

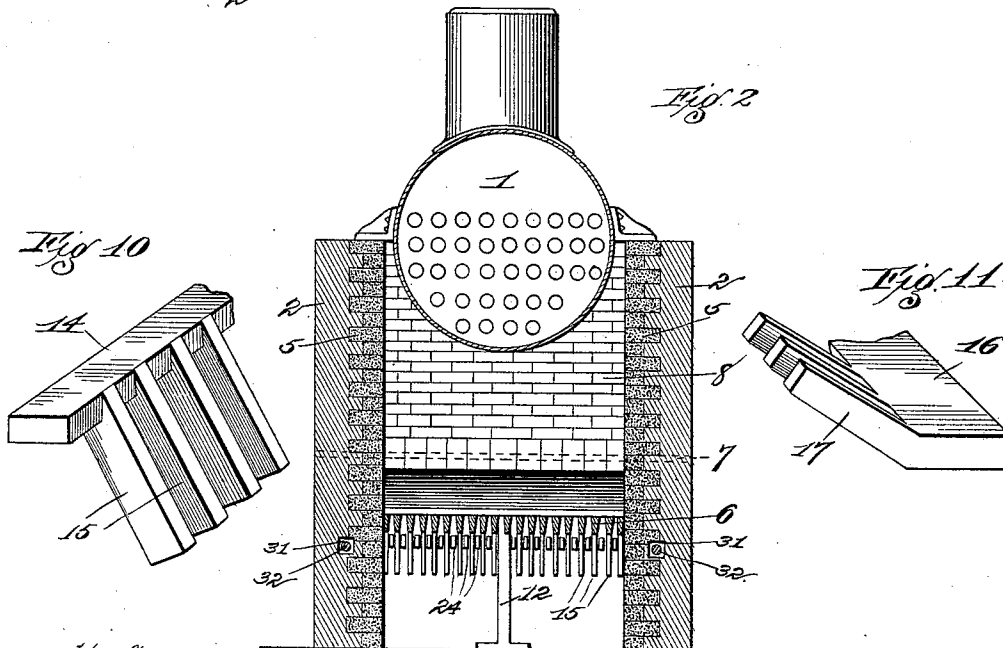
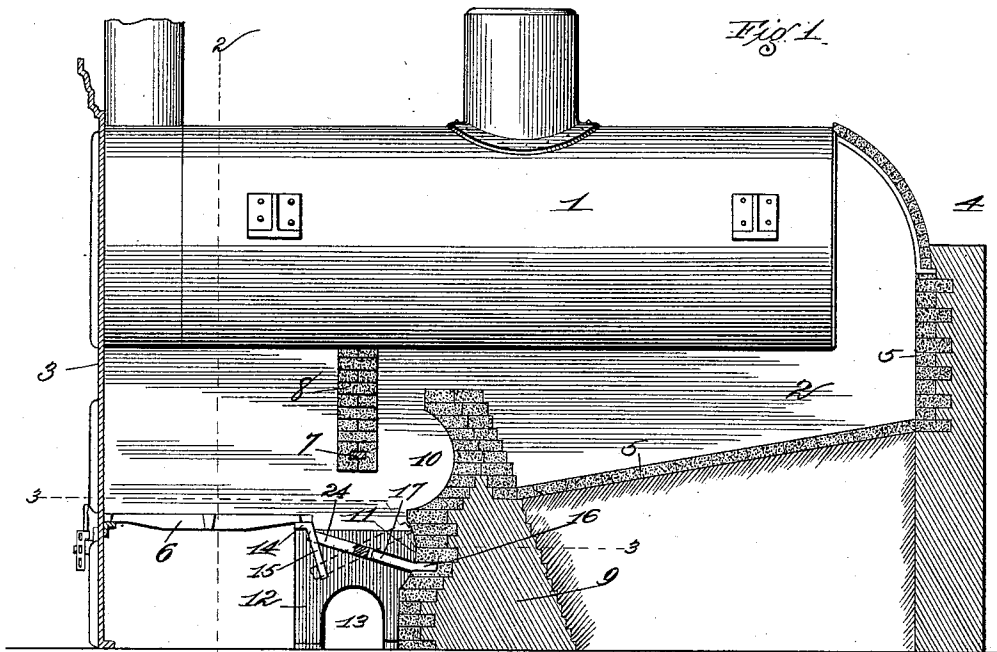
(No Model.)

2 Sheets—Sheet 1.

L. E. KILLIAN.
SMOKE CONSUMING FURNACE.

No. 540,990.

Patented June 11, 1895.



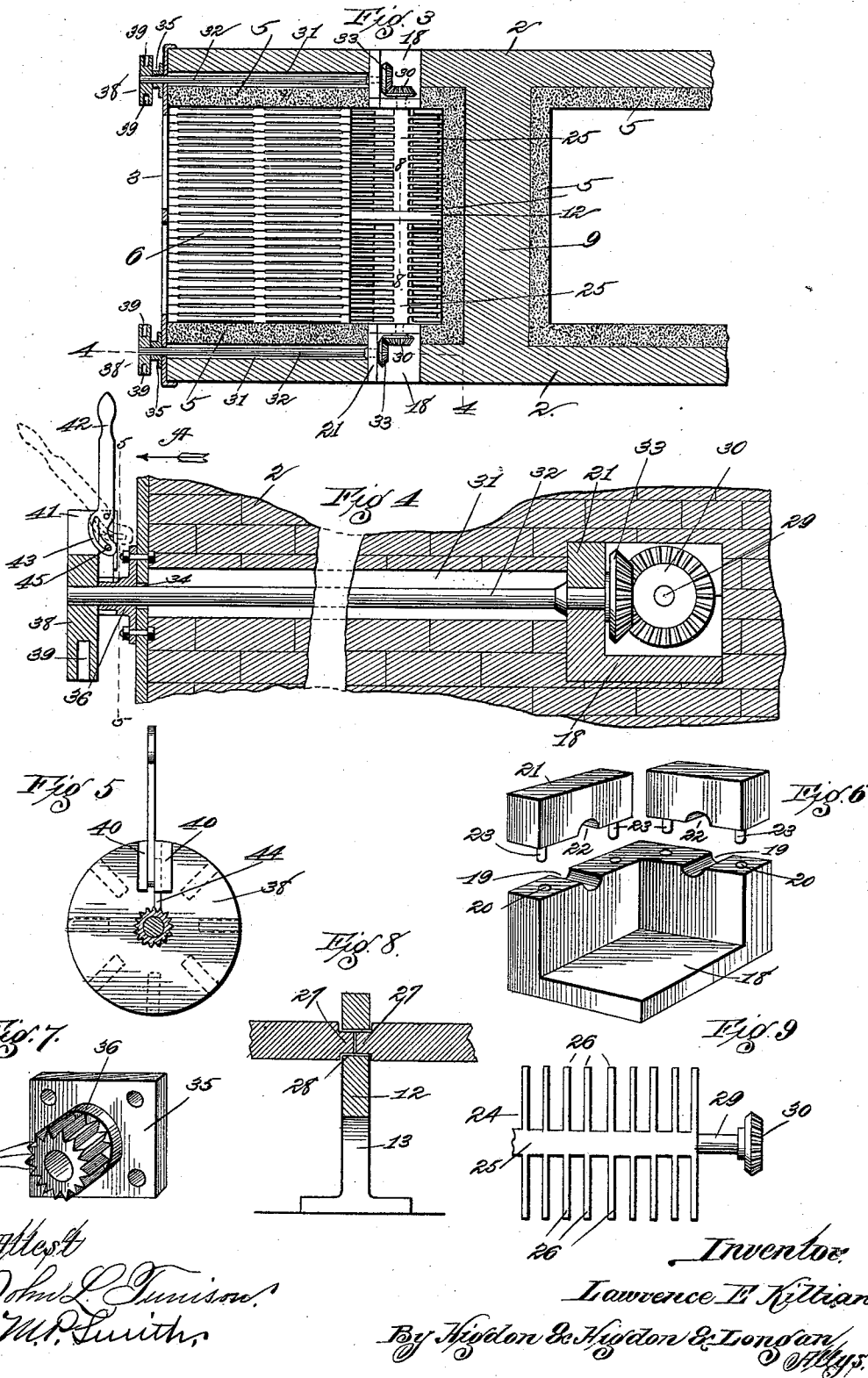
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UNITED STATES PATENT OFFICE.

LAWRENCE E. KILLIAN, OF ST. LOUIS, MISSOURI.

SMOKE-CONSUMING FURNACE.

SPECIFICATION forming part of Letters Patent No. 540,990, dated June 11, 1895.

Application filed March 23, 1895. Serial No. 542,989. (No model.)

To all whom it may concern:

Be it known that I, LAWRENCE E. KILLIAN, of the city of St. Louis and State of Missouri, have invented certain new and useful Improvements in Smoke-Consuming Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to an improved smoke consuming furnace, and consists in the novel construction, combination and arrangement of parts, hereinafter described and claimed.

In the drawings, Figure 1 is a longitudinal vertical sectional view of a boiler-furnace constructed in accordance with my invention. Fig. 2 is a vertical cross-sectional view taken, approximately, on the indicated line 2 2 of Fig. 1. Fig. 3 is a horizontal sectional view taken, approximately, on the indicated line 3 3 of Fig. 1. Fig. 4 is a detail sectional view taken, approximately, on the indicated line 4 4 of Fig. 3. Fig. 5 is a sectional view taken, approximately, on the indicated line 5 5 of Fig. 4 and looking in the direction as indicated by the arrow A, Fig. 4. Fig. 6 is a view in perspective of one of a pair of bearing-boxes of which I make use in carrying out my invention. Fig. 7 is a view in perspective of a plate having an integral ratchet-wheel of which I make use in carrying out my invention. Fig. 8 is a cross-sectional view taken, approximately, on the line 8 8 of Fig. 3. Fig. 9 is a detail plan view of a portion of one of the rotating grates of which I make use in carrying out my invention. Figs. 10 and 11 are detail views, in perspective, of portions of auxiliary grates used in my improved smoke-consuming furnace.

Referring by numerals to the accompanying drawings, 1 indicates the boiler that is located in the usual manner between the side-walls 2 of the furnace and between the usual boiler front 3 and rear wall 4. The interiors of the side-walls and the rear wall of the furnace are lined with fire-brick 5 in the usual manner.

Located beneath the forward end of the boiler 1 and a suitable distance from the floor line is the main fire-grate 6. Extending from one side-wall 2 to the other and slightly above and in the rear of the rear edge of the grate 6 is a metallic bar 7 that supports a fire-brick

arch 8, the same extending from one side-wall to the other, said arch being formed with a semi-circular top edge in order to receive the body of the boiler 1. The space between the lower front edge of this arch 8 and the rear edge of the grate 6 is equal to or slightly larger than the combined area of the boiler tube openings.

9 indicates a bridge-wall faced with fire-brick that is built approximately beneath the longitudinal center of the boiler 1 slightly in the rear of the arch 8, and said bridge-wall 9 extends from one side-wall 2 to the other. The space between the top surface of this bridge-wall 9 and the underside of the boiler 1, as well as the space between the front upper edge of said bridge-wall 9 and the rear face of the arch 8, is equal to the combined area of the boiler tube openings.

Formed in the face of the bridge-wall 9 directly in the rear of the lower end of the arch 8 is a recess or depression 10, the same extending from one side-wall 2 to the other and being semi-circular in cross-section.

The space between the rear lower edge of the arch 8 and the line along the lower edge of the semi-circular recess or depression, or where said depression starts in the bridge-wall, is equal to or slightly larger than the combined area of the boiler tube openings.

Formed in the face of the bridge-wall 9 immediately below the recess 10 and extending transversely from one wall 2 to the other is a recess or depression 11, the same being formed on a segment of a circle having its center at a point midway between the face of the arch beneath the recess or depression 10 and the rear edge of the grate 6.

Located immediately in front of the bridge-wall 9 and between the side-walls 2 is a vertically arranged metallic-plate 12 that extends beneath and sustains the rear edge of the grate 6. An opening 13 is formed in this plate 12 immediately in front of the bridge-wall 9 and adjacent the floor-line of the furnace.

Fixed to the under side of the rear edge of the grate 6 and extending from one side wall 2 to the other is a metallic bar 14, from which depend and extend slightly forward integral fingers 15.

Located in the recess 11 in the face of the

bridge-wall 9 and extending from one side-wall to the other is a bar 16 from which project laterally and upwardly fingers 17.

Located in the side-walls 2 of the furnace directly beneath the arch 8 are angular blocks 18, the same having in their top edge semi-circular bearings 19 and vertically arranged apertures 20 adjacent said semi-circular bearings 19.

Rectangular blocks 21 have provided on their under sides semi-circular bearings 22 that coincide with the semi-circular bearings 19, and said blocks 21 are also provided with dowel-pins 23 that enter the vertically arranged apertures 20 in the angular blocks 18.

Rotating grates 24 comprise center bars 25, with which are formed integral and extend laterally in opposite directions fingers 26. The inner ends of these bars 25 are formed into short journals 27 that extend toward one another and bear in an aperture 28 formed in the center-plate 12. The outer ends of these bars 25 are formed into journals 29 that bear in the pair of longitudinally arranged journal-bearings formed between the blocks 21 and block 18. Rigidly fixed upon the end of these journals 29 are beveled pinions 30.

Longitudinally extending passages 31 are formed in the side-walls 2 of the furnace and extend from the blocks 18 forward to the front plate 3 of the furnace. Extending longitudinally through these passages 31 are shafts 32, the rear ends of which pass through and are journaled in the transverse pair of journal-bearings formed by the blocks 21 and block 18. Upon the ends of these shafts 32 that extend through said bearings are rigidly fixed beveled pinions 33 that mesh with the beveled pinions 30 previously mentioned. The forward ends of these shafts 32 extend through apertures 34 formed in the front plate 3 of the furnace, and bolted to said front-plate 3 over each one of the apertures 34 are plates 35, from which project laterally integral bearings 36, through which the ends of the shafts 32 pass and project. The peripheries of these bearings 36 have formed therein a series of radially arranged and longitudinally extending grooves or notches 37.

Rigidly fixed upon the outer ends of the shafts 32 are disks 38, the peripheries of which are provided with a series of radially arranged bores or apertures 39, and formed integral with the rear faces of said disks 38 are a pair of ears 40. Between said ears 40 in the disk 38 is a slot 40. Pivoted between the upper ends of the ears 40 is a hand-lever 42, in the lower end of which and below the pivot-point is formed an eccentric slot 43.

A vertically moving dog or catch 44 has its lower end formed so as to engage in the notches 37 in the bearing 36, and said dog 44 is carried and moved by the hand-lever 42 by means of a pin 45 that passes through the upper end of said dog and through the eccentric slot 43.

The operation is as follows: After the fur-

nace has been fired in the usual manner, a quantity of the live coals from the grate 6 is located upon the rotating grates 24, said grates 24 being normally positioned as shown by solid lines in Fig. 1. The draft through these grates 24 and the bed of coals thereon will keep said bed of coals in a very highly heated and practically incandescent state, and the heat from said bed of coals and from the main fire located upon the grate 6 will heat to a very high degree the lower portion of the arch 8 and the front face and upper portion of the bridge-wall 9, or that portion of said bridge-wall 9 adjacent the recess or depression 10. The various spaces between the arch 8, grate 6 and bridge-wall 9 being of the same size or slightly larger than the combined area of the boiler tube openings, the heat, products of combustion and draft are free to pass through the grates between the arch and bridge-wall and through the boiler-tubes in the usual manner, and at no place is this passage or draft choked or in any way retarded. When additional fuel is supplied in the usual manner to the fire upon the grate 6, the products of combustion from said newly applied fuel will pass from the grate 6 over the bed of coals located upon the rotating grates 24, and as it passes over said bed of coals, will, together with the draft of air through the grates 24, be entirely consumed by combustion in the recesses 10 and between the arch 8 and bridge-wall 9. To rotate or partially rotate the grates 24 for bringing the rear bank of the bed of live coals upon said grates closer to the lower end of the arch 8, or to dislodge any clinkers that might form upon said grates 24 and between the fingers 15 and 17, the following operation takes place: The hand-levers 42 normally occupy vertical positions and the dogs 44 are in engagement with certain of the notches 37. The operator grasps the upper end of said hand-lever and pulls the same forward and away from the front plate of the furnace, dotted lines in Fig. 4 showing the position the hand-lever assumes after it has been pulled forward. With said forward movement of said hand-lever, the pin 45 is carried upwardly by reason of the peculiar inclination of the eccentric slot 43, and necessarily the dog 44 is carried out of engagement and away from the notches 37 of the bearing 36. Said hand-lever 42 now extends at an angle relative to the disk 38 and acts as a crank-handle therefor, and by means of said hand-lever said disk can be rotated in either direction. As said disk is rotated, the shaft 32 will necessarily be rotated, and rotary motion will be imparted to the beveled pinion 33. Said beveled pinion 33 will in turn impart rotary motion to the beveled pinion 30, and as said beveled pinion 30 is rigidly fixed upon the bearing 29 that is formed integral with the grate 24, said grate will be rotated as desired. The grates 24 being separate from each other, it is necessary of course to repeat this operation in rotating or par-

tially rotating either grate. The fingers 26 of the grate 24 are so located as that they will readily pass between the fingers 15 of the bar 14 and the fingers 17 of the bar 16. The dotted lines in Fig. 1 show the position assumed by one of the grates 24 when the same has been rotated so as to raise the rear end and bed of coals thereon into the same horizontal plane with the grate 6. When the grates 24 have been moved to the position as shown by dotted lines in Fig. 1, the draft to said bed of coals will readily enter between the fingers 15 of the bar 14. If it is found impossible to turn the grates 24 by means of the hand-levers 42, a long rod or lever, such as a crow-bar, may be used in turning the disks 38 on the ends of the shafts 32, the end of said rod or lever being positioned in one of the bores or recesses 39 in the periphery of the disk while in the act of turning said disk and contiguous parts.

A boiler furnace of my improved construction is easily constructed, is simple in operation, and is very efficient in use, as the entire products of combustion are completely consumed before they pass into the boiler tubes.

The horizontal metallic supporting bar 7 may be replaced with common feed-water pipes, or other tubular supports, and the function of supporting the depending wall 8 will be substantially the same in either case.

What I claim is—

1. In an improved smoke consuming furnace, an arch located beneath the boiler and in a vertical plane to the rear of the fire-grate, a bridge-wall built up from the floor of the furnace immediately in the rear of the arch and provided in its face with a transversely positioned semi-circular depression or recess, and a rotating grate operating between the fire-grate and the bridge-wall and immediately beneath the arch.

2. In an improved smoke consuming furnace, a metallic bar extending from one side-wall of the furnace to the other beneath the boiler, an arch built from said bar to the boiler, a bridge-wall built up from the floor of the furnace immediately in the rear of the

arch, said bridge-wall being constructed with a semi-circular recess or depression in its face opposite the lower end of the arch, a vertically arranged plate located midway between the side-walls of the furnace in front of the bridge-wall, a bar provided with downwardly depending fingers fixed to the under side of the rear edge of the fire-grate, a bar located in the front face of the bridge-wall and provided with integral forwardly extending fingers, a pair of rotating grates operating between the center-plate of the side-walls of the furnace and between the end of the fire-grate and the bridge-wall, and means for rotating said grates from the front of the furnace.

3. In a smoke consuming furnace, a pair of bearing-boxes arranged in the opposite side-walls of the furnace, rotating grates located within the furnace and provided with integral journals that pass through the longitudinally arranged bearings of the boxes, beveled pinions fixed to the ends of said journals, shafts passing longitudinally through the walls of the furnace to the front plate thereof, the rear ends of said shafts being journaled in the horizontal bearings of the bearing-boxes, beveled pinions mounted upon the rear ends of said shafts and meshing with the before-mentioned beveled pinions, plates bolted to the boiler front, bearings formed integral with said plate and through which the forward ends of the shafts pass, said bearings being constructed with peripheral notches or depressions, disks mounted upon the outer ends of the shafts and constructed with a series of peripheral bores or recesses, hand-levers pivoted to the rear sides of said disks and constructed with eccentric grooves in their lower ends, and dogs carried by the lower ends of said hand-levers, the lower ends of which engage in the notches of the bearings bolted to the front of the boiler-plate.

In witness whereof I affix my signature in presence of two witnesses.

LAWRENCE E. KILLIAN.

Witnesses:

M. G. IRION,
JOHN C. HIGDON.