

April 7, 1931.

S. E. DIESCHER

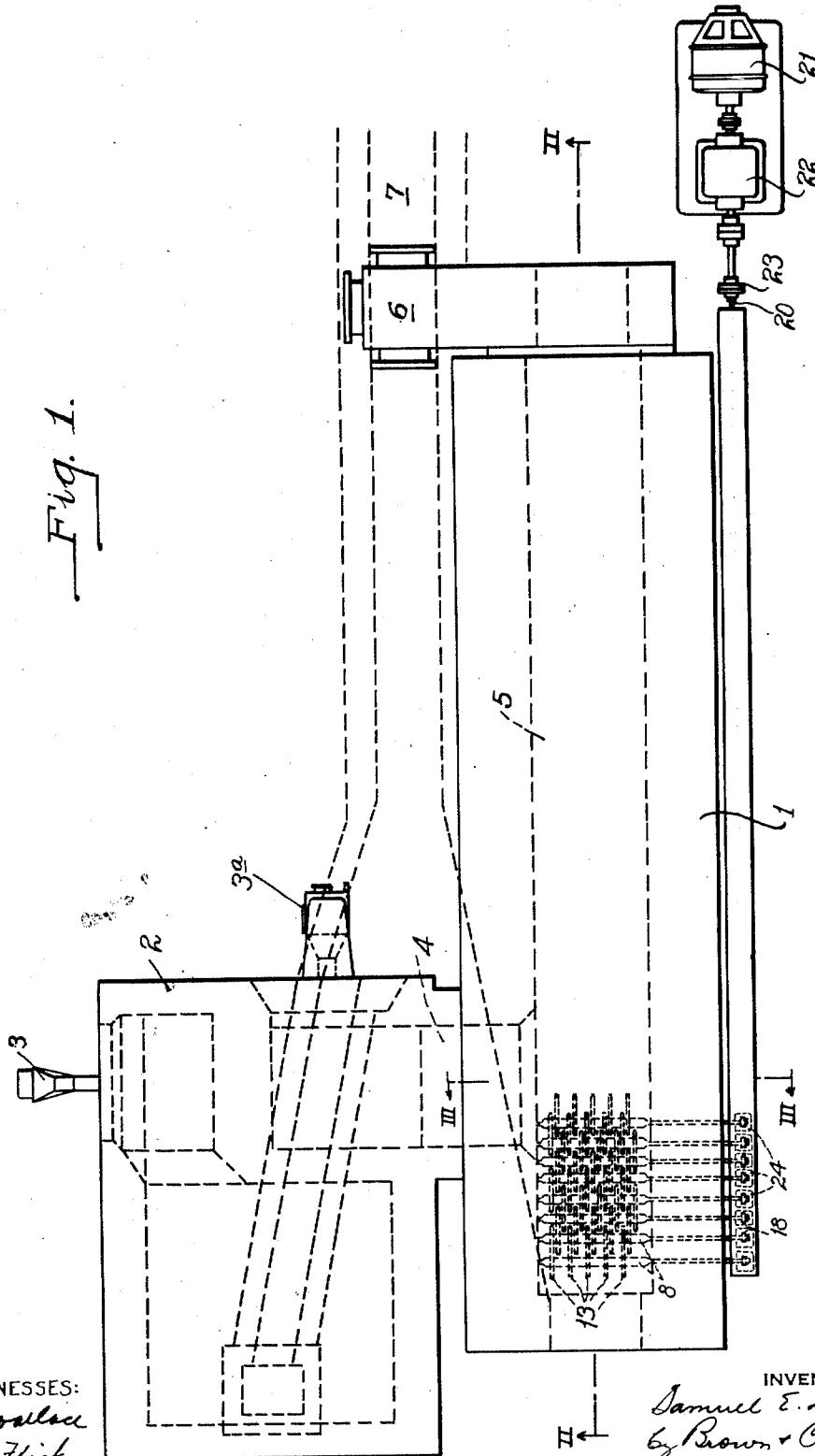
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CONTINUOUS HEATING FURNACE

Filed Sept. 25, 1929

5 Sheets-Sheet 1

Fig. 1.



WITNESSES:
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1,800,170

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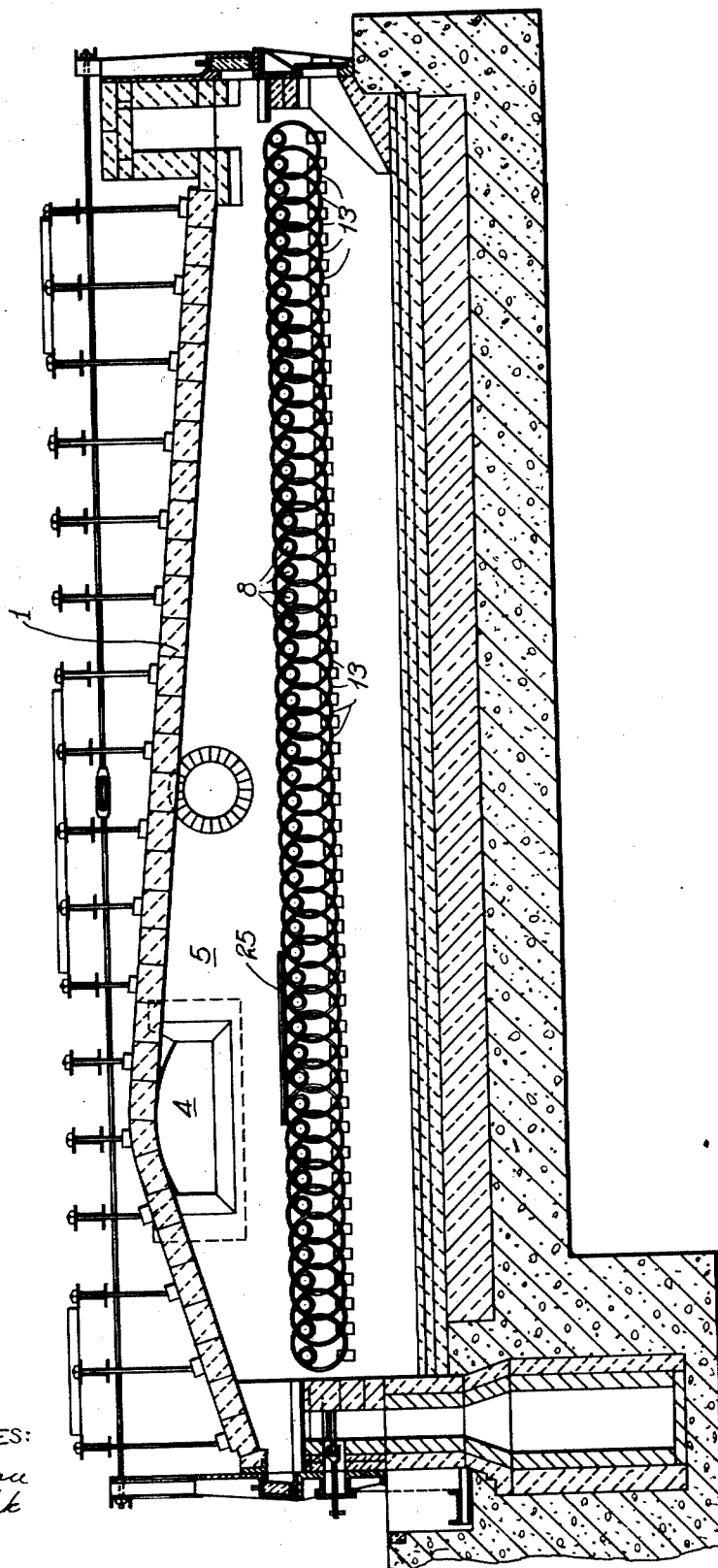
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5 Sheets-Sheet 2

Fig. 2.

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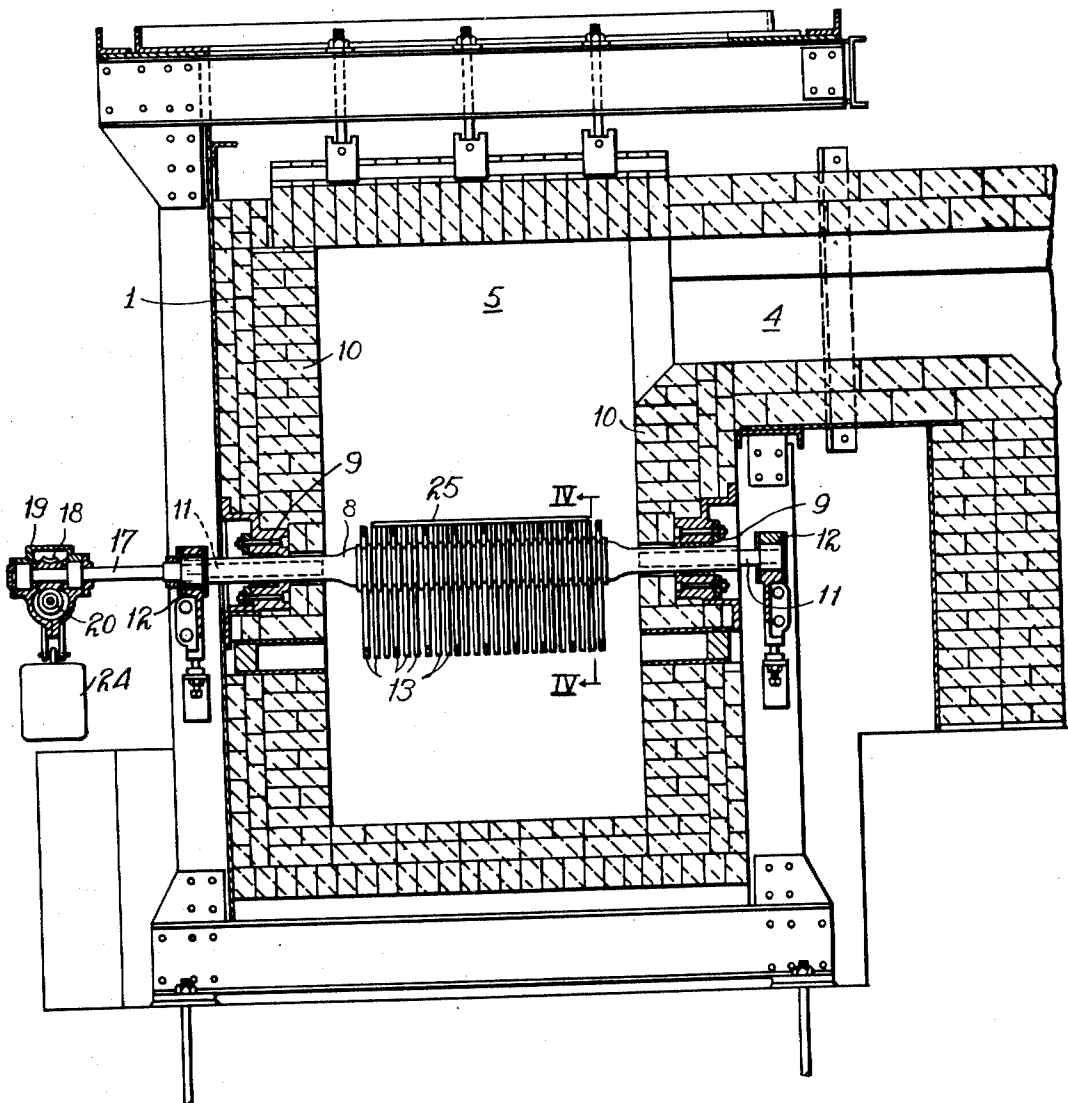
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5 Sheets-Sheet 3

Fig. 3.



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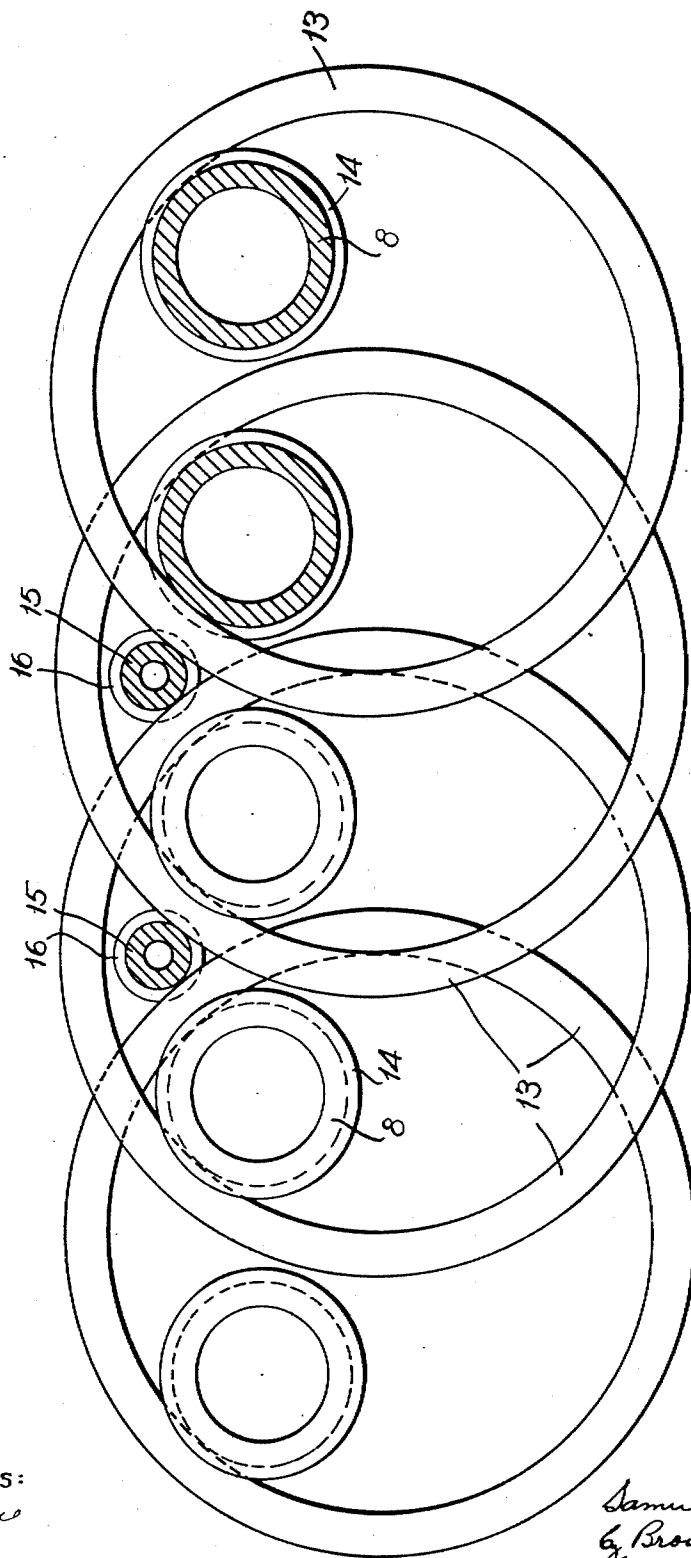
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CONTINUOUS HEATING FURNACE

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5 Sheets-Sheet 4

Fig. 4



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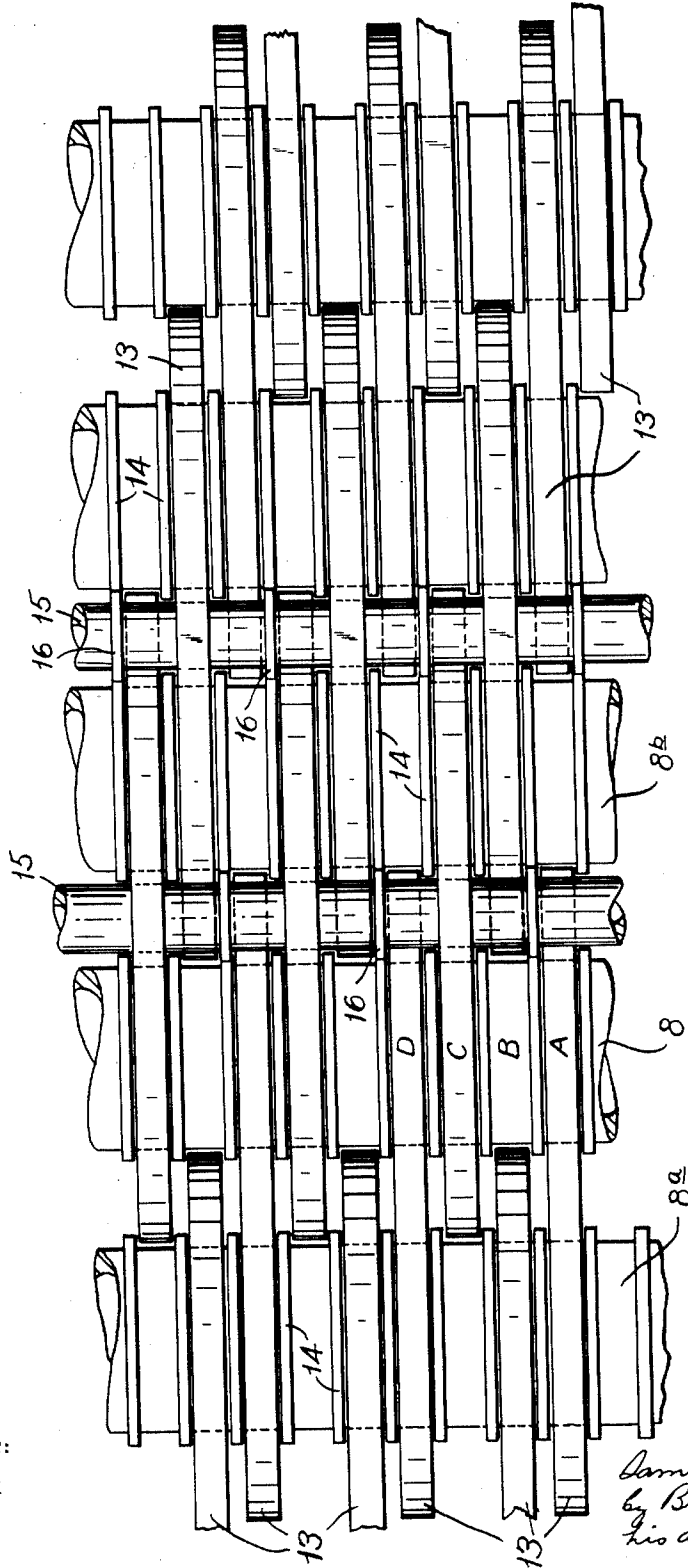
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CONTINUOUS HEATING FURNACE

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5 Sheets-Sheet 5

Fig. 5.



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UNITED STATES PATENT OFFICE

SAMUEL E. DIESCHER, OF PITTSBURGH, PENNSYLVANIA, ASSIGNOR TO S. DIESCHER & SONS, OF PITTSBURGH, PENNSYLVANIA, A PARTNERSHIP COMPOSED OF SAMUEL E. DIESCHER AND AUGUST P. DIESCHER

CONTINUOUS HEATING FURNACE

Application filed September 25, 1929. Serial No. 394,990.

This invention relates to heating furnaces, and especially to continuous sheet heating furnaces.

The development of modern strip-sheet rolling processes has made it possible to simplify the production of black plate and the like by providing, as a starting material, sheet of a thickness comparable to that of the matched plates in the three or four-part systems. This makes it possible to produce black plate by a two-part procedure in the ordinary hot mill. It is essential, however, that such sheets or packs formed of them be heated in continuous furnaces without any material disturbance of their arrangement. Also, in the case of some products, it is necessary to prevent injury to the surfaces of the plates, for example by contact with dirt carried by the conveyor elements.

An object of the present invention is to provide a continuous sheet heating furnace in which the conveyor, which comprises circular sheet-supporting members, moves the sheets, whether singly or in packs, without marring of the surfaces which contact with the conveyor members, and, when the sheets are in multiple, without disturbance of their arrangement, which is efficient and of simple and relatively inexpensive construction.

It is among other objects of the invention to provide a continuous conveyor for heating furnaces, and especially for furnaces of the type referred to, which embodies an improved drive and conveyor-supporting structure adapted to minimize the stresses due to the weight of the conveyor elements.

The preferred embodiment of my invention is shown in the accompanying drawings, in which Fig. 1 is a plan view of the furnace combined with an ordinary sheet-heating furnace; Fig. 2 a longitudinal section through the furnace taken on line II—II, Fig. 1; Fig. 3 a cross section of the furnace taken on line III—III, Fig. 1; Fig. 4 a fragmentary side elevation, partly in section, on an enlarged scale, showing the conveyor elements, taken in the direction of line IV—IV, Fig. 3; and Fig. 5 a plan view on an enlarged scale of a portion of the conveyor structure.

The furnace provided by this invention

comprises a heating chamber of any suitable construction provided with sheet-conveying means including a plurality of conveyor shafts journaled transversely of the chamber, sheet-conveying rings surrounding the shafts in a manner similar to internal gears, and drive means for rotating the shafts. Most suitably the rings each encircle and are supported by adjacent shafts, and preferably they frictionally engage the shafts for rotation thereby. In the preferred embodiment the shafts are provided with a longitudinal series of ring-receiving grooves, in which the rings seat to prevent lateral movements of them. The rings are disposed for uniformly supporting the sheets, which may be accomplished by so disposing them that on any one shaft adjacent rings extend in opposite directions, or, in other words, encircle the shafts on opposite sides of the one considered.

In order to relieve the strains on the conveyor shafts due to their weight and that of the sheet-carrying rings, special shaft-supporting and driving means are used. In the embodiment shown, the conveyor shafts are supported by stub shafts inserted in bores provided in their necks, the stub shafts preferably extending the full length of the necks. With this type of support, the unsupported span is shortened, and the shafts are supported interiorly instead of at a journal. These stub shafts are suitably journaled at their extended ends, and in accordance with the invention the weight of the shafts and rings is counter-balanced by setting up oppositely acting stresses in the stub shafts. For example, weights may be suspended from the stub shafts at the journals. For most purposes, it will be sufficient to provide counter-balance at only one end, thus giving a cantilever effect. This is preferably accomplished by suspending the driving means, with additional weights if necessary, from the stub shafts on one side of the furnace.

Having reference now to the drawings, Fig. 1 shows a plan view of a furnace layout adapted to a two-part sheet rolling process. It comprises a continuous sheet-heating furnace 1 embodying this invention, and an ordinary sheet furnace 2 of any suitable con-

struction for heating doubled packs from the first stage of the process. Furnace 2 is fired by a stoker 3, and continuous furnace 1 is fired by a stoker 3a through a port 4 opening into heating chamber 5 of the continuous furnace. Furnace 1 is built from suitable refractory and other constructional materials in any suitable manner. The flow of gases in the furnaces is controlled by appropriate flues and dampers, and a gas take-off from each furnace leads to a header 6 connected to a chimney flue 7.

In accordance with the invention, furnace 1 is provided with means for continuously moving sheets singly or in packs through the furnace, without disturbance of the sheets when in packs, and without injuring the surfaces of the sheets which contact with the conveyor. As here shown, the conveyor comprises a plurality of shafts 8 disposed transversely of the furnace at regularly spaced intervals, with their necks extending through stuffing boxes 9 disposed in the side walls 10 of the furnace. The necks of the shafts are provided with bores for receiving stub shafts 11, which, as shown in Fig. 3, extend substantially the full length of the necks of the conveyor shafts so that in effect shafts 8 are supported at the inner ends of shafts 11. This reduces the unsupported length of the conveyor shafts, and with this construction the conveyor shafts may be provided with a continuous bore if desired, which reduces the weight to be supported. The outer ends of the stub shafts are journaled in bearings 12 connected to the furnace framework.

The sheets are carried by rings 13 which enclose conveyor shafts 8. These rings, which are preferably of large diameter as compared to the shafts, each encircle and are supported by adjacent shafts, and they may be, and preferably are, driven by frictional engagement with the shafts. As shown best in Figs. 4 and 5, the conveyor shafts are provided with a longitudinal series of peripheral collars 14 which form ring-receiving grooves which maintain the alignment of rings 13.

In the preferred embodiment of the invention, the rings encircle adjacent pairs of shafts, and, to provide uniform support for the sheets, they are most suitably disposed so that adjacent rings on any one shaft extend in opposite directions. For example, considering shaft 8, Fig. 5, groove A is occupied with a ring which encircles this shaft and shaft 8a; groove B is unoccupied, there being other rings projecting toward it from shafts 8a and 8b; and a ring seated in groove C encircles shaft 8b on the side of shaft 8 opposite shaft 8a. The ring in groove D is positioned similarly to that in groove A, etc. This disposition of the rings provides substantially uniform support for the sheets, and prevents their distortion by sagging.

To prevent damage to the surfaces of the sheets, the surfaces of the rings should be kept polished and clean. This may be done simply and automatically by means of steel rollers 15 disposed as shown in Fig. 4 to run against the surfaces of overlapped pairs of rolls. These rollers, being idly mounted, are rotated upon rotation of the rings, and effectually maintain the peripheral surfaces of the rings clean. The rollers are preferably of substantial length and are provided medially with a collar 16 for preventing the rollers from slipping sidewise from the rings.

The weight of the sheet-carrying rings acting on the conveyor shafts subjects the latter to stresses of considerable magnitude, which, owing to the length of the unsupported span, tend to bend the shafts, especially at the high temperature prevailing in the furnace. The stub shaft support described above assists in reducing the tendency to bending of the shaft, and to further offset these downwardly acting stresses, there is provided a special form of driving mechanism which acts to counterbalance them. To this end, each stub shaft 11 on one side of the furnace is coupled to a spindle 17, Fig. 3, provided with a worm pinion 18 and journaled in bearings in a housing 19. All of the pinions 18 are rotated by a common worm shaft 20 which may be driven by a variable speed motor 21 connected thereto through a speed reducing mechanism 22 and flexible coupling 23. Additional counterbalancing force is attained by weights 24 suspended at regular intervals from housings 19, these weights being uniformly distributed to equalize their effect.

By thus suspending the drive mechanism from one side of the shafts, the stress set up in the shafts by the weight of the rings is counteracted to prevent the shafts from becoming bent or injured, and a level sheet-conveying bed is maintained. It will be seen that, if desired, stress relief may be secured by the use of counterbalances at each end of the conveyor shafts. For example, the stub shaft on the right-hand side of Fig. 3 may be provided with an extension shaft and rotating weight. In general, however, the construction shown and described is satisfactory. It will be seen also that this type of shaft support is applicable generally to continuous conveyors, and may be applied with equal benefits and advantages to other forms of conveyors than that shown and described.

In the furnace provided by this invention, rotation of the conveyor shafts causes the sheet-carrying rings to rotate and carry sheets placed thereon through the furnace either singly or in packs. The interlocking ring construction makes possible the use of larger diameter rings and closer spacing than is possible with the interlocking disc con-

veyors sometimes used in continuous furnaces. This results in more uniform support of the sheets, and provides more gradual approach and departure from contact of the sheets and rings. These features may be seen in Figs. 2 and 3 which show a pack on the conveyor. The invention is of particular advantage in connection with two-part black plate processes, as previously explained, because the conveyor transports packs without disturbance of their sheet disposition, and without spoiling their surfaces. Especially when short packs are moved through the furnace, they are less liable to be cantled or tipped than by prior conveyors.

According to the provisions of the patent statutes, I have explained the principle and operation of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. A furnace comprising a heating chamber, a plurality of rotatable shafts extending transversely of the chamber, means for rotating said shafts, and article-carrying rings surrounding and separate from and of substantially greater diameters than said shafts, said rings being supported and rotated by and upon said shafts and forming a support for continuously moving through the chamber articles placed upon them.

2. A furnace comprising a heating chamber, and means for continuously moving articles through the chamber comprising a plurality of rotatable shafts extending transversely of the chamber at closely spaced intervals, means for rotating said shafts, and a plurality of article-carrying rings each encircling and rotatably supported by an adjacent pair of shafts, said rings being positioned to provide a substantially uniform conveying support for articles resting on them.

3. A furnace comprising a heating chamber, and means for continuously moving articles through the chamber comprising a plurality of rotatable shafts extending transversely of the chamber at closely spaced intervals, the body of the shafts being provided with a plurality of peripheral collars forming a longitudinal series of ring-receiving grooves, means for rotating said shafts, and a plurality of article-carrying rings each seated in corresponding grooves of an adjacent pair of shafts and rotatably supported thereby, rings on each shaft encircling shafts on opposite sides to form an interlocking substantially uniform conveying support for articles resting on them.

4. A furnace comprising a heating cham-

ber, and means for continuously moving articles through the chamber, said means including a plurality of peripherally grooved rotatable shafts extending transversely of said chamber at closely spaced intervals, means operatively connected to all of said shafts for rotating them simultaneously, and a plurality of article-carrying rings each encircling and rotatably supported by two adjacent shafts and seated in aligned grooves thereof, successive pairs of rings on one shaft encircling shafts on opposite sides thereof, said rings forming a substantially uniform conveying support for articles placed upon them.

5. A pack heating furnace comprising a heating chamber, a plurality of rotatable shafts extending transversely of the chamber at closely spaced intervals, the necks of each shaft having a bore extending therethrough, a plurality of article-carrying rings each encircling and rotatably supported by an adjacent pair of shafts and forming a substantially uniform conveying support for articles placed thereon, means for rotating said shafts including rotatable stub shafts mounted in said bores, and means acting on said stub shafts to set up in the necks of said shafts forces counterbalancing the weight of said rings.

6. A furnace comprising a heating chamber, a plurality of rotatable shafts mounted transversely of the chamber, the necks of each shaft having a bore extending inwardly into the shaft, article-carrying rings each encircling and rotatably supported by an adjacent pair of shafts, a rotatable stub shaft disposed in each of said bores, and means for rotating the shafts connected to the stub shafts on one side of the furnace and effective by its weight to counterbalance the downwardly acting stresses in said shafts due to the weight of said rings.

7. A furnace comprising a heating chamber, a plurality of rotatable shafts extending transversely of the chamber, the necks of each shaft having a bore extending inwardly into the shaft, article-carrying rings each encircling and rotatably supported by an adjacent pair of said shafts, a stub shaft mounted in each of said bores and journaled at its extended end, and means for rotating said shafts and rings comprising a drive shaft operatively connected to and supported by the stub shafts on one side of the furnace for rotating all of the shafts simultaneously, and weights acting uniformly along said drive shaft, the weight of said means acting in said necks to counterbalance the downwardly acting stresses in the conveyor shafts set up by the weight of the rings.

8. A continuous heating furnace having a heating chamber provided with a continuous conveyor comprising a plurality of horizon-

tally-disposed rotatable shafts, bearings supporting said shafts adjacent to their ends, and means for counterbalancing the ends of said shafts beyond said bearings to reduce stresses in the shafts between the bearings.

5 9. A continuous heating furnace having a heating chamber provided with a continuous conveyor comprising a plurality of horizontally-disposed rotatable shafts, bearings supporting said shafts adjacent to their ends, and driving connections attached to and supported by the ends of said shafts beyond said bearings to reduce the stresses in the shafts between the bearings.

10 10. A continuous heating furnace having a heating chamber provided with a continuous conveyor comprising a plurality of horizontally-disposed rotatable shafts having longitudinal bores extending inwardly from their ends, bearings supporting said shafts adjacent to their ends, stub shafts arranged in said bores and having their ends extending inwardly through and beyond said bearings, and means acting downwardly on the outer ends of said stub shafts to counteract stresses in said conveyor shafts between their bearings.

15 11. A continuous heating furnace having a heating chamber provided with a continuous conveyor comprising a plurality of horizontally-disposed rotatable shafts having longitudinal bores extending inwardly from their ends, bearings supporting said shafts adjacent to their ends, stub shafts arranged in said bores and having their ends extending inwardly through and beyond said bearings, and driving connections attached to and supported by the ends of said stub shafts, the weight of said connections counteracting stresses in said conveyor shafts between their bearings.

In testimony whereof, I sign my name.

SAMUEL E. DIESCHER.

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