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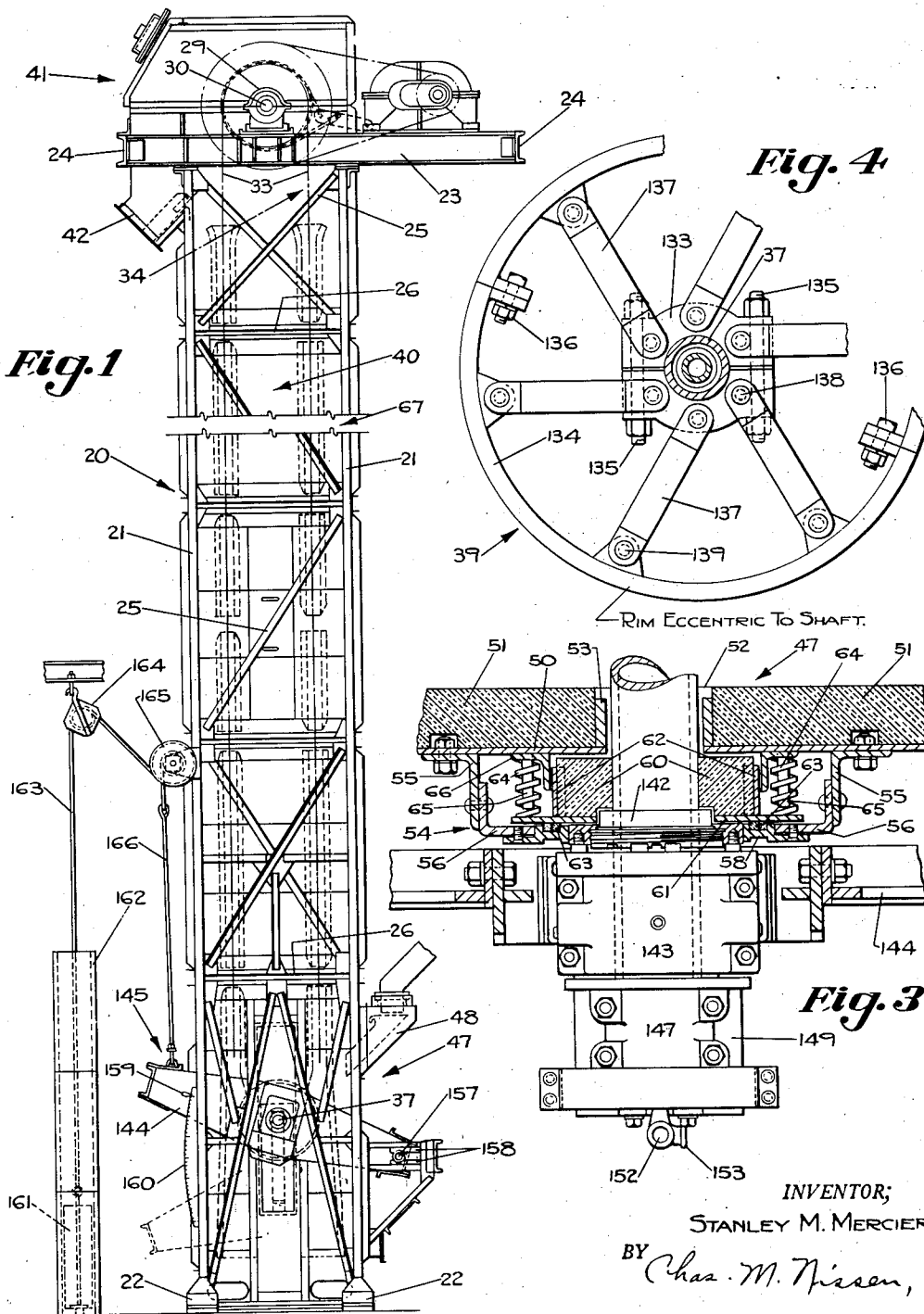
S. M. MERCIER

2,384,189

ELEVATOR

Filed May 2, 1944

3 Sheets-Sheet 1



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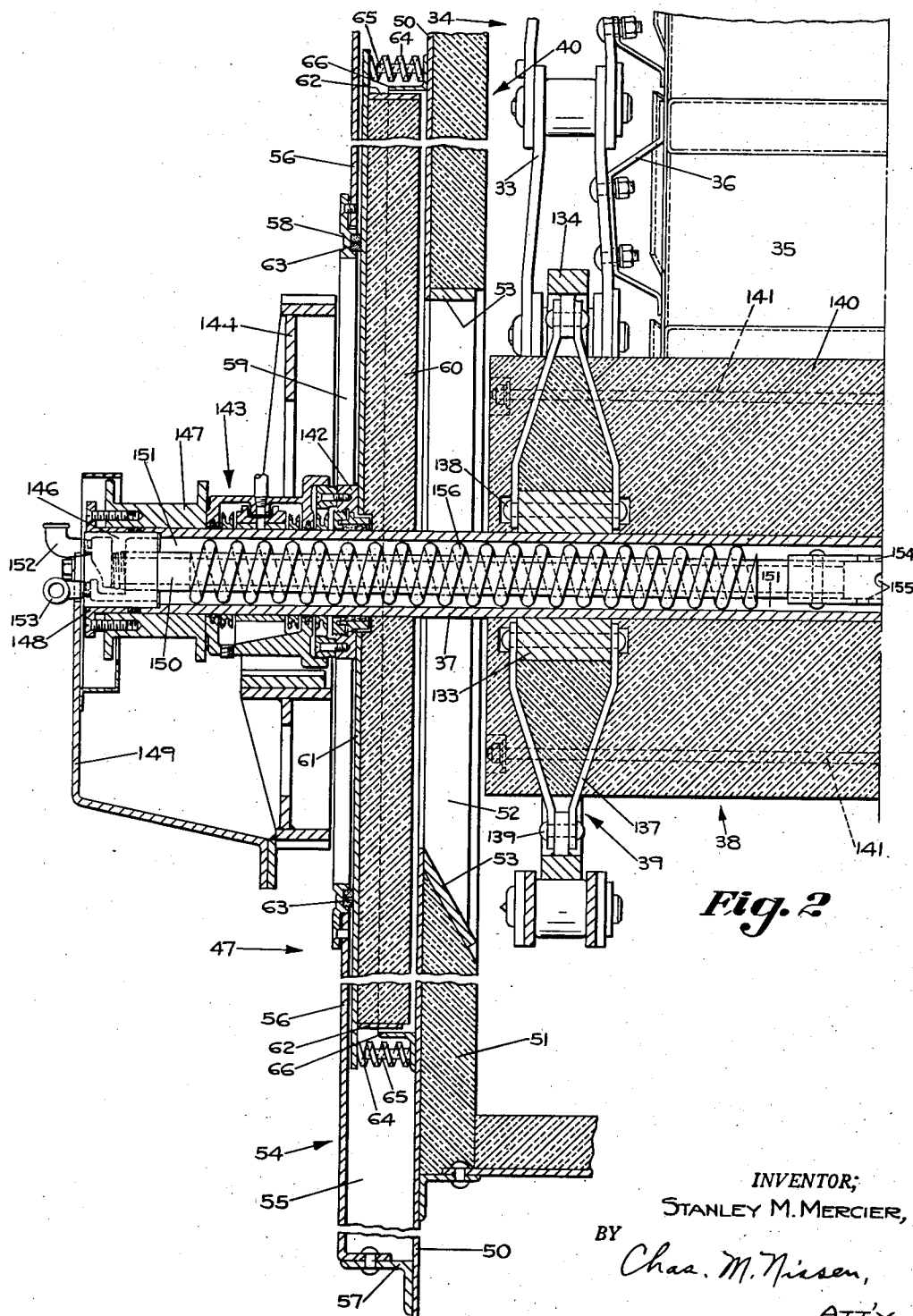
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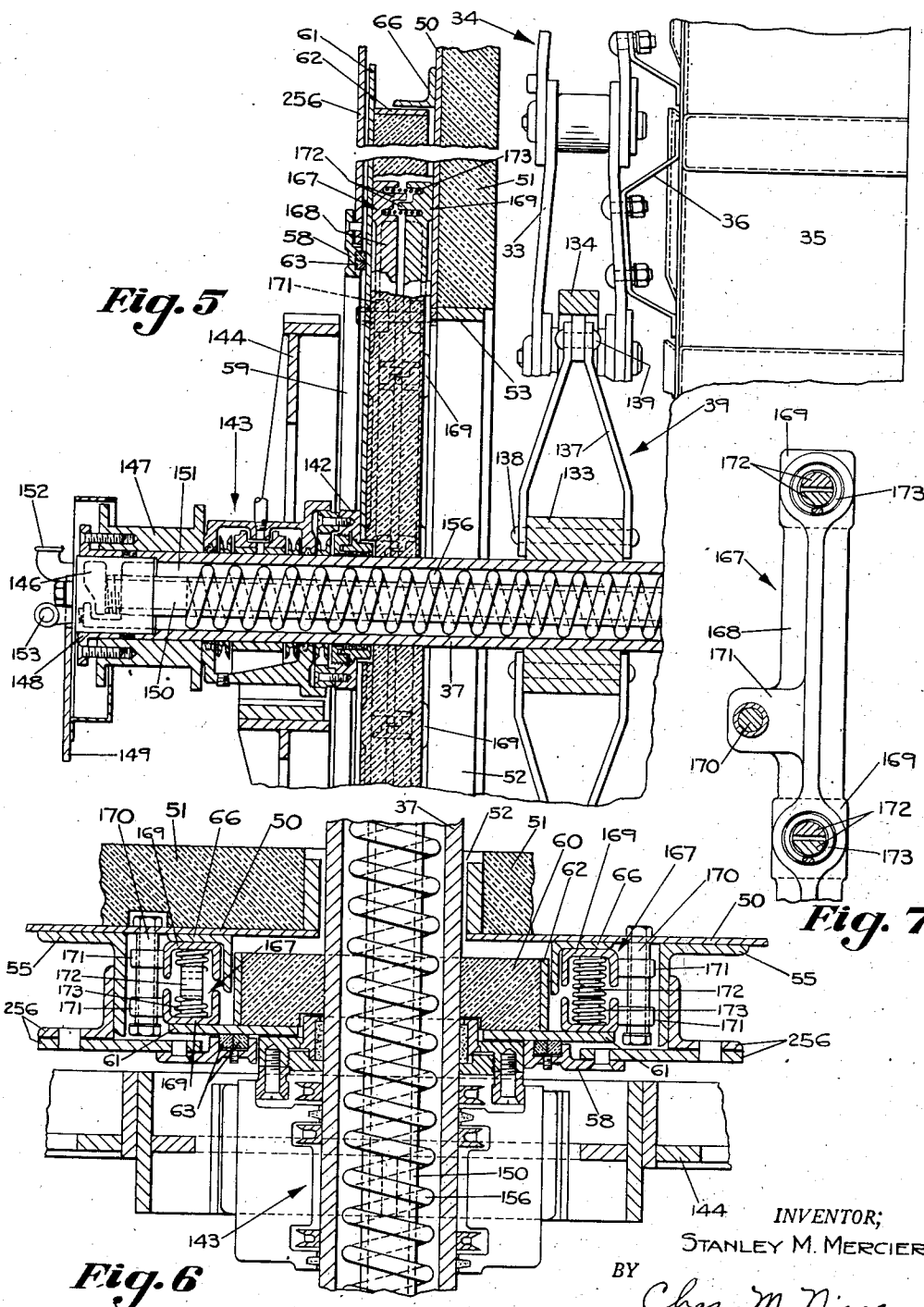
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UNITED STATES PATENT OFFICE

2,384,189

ELEVATOR

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Application May 2, 1944, Serial No. 533,718

8 Claims. (Cl. 198—207)

This invention relates to an elevator or conveyor which is constructed particularly for the elevation of hot material such as hot clay used in the cracking of petroleum.

An object of the invention is to provide an improved elevator or conveyor of the above-mentioned type in which a dust, heat or gas seal is provided between a floating or adjustable foot shaft and the housing or casing of the conveyor.

Still another object of the invention is to provide a device of the above-mentioned type to which the floating foot shaft is connected, said pivotal frame being so mounted that the floating shaft may move in a straight line and in which the pivotal frame may be provided with a counter-balance and if desired may also be provided with an indicating device.

Still another object of the invention is to provide an improved elevator or conveyor with a seal of the above-mentioned type together with means to cause the seal mechanism to have a cyclic motion with respect to the conveyor casing or housing to prevent sticking thereof.

Still another object of the invention is to provide a wheel structure preferably insulated in part in which provision is made for expansion of the rim thereof with respect to the hub or central portion thereof.

Other objects of the invention will appear hereinafter, the novel features and combinations being set forth in the appended claims.

In the accompanying drawings,

Fig. 1 is a side elevational view of an elevator or conveyor incorporating the features of my invention;

Fig. 2 is an enlarged sectional elevational view through the axis of the foot shaft of the conveyor showing one end of the foot shaft and associated structure;

Fig. 3 is a sectional plan view showing one end of the foot shaft and associated apparatus, the view being taken substantially at right angles to the view of Fig. 2, this view showing particularly the sealing means for said foot shaft;

Fig. 4 is an elevational view of one of the wheels of the foot shaft, part of the wheel being broken away;

Fig. 5 is a view similar to Fig. 2 showing a modified structure;

Fig. 6 is a view similar to Fig. 3 showing a modified structure and showing certain details in section which are not shown in section in Fig. 3; and

Fig. 7 is a combination sectional and elevational view of a guide for a group of springs.

This application is a continuation in part of my

application for an Elevator, Serial No. 500,799, filed September 1, 1943. It is to be understood that throughout, the disclosure of this application follows that of my parent application, above identified, unless a contrary fact is distinctly indicated in the drawings or specification.

The conveyor or elevator is illustrated as a whole in Fig. 1 of the drawings and comprises a vertical or upwardly extending tower or main frame 20 which is generally rectangular in cross section and at each of the four corners includes a vertical or upright structural member such as a channel 21. Each of the channels 21 in the finally assembled condition of the main frame 20 constitutes a continuous upright member which extends from the foot or bottom of the main frame 20 to the top thereof. At their bottoms, the channels 21 are provided with feet 22 preferably rigidly attached to base members which may, for example, be mounted on a poured concrete base sunk sufficiently in the ground to provide a firm foundation. At their tops the channel members 21 are rigidly connected together by side I-beams 23 and cross channels 24, all of said structural members 21, 23 and 24 being rigidly connected together. Along the sides, each of the two front and rear channel members 21 are connected by one or more diagonal braces 25 as well as by horizontal angle braces 26.

Mounted upon the I-beams 23 at the top of the main frame 20 is a pair of bearing boxes 29 which support a horizontally extending head shaft 30 which carries a pair of head sprockets which support and drive a pair of endless chains 33 of a bucket elevator or conveyor mechanism 34. Extending between the two chains 33 and carried thereby is a plurality of buckets 35 (see Fig. 2), said buckets being rigidly attached adjacent their sides to the inner side bars of the chains 33 by appropriate brackets or attachments 36.

At the foot or bottom of the tower or main frame 20 there is a foot shaft 37 which is disclosed in detail in Fig. 2 of the drawings and which is described more completely hereinafter. For the moment it may be pointed out that the foot shaft 37 carries a foot shaft assembly 38 including a pair of spaced traction wheels 39 which receive the two endless chains 33.

Supported by the main frame 20 and generally within the structural members thereof, there is a totally enclosing housing or casing 40 which includes as the three principal parts a head section 41, a foot section 47 and a plurality of intermediate sections 47. All of these sections are preferably formed at least in part of insulating

material so that the enclosing housing or casing is insulated against heat. Also the head section 41 is provided with a discharge spout or chute 42 by which material is discharged from the conveyor 34.

The foot part or section 47 involves a number of important details of construction. In the first place, the foot section includes a feed chute 48 by which hot clay or other material to be elevated is delivered preferably directly into the buckets 35 at the bottom of the feed run of the conveyor mechanism 34. Furthermore, the foot section or part 47 includes structure providing a gas tight dust and heat seal for the foot shaft 37 which is mounted for substantially free vertical movement through a limited range so as to compensate for changes in the lengths of the chains 33, particularly under the influence of temperature changes. Furthermore, it may be pointed out that the main frame 20 adjacent the foot section 47 is provided with considerable auxiliary equipment, as hereinafter described more completely.

Attention is now directed to Figs. 1, 2 and 3 of the drawings and to the structure of the foot part or section of casing 47 and associated apparatus which provides the gas tight heat and dust seal while providing for floating vertical movement of the foot shaft 37.

Referring particularly to Figs. 2 and 3 of the drawings which illustrate structure which is duplicated on each side of the elevator, it will be seen that the housing or casing 40 in this section includes a steel or metal side plate 50 which is attached to the adjacent portion of the main frame or tower 20. Rigidly attached to the side plate 50 and forming the lining of this portion of the casing or housing 40 is a heavy plate of insulating material 51 which is the same in texture as the insulating material used throughout most of the casing 40 to provide the insulating lining thereof and is preferably in the form of a molded insulating material having high insulation characteristics. The metal plate 50 and the insulating material 51 are provided with a vertical elongated slot 52 which is provided with a metal frame 53, rigidly attached to the plate 50 as by welding. The foot shaft 37 extends through the slot 52 and frame 53 and is mounted to move freely in a vertical direction therein. On the outside of the plate 50 and adjacent the slot 52 is a stationary box structure 54 which is formed by a pair of spaced vertical angle members 55 (see Fig. 3) which are rigidly attached to the plate 50 by appropriate bolts. Riveted to the angle members 55 and extending across the outer free ends thereof is a U-shaped cover plate 56. Both the top and bottom of the cover plate 56 are provided with angle members which extend between the upright angle members 55 and are rigidly connected thereto as well as to the plate 50 and the cover plate 56. The bottom of these angle members is seen at 57 in Fig. 2 of the drawings. It is thus seen that the angle members 55 and 57 and the U-shaped cover plate 56 cooperate to provide an enclosing stationary box adjacent the slot 52 and this stationary box is provided with an elongated slot similar to the slot 52 which is defined by a border frame member 58, which frame member 58 is rigidly attached thereto as by screws and includes a central elongated slot 59, which slot 49 is somewhat wider than the slot 52.

Mounted on the foot shaft 37 to move upwardly and downwardly therewith while at the same time providing for free rotation of shaft 37 with respect thereto, is a rectangular plate 60 of insulating

material, similar to the material 51, which is rigidly attached to a shiftable steel or metal plate 61 which has a rigidly attached frame 62 which frames the insulation plate 60 and helps to hold it rigid with the steel plate 61. The composite shiftable plate 60-61 is mounted for sliding movement within the aforescribed box formed by angle members 55 and 57 and cover plate 56. In cooperation with the side plate 50 means are provided so as to effect a substantially continuous insulating wall to seal the slot 52 for all positions of adjustment of the shaft 37. To this end the inner periphery of the frame member 58 is provided with a continuous groove which carries and supports a pair of continuous strips of gasket material 63 against which the steel plate 61 continuously bears and has a sliding relation, thus providing an effective seal along this line of contact while permitting free sliding movement of the composite plate 60-61.

Furthermore, the steel plate 61 extends around its entire periphery beyond the insulation plate 60 and the frame 62 and provides abutment or bearing areas for a plurality of coil springs 64 which are received by spaced guide posts 65 welded to a floating rectangular frame 66 made from an angle member which is bent or otherwise formed in a rectangle. The bottom of said frame 66 has frictional sliding contact with the side plate 50, the outwardly extending flange of which overlaps the frame 62 so that as the composite plate 61-62 moves up and down, it will carry the floating frame 66 held in frictional contact with the side plate 50. The overlapping flange of the frame 66 has a relatively close fit with the frame 62 so as to provide an effective seal therewith, though there is sufficient clearance between the two to provide for their relative movement along a horizontal axis. It is therefore seen that there is a double seal between the slot 52 and the atmosphere, one seal being provided by the cooperation of floating frame 66 with the side plate 50 and with the frame 62, the other seal being provided by the insulating strip 63 in cooperation with the steel plate 61.

Attention is now directed particularly to the structure of the foot shaft assembly 38 and the mechanism for mounting the foot shaft 37 for vertical adjustment in the slots 52. The structure illustrated in Fig. 2 is duplicated on each side of the unit.

The foot shaft assembly 38 includes at each side a traction wheel 39, the structure of which is illustrated in detail in Figs. 2 and 4 of the drawings. Said wheel 39 includes a hub 133 and a plain ring type rim 134, the hub and rim being split, the former being assembled and clamped to the shaft 37 by a pair of elongated bolts 135, the sections of rim 134 being connected by spaced bolts 136. Interconnecting the hub 133 and rim 134 is a plurality of yoke type spokes 137. It is to be noted that all of the spokes 137 extend from the hub 133 to the rim 134 in a similar manner and each is offset from the radial to provide for relative expansion between the hub 133 and the rim 134. To aid in this expansion the opposite ends of each spoke 137 are pivotally attached to the hub 133 and ring 134 by rivets 138 and 139, respectively. It is evident that if the ring 134 should expand under the influence of the heat in the casing 40 it will be free to do so and the spokes 137 will swing about their pivot points and move toward a radial position. Conversely, should the rim 134 contract, the spokes 137 would move farther away from the radial position.

Furthermore, the rim 134 is slightly eccentric to its axis of rotation, which is the axis of shaft 37, for a purpose hereinafter set forth in detail.

The construction provided is such as to compensate readily for temperature variations to which the wheel 39 is subjected, and to take care of the fact that shaft 37 is cooled while the rim 134 is hot while the conveyor is in operation. The hub 133 and the major portion of each of the spokes 137 are embedded in a drum of insulating material 140 which is built up of a plurality of axially separable sections held together by longitudinal tie rods 141. The drum 140 is also split along a plane passing through the axis of shaft 37, the parts being held together by tie bolts not shown.

The insulating material which is between the spokes 137 may be plastic in form when the foot shaft assembly 38 is originally assembled and it will become hard under the influence of the heat to which it is subjected.

Each end of the shaft 37 extends through a round hole in the insulation plate 60 and the attached steel plate 61, as previously described, and a stuffing box 142 is attached to the plate 61 which provides a seal between said shaft 37 and said steel plate 61 adjacent this opening. Each end of shaft 37 is also supported in a journal bearing 143 which is of the totally enclosed type and which is mounted in a beam 144. The two beams 144 on opposite sides of the casing 40 are preferably placed inside the main frame 20 and constitute the two side members of a box like frame 145 (see Fig. 1) the structure of which is described more completely hereinafter.

Mechanism is provided for cooling each of the bearings 143. To this end, the shaft 37 is hollow and there is a fitting 146 adjacent each end thereof which is received in a collar 147 clamped to the shaft 37, there being a packing ring and associated packing gland 148 to provide a water seal between the cylindrical outer surface of the fitting 146 and the collar 147, as well as with the rotating shaft 37. The fitting 146 is stationary and is supported by a bracket 149 which is connected to the beam 144. Connected to the fitting 146 is a pipe 150 the outside surface of which is spaced inwardly from the bore 151 of the hollow shaft 37. Cooling water feed elbow 152 is connected through fitting 146 to the interior of pipe 150 and water discharge elbow 153 is connected by fitting 146 to the passageway formed on the outside of the pipe 150 and the surface of bore 151. The two pipes 150 which extend from opposite sides of the assembly 38 are connected together by a pipe 154 (Fig. 2) which telescopes with the two pipes 150 and is riveted to them. This pipe 154 is provided with radial bores 155 providing ports to permit the feed water on the interior of the pipes 150 to flow outwardly into the return passageways between the outside of pipes 150 and the inside of hollow shaft 37. A brass helix 156 surrounds each pipe 150 and is rigidly attached thereto and spaced a very small amount from the wall of bore 151 to provide an elongated helical path for the cooling water, causing it to scour the interior surface of the hollow shaft 151 and thus to cool it. It is to be noted that the cooling path of this foot shaft 37 extends appreciably into the assembly 38 and consequently the interior thereof will be cooled.

Attention is now directed particularly to Fig. 1 of the drawings and to the construction which

provides for the floating vertical relation of the foot shaft assembly 38. The box like frame 145 is pivotally mounted at its rear on two pivot points one of which is seen at 157, said pivots 157 being mounted on rollers which roll between the top and bottom guides 158. As a consequence, as the frame 145 pivots about said pivots 157 they move in a horizontal plane to provide for vertical or rectilinear instead of arcuate travel of the shaft 37. It is, of course, evident that the axis of pivots 157 is parallel with the axis of shaft 37.

It is also desirable to indicate the position of the frame 145 and, as a consequence, of the shaft 37 in a slot 52. To this end one of the frame beams is provided with a pointer 159 which co-operates with a stationary scale 160 attached to the main frame 20 and indicates directly the position of the frame 145. It is, of course, obvious that in view of the great height of the elevator or conveyor there will be an exceedingly heavy load on the head shaft 30 and on the links of chains 33 at the upper ends since they must support the weight of substantially the entire conveyor mechanism 34. In order not to increase this load further, the frame 145 and the foot shaft assembly 38 is substantially counterbalanced by means of a counterbalancing weight 161 preferably mounted in a housing 162 and suspended from one or more cables 163 which is reeved over a pulley 164 which may be hooked to any frame structure and attached to a double diameter drum 165. One or more suspension cables or rods 166 extend from the small diameter of the drum 165 to the free end of the frame 145. The double cylindrical drum 165 operates as a moment multiplier to reduce the necessary weight of the counterbalancing weight 161.

In order to prevent damage to the unit, and also to insure its proper operation, it is necessary to prevent the sealing plate 60—61 becoming stuck, particularly in an elevated position. To prevent such sticking is the purpose of making the outer surface of rim 134 slightly eccentric relative to the axis or outer surface of shaft 37. As a consequence of this eccentricity, during operation of the conveyor mechanism 34 the shaft 37 will be cyclically continuously moved upwardly and downwardly a slight amount thus preventing the sticking of said sealing plate 60—61 to any adjacent structure. This, of course, also prevents sticking of the frame 66 to plate 50.

In Figs. 5, 6 and 7 there are shown certain features which have been modified as compared with those above described. It is to be understood, however, that unless a contrary fact is indicated the structure of Figs. 5 and 6 follows that above described and disclosed particularly in Figs. 2, 3 and 4. Only those structural features which differ from those above described will be specifically pointed out.

The structure for mounting the frame member 58 has been modified in that it includes a composite member 256 including an upright plate and a pair of upstanding rigidly attached angle members which in turn are rigidly attached to the angle members 55. This structure is clearly illustrated in Fig. 6 of the drawings.

There is a further modification particularly in the mechanism for pressing the floating frame 66 against the plate 50 and simultaneously pressing the steel plate 61 against the seal strips 63. This modified mechanism includes a similar structure along each side of the frame 62 and cooperating with the opposite vertical edges of the plate 61.

and the plate 50 on opposite sides of the shaft 37. Each of said mechanisms includes a pair of similar complementary upstanding spring holders 167 shown in detail in Fig. 7 of the drawings. Each spring holder 167 is formed preferably as an elongated casting having a body 168 provided with spaced pads 169. Each pair of complementary holders 167 is supported from the plate 50 in a vertical or upstanding position by a pair of spaced bolts 170 provided with sleeves which extend into holes in lugs 171, there being a pair of lugs 171 on each holder 167, one near the top and one near the bottom. It is thus evident that there is a pair of complementary holders 167 along each edge of the sealing mechanism and one of each of said pair of holders abuts a vertical edge of plate 61 and the other abuts a vertical portion of the floating frame 66. Each of these complementary spring holders 167 thus has a plurality of pads 169, one set of pads contacting the floating frame 66, the other set contacting the plate 61 adjacent an upright edge. Since the two holders 167 of each complementary pair are free to move a limited amount toward and from each other by virtue of the sliding relation between their lugs 171 and the supporting bolts 170 they will press the floating frame 66 against the plate 50 and also press the plate 61 against the strips 63 while providing for sliding movement therebetween as dictated by the up and down movement of the shaft 37 by virtue of the eccentricity of the rim 134 and also by virtue of the expansion and contraction of the chains 33. To effect this sealing action each pad 169 of each spring holder 167 includes complementary split pin means 172, that is, the pins 172 are formed half on each complementary pad 169 of the two complementary holders 167. Surrounding each of said pins 172 is a helical spring 173 the ends of which are received in cups formed in the pads 169. The springs 173 push the complementary spring holders 167 apart thus aiding in effecting the sealing action above described. It is, of course, evident that there will be a number of pads 169 and associated pins 172 and springs 173 spaced from the tops to the bottoms of the spring holders 167.

There is another modification of the structure as illustrated in Figs. 5 and 6 as compared with that of Figs. 2 and 3. It has been found that in some installations it is not absolutely necessary to insulate the shaft 37 and the wheel 39, consequently in the structure of Figs. 5 and 6 no insulation comparable with insulation 140 has been provided. Under certain circumstances it may even be desirable to eliminate the insulation 60 but it will still be desirable to provide the seal to prevent entrance of dirt as well as prevent the free ingress or egress of cooling air through the slot 52. In any case, however, the eccentricity of the rim 134 of the wheel 39 with respect to its axis of rotation is maintained.

To review briefly the operation of the device in both modifications, when the elevator is running the conveyor mechanism 34 receives material from the feed chute 48 and carries it in the buckets 35 discharging it at chute 42. By virtue of the eccentricity of the rims 134 of wheels 39 the shaft 37 together with those parts which are connected to move upwardly and downwardly therewith will so move thus preventing any sticking of the sealing mechanism for the shaft 37. Boxlike frame 145 will, of course, move with the shaft 37 and its movement, for example as registered by indicator 159—160, will

indicate not only the length of the chains 33 but also indicate by its cyclic up and down movement that the sealing mechanism is not stuck. The sealing mechanism provides a double seal, one seal being between the sliding frame 66 and the frame 62 of insulating material 60, the other being between the pads 63 and the plate 61. The sealing mechanism, however, is relatively free to slide upwardly and downwardly with the frame 66 sliding over the plate 50 and the plate 61 sliding over the pads 63. Cooling of the shaft 37 by fluid or liquid cooling mechanism prevents burning out of the bearing 143.

Obviously those skilled in the art may make various changes in the details and arrangement of parts without departing from the spirit and scope of the invention as defined by the claims hereto appended and I wish therefore not to be restricted to the precise construction herein disclosed.

Having thus described and shown an embodiment of my invention, what I desire to secure by Letters Patent of the United States is:

1. In an elevating conveyor, an enclosing housing, endless chain conveyor mechanism in said housing including a head shaft, a second shaft extending through said housing, means providing a slidable seal between said second shaft and said housing, and means including an eccentric wheel on said second shaft for moving said slidable seal cyclically upwardly and downwardly to prevent sticking thereof when said conveyor mechanism is in operation.

2. In an elevating conveyor, an enclosing housing, endless chain conveyor mechanism in said housing including a head shaft, a second shaft extending through said housing, means providing a slidable seal between said second shaft and said housing, and means for moving said slidable seal cyclically upwardly and downwardly to prevent sticking thereof when said conveyor mechanism is in operation.

3. In a conveyor, a casing having side walls of material providing heat insulation, conveyor mechanism in said casing including a conveyor shaft extending through an opening in said casing and movable upwardly and downwardly relative thereto, means providing a seal between said shaft and casing including a plate having material providing heat insulation and having an opening through which said shaft extends, said plate moving upwardly and downwardly with said shaft while providing for rotation thereof, spring pressed means providing a seal between said plate and said casing while providing for sliding movement of said plate over said casing, and means including an eccentric wheel on said shaft for causing up and down movement of said shaft and plate when said conveyor mechanism is operating.

4. In a conveyor, a casing having side walls of material providing heat insulation, conveyor mechanism in said casing including a conveyor shaft extending through an opening in said casing and movable upwardly and downwardly relative thereto, means providing a seal between said shaft and casing including a plate having material providing heat insulation and having an opening through which said shaft extends, said plate moving upwardly and downwardly with said shaft while providing for rotation thereof, spring pressed means providing a seal between said plate and said casing while providing for sliding movement of said plate over said casing, and means for causing cyclic up and

down movement of said shaft and plate when said conveyor mechanism is operating.

5. An elevator including a casing, a conveyor therein including a foot shaft extending through said casing, seal means for said shaft including a plate contacting said casing and movable with said shaft, and a foot wheel on said shaft having a rim eccentric to the axis of said shaft whereby said shaft moves upwardly and downwardly as it rotates.

6. A conveyor including a casing, a conveyor shaft extending through an opening in said casing, a seal plate around said shaft slidable over said casing, a guide for said seal plate, said seal plate being movable between said guide and casing, spring means extending between said guide and seal plate and pressing said seal plate to sealing position, said spring means including opposed elongated abutment members abutting said seal plate and said guides with aligned split pins formed in two parts on said opposed members, and springs surrounding said pins and pushing said members apart.

7. A conveyor including a casing, a conveyor

shaft extending through an opening in said casing, a seal plate around said shaft slidable over said casing, a guide for said seal plate, said seal plate being movable between said guide and casing, spring means extending between said guide and seal plate and pressing said seal plate to sealing position, said spring means including opposed elongated abutment members abutting said seal plate and said guides with aligned split pins formed in two parts on said opposed members, springs surrounding said pins and pushing said members apart, and means supporting said members in opposed upright positions while providing for relative movement thereof toward and from each other.

8. A conveyor including a casing, spaced wheel means, endless conveyor means supported on said spaced wheel means, shaft means for one of said wheel means extending through said casing, a sliding seal between said shaft and casing, the wheel associated with said shaft being eccentric whereby said seal slides cyclically relative to said casing as said conveyor means operates.

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