Nov. 21, 1944. S. B. BRITTAIN 2,363,291

DRAG-OUT MECHANISM FOR FURNACES

Filed Feb. 20, 1943 3 Sheets-Sheet 1

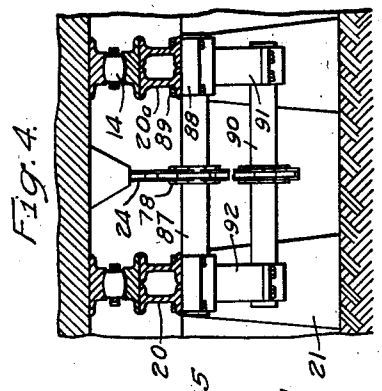



FIG. 4.

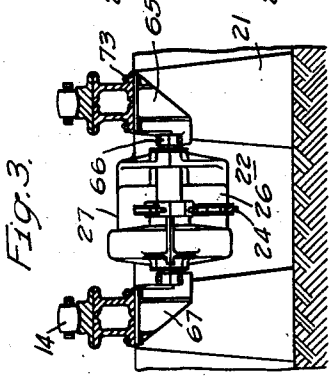



FIG. 3.

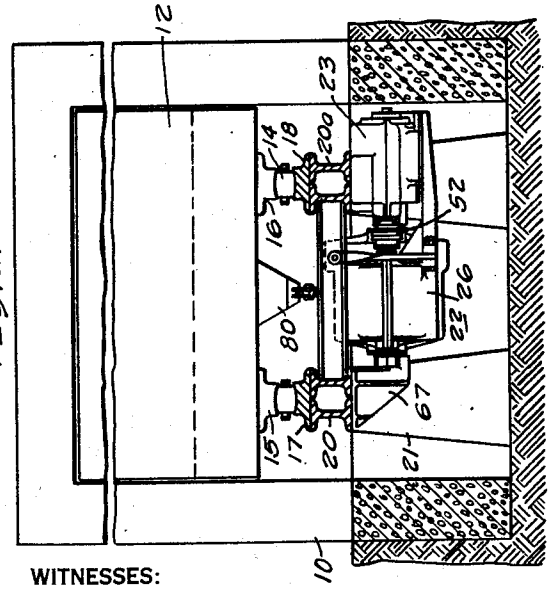



FIG. 1.

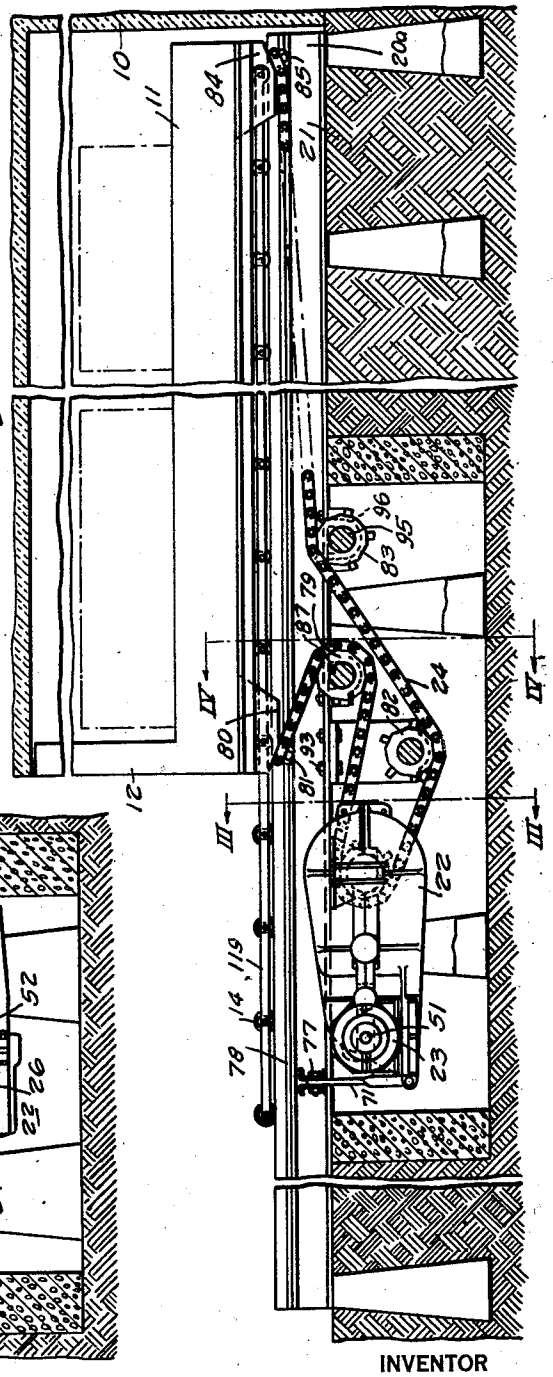



FIG. 2.

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DRAG-OUT MECHANISM FOR FURNACES

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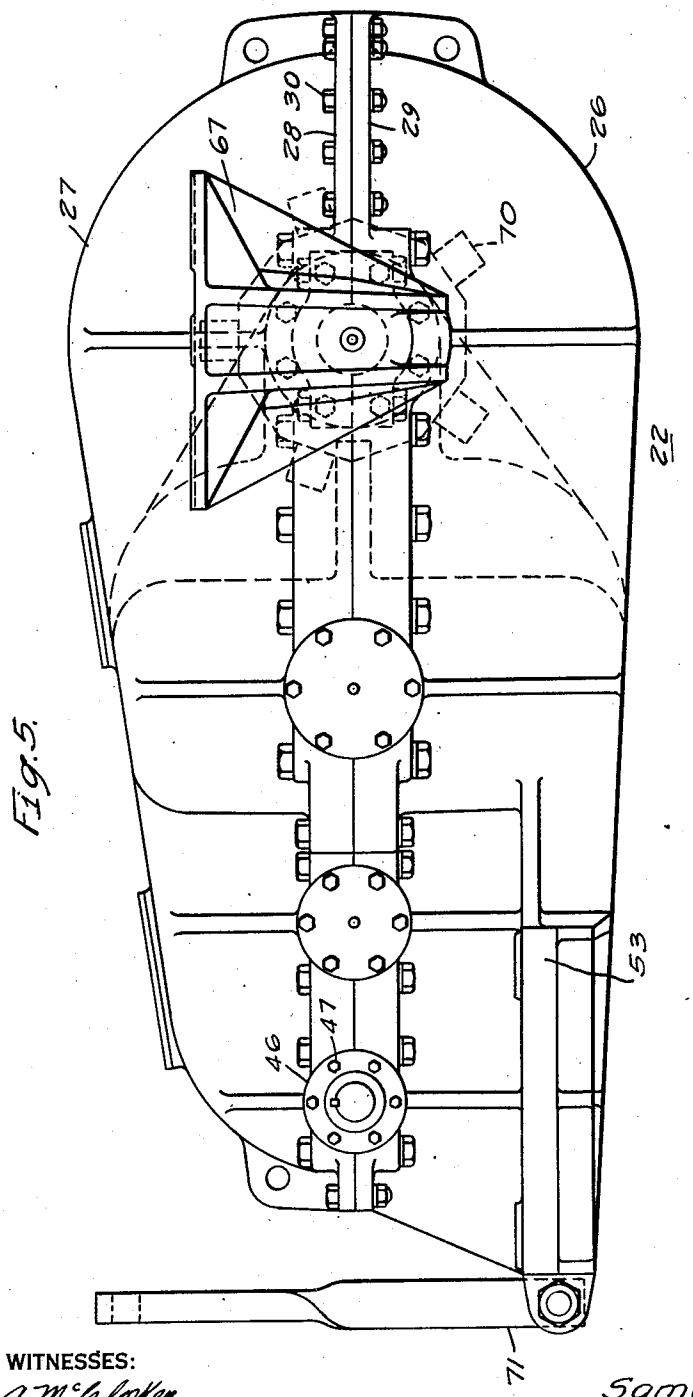



Fig. 5.

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DRAG-OUT MECHANISM FOR FURNACES

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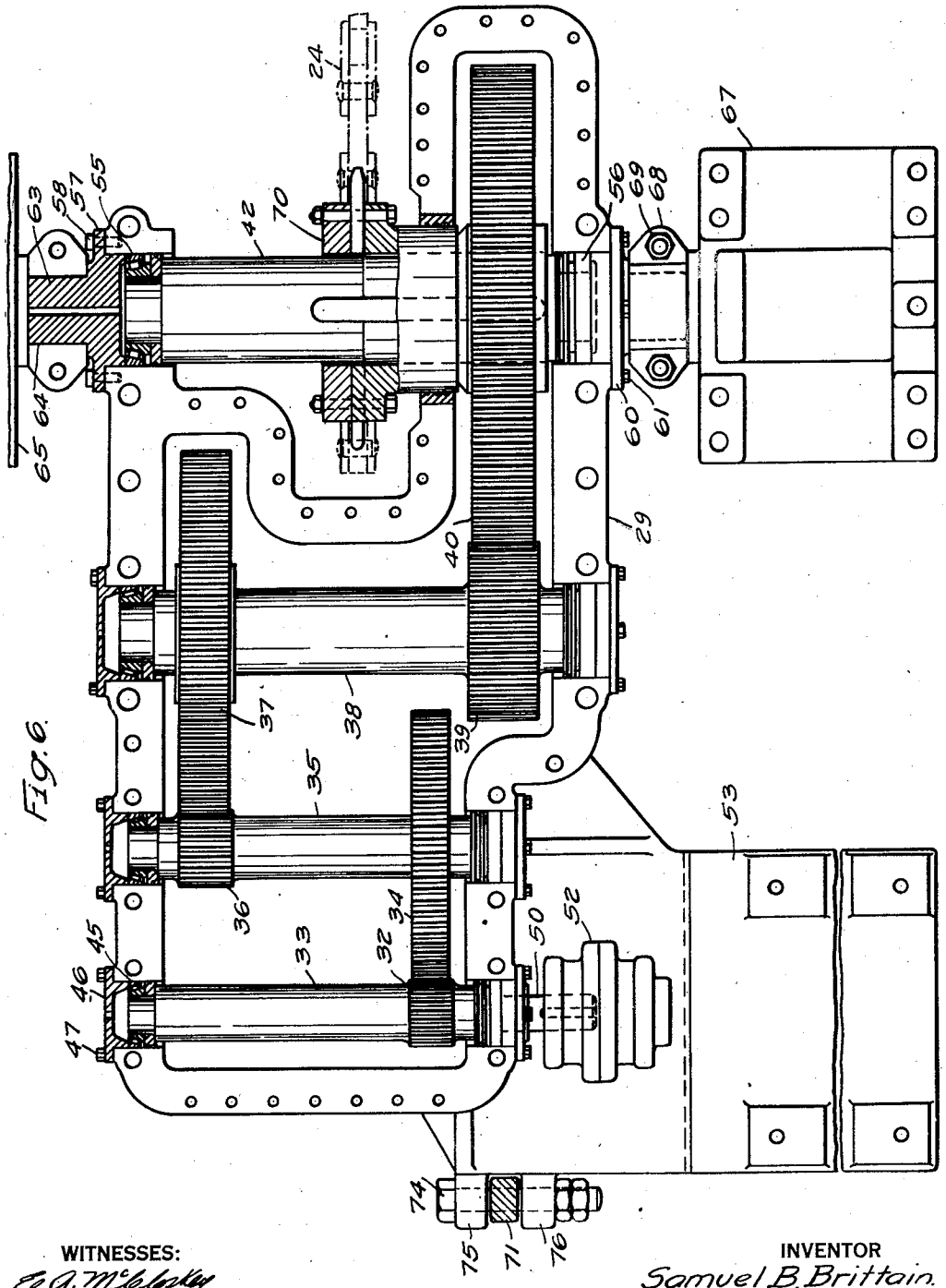



Fig. 6.

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# UNITED STATES PATENT OFFICE

2,363,291

## DRAG-OUT MECHANISM FOR FURNACES

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Application February 20, 1943, Serial No. 476,656

9 Claims. (Cl. 104—172)

My invention relates to drag-out mechanisms for furnaces, and more particularly to drag-out mechanisms for car type furnaces for annealing or heat treating such objects as armor plate, guns of large caliber, etc.

A furnace of this character is provided with a bottom constructed in the form of a car which is movably mounted on a track so that it may be moved into and out of the furnace. In practice, the car is hauled out of the furnace by a drag-out mechanism, loaded or unloaded and then hauled back into the furnace by the drag-out mechanism. Also a furnace of this character is usually very large, sometimes as much as 60 feet in length, and the total load handled by it at one time may amount to as much as 800 tons. Necessarily such enormous loads cause very severe strains, distortions, etc., of the cars, the rails on which the cars ride, the supporting track foundations, and the previously used drag-out mechanisms. Heretofore this has seriously affected the furnaces and their operating mechanisms, by causing misalignment of the drag-out mechanism as well as their operating shafts and their connections with the hauling devices.

One object of my invention is to eliminate the separate foundation for the drag-out mechanisms heretofore believed to be necessary and to also eliminate the necessity for low-speed couplings, head shafts, and head shaft bearings in connection with the drag-out mechanism.

Another object is to provide a drag-out mechanism and means for mounting it by which it may be supported directly by the track rails and the track rail supporting structure on which the cars operate.

Another object is to provide for absorbing the heavy chain pull by integral low-speed end cap trunnions through mounted brackets on the track rails without causing any strains from the chain pull to pass through the walls of the housing of the drag-out mechanism.

Another object is to provide a simple three-point suspension for the drag-out mechanism from the underside of the track which will eliminate any housing strains originating from track distortions or foundation settling and to also eliminate the problem of possible misalignment of the driving shafts of the mechanism.

A further object is to provide a drag-out mechanism in which the mounting brackets therefor may be easily and quickly aligned prior to the insulation of the gear unit and driving motor.

A still further object is to provide a drag-out mechanism in which the chain driving sprocket will be located at the center line of the gear unit and at the midpoint between the track rails for the car, and, therefore, eliminate the usual low-speed shaft extensions.

It is also an object to provide a drag-out mechanism which shall be simple and inexpensive to construct, install, operate and maintain in operation.

For a better understanding of the invention, reference may be had to the accompanying drawings, in which:

Figure 1 is a view in front elevation of a furnace provided with my improved drag-out mechanism,

Fig. 2 is a view in side elevation, partly in section, of the furnace and drag-out mechanism illustrated in Fig. 1,

Fig. 3 is a view taken along the line III—III of Fig. 2,

Fig. 4 is a view taken along the line IV—IV of Fig. 2,

Fig. 5 is an enlarged view in side elevation of the gear unit and the means for mounting it illustrated in Fig. 2, and

Fig. 6 is an enlarged top plan view of the reducing gear unit shown in Fig. 5 with the upper half of the housing removed.

Referring more particularly to the drawings, I have illustrated an annealing or heat treating furnace 10 of the car bottom type as provided with a car 11. The car 11 is provided with an elevated front wall 12 which operates to close the furnace when the car is in its proper position in the furnace. The car 11 may be movably supported by car wheels (not shown) or by any suitable anti-friction means such as a plurality of rollers 14 which are seated in a pair of guide rails 15 and 16 mounted on the underside of the car and a track comprising a pair of rails 17 and 18 and a plurality of I-beams 20 and 20a. The rollers 14 are maintained a proper distance apart by the use of spacing bars 19. The rail 17 is seated on the I-beams 20 which are firmly mounted upon a number of concrete piers 21 associated with the foundation of the furnace 10. The rail 18 is mounted and supported on the I-beams 20a in the same manner as the rail 17.

The drag-out mechanism for moving the car 11 out of the furnace to be loaded or unloaded and then moving it back into the furnace on the rollers 14 comprises a gear reducing unit 22, an electric motor 23 for driving the gear unit and a flexible drive member such as a sprocket chain 24 operated by the gear unit.

The gear unit 22 is provided with a housing comprising a lower half 26 and an upper half 27 which are provided with outwardly extending flanges 28 and 29 at their horizontal central meeting point. A plurality of bolts 30 are provided for securely bolting the upper and the lower parts of the housing together. The reduction gearing mounted in the housing comprises a power pinion 32 mounted on a power shaft 33 in position to drive a gear wheel 34 fixed on one end of a shaft 35 on the other end of which is mounted a pinion 36 in position to mesh with a driving gear wheel 37 fixed on one end of a shaft 38, on the other end portion of which is a pinion 39 disposed in position to engage and operate a gear wheel 40 fixed by means of a suitable key 41 on one end portion of a drive shaft 42.

The gear shafts are mounted in parallel arrangement with each other and horizontally and transversely in the upper edge of the lower half of the housing in position to be clamped in their bearings by the upper half of the housing when it is bolted to the lower half of the housing. Each of the gear shafts is mounted in suitable roller bearings 45 which are protected and held in position by an oil cap 46 which is securely bolted to the upper and the lower housing by a plurality of cap screws 47.

The power shaft 33 is provided with a suitable extended portion 50 with which the shaft 51 of a driving motor 23 may be connected by means of a flexible joint 52. The motor 23 is mounted upon a supporting base 53 which is to be bolted on one side of lower half of the housing 26. This feature facilitates ease of installation by permitting the unit to be lowered between the rails without being tilted.

The ends of the drive shaft 42 are mounted in roller bearings 55 and 56 seated in each side of the gear housing and at one end thereof. The roller bearing 55 is maintained in position by a bearing cap 57 which is firmly secured to the upper and the lower parts of the housing by a plurality of cap screws 58 which pass through an outer flange on the bearing cap and into housing. The roller bearing 56 is maintained in its correct position by a bearing cap 60 which is secured to the other side of the gear housing by a plurality of cap screws 61. The outer ends of the bearing caps 57 and 60 are formed as round integral trunnions or bearing portions 63.

The reducing gear unit 22 and the motor 23 mounted thereon are supported from the underside of the track beams 20 and 20*a* by a pair of bearing brackets 65 and 67 (Fig. 3) at one end and by a supporting bar 71 at the other end. The hanger brackets are bolted to the underside of the track I-beams by a plurality of bolts 73 with their bearings turned inwardly to receive and rotatably support the outer rounded end portions 63 of the bearing caps 56 and 60, thus holding the front end of the gear unit firmly in position underneath the track I-beams.

Each of the brackets 65 and 67 is provided with a removable upper half cap 68 to facilitate lowering of gear unit 22 complete with trunnions 63 after brackets 65 and 67 have been aligned and installed. The lower end of the supporting bar 71 is hingedly mounted by a bolt 74 in a pair of projections 75 and 76 on the opposite end of the gear unit housing. The upper end of the supporting bar 71 is secured by a bolt 77 between a pair of channel irons 78 which are mounted transversely between the track supporting I-beams 20 and 20*a*. The hinged connections of the bar 71 and the rounded trunnion portions of the bearing caps provide a flexible three point suspension for the operating unit of the drag-out mechanism on the underside of the track, so that no binding action thereon will result from the strains normally placed upon the track and the foundation thereof by the car when it is heavily loaded. Furthermore, the supporting brackets 65 and 67 may be easily given their correct alignment when they are mounted on the underside of the track by using an aligning bar.

The sprocket chain 24 is mounted on a drive wheel such as a sprocket wheel 70 mounted on the central portion of the drive shaft 42. One end of the chain extends around the idler sprocket 79 to a bracket 80 underneath the front end of the car to which it is secured by suitable bolt 81. The other end of the chain extends under an idler sprocket wheel 82 and over an idler sprocket wheel 83 to a bracket 84 on the other end of the car to which it is attached by a bolt 85.

The idler sprocket 79 is rotatably mounted on a transverse shaft 87, the outer ends of which are secured by a pair of holding brackets 88 mounted by a plurality of bolts 89 on the underside of the track I-beams 20 and 20*a*. The idler wheel 82 is mounted on a transverse shaft 90, the outer ends of which are secured by a pair of suitable depending brackets 91 and 92 attached to the undersides of the track I-beams by a plurality of bolts 93. The idler sprocket wheel 83 is mounted on a shaft 95 transversely disposed underneath the track I-beams and secured thereto by suitable brackets 96.

When the motor 23 is operated in one direction, it will rotate the shaft 33 and thus operate the sprocket wheel 70, through the action of the pinion 32, gear wheel 34, shaft 35, pinion 36, gear wheel 37, shaft 38, pinion 39, gear wheel 40 and the drive shaft 42, and thereby operate the sprocket chain 24 to exert a pull on the bracket 84 and thereby move the car 11 out of the furnace. After the car is unloaded, and loaded, it may be returned to its correct position within the furnace by operating the motor 23 in the opposite direction to cause the sprocket chain 24 to exert a pull on the bracket 80 and thereby move the car into the furnace.

From the foregoing description in connection with the drawings, it will be apparent that the drag-out mechanism comprises a single unit which may be easily dropped into position and mounted on the underside of the track structure so that it will not require a separate foundation and will not be subject to any severe distortions or strains which may be caused by the enormous loads carried by the furnace car. It will also be apparent that, with the three point suspension of the drag-out unit on the underside of the track structure, such distortions as may occur in the track will not affect the drag-out unit. It will be further apparent that the pull on the sprocket chain will be effected by a sprocket wheel located midway between supports suspending from the track and therefore that the resulting strain will be evenly distributed on the track rails, and that the torque of the unit will be easily taken care of by the supporting bar 71 at the other end of the drag-out unit.

Although I have illustrated and described only one specific embodiment of my invention, it is to be understood that modifications thereof and

changes therein may be made without departing from the spirit and scope of the invention.

I claim as my invention:

1. In a furnace, a car, a track for the car, and a drag-out mechanism for hauling the car along the track into and out of the furnace comprising a housing, a trunnion extending from each side of the housing at one end thereof, a pair of brackets mounted on the underside of the track and provided with bearings for supporting the trunnions, a torque bar supporting the other end of the housing from the underside of the track, a drive shaft rotatably mounted in the housing between the trunnions and in axial alinement therewith, a power shaft rotatably mounted at the other end of the housing, a motor mounted on the housing for rotating the power shaft, gearing mounted in the housing between the power shaft and the drive shaft whereby rotation of the power shaft causes rotation of the drive shaft, a plurality of idler sprocket wheels mounted on the underside of the track, a driving sprocket wheel mounted on the central portion of the drive shaft, and a sprocket chain disposed on the driving sprocket wheel and the idler sprocket wheels with its ends fastened to opposite ends of the car whereby rotation of the motor in one direction will haul the car out of the furnace and rotation in the opposite direction will haul the car into the furnace.

2. In a furnace, a car, a track for the car, and a drag-out mechanism for moving the car into and out of the furnace comprising a housing, a drive shaft rotatably mounted horizontally and transversely in one end of the housing, a trunnion mounted on each side of the housing at the ends of the drive shaft, a pair of brackets mounted on the underside of the track and provided with bearings for supporting the trunnions, a torque bar supporting the other end of the housing from the underside of the track, a power shaft rotatably mounted at the other end of the housing, a motor mounted on the housing for rotating the power shaft, gearing mounted in the housing between the power shaft and the drive shaft whereby rotation of the power shaft causes rotation of the drive shaft, a plurality of idler wheels mounted on the underside of the track, a drive wheel mounted on the drive shaft, and a flexible drive member disposed on the drive wheel and the idler wheels with its ends fastened to opposite ends of the car whereby rotation of the motor in one direction hauls the car out of the furnace and rotation in the opposite direction hauls the car into the furnace.

3. In a furnace, a car, a track for the car, and a drag-out unit comprising a housing, a trunnion extending from each side of the housing at one end thereof, a pair of brackets mounted on the underside of the track and provided with bearings for supporting the trunnions, a torque bar for supporting the other end of the housing from the underside of the track, a drive shaft rotatably mounted in one end of the housing, a power shaft rotatably mounted in the other end of the housing, a motor mounted on and supported by the housing for rotating the power shaft, gearing mounted in the housing for causing rotation of the power shaft to effect rotation of the drive shaft, a plurality of idler sheaves mounted on the underside of the track, a drive wheel mounted on the drive shaft, and a flexible drive member disposed on the drive wheel and the idler wheels with its ends fastened to opposite ends of the car whereby rotation of the motor in one direction hauls the car out of the furnace and rotation in the opposite direction hauls the car into the furnace.

4. In a furnace, a car, a track for the car, a drag-out unit comprising a housing, a pair of bearings disposed one in each side of the housing adjacent one end thereof, a drive shaft rotatably mounted in the bearings, a bearing cap mounted on the housing at each of said bearings in position to cap that bearing, each of said bearing caps having a short trunnion shaft extending outwardly for use in providing a point of support for the housing, a power shaft mounted in the housing, gearing connecting the power shaft and the drive shaft, a motor mounted on the housing for rotating the power shaft, a pair of brackets attached to and supported by the underside of the track and disposed to receive the trunnion shafts on the bearing caps for a two point suspension of the drag-out unit, a torque bar for supporting the other end of the housing, from the underside of the track, and a flexible drive member connected with the drive shaft and attached to the car whereby rotation of the drive shaft will haul the car along the track.

5. In a drag-out mechanism for a furnace having a car movably mounted on a track, a housing, a power shaft and a drive shaft mounted in the housing, a motor mounted on the housing and connected to drive the power shaft, a plurality of speed reducing gears mounted in the housing and connecting the power shaft and the drive shaft whereby rotation of the power shaft causes rotation of the drive shaft, a drive wheel fixed on the drive shaft, a flexible drive member disposed on the drive wheel with its ends connected to opposite ends of the car whereby rotation of the motor in one direction hauls the car out of the furnace and rotation in the opposite direction hauls the car into the furnace, and members depending from the track for supporting the housing at only three points on the underside of the track.

6. A drag-out unit for a car type furnace, comprising a housing, a drive shaft rotatably mounted in a horizontal and transverse position in one end of the housing, a power shaft mounted in the opposite end of the housing, a pair of trunnions mounted on the sides of the housing, one at each end of the drive shaft for use in providing a line of support, a torque device for supporting the other end of the housing, reducing gearing disposed between and connecting the power shaft and the drive shaft, and a motor mounted on the housing for rotating the power shaft to operate the gearing to rotate the drive shaft.

7. A drag-out unit for a car type furnace, comprising a housing, a pair of bearings disposed one in each side of the housing at one end thereof, a drive shaft rotatably mounted in the bearings in the housing, a bearing cap mounted on the housing at each of said bearings in position to cap that bearing, each of said bearing caps having a short trunnion shaft extending outwardly for use in providing a point of support for the housing, a torque bar for supporting the other end of the housing, a power shaft mounted in the housing, gearing connecting the power shaft and the drive shaft, and a motor mounted on the housing for rotating the power shaft.

8. In a furnace, a car, a track for the car, a power unit for operating the car comprising a housing, a motor mounted on the housing and a

drive shaft and gears mounted in the housing to be operated by the motor, and three members depending from the track for suspending and supporting the power unit from only three points on the underside of the track.

9. In a furnace, a car, a track for the car, a power unit for operating the car comprising a housing and a drive shaft and gears mounted in the housing to be operated by the motor, three members depending from the track for suspending and supporting the power unit from only three points on the underside of the track, a plurality of idler wheels mounted and supported on the underside of the track, and a flexible drive member disposed on the idler wheels in position to be operated by the drive shaft for moving the car along the track.

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