Oct. 11, 1932. W. J. ASSEL 1,882,470

FURNACE

Filed Feb. 2, 1931 4 Sheets-Sheet 1

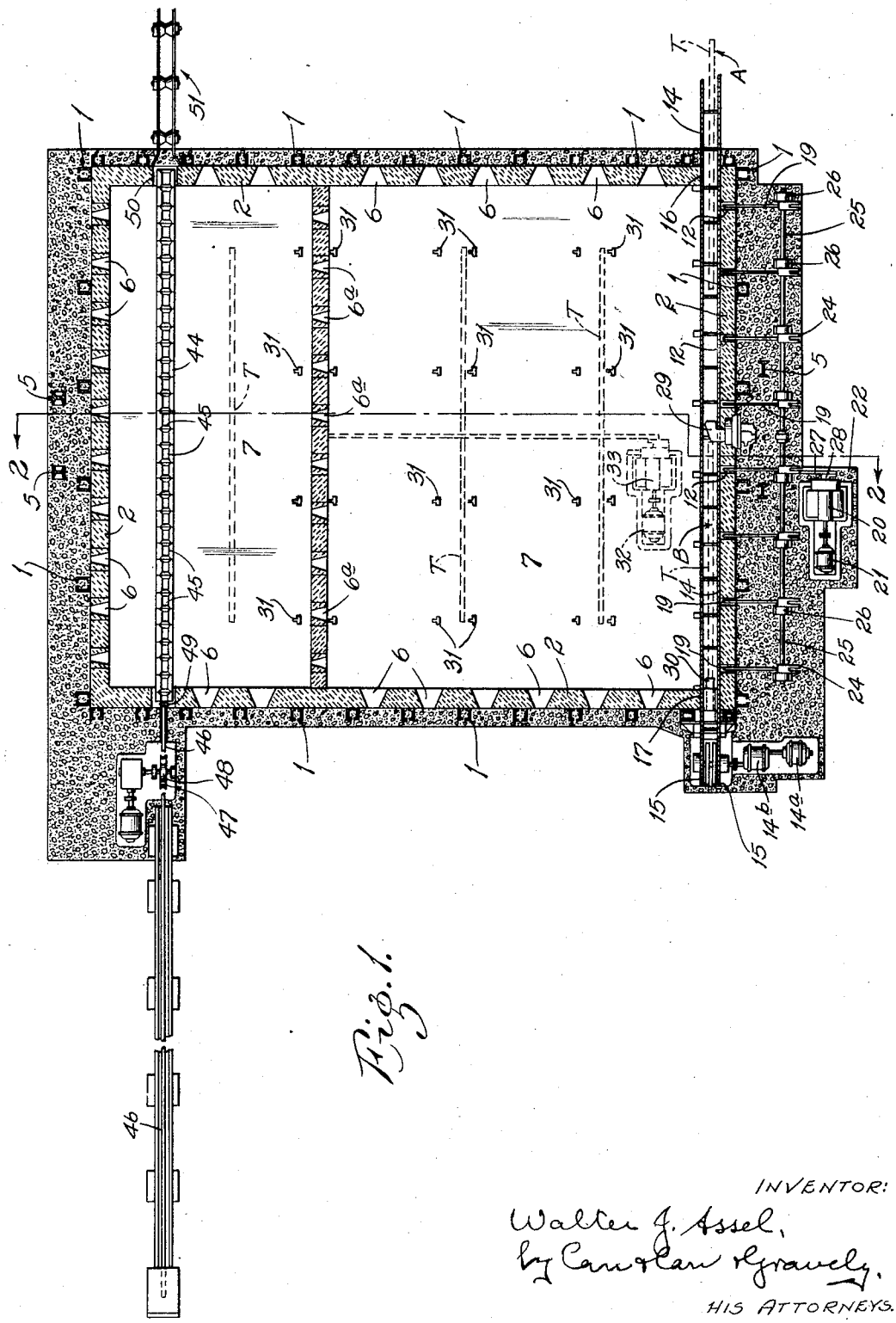


Fig. 1.

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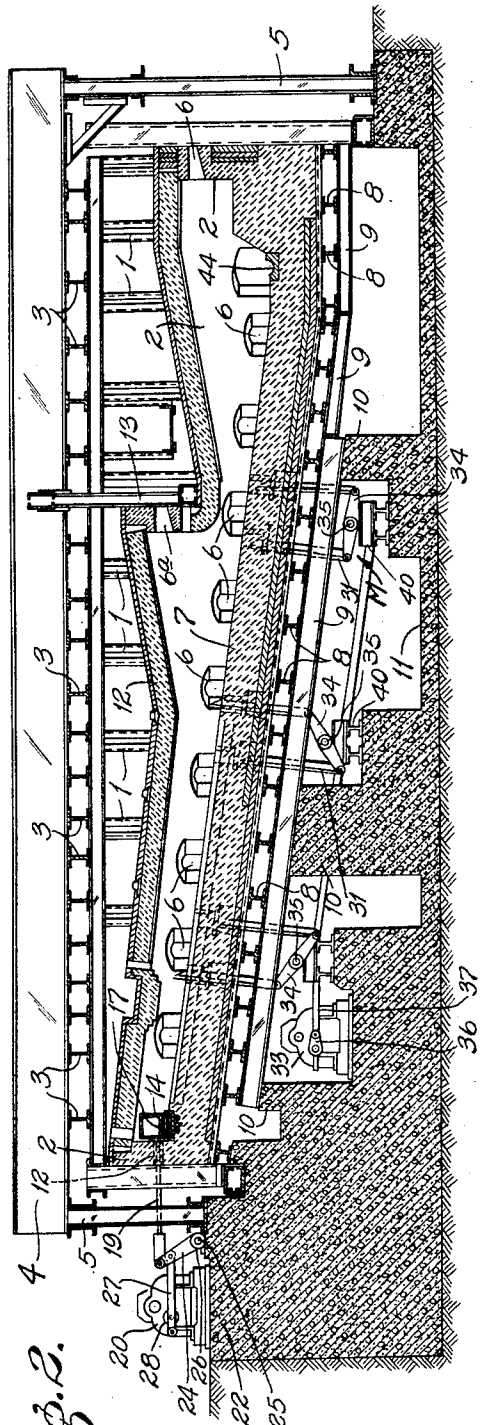


Fig. 2.

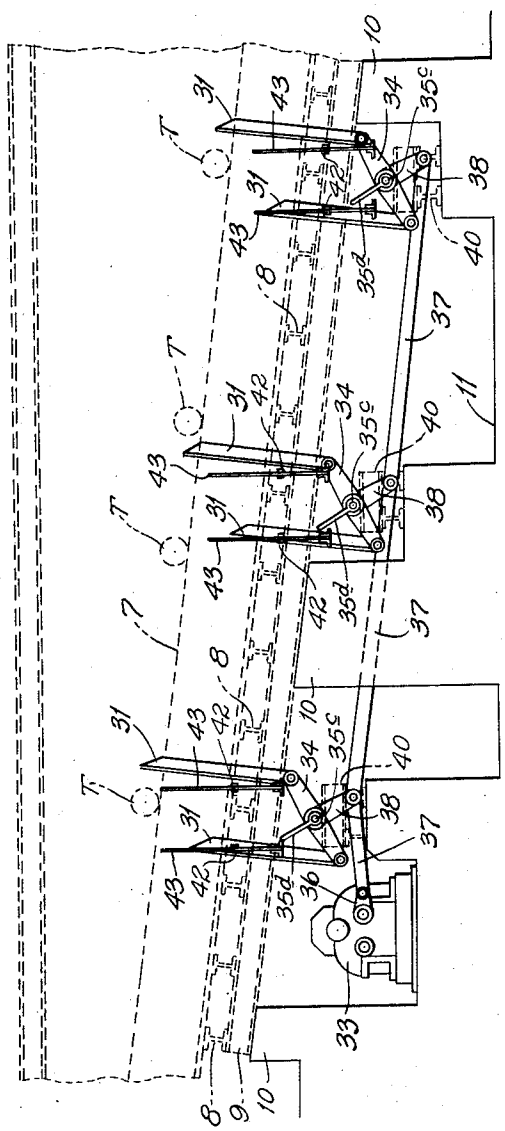


Fig. 4.

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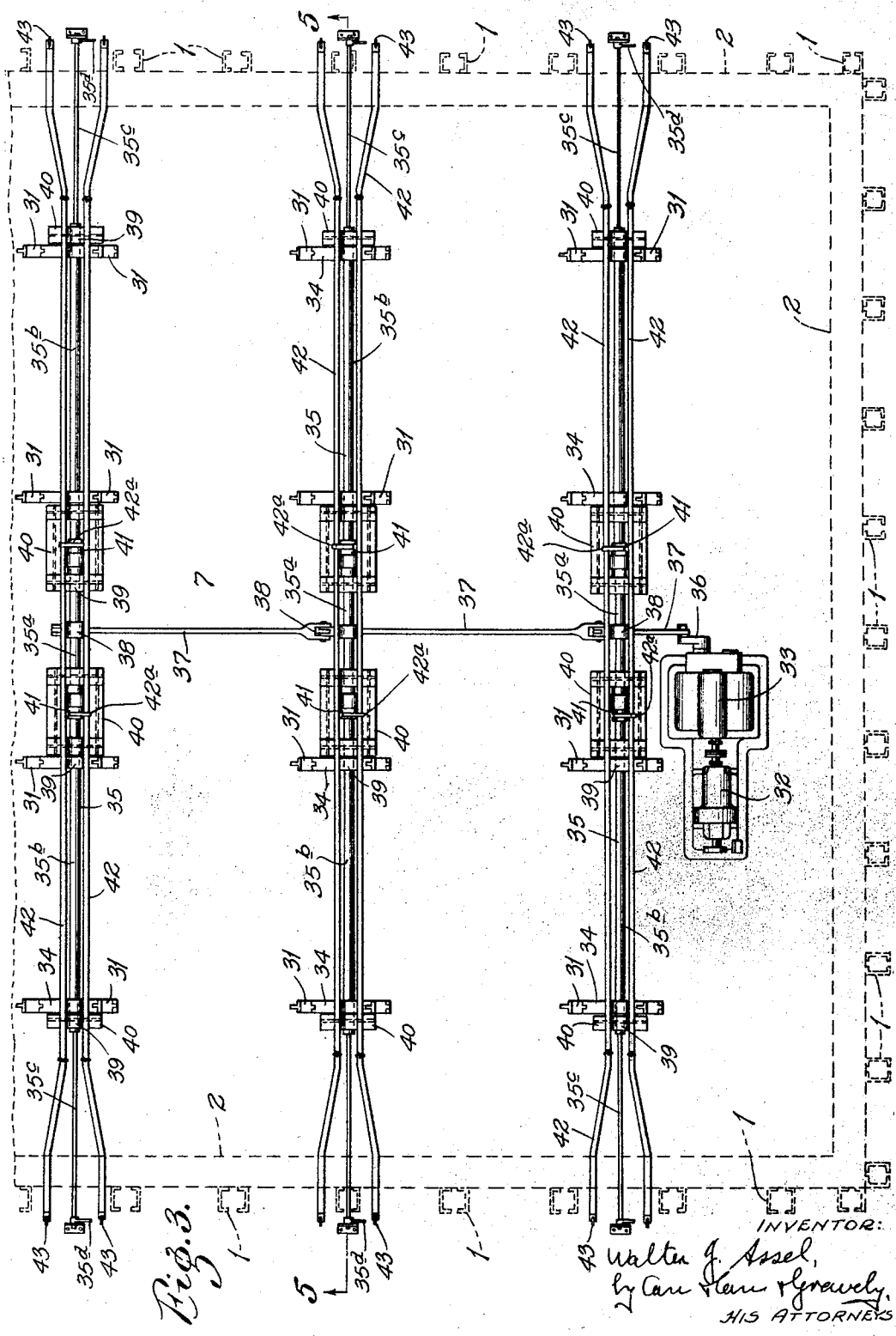


Fig. 3.

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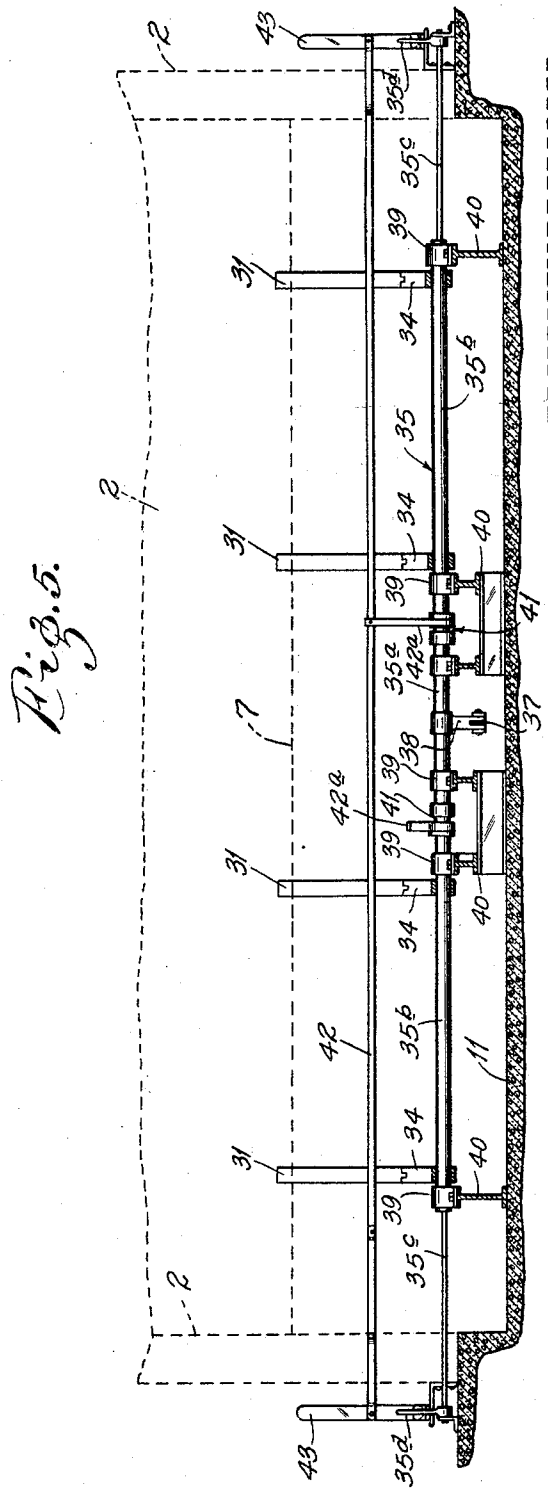


Fig. 5.

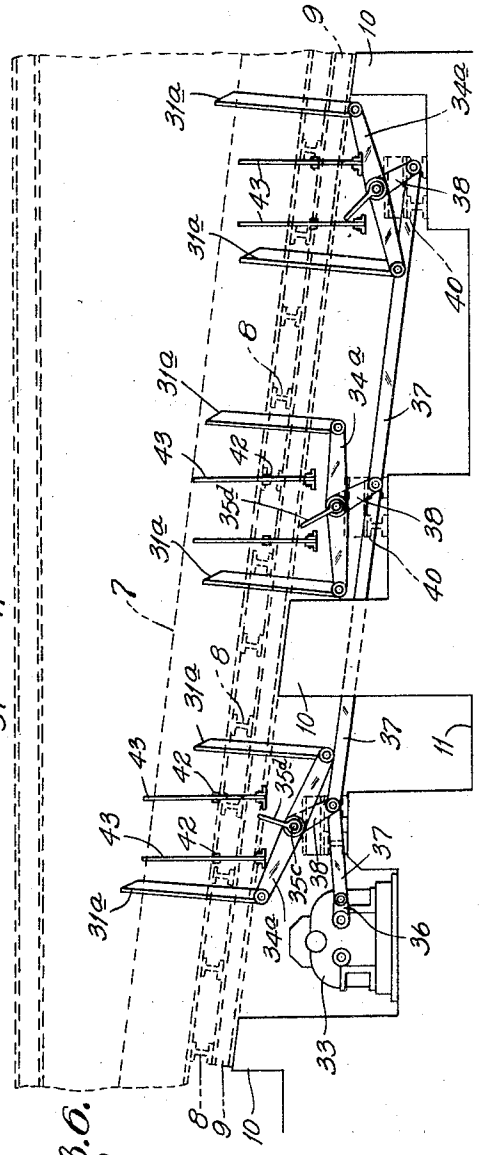


Fig. 6.

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Patented Oct. 11, 1932 1,882,470

UNITED STATES PATENT OFFICE

WALTER J. ASSEL, OF CANTON, OHIO, ASSIGNOR TO THE TIMKEN ROLLER BEARING COMPANY, OF CANTON, OHIO, A CORPORATION OF OHIO

FURNACE

Application filed February 2, 1931. Serial No. 513,007.

My invention relates to furnaces, particularly to furnaces for heating tubes and the like wherein mechanical means are used for continuously delivering tubes or like articles to said furnaces, for controlling the movement therein, and for removing the same therefrom. Up to the present time, there has been a distinct need in the tube and pipe industry for a comparatively inexpensive continuous large capacity normalizing furnace wherein the movement of tubes and the like through the furnace can be readily controlled to suit various lengths and sizes of articles, and the principal object of this invention is to devise such a furnace.

My invention consists principally in providing a furnace with a hearth which slopes from the forward end to the rear end of said furnace whereby articles will advance along said hearth by rolling thereon, and means for blocking and releasing articles rolling down said hearth controlled by means actuated outside the walls of said furnace. My invention also consists in the furnace and in the parts, combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawings, which form part of this specification and wherein like reference symbols refer to like parts wherever they occur,

Fig. 1 is a horizontal sectional view looking down on the inclined hearth and showing the general layout of a furnace embodying my invention,

Fig. 2 is a vertical longitudinal sectional view on a larger scale of the furnace shown in Fig. 1 taken along the line 2—2 of Fig. 1, and showing also the roof structure of the furnace.

Fig. 3 is a plan view of the blocking mechanism and controlling means for controlling the movement of articles rolling down the hearth.

Fig. 4 is a side view of said blocking mechanism,

Fig. 5 is a sectional view along the line 5—5 of Fig. 3, and

Fig. 6 is a view similar to Fig. 4 showing a modified form of blocking mechanism.

In the construction illustrated, the furnace proper which is preferably rectangular in shape, is mounted and enclosed in a suitable framework comprising spaced vertical columns 1 surrounding the walls 2 of the furnace, and transverse I-beam members 3, constituting the roof of the structure, mounted on the side columns 2. The tranverse I-beams 3 are also secured at their centers to a large longitudinal I-beam 4 extending above the middle of the furnace and supported at its ends on suitable columns 5 in the front and rear of the furnace extending from suitable foundations.

The furnace proper comprises the walls 2 constructed inside the vertical column members 1 and burner openings 6 are provided in said walls 2 on both sides and at the rear of the furnace, said burner openings 6 being suitably constructed for the combustion of natural gas or the like and preferably the burners (which together with the feed pipes are not shown) are controlled by means of usual automatic temperature controls. The hearth 7 of said furnace slopes downwardly from the front of the furnace to the rear thereof and is made of suitable fire brick or the like supported on sloping transverse I-beam members 8 which are mounted on longitudinal members 9 which are suitably supported on foundation blocks 10 projecting from the floor or foundation 11 of the furnace. The hearth roof 12, which is constructed of material similar to the bed of the hearth, is supported by vertical members 13 hung from the transverse I-beam members 3 of the supporting framework, and said roof 12 extends substantially parallel with the bed of the hearth from the front end to about the middle of the furnace from whence it is disposed slightly upwards and thence downwardly to form a short vertical portion through which are provided burner openings 6a similar to those in the side walls. The remaining portion of the hearth roof slopes slightly upwardly from the bottom of the vertical portion thereof and reaches the rear wall just above the burner openings 6 at that end.

The operation of the furnace which will help clarify the description thereof is as

follows: a tube T, (shown in position A to be delivered to the furnace) is placed by any suitable means on a conveyor chain 14 mounted on sprocket wheels 15 which are mounted at the front end of the furnace. The chain 14 enters the furnace through an opening 16 in the side wall about the same height as the top of the furnace, so that said tube T (shown in position B) when in the furnace will be located longitudinally with the front wall of said furnace and in a position to be rolled onto the hearth. The chain travels out of the furnace through an opening 17 in the other side wall opposite the opening 16 and the lower portion of the chain passes in and out of the furnace through suitable openings in the side walls located below the bottom of the hearth. A suitable source of power 14*a* may be used for driving the chain preferably through a speed reducer 14*b*. The tube is pushed onto the hearth by means of oscillatively mounted pusher rods 19, which extend through openings 12 in the front wall of the furnace, and said rods 19 are operatively connected to a gear speed reducer 20 driven by a suitable motor 21, both of which are mounted on a raised foundation 22 provided in front of the furnace. The pusher rods 19 are hinged to cranks 24 mounted on a horizontal shaft 25 suitably supported in bearings 26 mounted on the foundation 22, and said shaft 25 is operatively connected to the gear speed reducer 20 by means of a reciprocating arm 27 connecting a crank 28 provided on the gear speed reducer and one of the cranks 24 on the shaft 25. Obviously, the motor 21, when running will oscillate the horizontal shaft 25 which will give reciprocating movement to the rods 19 causing them to push the tube off the chain and onto the hearth. Any suitable means may be used for normally starting and stopping said motor 21.

My furnace is equipped for heating and normalizing various sizes of tubes. If it is desired to heat short tubes, it is possible to run and control two rows of tubes through the furnace. This is accomplished by a manually air operated movable stop 29 which is provided at the front and in the center of the furnace and which is operatively connected to the motor 21 operating the pusher rods, said stop 29 preventing the progress of the tubes longitudinally, the tube being pushed off the chain as hereinabove described. If a second row of tubes is to be put through the furnace, the stop 29 can be raised so that the tube will continue its travel on the chain and will be stopped by the fixed stop 30 provided at the far side of the furnace where it is pushed off in the usual manner. When long tubes are to be put through the furnace in a single row, the stop 29 is also raised and the tube is carried through until it abuts against the fixed stop and is then pushed off.

In order to control the movement of the tubes down the hearth and to hold back certain batches when necessary, the blocking and releasing mechanism employed comprises upstanding members or fingers 31 which project up through openings in the hearth, and the mechanism is so constructed and arranged that the fingers 31 may be extended above the bed of the hearth when it is desired to hold back tubes, or they may be depressed below the bed of the hearth allowing the tubes to roll thereby. Preferably, three double rows of fingers are provided, all of which are driven by a common source of power 32 which is operatively connected to a gear speed reducer 33. Each half of each double row of fingers can be operated independently of the other fingers; a complete double row can be operated independently of the other row; or else, all of the fingers can be operated at the same time. The lower end of each finger is hinged to a rocker arm 34 which is rigidly mounted on an oscillatively mounted horizontal shaft 35 located below the bed of the hearth, whereby the fingers may be made to extend above the bed of the hearth or depressed below. With this arrangement, any finger can be made to project a suitable distance above the hearth while the adjacent finger on the opposite end of the rocker arm is depressed below the hearth line and all of the fingers may also be disposed beneath the bed of the hearth, thus leaving the entire hearth unobstructed as shown at M in Fig. 2. The three shafts carrying the rocker arms are divided into three sections, namely one central section 35*a* and two end sections 35*b* which are all in direct alinement, and the three center sections are all coupled together and connected to the gear speed reducer which is provided with a crank 36 secured to a reciprocating connecting rod member 37 (comprising three sections) which is hinged to arms 38 extending from the central section 35*a* of the horizontal shafts, and which impart an angular oscillating movement to the three center sections of the shafts. Each of the shafts 35 are mounted in bearings 39 provided on foundation blocks 40 extending from the floor or foundation of the furnace. The outer ends 35*b* of the three shafts which carry the rocker arms are adapted to be connected to the center driven sections by means of clutches 41, which are operatively connected by means of horizontal rods 42 carrying shifter forks 42*a* to operating levers 43 provided on the outside of the furnace. Each clutch is connected to two levers, one on either side of the furnace, and thus it is possible to connect the center driven section to the end sections either collectively or individually from either side of

the furnace. A small shaft 35*c* extending from each of the shafts 35 to the outside of the furnace and provided with an indicating arm 35*d* may be employed for determining the position and oscillative movement of said shafts 35. While I have shown three sets of blocking fingers any suitable number and spacing arrangement may be used without departing from the spirit of my invention.

After the tubes have been completely heated, they roll into a transverse trough 44 in the rear of the furnace provided with skids 45 on the bottom, from whence they are pushed out of the furnace, by means of a pusher rod 46, which is operated by means of a friction roller 47 engaging the lower side of the rod and pressing said rod up against an idler roller 48 engaging the top of the rod, whereby the friction roller 47 will push the rod forward, said rod having a pusher head 49 which engages and pushes the tubes out of the furnace through an opening 50 provided therefor. Preferably, a roller conveyor 51 is constructed outside of the furnace for receiving and conveying the tube as it is pushed out of the furnace.

As stated above, any spacing arrangement of the blocking fingers may be used, and Fig. 6 shows a modified form of blocking means wherein the fingers 31*a* are mounted in rocker arms 34*a* which are of such length that the fingers are spaced equidistant apart which may be preferable in some cases.

Since many other variations in the construction illustrated may be used without departing from the spirit of my invention, I do not wish to be limited to the precise construction shown.

What I claim is:

1. A furnace for heating articles comprising a hearth along which articles travel and movable blocking devices located at different points across said hearth, said blocking devices being selectively operable jointly and individually whereby the blocking devices may be adapted to effectively control the movement of a single article or to control the movement of a plurality of shorter articles separately.

2. A furnace for heating elongated articles comprising a hearth along which articles travel and movable blocking devices arranged in longitudinal and transverse rows with respect to the hearth, each of said blocking devices being operable independently of the others whereby the blocking devices may be adapted to effectively control the movement of a single elongated article or to separately control the movement of a plurality of shorter elongated articles traveling along the hearth in different paths.

3. A furnace for heating articles comprising a hearth along which articles travel, a plurality of blocking devices movable into the path of articles traveling on said hearth, a common source of power operatively connected to said blocking devices, and clutches operatively connected to said common source of power and each of said blocking devices for controlling the operation of said blocking devices whereby each of said blocking devices may be operated independently of the others or conjointly with any number thereof.

4. A furnace for heating articles comprising a hearth along which articles travel in a plurality of paths, blocking means provided in each path for blocking articles traveling in said paths, a common means for operating all of said blocking means, clutching means operatively connected to said common operating means and each of said blocking means for controlling the movement of articles traveling in one path independently of those traveling in the other paths.

5. A furnace for heating articles comprising a hearth along which articles travel, an oscillatively mounted shaft located near said hearth, means for oscillating said shaft, a second oscillatively mounted shaft in line with the other shaft, a clutch connecting the two oscillatively mounted shafts, a rocker arm mounted on said second oscillatively mounted shaft, and a member mounted on said arm adapted to block the path of an article traveling on said hearth when its supporting rocker arm is near one end of its travel and leave the hearth unobstructed near the other end of its travel.

6. A furnace for heating articles comprising a hearth along which articles travel, a transverse shaft located near said hearth, means for oscillating said shaft, a second shaft mounted in line with the first mentioned shaft, clutching means connecting the two shafts, a plurality of rocker arms mounted on said second shaft and a blocking member mounted on each end of each rocker arm adapted to block the path of an article traveling on said hearth when in one position and leave the hearth unobstructed when in another position.

7. A furnace for heating articles comprising a hearth along which articles travel, a sectional shaft located near said hearth, a source of power operatively connected to a driving section of said shaft to oscillate the same, clutches operatively connected to said driving section and to each of the other sections respectively, rocker arms mounted on said other sections and a blocking member mounted on each end of each rocker arm for blocking articles traveling on said hearth.

8. A furnace for heating articles comprising an inclined hearth along which articles travel, a sectional shaft located near said hearth, a source of power operatively connected to a driving section of said shaft to oscillate the same, rocker arms mounted on

the other of said shaft sections and having blocking fingers adapted to move into the path of articles traveling on said hearth, clutches operatively connecting said driving section and said other sections respectively, and clutch actuating means operatively connected to each clutch to actuate the same and extending away from said hearth for manual operation.

9. A furnace for heating elongated articles comprising a hearth along which articles travel, a plurality of spaced sectional transverse shafts located below said hearth, each of said shafts having a driving section, a common source of power operatively connected to the driving sections of said sectional transverse shafts to oscillate the same, rocker arms mounted at their middle on the other sections of said sectional transverse shafts, an upstanding blocking member mounted on each end of each rocker arm adapted to project up through an opening provided in said hearth and block articles thereon, clutches operatively connected to the driving section and the sections carrying the blocking members, and means operatively connected to each clutch to actuate the same, said clutch actuating means extending from said hearth and manually operable at a distance therefrom.

10. A furnace for heating elongated articles comprising a hearth along which articles travel, a plurality of spaced sectional transverse shafts located below said hearth, each of said shafts comprising a center section interposed between end sections, a common source of power operatively connected to each center section to oscillate the same, clutches, each of said clutches operatively connected to each end of each center section and to the adjacent end of an end section respectively, means operatively connected to each clutch to actuate the same, said clutch actuating means extending outside of said furnace for manual operation, rocker arms rigidly mounted at their middle on said end shaft sections, and an upstanding blocking finger mounted on each end of each rocker arm adapted to project up through an opening provided therefor in said hearth and block articles thereon when the end of its supporting rocker arm is near its highest end of travel and depressed below the hearth when near its lower end of travel thereby leaving the hearth unobstructed.

11. The combination of a furnace for heating elongated articles having a hearth along which articles travel, means for conveying articles into said furnace adjacent to one end of said hearth, a fixed stop located near the far side of said furnace in position to block articles carried by said conveying means, a movable stop capable of being moved into position to block articles carried by said conveying means before reaching said fixed stop and means for shifting articles from said conveying means onto said hearth.

12. The combination of a furnace for heating elongated articles having an inclined hearth along which articles travel due to the force of gravity, means for conveying articles into said furnace adjacent to and longitudinal with the higher end of said hearth, a fixed stop located near the far side of said furnace in a position to block articles carried by said conveying means, a movable stop capable of being moved into a position to block articles carried by said conveying means before reaching said fixed stop and means for shifting articles from said conveying means.

13. The combination of a furnace for heating elongated articles comprising a hearth along which articles travel, means for conveying articles into said furnace, means for shifting articles from said conveying means onto said hearth, means for blocking the movement of articles traveling on said hearth, means for operating said locking means, clutching means operatively connected to said blocking means and said operating means, manually operable means located outside of said furnace and extending therein and operatively connected to said clutching means to actuate the same for controlling the operation of said blocking means, and means for receiving articles from said hearth and removing the same from said furnace.

14. The combination of a furnace for heating elongated articles comprising an inclined hearth along which articles travel, means for conveying articles into said furnace adjacent to the higher end of said hearth, means for shifting articles from said conveying means onto said hearth, means for blocking the movement of articles traveling on said hearth, means for operating said blocking means, clutching means operatively connected to said blocking means and said operating means, manually operable means located outside of said furnace and extending therein and operably connected to said clutching means to actuate the same for controlling the operation of said blocking means, a trough located adjacent to the lower end of said hearth for receiving articles therefrom, means for moving articles along said trough and out of said furnace, and conveying means located outside of said furnace for receiving articles from said trough.

15. The combination of a furnace for heating elongated articles comprising an inclined hearth along which articles travel, means for conveying articles into said furnace adjacent to the higher end of said hearth, a fixed stop located near the far side of said furnace in a position to block articles carried by said conveying means, a second stop movable into a position to block articles carried by said conveying means before reaching said fixed stop, means for shifting articles from said

conveying means onto said hearth, means for blocking the movement of articles traveling on said hearth, means for operating said blocking means, clutching means operatively connected to said blocking means and said operating means, manually operable means located outside of said furnace and extending therein and operatively connected to said clutching means to actuate the same for controlling the operation of said blocking means, a trough located adjacent to the lower end of said hearth for receiving articles therefrom, means for moving articles along said trough and out of said furnace and conveying means located outside of said furnace in direct alinement with said trough for receiving articles therefrom.

Signed at Canton, Ohio, this 16 day of January 1931.

WALTER J. ASSEL.