

(No Model.)

3 Sheets—Sheet 1.

W. SWINDELL.

SHAKING AND DUMPING GRATE.

No. 266,328.

Patented Oct. 24, 1882.

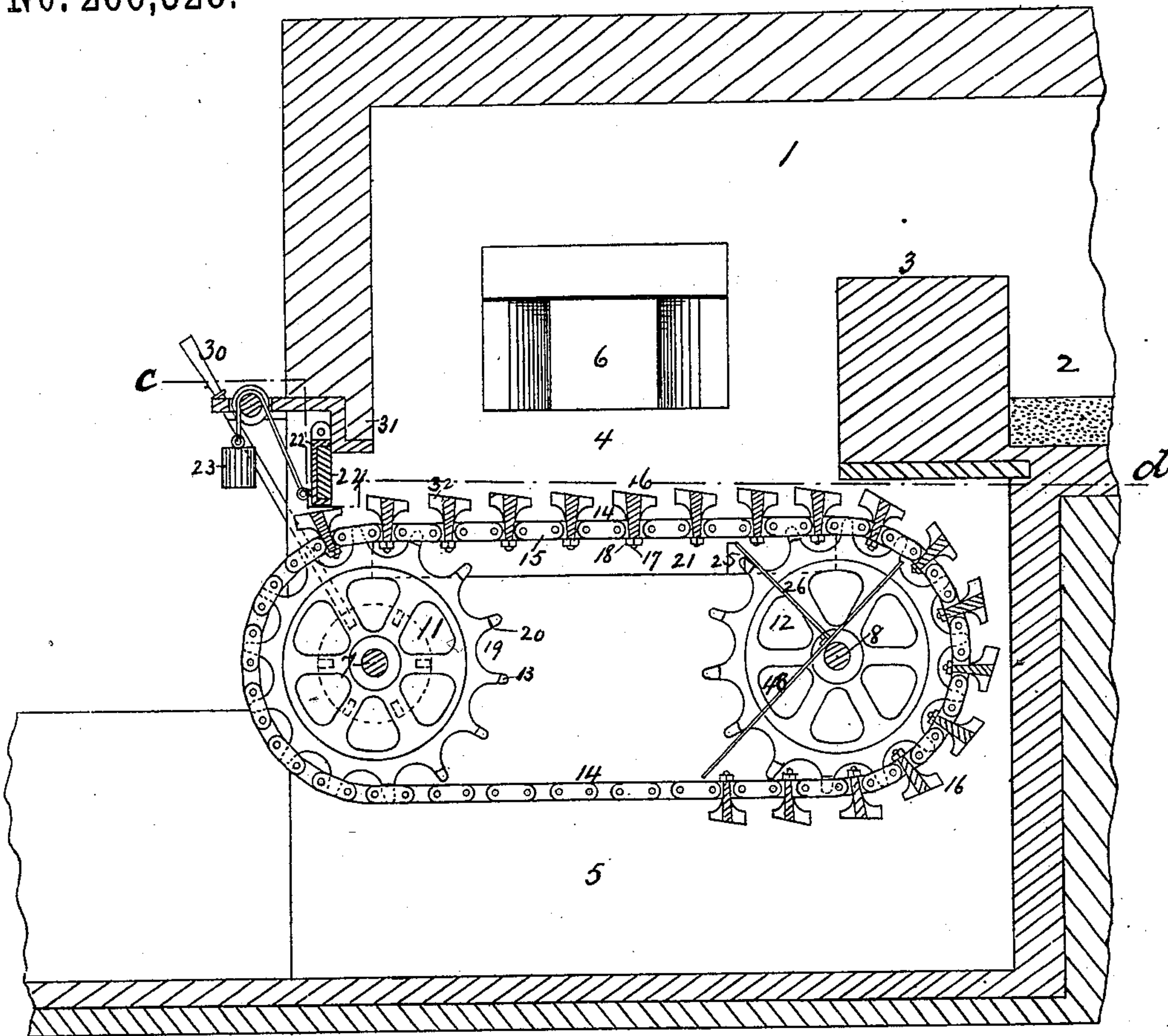


Fig. 1.

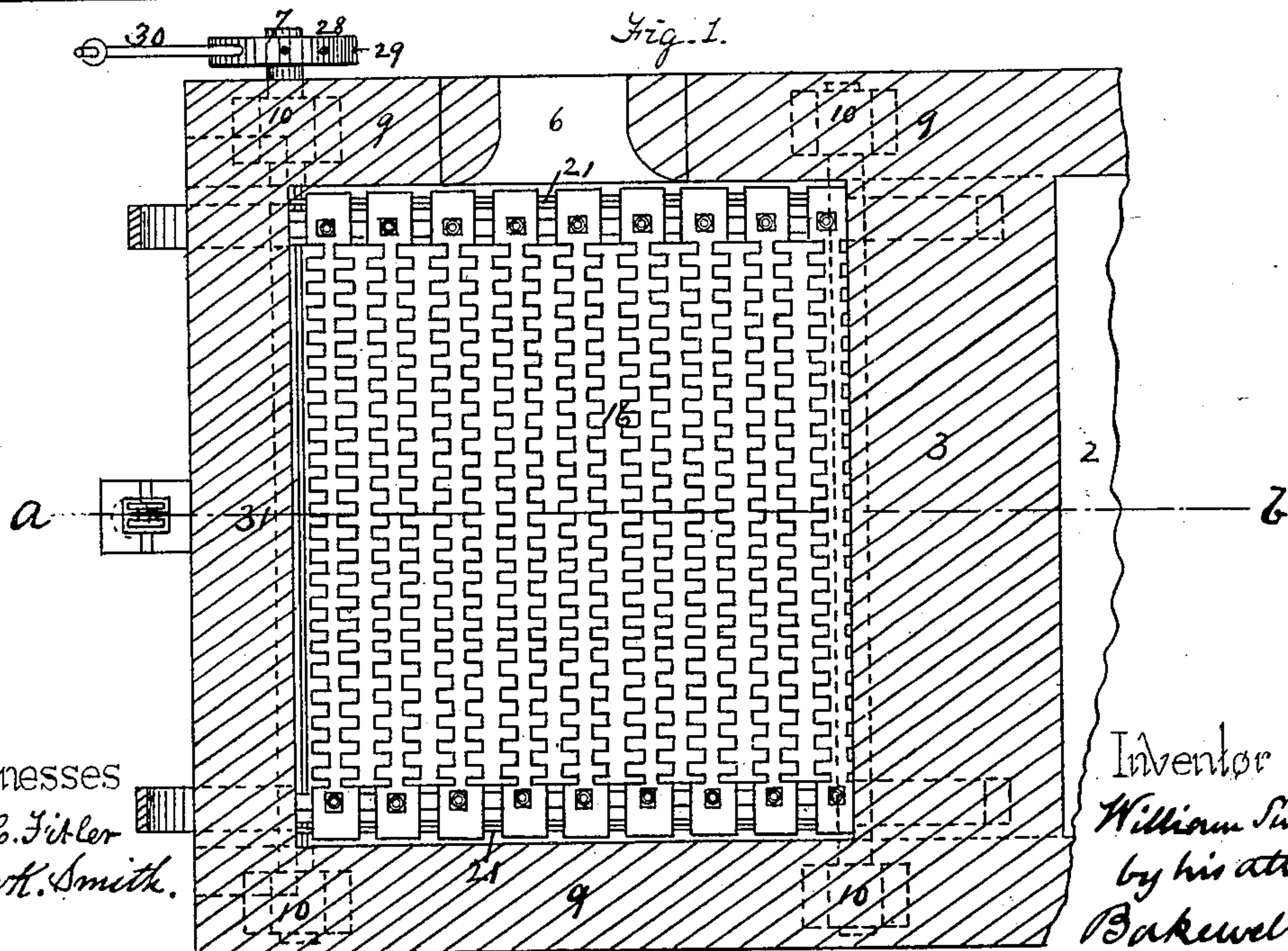


Fig. 2.

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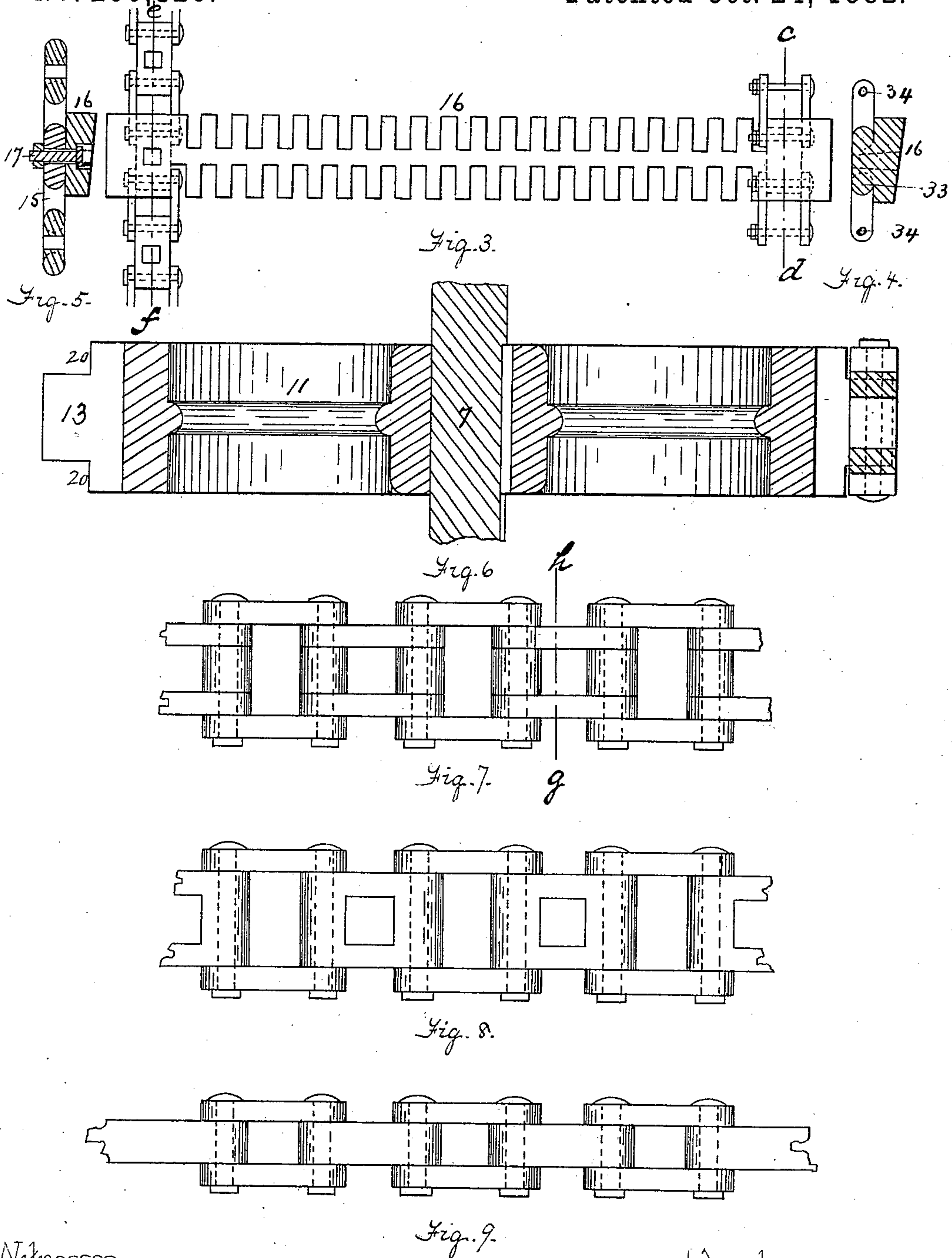
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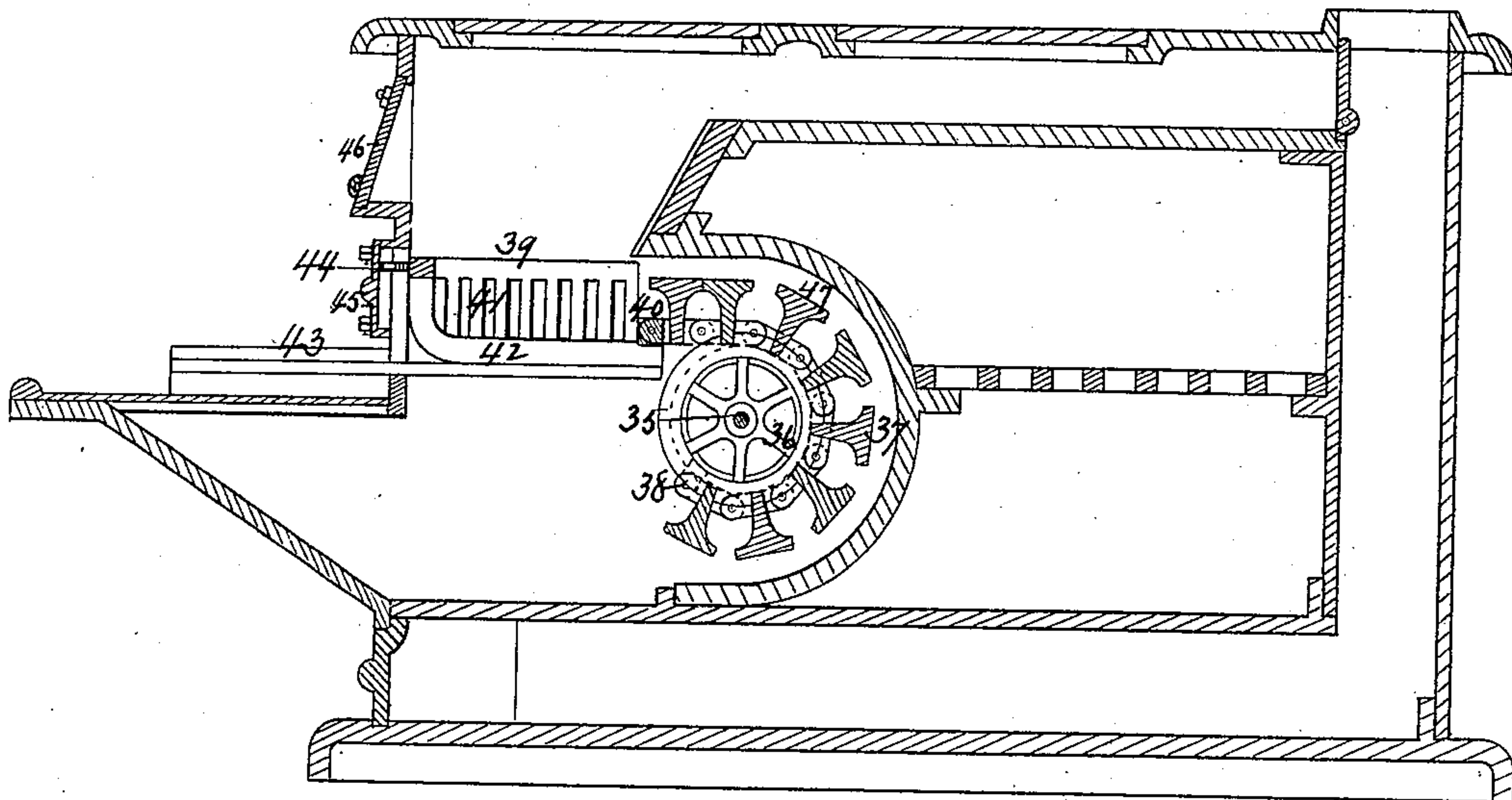


Fig. 10.

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UNITED STATES PATENT OFFICE.

WILLIAM SWINDELL, OF ALLEGHENY CITY, PENNSYLVANIA.

SHAKING AND DUMPING GRATE.

SPECIFICATION forming part of Letters Patent No. 266,328, dated October 24, 1882.

Application filed June 15, 1882. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM SWINDELL, of Allegheny City, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Shaking and Dumping Grates; and I do hereby declare the following to be a full, clear, and exact description thereof.

My improved shaking and dumping grate is especially applicable for use in iron and steel furnaces, gas-producers, boiler-furnaces, and similar places; but it is also applicable to cooking stoves, ranges, and other like furnaces.

In the puddling and boiling furnaces now commonly in use the grate-bars are straight loose bars of iron, which may be drawn out or raised and shaken separately for the purpose of discharging the dust and ashes which accumulate in the bottom of the fire-chamber, and also to remove the cinder and scoria which runs down and clogs the grate. This cinder is produced by the melting of the ashes and dust caused by the intense heat in the fire-chamber, and in running down it closes up the grate and so interferes with combustion that the heat of the furnace is materially reduced. It is therefore necessary to clear out the cinder, and this operation under the old construction of grate is accomplished by drawing the bars and letting it fall into the ash-pit. The dust is cleared out by raising the bars singly and shaking them. This work is not only hard, but it materially reduces the economy and effectiveness of the furnace. It is necessary when the bars are drawn to take out the cinder to push the live coals to one side of the fire-chamber. This is done by means of iron bars or rods by the workman. Then the grate-bars are drawn out and cleaned and restored to place, and the fire drawn onto the clean bars and the others taken out and cleared of cinder. The operation of clearing out the fire is necessary in many cases several times a day, that depending, however, on the quality of the fuel used, which ordinarily is a poor quality of coal.

To enable others skilled in the art to make and use my invention, I will now describe it by reference to the accompanying drawings, in which—

Figure 1 is a vertical sectional view, on the line *a b* of Fig. 2, of the fire-chamber of an ordinary puddling-furnace. Fig. 2 is a horizon-

tal section on the line *c d* of Fig. 1. Fig. 3 is a plan view of one of the grate-bars, showing its attachment to the chains by which it is moved. Figs. 4 and 5 are sections on the lines *c d* and *e f*, respectively, of Fig. 3. Fig. 6 is a vertical section of one of the wheels by which the chains are operated. Figs. 7, 8, and 9 are views of various forms of chain. Fig. 10 is a vertical longitudinal section of a cooking-stove to which I have applied my invention.

Like figures of reference indicate like parts in each.

In Figs. 1 and 2 the furnace 1 is a puddling-furnace of the usual construction, having a bed, 2, bridge-wall 3, fire-chamber 4, ash-pit 5, and a fuel or feed door, 6. Extending across the ash-pit 5 are two shafts, 7 8, which are journaled in the side walls, 9, in suitable boxes or bearings, 10, said bearings being placed in the walls beyond the sides of the ash-pit for the purpose of preventing any dust or cinders getting into them and clogging or cutting them. On each shaft 7 and 8 are two gear-wheels placed near their ends and close to the side walls, 9, the wheels on the shaft 7 being marked 11, and the wheels on the shaft 8 being marked 12. These wheels are fitted with slender cogs 13. At each side of the furnace is a chain, 14, having links 15, which fit on the cogs 13 on the wheels 11 and 12. Each chain is mounted upon two wheels, 11 and 12, on its side of the furnace. The grate-bars 16 extend laterally across the fire-chamber, and at each end they are fitted with spurs or stems 17, which extend down into suitable recesses in the chains, and are secured therein by nuts 18, screwed on the lower ends of the stems.

Between each pair of cogs 13 on the wheels 11 and 12 is a grooved-out or recessed portion, 19, and each cog is fitted with shoulders 20, which prevent the chain from descending any farther down on the cog. The lower end of the stem 17, with its nut 18, projects down into the recess 19 below the shoulders 20, and is thus prevented from striking the wheel or coming in contact with the cogs. The links 15 are placed so as to register with the cogs 13 in order that when the wheels are rotated the cogs 13 shall turn properly into and engage the links of the chain. The grate-bars 16 extend across the fire-chamber at right angles

to the chains, and there are enough grate-bars mounted on the chains to supply two entire sets for the furnace, but not sufficient to form a continuous chain-grate. This construction has its advantages in reducing the weight of the grate, obviating in a measure its tendency to sag, facilitating its movement and the escape of fine dust and ashes. As the grate motion is that of reciprocation rather than rotation, such a construction is fully effective. The bars 16 (shown in Figs. 1 and 2) have inclined upper surfaces, so that one edge shall project above the adjacent edge of the next preceding bar. The purpose of this construction will be stated hereinafter.

At the sides of the furnace are two bars, 21, one on each side, which stand under the outer ends of the grate-bars and afford a support thereto, upon which they slide when being drawn forward or back by the operation of the chains.

At the front side of the furnace is a small hinged door, 22, to which is attached a counter-weight, 23, which door is designed for closing the opening 24, provided to give passage to the cinder upon the grate, when the latter is drawn out, as hereinafter described.

Extending across between the guide-bars 21 is a brace, 25, from which straps 26 are extended downward and backward, and at their lower ends support a sheet of iron or other material, 48, which extends over the shaft 8 and the grate-bars at the rear of the shaft, for the purpose of deflecting any ashes or cinders which may fall down at the rear end of the fire-chamber, and preventing their falling and lodging upon the grate-bars below and in the rear of the shaft. One end of one of the shafts, 7, extends beyond the side of the furnace, and is provided with a wheel, 28, which is fitted with holes 29 for the insertion of a lever, 30, by means of which it may be turned, and by turning the wheel 7 cause the chains to be drawn around and the grate-bars to be moved. Instead of the holes 29, I can provide the wheel with lever-arms, or with projections on its face, by means of which it may be drawn around by the lever 30.

The operation of my improved grate is as follows: If it is desired to merely shake the grate to relieve it of dust and ashes, the lever 30 is inserted into one of the holes 29 in the wheel 28, and the wheel moved backward and forward. This causes the grate-bars to be moved backward and forward in the fire-chamber upon the bars 21, and will shake out or dislodge the ashes or dust thereon. If, however, it is desired to draw out the bars in order to clean them of cinders, the door 22 is raised and the wheels 7 are turned by means of the bar 30 until the grate-bars which occupied a horizontal position in the fire-chamber and sustained the fire are drawn out past the opening 24, and the grate-bars which in Fig. 1 are shown to be below the bridge wall 3 are drawn forward into the fire-chamber, and occupy the position formerly oc-

cupied by the grate-bars which passed through the opening 24. The front wall, 31, of the furnace extends down sufficiently near the tops of the grate-bars to retain within the fire-chamber the upper or live portion of the fire, while the lower or deader portion, which includes the cinder, dust, and ashes, will pass out upon the tops of the grate-bars which are drawn beyond the opening 24. The live coals and fuel, which are retained in the fire-chamber by the wall or dam 31, will then settle down upon the second set of grate-bars, which are brought into position by the turning of the wheels. The cinder, ashes, and dust will drop, or may then be cleaned off of the grate-bars which have been drawn out of the furnace, and when so cleared the wheels may be reversed and the said bars restored to their original position in the fire-chamber.

The projecting or raised edges 32 of the grate-bars 16 are designed to catch upon the cinder and drag it out of the furnace as the grate-bars are drawn out in the operation just described. In this way I am enabled with but little work and with great ease and rapidity to clear the fire of dust, ashes, and cinder, and that without any interruption in the fire-chamber or any diminution of the heat in the furnace.

In Fig. 3 I show a plan view of the grate-bar; but I desire to state distinctly that I do not limit myself to any particular form of grate-bar, because I can use with the shaking and dumping construction just described grate-bars of various forms.

In Fig. 4 I show a different way of attaching the chain-links to the grate-bars. Here the open links are riveted to the under side of the bar, as shown at 33. The next link of the chain would be pivoted to the link at 34.

In Fig. 5 I show how the grate-bar may be attached to the chain by means of a bolt, the head of which is countersunk in the bar, the bolt being secured to the chain by means of a nut similar to the manner shown in Fig. 1.

In Fig. 6 I show a section of one of the wheels 11. In this case the cogs 13 are designed to be used with a chain similar to that shown in Fig. 7, the section at the right side of the figure being a portion of the chain on the line *g h*, Fig. 7.

In Figs. 8 and 9 I show different forms of chain which may be used. I do not limit myself to any particular forms of chain or of cogs.

In some cases, such as in a battery of cylinder-boilers, where the boilers are arranged side by side and are supported by intermediate walls, it will be necessary to have separate shafts, wheels, chains, and grate-bars for each section of the battery. In such case, as the end of the shaft could not be brought outside of the side wall, it is necessary to adopt some other means of turning the wheels for the purpose of shaking or dumping the grate. This may be accomplished by having a straight bar connected to the chain below the wheels and extending out in front of the furnace in or under the floor,

said bar to be provided with holes or notches, by which it may be moved by a lever or by a cog-wheel. Various other ways of moving the wheels may be suggested, and I therefore do not limit myself to any particular method.

My invention is also applicable to stoves or ranges, and in Fig. 10 I show it as applied to a common cooking-stove. In this stove there is but one shaft, 35, having a wheel, 36, at each end. Here one end of the chain 37 is attached to a lug on the wheel, as at 38, and the other end is fastened to a grate, 39, as at 40. The grate 39 is provided with side bars, 41, as well as grate-bars 42, and it is placed upon ways or slides 43, which are extended out beyond the front of the stove any desired distance. The grate is also provided with a staple or eye, 44, by means of which it may be drawn out through the door 45, if desired. Above the door 45 is the usual feed-door, 46. The grate-bars 47 are of such width that when they are drawn up to a horizontal position their edges will come together and form a close bottom. When the grate 39 is drawn out to be cleaned the door 45 is opened, a hook or other tool inserted into the staple 44, and the grate drawn forward on the ways 43. This turns the wheels 36 and draws the grate-bars 47 up into the position formerly occupied by the grate. The upper portion of the fire in the fire-chamber of the stove will be retained in position by the front plate while the grate is being drawn out through the door 45, and will then settle down upon and be supported by the grate-bars 47. That portion of the fire which is drawn out of the stove in the grate 39 will be composed of hot embers, and is very suitable for boiling and similar purposes. These operations may be carried on upon it, and by opening the upper doors, 46, of the stove all vapors or any smoke which may arise therefrom will be drawn into the stove and carried out by the draft; or after the grate 39 has been drawn out it may be rattled out, and all cinders, dust, and ashes removed therefrom, and then by pushing it backward it may be restored to its proper place in the stove. The chain 37 is disconnected from the wheel 36, except at the point 38, and the wheels are free to turn whenever the grate 39 is moved from the front.

In ordinary cooking-stoves the construction shown in Figs. 1 and 2 may be applied instead of the ordinary grate; but this construction would not have the advantage of affording a broiling fire such as is given by the one shown in Fig. 10.

The main advantage of my invention is the fact that it gives an efficient and easily-operated shaking and dumping grate for large furnaces, and one in which burnt or defective bars are accessible for renewal without disturbing the operation of the furnace. It increases combustion and renders the operation

of the furnace much more even and perfect. It enables me to utilize an inferior quality of fuel for the reason that I am enabled to keep the fire open and the grate clear.

The chain-grate may be used as a shaking-grate without being mounted on wheels. In such case the bars would be supported on rails—as, for instance, at 21, Figs. 1 and 2—and may be shaken by being pushed back and forth on the rails by means of a suitable hook or shaker.

I am aware that a rotating chain-grate delivering at its rear has heretofore been used in conjunction with a sliding feed-door; but so far as I am aware a reciprocating chain-grate having a front delivery has not been used in conjunction with an escape-door and fire-plate or cut-off.

I am also aware that a grate composed of a series of chain-carriers and a series of short longitudinal detachable bars or bar-sections has been devised, and do not herein claim the same, for the reason that such a grate would not have the required rigidity to prevent the sagging and burning off of the bar-sections; but

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of a movable chain-grate having a grated surface of greater area than that of the fire-chamber in which it is placed, in combination with said fire-chamber having a door or opening in front of the grate and a fore-plate or dam above said door, substantially as and for the purposes described.

2. The combination of a chain-grate turning on wheels with a shield or deflector extending over the axle of the rear wheels, to prevent the ashes, &c., from falling in the rear of the ash-pit back of the fire-chamber, substantially as and for the purposes described.

3. A movable chain-grate having bars, one edge of which is higher than the adjacent edge of the preceding bar, substantially as and for the purposes described.

4. A fire-chamber having a movable grate, in combination with a chain-grate attached thereto, so that when the former is drawn out the latter will take its place and sustain the fire in the chamber, substantially as and for the purposes described.

5. In a reciprocating chain-grate, the combination of the continuous chain-carriers and a series of detachable transverse bars, said series of bars being less in extent than the continuous carriers, substantially as and for the purpose specified.

In testimony whereof I have hereunto set my hand this 10th day of June, A. D. 1882.

WILLIAM SWINDELL.

Witnesses:

T. B. KERR,
JAMES H. PORTE.