to be fed or forced into said chamber by the cross-bar or plate 37, displacing the rearmost boxes from said chamber upon the plunger 34. These boxes, closing the switch H, cause the door 14 to be closed, the push plate 37 to be withdrawn, and the plunger 34 to descend. As the plunger descends, it closes the switch I opening the doors 12 and 13. The final movement of the platform 34 closes the switch J, thereby operating the push plate 40 to force or feed the crates from the platform 34 into the chamber A. This forces boxes or crates from said chamber upon the platform at the front ends of the rails 9, closing the switch L, thereby retracting the push plate 40 which throws the switch M, closing the doors 12 and 13 and elevating the platform 34. This completes the cycle of automatic operations.

Reference has been made to the ports 21. These are used when it is desired to heat the chamber D quickly or to an unusual extent. By opening the dampers 22, products of combustion from the chamber B will flow directly into the chamber C and thence through the passages 28 into the chamber D. Ordinarily, however, the chamber A will be the chamber of higher temperature with the chamber D the chamber of lower temperature.

In Figs. 3 and 4 there is shown a modification of the invention wherein the chambers A', B', C' and D' are arranged in the same order as the like-designated parts in Figs. 1 and 2. In this form of my invention, however, the order of travel through the uppermost and the lowermost chamber is reversed; the articles in this case are conducted first

through the lowermost chamber and thence through the uppermost chamber. However, the lowermost chamber is the chamber of higher temperature while the uppermost chamber is the chamber of lower temperature. The chamber B' is constructed in the same manner as the chamber B in the preceding views, and the burner mountings are designated by the same reference characters.

As in the case with the preceding form of my invention, products of combustion from the chamber B' are delivered through the apertures 5^a in the arch 5 into the chamber A' and thence through bottom transverse flues 25^a and vertical side flues 26^a into the chamber C'. In this latter form of my invention, the flues 26^a are not staggered, but are located directly opposite each other, and each pair of such opposed flues communicates with a common transverse flue 25^a. No imperforate floor is provided between the chambers C' and D'. Instead of such floor, I employ a light, freely-perforated floor 50 supported by transverse I-beams 51, the floor and beams in turn supporting the tracks 10.

The tracks 9 and 10 project beyond the front of the receiving platforms. The upper chamber D' is closed by a door 14 operated from a cylinder 14^a in the same manner as shown and described in connection with the earlier described form of my invention.

At the rear of the chambers A', B', C' and D' is located a well 52, which is within the furnace enclosure; and the platform 34, rod 33, and cylinder 32 are located in such well.

In front of the platform formed by the front ends of the tracks 9 is a fluid pressure cylinder 53 having the cross plate 54 carried by the rod 55 and arranged in position to push into the chamber A' boxes or crates that may be placed upon said tracks. The front of the chamber A' is closed by a door 56 which can be raised by means of a plunger or piston rod 57 mounted in a cylinder 58.

At the rear of the chamber D' is located a cylinder 59 having the plunger rod 60 projecting therefrom, said rod being provided with a cross plate 61 adapted to push from the platform 34 boxes or crates delivered thereupon (when the platform is in its lowered position) by the forcing of other boxes or crates by the cross plate 54 into the chamber A'.

It will be understood that the doors 14 and 56, the feeding cylinders 53, 59, and the platform 34 will be operated automatically in substantially the same manner as described in connection with the preceding views so that, when the door 56 is open, crates on the front of the tracks 9 will be pushed into the chamber A', the platform 34 having been lowered into the receiving position and that, as the crates or boxes are delivered onto said platform, the door 56 will be closed, the platform elevated, the plunger rod 55 and its

cross plate retracted, the door 14 opened, and the cross plate 61 operated to push the boxes or crates upon the rails 10, after which the door 14 will be closed and the plate 61 restored to initial position.

It will be noted that the platform and its operating mechanism are located within the furnace proper, whereby there will be no loss of heat involved in the operation of transferring the articles from the lowermost to the uppermost chamber.

Having thus described my invention, what I claim is:

1. A heat-treatment furnace comprising a combustion chamber, a chamber above the combustion chamber, a heat-treatment chamber arranged above the second chamber and a heat-treatment chamber arranged below the combustion chamber, means for delivering the products of combustion from the combustion chamber into the heat-treatment chamber therebeneath, means for conducting products of combustion from the bottom of the last mentioned chamber into the chamber above the combustion chamber, means for circulating products of combustion from the last mentioned chamber into and through the uppermost chamber, means for conducting articles through one of the heat-treatment chambers, and means for transferring articles from such heat-treatment chamber to the other heat-treatment chamber.

2. A heat-treatment furnace comprising a combustion chamber, a heat-treatment chamber above the combustion chamber, a heat-treatment chamber arranged below the combustion chamber, means for delivering the products of combustion from the combustion chamber into the heat-treatment chamber therebeneath, means for conducting products of combustion from the last-mentioned chamber into the heat-treatment chamber above the combustion chamber, and means for transferring articles from one of the heat-treatment chambers to the other.

3. A heat-treatment furnace comprising a combustion chamber, a chamber above the combustion chamber, a heat-treatment chamber arranged above the second chamber and a heat-treatment chamber arranged below the combustion chamber, means for delivering products of combustion from the combustion chamber into the heat-treatment chamber therebeneath, means for conducting products of combustion from the last mentioned chamber into the chamber above the combustion chamber, means for circulating products of combustion from the last mentioned chamber into and through the uppermost chamber, means for feeding articles to be treated through one of such heat-treatment chambers, power-actuated means for conducting the articles delivered from such heat-treatment chamber to and delivering it into the other heat-treatment chamber, and

power actuated means for conducting material through both heat-treatment chambers.

4. A heat-treatment furnace comprising a combustion chamber, a chamber above the combustion chamber, a heat-treatment chamber arranged above the second chamber and a heat-treatment chamber arranged below the combustion chamber, ports leading from the combustion chamber to the heat treatment chamber therebeneath, ports leading from the combustion chamber to the second chamber, means for opening and closing the second mentioned ports whereby products of combustion may be delivered from the combustion chamber into the heat treatment chamber therebeneath, or into both the heat treatment chamber therebeneath and the second chamber, means for conducting products of combustion from the second heat-treatment chamber into the chamber above the combustion chamber, means for circulating products of combustion from the last-mentioned chamber into and through the uppermost chamber, and means for feeding material to be treated successively through such heat-treatment chambers.

5. A heat-treatment furnace or apparatus comprising in combination a high-temperature heat-treatment chamber, a low-temperature heat-treatment chamber vertically spaced from the first-mentioned chamber, a combustion chamber interposed between the first two chambers, means for delivering products of combustion from the combustion chamber into the high temperature heat-treatment chamber and from the latter chamber into the low-temperature heat-treatment chamber, means for conveying articles to be heated through one of such heat-treatment chambers, and means operating automatically to transfer the articles conducted through the last-mentioned chamber to the other heat-treatment chamber.

6. A heat-treatment furnace or apparatus comprising in combination a high-temperature heat-treatment chamber, a low-temperature heat-treatment chamber vertically spaced from the first mentioned chamber, a combustion chamber, means for delivering products of combustion from the combustion chamber into the high temperature heat-treatment chamber and from the latter chamber into the low-temperature heat-treatment chamber, means for conveying articles to be heated through one of such heating chambers, and means operating automatically to transfer the articles conducted through said chamber to the other heating chamber.

7. A heat-treatment furnace or apparatus comprising in combination a high-temperature heat-treatment chamber and a low-temperature heat-treatment chamber vertically spaced from the first mentioned chamber, a combustion chamber, means for delivering products of combustion from the combustion

chamber into the high temperature heat-treatment chamber and from the latter chamber into the low-temperature heat-treatment chamber, means for conveying articles to be heated through one of such heat-treatment chambers, and means operative by the delivery of material from one of the heat-treatment chambers for automatically transferring such material into the other heat-treatment chamber.

8. A heat-treatment furnace or apparatus comprising in combination a combustion chamber, a chamber above such combustion chamber, a heat-treatment chamber above the second chamber and a heat-treatment chamber below the combustion chamber, means for delivering products of combustion from the combustion chamber into the second heat-treatment chamber, the last mentioned chamber being provided with transverse flues in the floor thereof communicating at their ends with vertical flues in the sides of the furnace, the said vertical flues discharging at their upper ends into the chamber above the combustion chamber, flues for delivering products of combustion from the second chamber into the upper heat-treatment chamber, and means for delivering products of combustion from the combustion chamber directly into the chamber thereabove.

9. A heat-treatment furnace or apparatus comprising in combination a combustion chamber, a chamber above such combustion chamber, a heat-treatment chamber above the second chamber and a heat-treatment chamber below the combustion chamber, means for delivering products of combustion from the combustion chamber into the second heat-treatment chamber, means for delivering products of combustion from the last-mentioned chamber into the chamber above the combustion chamber, means for delivering products of combustion from the second chamber into the upper heat-treatment chamber, and means for delivering products of combustion from the combustion chamber directly into such second chamber thereabove.

10. An apparatus or furnace for the heat-treatment of articles comprising in combination a combustion chamber, a chamber above the combustion chamber, a heat-treatment chamber above the second chamber, and a heat-treatment chamber beneath the combustion chamber, means for burning a combustible mixture within the combustion chamber, means for delivering the products of combustion from the combustion chamber into either the heat-treatment chamber therebeneath or the chamber thereabove, means for delivering products of combustion from the last mentioned heat-treatment chamber into the second chamber, and means for delivering such products of combustion from the second chamber into the upper heat-treatment chamber.

11. A heat-treatment furnace or apparatus comprising in combination a high-temperature heat-treatment chamber and a low-temperature heat-treatment chamber vertically spaced from the first-mentioned chamber and means for heating said chambers, a door closing the receiving end of one of said chambers, doors closing the receiving and the delivery ends of the other chamber, means for opening the first mentioned door, means operative by the opening of said door for automatically feeding into the receiving end of the corresponding chamber articles to be treated therein, a vertically reciprocable platform at the delivery end of the last-mentioned chamber, means operative through the articles delivered upon said platform for closing the first-mentioned door and for moving the platform to the receiving end of the other chamber, means operative by the movement of said platform for opening the doors of such other chamber and for delivering articles from said platform into such chamber, and means operative by the delivery of articles from the last mentioned chamber for closing the last mentioned doors.

12. A heat-treatment furnace or apparatus comprising in combination a high-temperature heat-treatment chamber and a low-temperature heat-treatment chamber vertically spaced from the first mentioned chamber and means for heating said chambers, a door closing the receiving end of one of said chambers, doors closing the receiving and the delivering ends of the other chamber, means for opening the first mentioned door, means operative by the opening of said door for automatically feeding into the receiving end of the corresponding chamber containers having the articles to be treated therein, a vertically reciprocable platform at the delivery end of the last-mentioned chamber, means operative by the containers delivered upon said platform for closing the first-mentioned door and for moving the platform to the receiving end of the other chamber, means operative by the movement of said platform for opening the doors of the other chamber and for delivering containers from said platform into such chamber, and means operative by the delivery of said containers from the last mentioned chamber for closing the last mentioned doors and for returning the said platform to its initial receiving position.

13. A heat-treatment furnace or apparatus comprising in combination a high-temperature heat-treatment chamber and a low-temperature heat-treatment chamber vertically spaced from the first mentioned chamber and means for heating said chambers, means for feeding articles in containers progressively through one of said chambers, movable means controlled by the delivery of such containers from the last-mentioned chamber for auto-

atically transferring said containers to the other chamber, and means controlled by the movement of such transferring means for forcing or feeding said containers so delivered progressively through such other chamber.

14. A heat-treatment furnace or apparatus comprising in combination a high-temperature heat-treatment chamber and a low-temperature heat-treatment chamber vertically spaced from the first-mentioned chamber and means for heating said chambers, means for feeding articles progressively through one of said chambers, means controlled by the delivery of such articles from the last-mentioned chamber for automatically transferring the articles so delivered to the other chamber, and means for forcing or feeding the articles so delivered progressively through the other chamber.

15. A heat-treatment furnace or apparatus comprising in combination a high-temperature heat-treatment chamber, a low-temperature heat-treatment chamber vertically spaced from the first mentioned chamber and means for heating said chambers, means for feeding progressively through one of said chambers containers having therein the articles to be treated, a reciprocable platform adapted to receive containers from the last-mentioned chamber, means operative by the delivery of said containers upon said platform for moving the platform in operative relation to the other chamber, means operative by such movement of the platform for automatically delivering the containers therefrom into the last mentioned chamber, and means operative by the delivery of the containers from the last-mentioned chamber for moving the platform into operative relation to the first chamber.

16. A heat-treatment furnace or apparatus comprising in combination a high-temperature heat-treatment chamber, a low-temperature heat-treatment chamber vertically spaced from the first-mentioned chamber and means for heating said chambers, reciprocable means for feeding containers having therein articles to be heated successively into one of said chambers, a reciprocable support or platform at the opposite end of the last-mentioned chamber, means for moving the support or platform in operative relation to the other chamber, reciprocable means for forcing the containers upon such support or platform into such other chamber, and means for returning the support or platform to article-receiving position with reference to the first of the two chambers with which it cooperates.

17. A heat-treatment furnace or apparatus comprising in combination a high-temperature heat-treatment chamber, a low-temperature heat-treatment chamber vertically spaced

from the first-mentioned chamber and means for heating the said chambers, means for feeding articles to be heated progressively through one of said chambers, a reciprocable support or platform at the opposite end of the last-mentioned chamber, means for moving the support or platform to deliver the articles thereon in operative relation to the other chamber, and means for forcing or feeding the articles from such support or platform into and through the other chamber.

18. A heat-treatment furnace or apparatus comprising in combination a high-temperature heat-treatment chamber, a low-temperature heat-treatment chamber vertically spaced from the first-mentioned chamber and means for heating said chambers, a door at the receiving end of one of said chambers and a reciprocable platform at the delivery end of said chamber, a reciprocable device arranged in front of said door and adapted to feed containers for articles to be treated into said chambers, means for opening the said door, means operative by the opening of said door for operating the said reciprocable device to force or feed one or more of said containers into such chamber, means operative by the feeding of the containers through said chamber for moving the said platform from receiving position at the delivery end of the last-mentioned chamber to delivering position at the receiving end of the other chamber, a reciprocable device arranged to force or feed containers from the platform into the second chamber, and means controlled by the movement of the containers through the second chamber for auto-

matically restoring the platform to its initial receiving position.

19. A heat-treatment furnace or apparatus comprising in combination a high-temperature heat-treatment chamber, a low-temperature heat-treatment chamber vertically spaced from the first-mentioned chamber and means for heating said chambers, a reciprocable charging device arranged at the receiving end of one of said chambers and a door for such end of said chamber, doors for the other chamber and a reciprocable platform in operative relation to the delivery end of the first-mentioned chamber, means operative by the opening of the first-mentioned door for operating the said device thereby to force containers having therein articles to be treated into the corresponding chamber, means operative by the delivery of the said containers upon the platform for automatically moving the latter to delivering position with reference to the other chamber, means operative by such movement of the platform for opening the doors of the second chamber, a reciprocable device in operative relation to the second chamber, means operative by the movement of the platform for operating such device to transfer the container or containers from the platform into the second chamber, and means operative through the movement of the containers through the second chamber for closing the doors of said chamber and for moving the said platform to receiving position with reference to the first chamber.

In testimony whereof, I hereunto affix my signature.

HARRY P. McCANN.