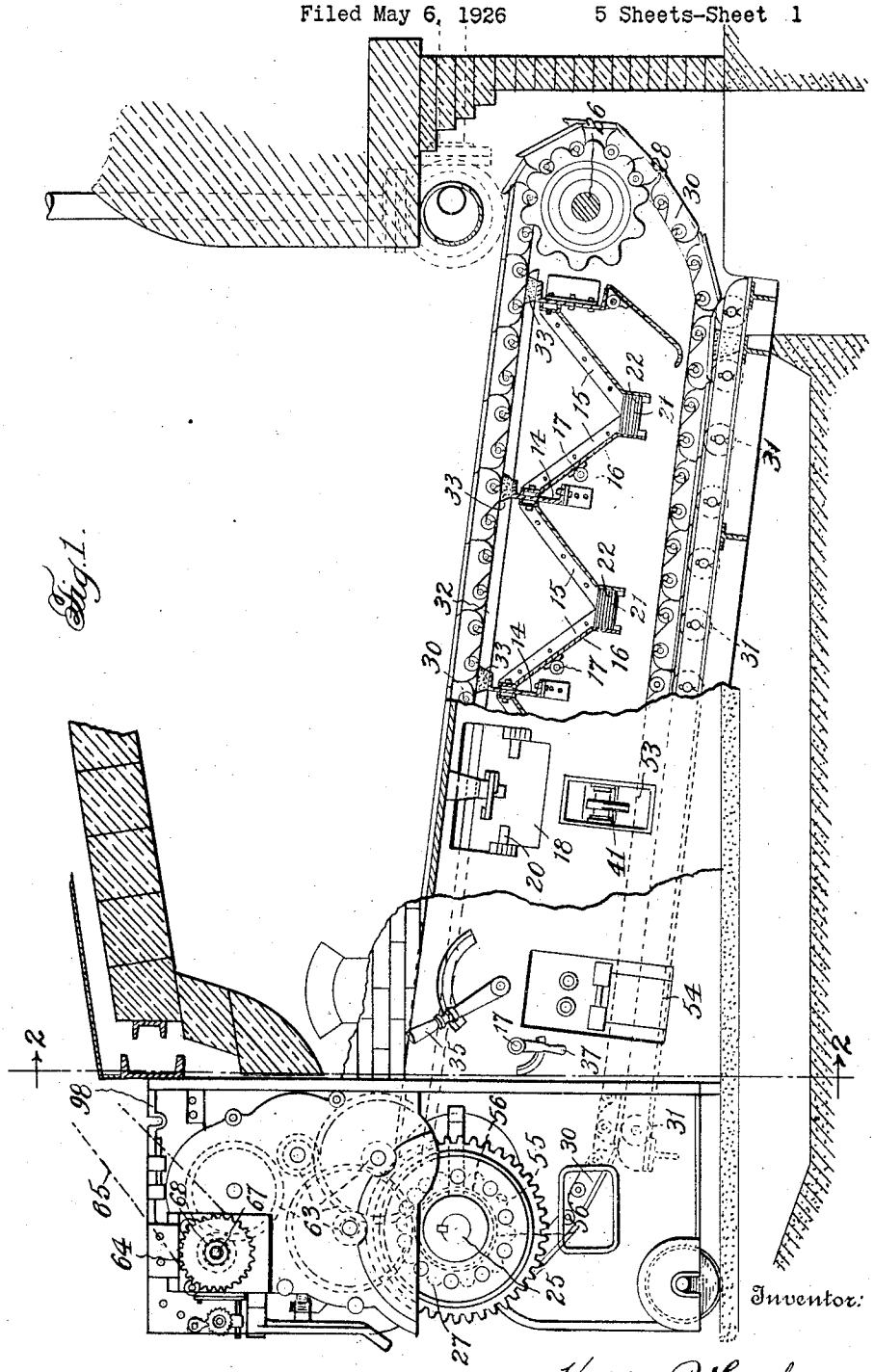
Nov. 8, 1932. H. P. GROHN 1,887,153

FURNACE

Filed May 6, 1926 5 Sheets-Sheet 1



Nov. 8, 1932. H. P. GROHN 1,887,153

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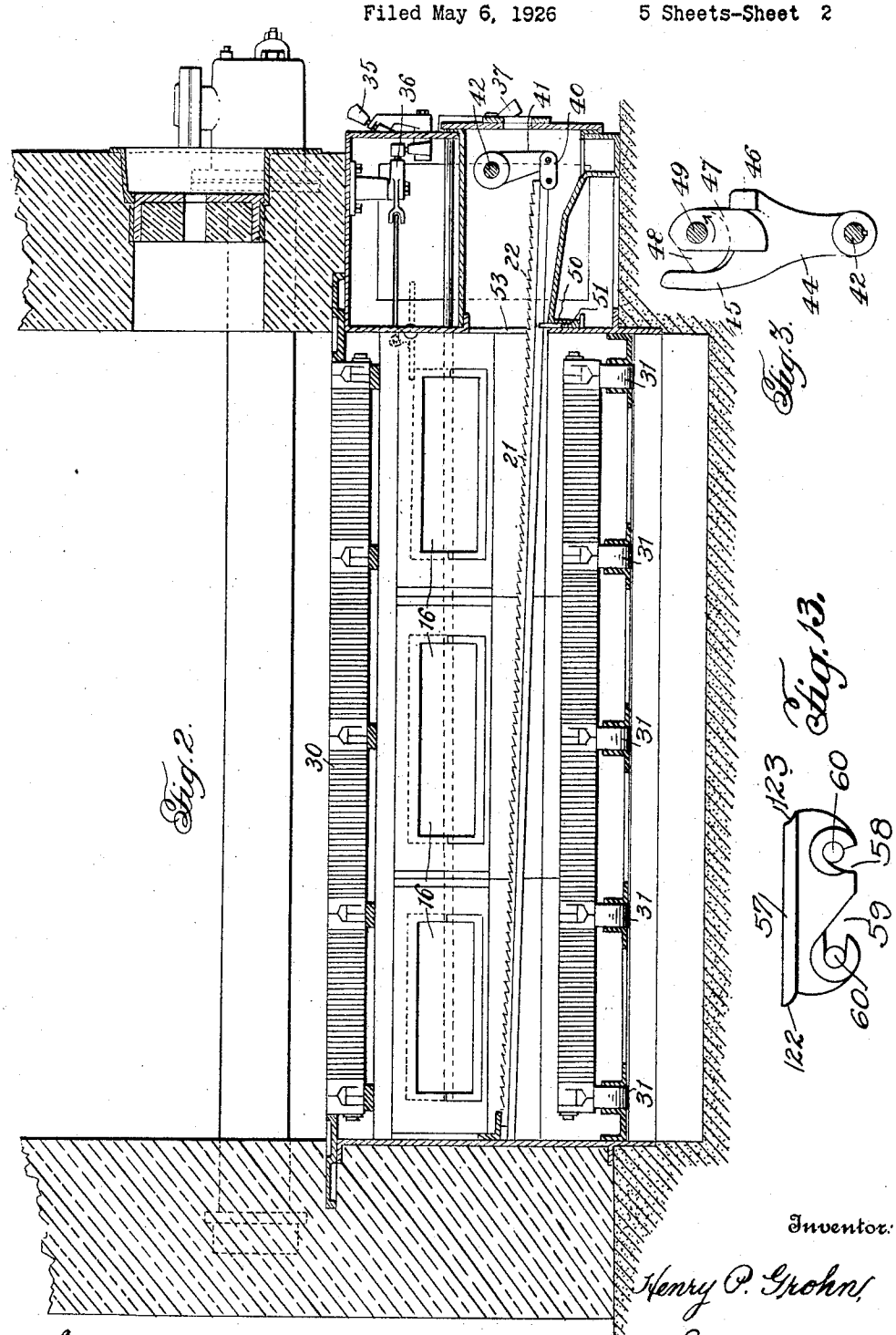


Fig. 2.

Fig. 3.

Fig. 13.

Inventor:
Henry P. Grohn,

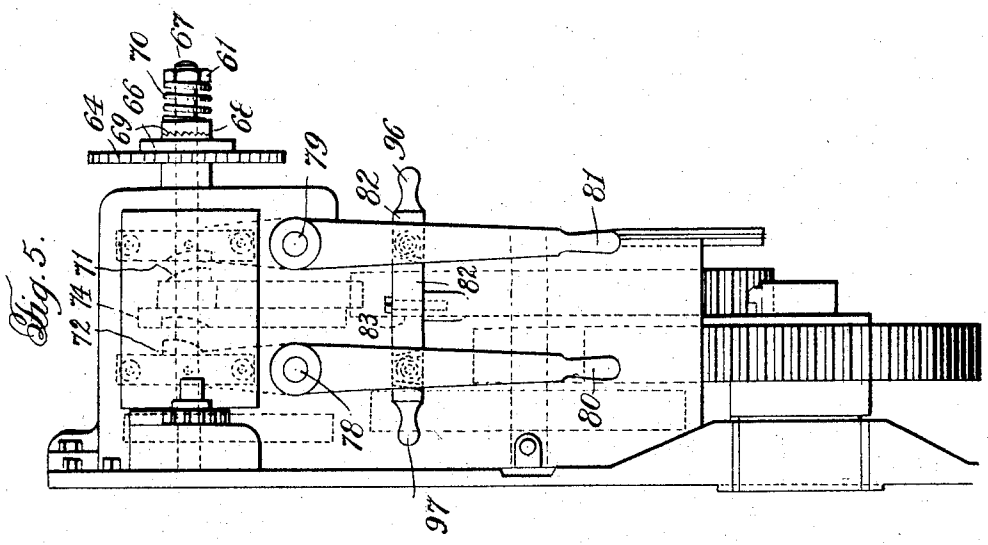
Witness:
Jas. E. Hutchinson.

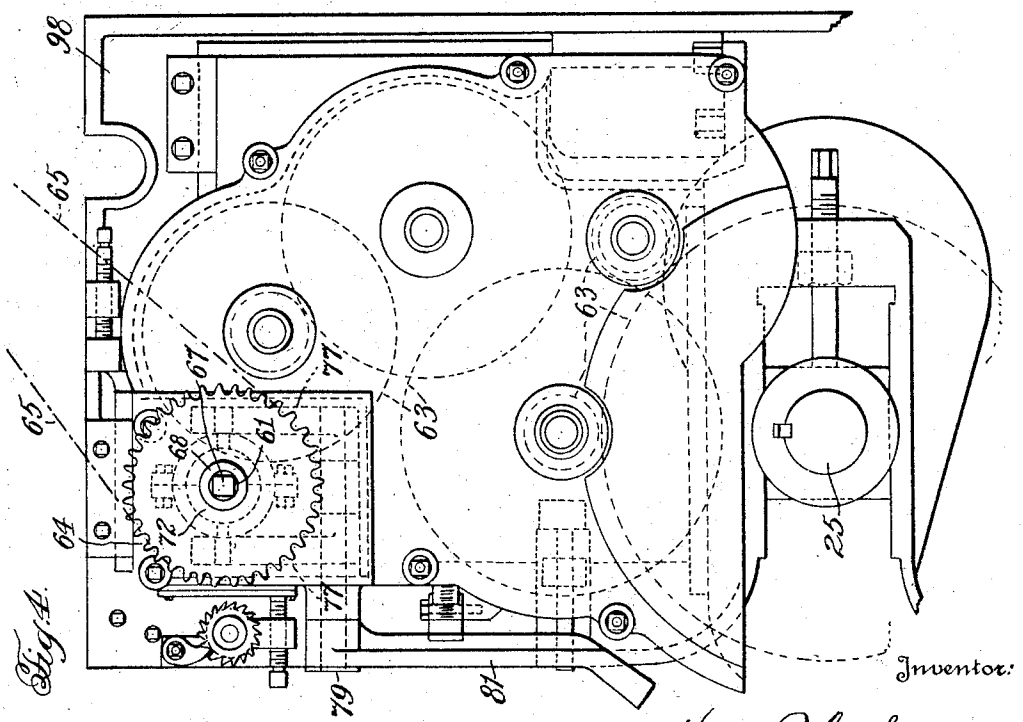
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Jas. E. Hutchinson.

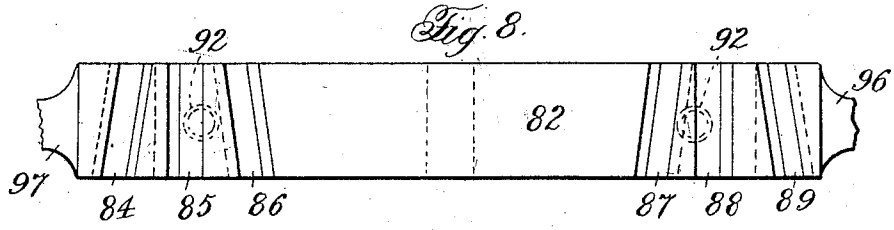
Inventor:
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Nov. 8, 1932. H. P. GROHN 1,887,153

FURNACE

Filed May 6, 1926 5 Sheets-Sheet 4

Fig. 8.



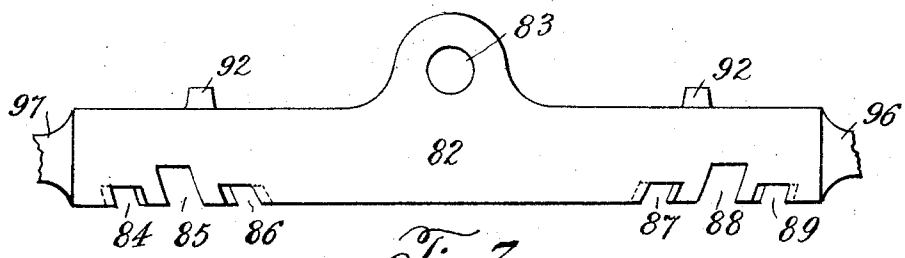
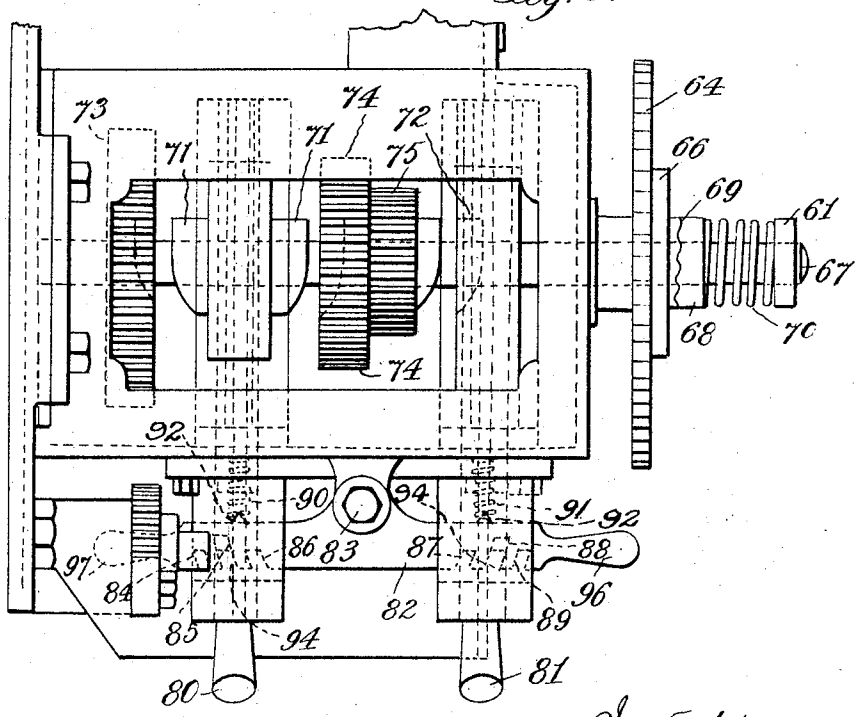


Fig. 7.

Fig. 6.



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Nov. 8, 1932. H. P. GROHN 1,887,153

FURNACE

Filed May 6, 1926 5 Sheets-Sheet 5

Fig. 9.

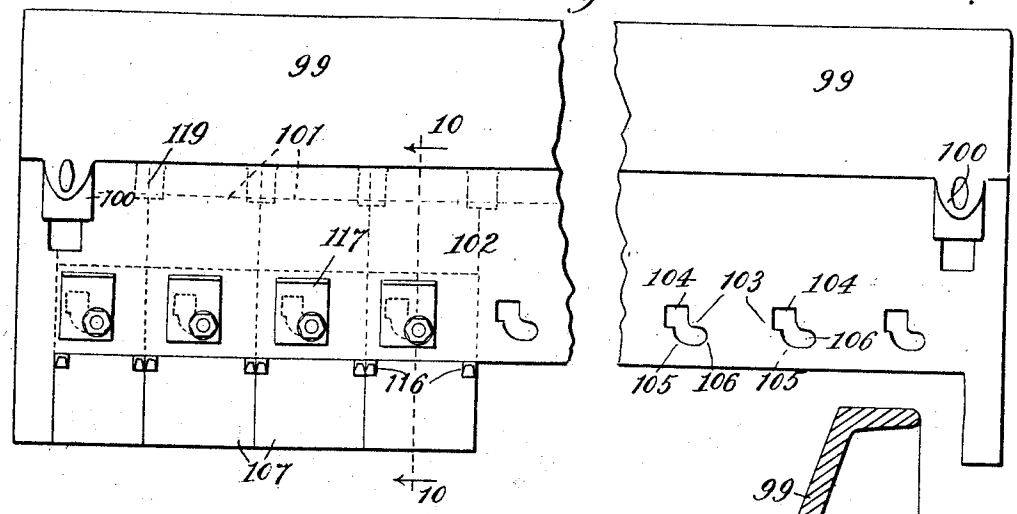


Fig. 11.

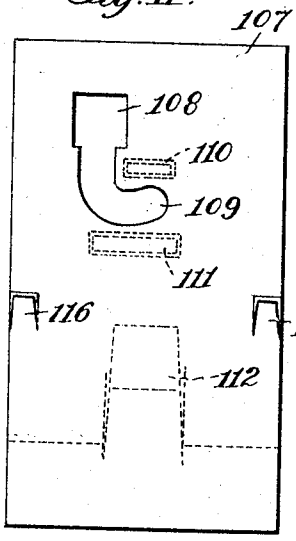


Fig. 12.

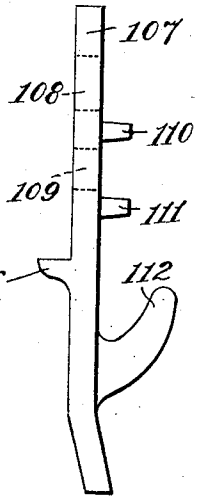
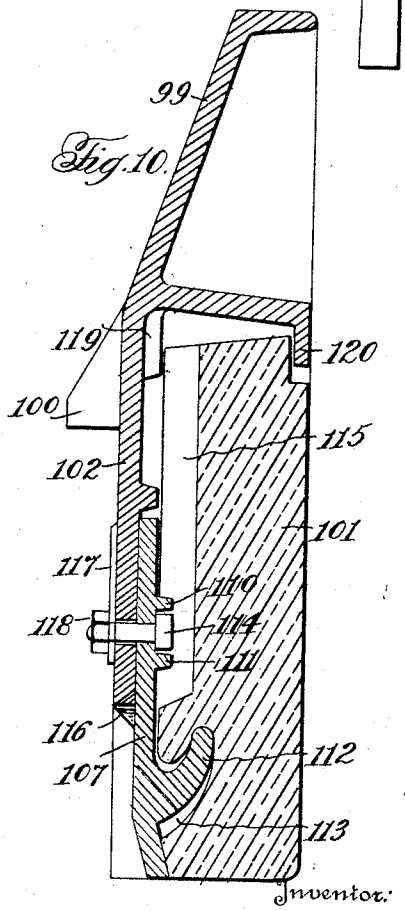


Fig. 10.



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Patented Nov. 8, 1932 1,887,153

UNITED STATES PATENT OFFICE

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FURNACE

Application filed May 6, 1926. Serial No. 107,299.

This invention relates to chain grate furnaces and has for its principal object the provision of a more efficient type of such furnace suitable for either natural or forced draft. A further object is to provide a simple effective means for continuously removing the coal siftings from beneath the grate to prevent burning the grate.

Another object is to provide a novel sprocket and link construction to permit ready removal and replacement of any link of the chain grate. Another object is to provide an improved tile holding constructon on the hopper gate.

An important object of the invention is to provide a positive change speed direct drive for the chain grate and a safety lock for the change speed mechanism.

The above and other objects of the invention will be more fully set forth and described in the following specification and shown in the accompanying drawings, in which

Figure 1 is a side elevation with portions broken away of the furnace and grate construction.

Figure 2 is a transverse section of the construction shown in Figure 1.

Figure 3 is a detail view of the drive for the siftings removers.

Figure 4 is a side elevation of the change speed positive drive for the chain grate.

Figure 5 is a front elevation thereof.

Figure 6 is a top plan view of a portion of the drive mechanism.

Figure 7 is a top plan view of the safety lever.

Figure 8 is a front elevation thereof.

Figure 9 is a front elevation of the hopper gate partly with tiles in assembled position.

Figure 10 is a section on line 10—10 of Figure 9.

Figure 11 is a front elevation of a tile supporting plate.

Figure 12 is a side elevation thereof.

Figure 13 is a side view of a link.

Extending across the furnace, are beams 14 supporting transverse trough shaped air duct constructions 15 having natural draft dampers 16 pivoted at 17 and adjustable butterfly dampers 18 pivoted at 20 at the side of the furnace. Along the bottoms of the air ducts extend siftings remover plates 21 inclined down toward one side of the furnace and having teeth 22 facing toward the lower end.

Also extending across the furnace, are shafts 25 and 26 carrying sprockets 27 and 28 over which travels a chain grate 30. The lower run of the chain travels on rollers 31 and the upper run slides on skids 32 extending along the tops of beams 14. Arranged transversely between the skids 32 are trays 33 which fill with ashes and act as air seals between the air ducts. Dampers 16 are opened when natural draft is to be used and closed when forced draft is used. Dampers 18 are opened when forced draft is used to permit entrance of air to the air ducts. Butterfly dampers 18 are operable by hand levers 35 and linkage 36. Dampers 16 are operable by hand levers 37.

Siftings remover plates 21 are each reciprocated by a link 40 connected to crank arm 41 secured on shaft 42. Secured on shaft 42 (Figure 3) is a cam arm 44 having cam portions 45 and 46 operable respectively by cam portions 47 and 48 secured on rotatable driving shaft 49. From observation of the shape of the cam portions it will be seen that link 40 (Figure 2) will give a rapid movement to the right with a somewhat sudden stop, and a slower movement to the left. This movement together with the slope of plate 21 and the direction of teeth 22 thereon, will cause the siftings from the grate continually but intermittently to fall off the right end of the plates 21 from whence the siftings may be removed by any desired means. Underneath plates 21 are closure plates 50 normally pressed up against plates 21 by leaf springs 51 to prevent leakage of air pressure at the point. Plates 21 extend thru sifting outlets 53. 54 are sifting gates.

The main drive shaft 25 of the grate carries the sprocket wheel 27 varying only from usual practice in such details as for example, the enlarged bays 55 and in the provision of an annular flange 56. As shown each of the links of the chain are exactly alike having a flat top portion 57 and two slots 58 and 59

to receive the cylindrical grate rods 60 which extend in the usual fashion the entire width of the grate. The bays or notches 55 of the sprocket wheel are much wider than usual so that there will be a very appreciable play between the front of any rod and the rear face of the next forward adjacent tooth, so that when the slack is taken up there will be sufficient room in each bay to allow the lowest rod in engagement with the sprocket wheel to move upwardly and rearwardly to give a considerable gap in the chain about the sprocket wheel as the slack in the lower reach of the chain is taken up by the draw hook.

The forward slot 58 of each link extends directly rearwardly from the rod and then downward at an angle of 45°. The rear slot 59 extends from the rod forwardly and downwardly in a curve. By bringing any two adjacent rods 60 together any link engaging both may be removed by first lifting out the rear end of the link, turning the link about the forward rod 60 as a pivot, and then, when it is entirely free of the rear rod 60, removing it without difficulty from the forward rod by moving the link forwardly of the rod when it will free itself by reason of the 45° bevel of the margin of the slot 58.

The main shaft 25 is driven by gears 63 from sprocket 64 and chain 65. Sprocket 64 is carried on hub 66 loose on shaft 67. Splined to shaft 67 is a hub 68 having a corrugated grip face 69 normally pressed against a similar grip face on hub 66 by spring 70 held by a nut 61. Thus sprocket 64 gives a drive which is positive, but which will cease to drive if the driving force required should rise above a predetermined amount, since the grip faces 69 would then slip over one another.

Splined on shaft 67 are clutches 71 and 72. Clutch 71 upon being shifted to the left engages high speed gear 73 (see Figure 6 which shows the clutches in neutral position.) Clutch 71 on being shifted to the right engages intermediate speed gear 74. Clutch 72 on being shifted to the left engages low speed gear 75. Clutches 71, 72 are shifted by forks 76 and 77, secured on rock shafts 78 and 79 operated by shifting or control levers 80 and 81.

In order to prevent both of these levers from being in driving position at the same time and thereby destroying or injuring the mechanism, a safety lock lever 82 is pivoted at 83 and has arcuate notches 84 to 89 nearly concentric with pivot 83 for engagement with the control levers. Lock lever 82 is normally held in the neutral position shown in Figure 6 by springs 90, engaging over lugs 92 projecting rearwardly from the lock lever. Each shifting lever has a rear rib 94 for engagement with the notches in the locking lever as follows. Suppose, for example, that with levers 80 and 81 both in neutral as shown in Figures 5 and 6, it is desired to drive the grate at low speed, hand grip 96 of lock lever 82 is pressed rearwardly, compressing the proximate spring 90. Since the ribs 94 do not extend to the bottoms of the deep notches when the lever 82 is in neutral position, this end of the locking lever can be pushed back until rib 94 of the lever 81 is free of the deeper notch 88 at which time the lever 81 can be swung to the right until its rib 94 comes opposite the shallow notch 89. The safety lock lever 82 is now released and the compressed spring 90 forces the right end of this lock lever 82 forward until shallow notch 89 engages rib 94 of lever 81. At the time lever 81 was swung to the right, its clutch engaged low speed gear 75. Since notch 89 is relatively shallow, pressure on left hand grip 97 will not be able to release this notch from rib 94 of the lever 80. It will thus be seen that when the rib of either lever is in a shallow notch as it would be in any driving position, the other shifting or control lever is held locked in neutral since this other lever cannot be moved out of its deep notch or neutral position.

Mounted in hopper 98 in a manner well known in the art, in position to be raised or lowered to regulate the rate the fuel is fed by the grate 30, is a hopper gate 99 (Figures 9 and 10) the cored lugs 100 at each end near the furnace side wall being provided to receive the chains or cables for raising or lowering the gate. The tiles 101 which protect the metal parts of the hopper gate from the furnace heat, are attached to the main frame 102 of the hopper gate as will now be described. The panel of the hopper gate main frame 102 has a plurality of openings 103 therein equal in number with the tiles, each opening having a square bolt head receiving portion 104 leading by smaller curved portions 105 to seats 106. Corresponding to each hole 103 is a tile support or cast iron plate 107 having a square hole 108 leading by a narrower downwardly directed slot to a seat 109. Above and below seats 109 are horizontal ribs 110 and 111 on the rear of the plate 107. Also on rear of the plate 107 is a tile holding bracket lug or hook 112 engaging in a recess 113 in the tile.

The tile 101 is first engaged on lug 112 and then plate 107 with the tile is slid up behind the main frame 102 of the hopper gate until the square holes 104 and 108 match. Then the square head 114 of a bolt is inserted thru the matched holes and plate 107 is pushed upward and the bolt is moved sideways to the right, the bolt head moving freely in tile slot 115, until the bolt rests in seats 106 and 109 with its square head between the parallel ribs 110 and 111 which latter are to prevent the bolt head from turning. Lugs 116 by engaging the lower edge of main frame 102, position and prevent turning of plate 107. If

desired, a cover washer plate 117 may be slipped on the bolt stem and be held in place by the nut 118. It will be seen that by loosening the nut and moving the bolt to the left and lowering plate 107, the latter with its tile can be removed from its place. A new hopper gate tile can be substituted on its supporting plate and the latter again raised and secured in position. The upper end of each tile 101 engages between pads 119 and the depending edge 120 of the gate.

Each link of the chain grate 30 has a rearwardly extending shelf 122 nesting in a recess 123 of the next link to the rear. This gives a shape which aids in preventing coal siftings passing thru the grate and also provides a part to press upon for lever action in removing a link from the grate.

While any convenient tool may be used to remove or replace a link the best device for this purpose is the draw hook shown in my pending application Serial Number 96,090, filed March 19, 1926, which is most convenient. This hook is positioned against alternate lings of one longitudinal row pulling them together as they pass over the sprocket wheel but not forming a bulge. The bays of the wheel permit the transverse rods to approach each other. Holding the parts in such position with one transverse rod in registry with the front slot of the proximate intermediate lateral link, such link is released from the registered rod by pressing upon the rear shelf or tongue 122 and is then released from the other transverse rod by letting the link move downward as by gravity which will free it from the second or rear rod. The action is so rapid a link can be replaced without stopping the travel of the grate if desired.

What I claim is:—

1. In a furnace, a sprocket wheel having enlarged notches, a plurality of rods, teeth on the sprocket wheel to engage the rods, links mounted thereon to form a chain grate, each link engaging two adjacent rods by means of a pair of open slot seats, the relation between the parts of the chain engaging in the notches of the sprocket wheel and the size and shape of the notches, being such that two longitudinally adjacent links can be drawn toward each other without being forced outwardly by contact with the sprocket wheel, so that two rods in a pair of seats in a link laterally of said two longitudinally adjacent links, can be drawn together sufficiently to permit said lateral link to be removed from or placed on the two rods.

2. The method of removing and replacing links in an endless chain sprocket wheel driven grate in which the rods are cylindrical and each chain link has two slots to receive proximate rods, which consists in drawing longitudinally adjacent links together while holding both in contact with the sprocket wheel, maintaining said links in such position, tilting a laterally adjacent link about one rod and then removing it from the other rod.

3. The method of removing and replacing links in an endless chain grate while it is in motion over a sprocket wheel, in which the links each have two slots to connect with rods to form the chain, relation between the notches intermediate the sprocket teeth and the chain, is such that longitudinally adjacent chain links can be forced closer together whereby two adjacent rods in the slots of a laterally adjacent link can be brought closer together to remove or replace said laterally adjacent link, which method consists in forcing said longitudinally adjacent links closer together while the chain links operated upon are in motion over the sprocket wheel, and in removing and replacing said laterally adjacent link while said motion continues.

4. A chain grate each link of which has a plane upper fuel supporting surface the forward edge of which, in the direction of movement of the chain, is beveled rearwardly and upwardly, and the rear edge of which is substantially parallel to the forward edge.

In testimony whereof I affix my signature.

HENRY P. GROHN.