Mar. 5, 1929. F. W. MANKER 1,703,943

CONTINUOUS NORMALIZING FURNACE

Filed Nov. 19, 1925 2 Sheets-Sheet 1

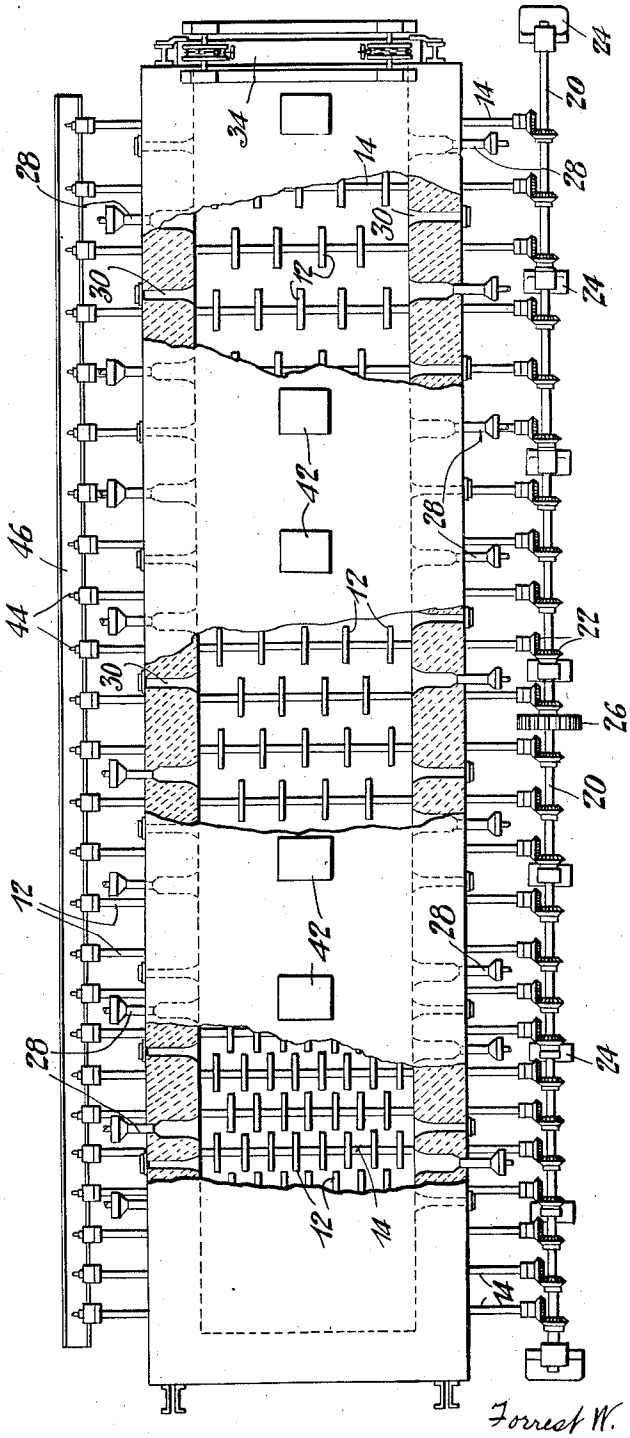

Fig. 1.

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Fig. 2.

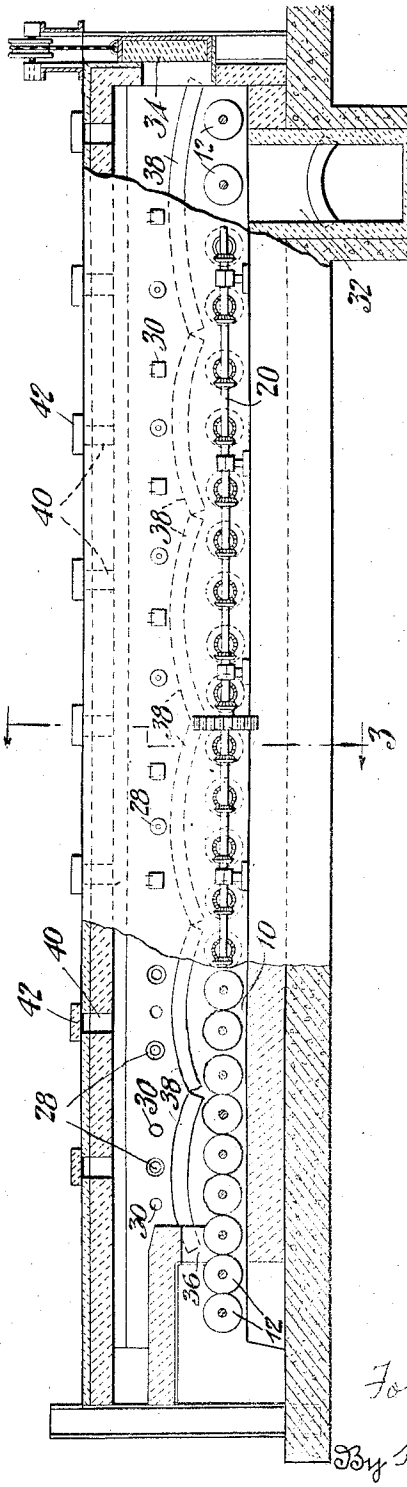


Fig. 4.

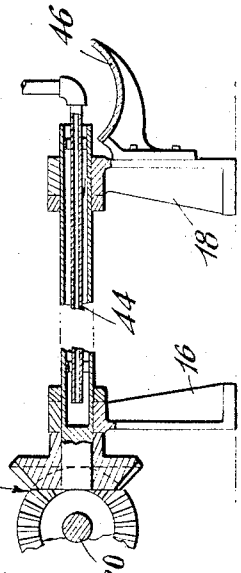
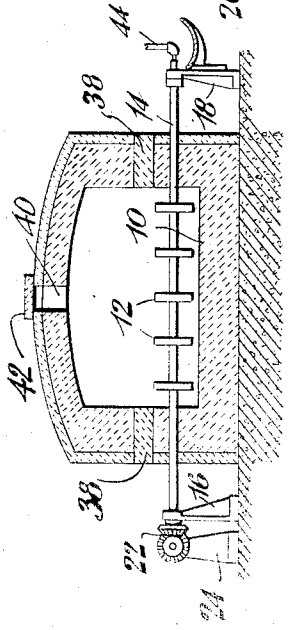


Fig. 3.



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UNITED STATES PATENT OFFICE.

FORREST W. MANKER, OF JACKSON HEIGHTS, NEW YORK, ASSIGNOR TO THE SURFACE COMBUSTION COMPANY, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

CONTINUOUS NORMALIZING FURNACE.

Application filed November 19, 1925. Serial No. 69,971.

This invention relates to improvements in furnaces and more particularly to a continuous normalizing furnace for heating thin sheets or plates.

It is an object of the invention to provide a furnace of such construction that thin sheets may be uniformly heated while passing through the furnace.

Another object is to provide a furnace with sheet supporting means arranged in such a manner that free circulation of hot gases may be had below the sheets and further arranged so that the sheets may be moved through the furnace without buckling or bending when highly heated.

A still further object is to provide means for uniformly heating a furnace throughout its length.

An additional object is to provide a novel arrangement of rolling means on which the sheets shall be supported while being moved through the furnace.

Another object is to so mount the sheet supporting means that such means may be removed from the furnace for repairs or replacement without the necessity of breaking up the entire furnace.

A still further object is to provide means for cooling the shafts on which the rolling means are supported.

The above and other objects will more fully appear from the detailed description taken in connection with the accompanying drawings forming part of this specification.

Referring to the drawings,

Fig. 1 is a plan view of the improved furnace, parts of the same being broken away to more fully show the arrangement of the rolling means on which the sheets are adapted to be supported.

Fig. 2 is a combined side elevation and sectional view of the furnace illustrated in Fig. 1.

Fig. 3 is a vertical transverse sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a fragmentary sectional view on an enlarged scale, of one of the disk-supporting shafts and showing the manner of cooling the same.

The improved furnace has a relatively long heating chamber, above the floor 10 of which are a series of disks 12 of uniform diameter fixedly secured to shafts 14 which extend transversely through the furnace and above the floor thereof, the ends of the shafts being mounted in standards 16 and 18 located on opposite sides of the furnace. The shafts extend in parallel relation from one end of the furnace to the other and are driven in unison by a driving shaft 20 extending lengthwise of the furnace along one of the ends of the shafts. The driving shaft is coupled to the shafts 14 by beveled gears 22 and is supported throughout its length by standards 24 disposed at spaced intervals there-along. A gear 26 affixed on the driving shaft 20 at any convenient point as intermediate its ends serves to couple the shaft to any suitable source of power not shown. By imparting rotation to the disk-carrying shafts 14 by means of a common driving shaft 20, back lash will be prevented and the sheets resting on the disks will be moved through the furnace in a steady manner.

The space interval between the disk supporting shafts 14 decreases in successive stages from one end of the furnace to the other, the drawings illustrating three distinct space intervals, the distance between the shafts being greatest at the charging end of the furnace and least at the discharging end thereof. By gradually decreasing the space interval between the shafts in the manner indicated, any tendency for the sheets to bend or buckle as they gradually become hotter will be entirely obviated with the result that a better finished sheet will be obtained than has heretofore been possible of attainment.

The disks 12 are mounted on the shafts 14 in staggered relation to the disks on adjacent shafts, thus affording a better support to the sheets than would be afforded if the disks on the adjacent shafts were in alignment and also permitting the space interval between the shafts to be made less at the discharging end of the furnace where more support is needed due to the sheets being hotter and more flexible. The disks 12 on the more closely spaced group of shafts are more closely spaced on their respective shafts than are the disks on the shafts toward the charging end of the furnace. It will thus be seen that a greater number of points of support are provided for the sheets at that end of the furnace where the sheets are hottest and most flexible,—consequently any tendency for the sheets to buckle or bend is entirely obviated.

The furnace is heated by a series of gas

burners 28 projecting through the side walls of the furnace from the charging to the discharging end thereof, all of the burners being preferably located in a common plane. A series of normally closed peep holes 30 are also provided in the side walls of the furnace in the same plane as the burners to permit the burners to be regulated and for observing the character of the flames.

The products of combustion pass out of the furnace by way of a passage 32 extending downwardly from the floor 10 of the same, adjacent the charging end of the furnace. The charging end of the furnace is normally kept closed by door 34. The heated plates leave the furnace through a restricted opening 36, the last few disks extending beyond said opening.

In order to permit the disks and their shafts to be removed from the furnace for replacement or repairs without breaking up an undue section of the furnace side walls, arches 38 are built into the side walls below the burners and peep holes previously mentioned and the floor of the furnace and the space below the arches filled with brick work. By removing the brick work below the arches, the shafts with their disks may be readily withdrawn from the furnace with minimum amount of damage to the side walls of the furnace and without disturbing the burners and peep holes mounted above the arches. The top of the furnace is preferably provided with a series of longitudinally extending manholes 40 normally closed by tiles 42.

Inasmuch as the disk-supporting shafts 14 are located above the floor of the furnace and in the path of the hot gases it becomes necessary to provide means for cooling the shafts. Cooling is effected by making the shafts hollow for a portion of their length as between their supporting standards 16 and 18 and inserting a pipe 44 in the hollow portion of each shaft, the end of the pipe terminating short of the closed end of the shaft. The pipes are of considerably smaller diameter than the bore of the shafts and consequently the cooling medium which is preferably water when discharged from the pipe will flow backwards toward the open end of the shafts. The water discharges from the shafts into a trough 46 below the open ends of the shafts, said troughs being conveniently secured to the standards 18 supporting the adjacent ends of the shafts.

It will be noted that the disks 12 and their supporting shafts 14 are mounted clear of the floor 10 of the furnace. This allows a complete circulation of the products of combustion around both sides of the sheets with the result that the sheets can be moved through the furnace at an unusually rapid rate due to the rapid and uniform heating of the sheets.

What is claimed is:

In a furnace for heating sheets, the combination of an elongated heating chamber, a series of shafts extending transversely within said chamber, disks on said shafts, the disks in one end portion of the chamber being in closer spaced relation on their respective shafts than the disks on the shafts in the other end portion of the chamber, and the shafts on which the more closely spaced disks are mounted being in closer spaced relation than the other shafts.

In testimony whereof I affix my signature.

FORREST W. MANKER.