Dec. 25, 1928. 1,696,801

L. E. HOWARD

HEAT TREATING APPARATUS

Filed Nov. 16, 1926 2 Sheets-Sheet 1

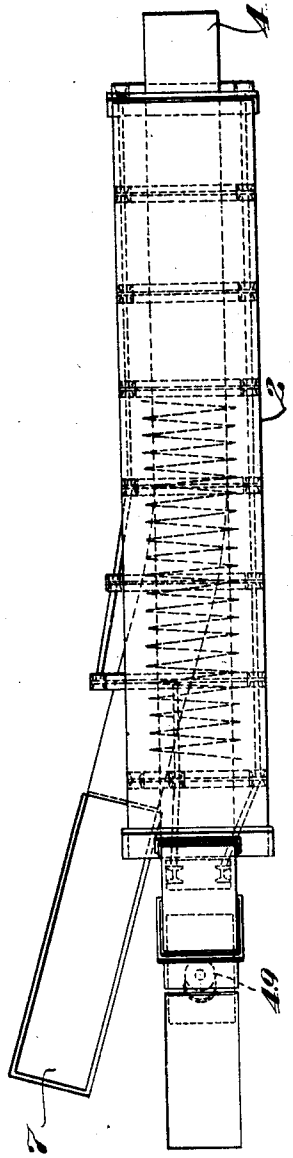


Fig. 1

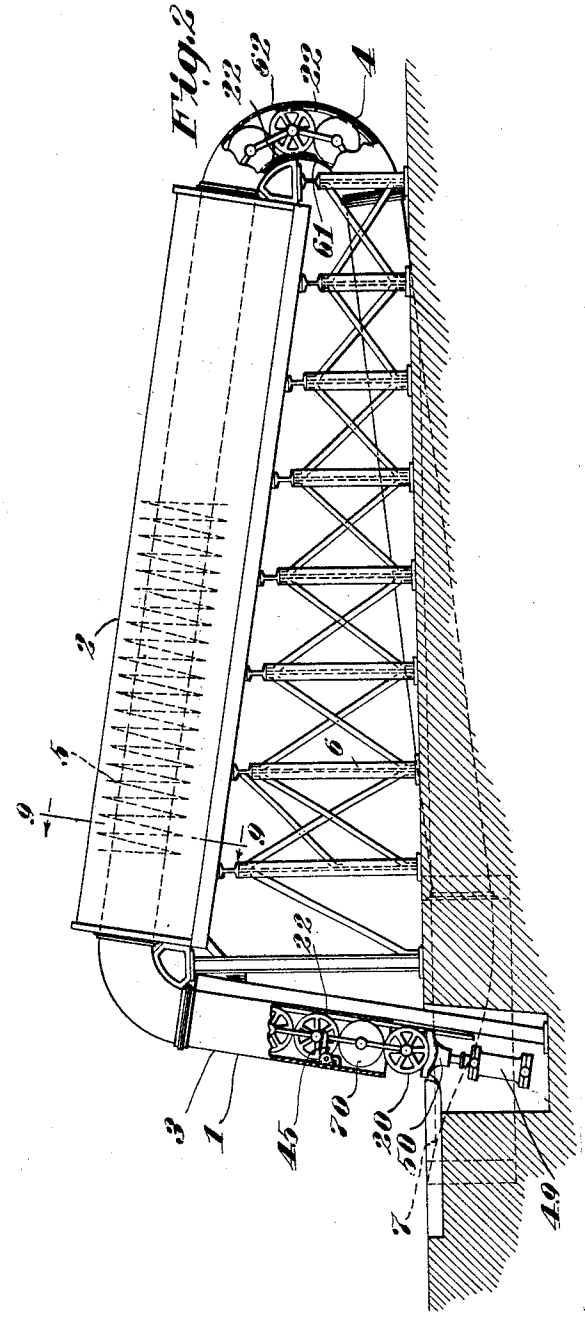


Fig. 2

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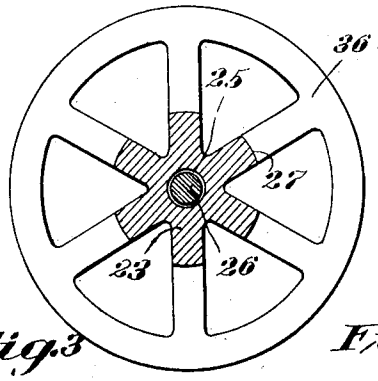


Fig. 3

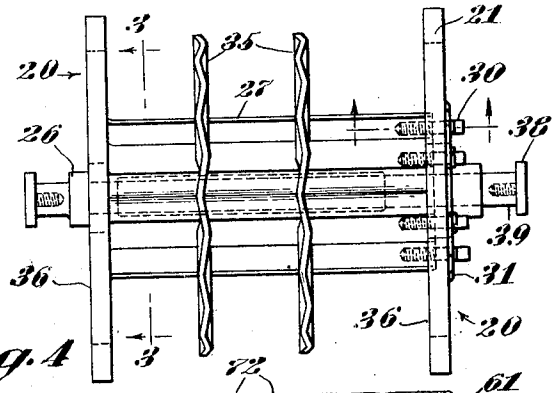


Fig. 4

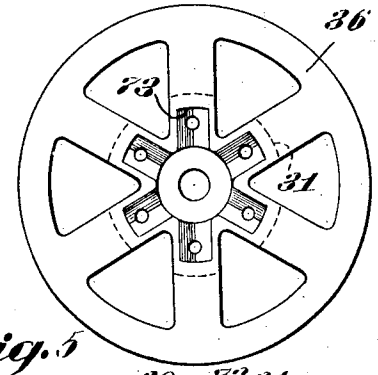


Fig. 5

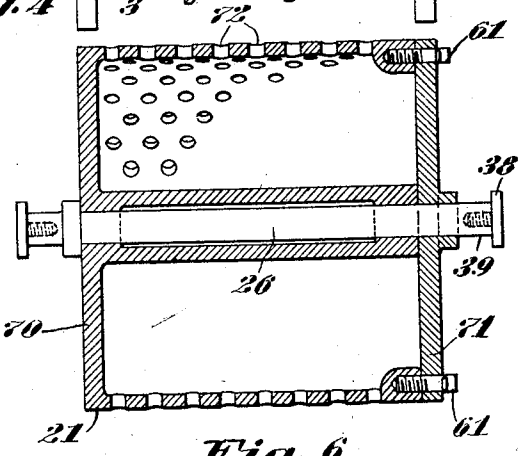


Fig. 6

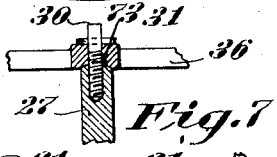


Fig. 7

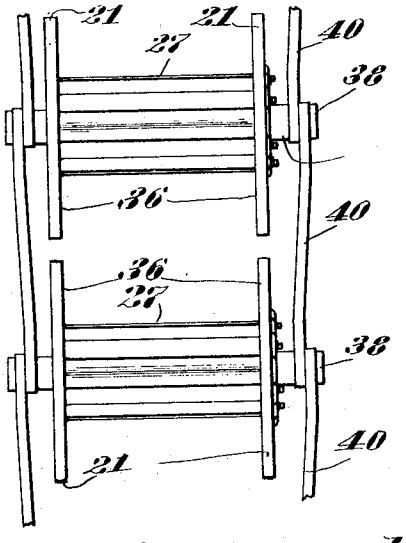


Fig. 8

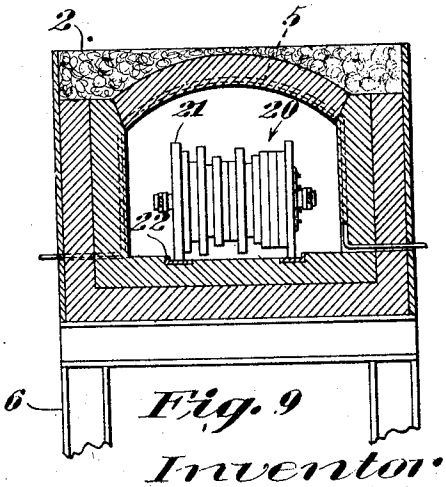


Fig. 9

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Patented Dec. 25, 1928. 1,696,801

UNITED STATES PATENT OFFICE.

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HEAT-TREATING APPARATUS.

Application filed November 16, 1926. Serial No. 148,689.

This invention relates to an improved method and means for continuously conveying articles through heat treating apparatus, and more particularly through an annealing furnace designed for the bright annealing of metal objects in a gaseous atmosphere which excludes oxygen or common air and thus prevents oxidization of the surface metal.

The invention discloses apparatus for conveying metal articles through a furnace of this character which not only permits any desired rate of movement of the articles being heat treated, but also allows the loading of conveyor units to take place at a controllable rate. These conveyor units are adapted to carry different types of metal objects, such as reels of wire, small metal parts or the like, yet they are interchangeable and are readily moved to various parts of the plant before or after the heat treating operation. The units are constructed to permit free circulation of air about the metal being treated and to be rotated in order to afford uniform heat treatment for all parts of the metal.

Furthermore, conveying means of this character is readily repaired, may still be operative when certain parts break, its units may be quickly removed and replaced, and therefore it permits of practically continuous operation of the plant with little or no need of shut-downs in order to repair the conveying mechanism, load or unload, etc. Furthermore, conveying means of this character is designed to be manufactured at a low first cost and is adaptable to installation in a wide variety of heat treating systems of this general character.

The above and further advantages and objects of the invention will be apparent to those skilled in the art upon a reading of the subjoined description and claims in conjunction with the accompanying drawings, in which:

Fig. 1 is a top plan view of an annealing furnace using the improved conveying system;

Fig. 2 is a side elevation of the same furnace with a part of the wall thereof broken away;

Fig. 3 is a section on line 3—3 of Fig. 4;

Fig. 4 is an elevational view of a conveyor unit;

Fig. 5 is an end view of a part of the same unit;

Fig. 6 is a central sectional view of another form of unit;

Fig. 7 is a section on line 7—7 of Fig. 1;

Fig. 8 is a plan view of a portion of the conveyor train; and

Fig. 9 is a section on line 9—9 of Fig. 2.

Conveyor means of the type illustrated herein is designed to be used in a wide variety of furnaces, ovens and the like wherein metal objects, such as reels of wire or small metal parts are to be annealed or treated in any analogous manner. The conveyor system is more particularly illustrated as used in conjunction with an annealing furnace adapted to accomplish bright annealing of metal in an inert gas, such as nitrogen, hydrogen, or preferably ordinary illuminating gas.

A furnace of this character, shown in Figs. 1, 2 and 9, may comprise a passageway 1 having a sharply inclined upwardly extending entrance 3; this is continued in an elevated heating zone 2 which has a long gradual downward slope and which, in turn, merges into a reverse curve 4, from which the passage inclines still further downwardly but in a generally longitudinal direction substantially opposite to its previous extent so that the two elongate inclined portions of the passage form an acute angle with each other as viewed in side elevation, Fig. 2. The passageway then terminates in an upwardly extending outlet portion 7 which preferably comprises a sealing vat of oil or other suitable liquid. A suitable gas which is lighter than air, such for example as ordinary illuminating gas is trapped in the passage and is prevented by the liquid seal from passing out of the passage with objects moving therethrough, thus excluding air and preventing oxidization of the metal surfaces. The elevated heating zone preferably is covered with suitable heat-resistant material and is provided with suitable heating elements, such as the electric resistance units 5, which are adapted to raise the temperature of the interior of this portion of the passageway or furnace. Fig. 9 shows

such an arrangement in cross section, the resistance elements 5 being located in the side walls and above the passageway and being surrounded with layers of fire brick or similar heat-resistant material.

Any suitable supporting means, such as the framework 6, is provided to support the elevated heating chamber of the furnace in the manner shown. The outlet 7 of passageway 1 preferably is at one side of the inlet, as indicated in Fig. 1, to permit the ready removal of objects therefrom. As thus described the annealing furnace is illustrative of a common type of furnace which may be varied in many suitable ways to suit different installations and plants and is merely exemplary of what is well known in the art.

The present invention pertains more particularly to the provision of improved conveyor means for supporting and carrying articles which pass through a heat treating furnace of this general character. Heretofore it has been common in the art to provide continuous chains, moving tables, and the like to support objects to be annealed. However, many disadvantages which have accompanied the use of such conveying means are obviated by the present mechanism which comprises a series of conveyor units or rolls 20 and 70 having peripheral portions 21 which are adapted to roll in a suitable flanged or grooved track 22, or upon the floor of the passageway. These peripheral portions of the conveyor unit or roll may be the rims of spider plates 36 at either end of rolls 20, while the intermediate part thereof comprises a suitable core 23 of spider-like cross section having radiating ribs 27 aligned with the radiating arms of the spider plates and a central opening 25 to receive and rotate about an axle 26. If desired, the core 23 and one of the spider plates 36 may be formed integrally or permanently united as disclosed in Fig. 4. Preferably at least one plate 36 is detachable and is provided with depressions 73 to interfit with the end of the core 23 (Fig. 5) being held to the same by studs 30 which are provided with suitable taper pins 31 passing through transverse openings 32 (Fig. 7).

The axle 26 of the roll projects from either end thereof and is provided with detachable screw-threaded heads 38 and bearing portions 39 of restricted diameter adjoining the threaded heads, which are adapted to engage openings in connecting links 40 to tie the conveyor rollers together in a series or train. Links 40, as disclosed more specifically in Fig. 8, may comprise metal bars having openings at either end and being slightly bent, whereby one end thereof is adapted to engage the outer portion of the bearing 39 upon one axle and the opposite end is adapted to engage the inner portion of the bearing upon the corresponding end of the axle of the adjoining roll.

Beneath the inlet end of the passageway 1 is located a suitable lifting mechanism of any form, preferably a hydraulic jack 49 provided with a manually adjustable control valve and having a reciprocating plunger 50 in alignment with the opening of the passageway to push conveyors into the same. The conveyor units, being assembeld in a series, are rolled upon the plunger 50 and are thereby pushed upwardly into the steeply inclined portion 3 of the annealing furnace. A pair of suitable spring-controlled ratchets or locks 45 are adapted to engage the heads of the axle of one of the units and to prevent its dropping backward toward the jack while the plunger is retracted and another unit is being attached to the end of the train. It is thus evident that one movement of the jack is adapted to move the train forward a distance approximately equal to the center to center dimension of one of the links 40, and that the train will be maintained in its advanced position not only by the friction throughout the system but by the pawls 45.

Preferably a pair of depending links 40 are secured to the last roll which is thus being held in its advanced position and an additional roll is brought into a suitable position above the retracted plunger 50 and is joined to the train by attachment of its axle to the depending links 40, while another pair of links are secured upon this roll for connection to the succeeding roll. The jack 49 is then actuated to force the added roll upward to an advanced position in passageway 1 wherein it is engaged by pawls 45, and thus the entire train or series of rolls is advanced as each new roll is added. Meantime conveyor units issuing from the outlet of the passage may be detached from the series at any desirable intervals.

Track 22 may be located upon the lower portion of passage sections 3 and 2, while in the reversably curved portion 4, tracks 22 may be located at either side of the conveyor train, the track in the upper section terminating at 61 and the track in the lower section beginning at 62, Fig. 2, thus the rolls may continue their rolling movement on a grooved track, although their direction of rotation will be reversed at this portion of their path.

The construction of the conveyor rolls with the spiderlike core and connecting openings in the end plates permits the ready circulation of air about the central portion of the roll as well as about its periphery. Therefore, assuming that wire or similar material to be annealed is placed upon the roll either by removing end plate 36 or in any suitable way, hot air will have a maximum opportunity to circulate about the wire and to effect uniform annealing thereof as

the roll rotates on its journey through the heating zone of the furnace, exposing different portions of the wire in succession to the region of higher temperature. It is often advantageous to provide suitable spacer plates 35 to separate the reels upon one roll. If desired, these spacer plates may be either flat or may be corrugated as shown or otherwise shaped in order to aid the circulation of air about the wire and between the reels thereof. Plates 35 may be frictionally or otherwise held upon the core and may be removed when spider 36 is detached.

When it is desired to anneal various small objects such, for example, as small metal fittings, conveyor rolls, 70 adapted to be containers, as illustrated in Fig. 6, may be used interchangeably in each conveyor train or series with the conveyor rolls previously described. Such a unit comprises a cylindrical container having an axle 26 and having numerous openings or perforations 72 in its outer wall and also in its ends, if desired. The unit has a removable end 71 secured thereto by pins 61 in a manner similar to the arrangement of pins 30 in the preferred form of the invention, these pins preferably projecting from one end of the cylindrical wall and permitting the removal of one end 71 of the cylindrical container so that metal objects can be placed loosely therein. Circulation of hot air through conveyor unit 70 is permitted by the perforations, and the slow rotation thereof will result in the relative movement and turning of the various objects carried in the unit so that uniform exposure of the various metal surfaces to the heat will result.

It is particularly advantageous to have conveyor means of this character in which the units may be interchangeably assembled either to convey reels of wire or the like or various small objects or in which, if desired, many of the units in the train may be passed through the furnace without carrying metal parts when the plant or furnace is not working at full capacity. In case one of the links 40 should break the other link and the juxtaposed position of successive rolls will ordinarily permit the continued operation of the train until the broken link appears at the outlet of the furnace and may be replaced. The manually controlled hydraulic jack permits the rapidity of movement of the conveyor train to be altered at will and the loading of the same to take place during any desired interval of time. The track 22 which extends through the furnace passageway may have suitable continuations so that the conveyor units may be rolled to any convenient part of the plant.

I claim:

1. The combination of heat-treating apparatus having an upwardly inclined entrance passage and conveyor mechanism to transport articles through the apparatus, said mechanism comprising a series of rolls, a jack adjoining the entrance passage, said jack having a plunger adapted to push the rolls into the same, and means to hold the rolls in advanced position when so pushed to permit retraction of the plunger and addition of another roll to the series.

2. The combination of heat-treating apparatus having an upwardly inclined entrance passage and conveyor mechanism to transport articles through the apparatus, said mechanism comprising a series of rolls, a hydraulic jack adjoining the entrance passage, said jack having a plunger to push the rolls into the same, manual control means for the jack means to hold the rolls in advanced position when so pushed, to permit retraction of the plunger and addition of another roll to the series, whereby the speed of conveyor movement and of adding new rolls to the series may be controllably varied.

3. The combination of heat-treating apparatus having an upwardly inclined entrance passage and conveyor mechanism to transport articles through the apparatus, said mechanism comprising a series of rolls, a jack adjoining the entrance passage, said jack having a plunger to push the rolls into the same, and automatic means to hold the rolls in advanced position when so pushed in order to permit retraction of the plunger and addition of another roll to the series.

4. A conveyor of the class described comprising a series of rolls, links connecting the rolls in line and permitting their independent rotation, a cooperating track adapted to engage the peripheries of the rolls, one end of each roll being removable to permit the ready placing of articles thereon.

5. A conveyor system of the class described, comprising a series of rolls, means for adding rolls to and removing rolls from the series, a controllable pusher for pushing the series of rolls, and a spring controlled pawl for holding the rolls in advanced position while a new roll is being added.

6. A conveying system of the class described comprising a series of rolls, means for adding rolls to and removing rolls from the series, a controllable pusher for pushing the rolls, said pusher comprising a reciprocable plunger, and latch means to hold the rolls in advanced position whereby the plunger may be retracted and a new roll added to the series.

7. A conveyor system of the class described comprising a series of rolls, links connecting the axes of the rolls and permitting their independent rotation, peripheral portions of the rolls being adapted

to engage a track, said rolls being readily detachable from the links and thus from the series and being interchangeable in relation to the links and series, certain of said rolls comprising containers adapted to receive articles therein and other of said rolls comprising reels to receive wound material thereon, whereby the series of conveyor units may comprise interchangeable containers or reels.

8. A conveyor system of the class described comprising a series of rolls, links connecting the axes of the rolls and permitting their indefinite rotation, peripheral portions of the rolls being adapted to engage a track, said rolls being readily detachable from the links and thus from the series and being interchangeable in relation to the links and series, certain of said rolls comprising containers adapted to receive articles therein and having openings to permit circulation of air about said articles, other of said rolls comprising reels adapted to receive wound material upon a ribbed core provided with passages between the ribs, whereby the series of conveyor units may comprise any desired proportion of reels and of containers, both of which permit air circulation about the material carried thereby.

9. A conveyor of the class described comprising a series of interchangeable rolls, each of said rolls being adapted independently to convey material, a track in engagement with peripheral portions of the rolls, links having ends pivotally connected to the central portions of the rolls and spaced from the track, said links being detachable to permit the separate removal of any desired roll from the series.

Signed by me at Lockport, New York, this eighth (8th) day of November, 1926.

LESLIE E. HOWARD.