No. 646,913.

Patented Apr. 3, 1900.

W. McCLAVE.

GRATE.

(Application filed Oct. 10, 1899.)

(No Model.)

4 Sheets—Sheet 1.

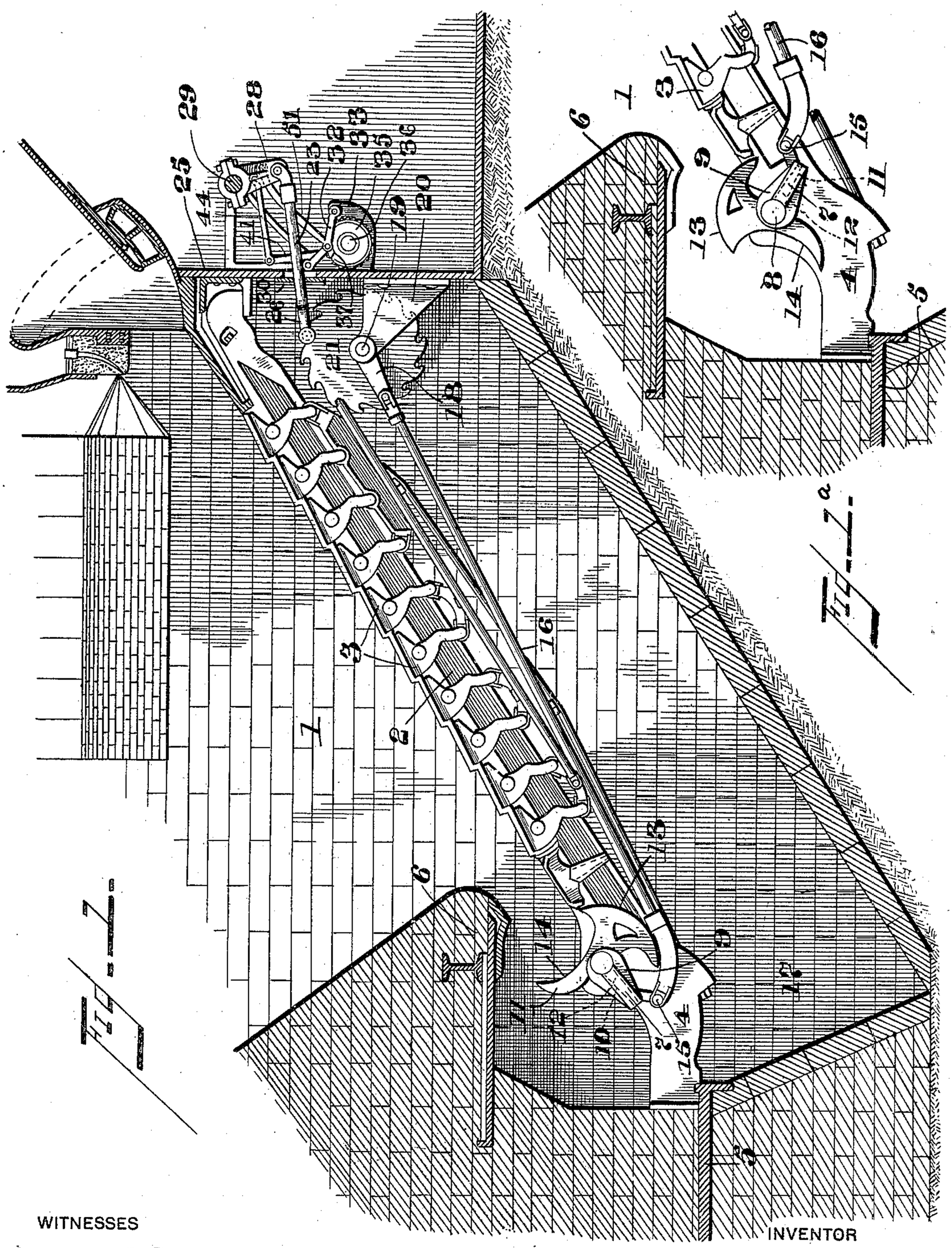

FIG. 1.

FIG. 1a.

WITNESSES

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(No Model.) 4 Sheets—Sheet 2.

FIG. 2.

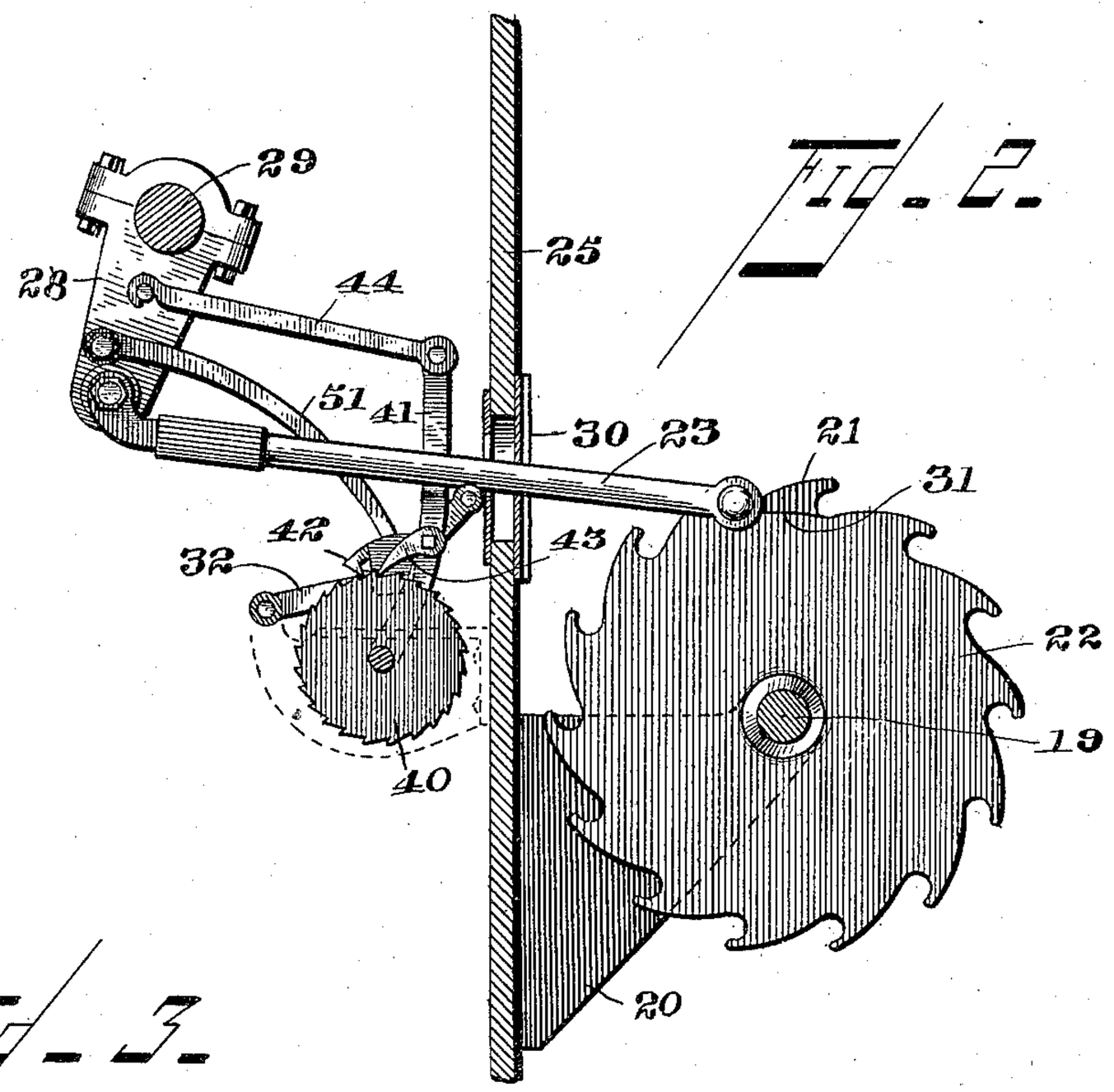
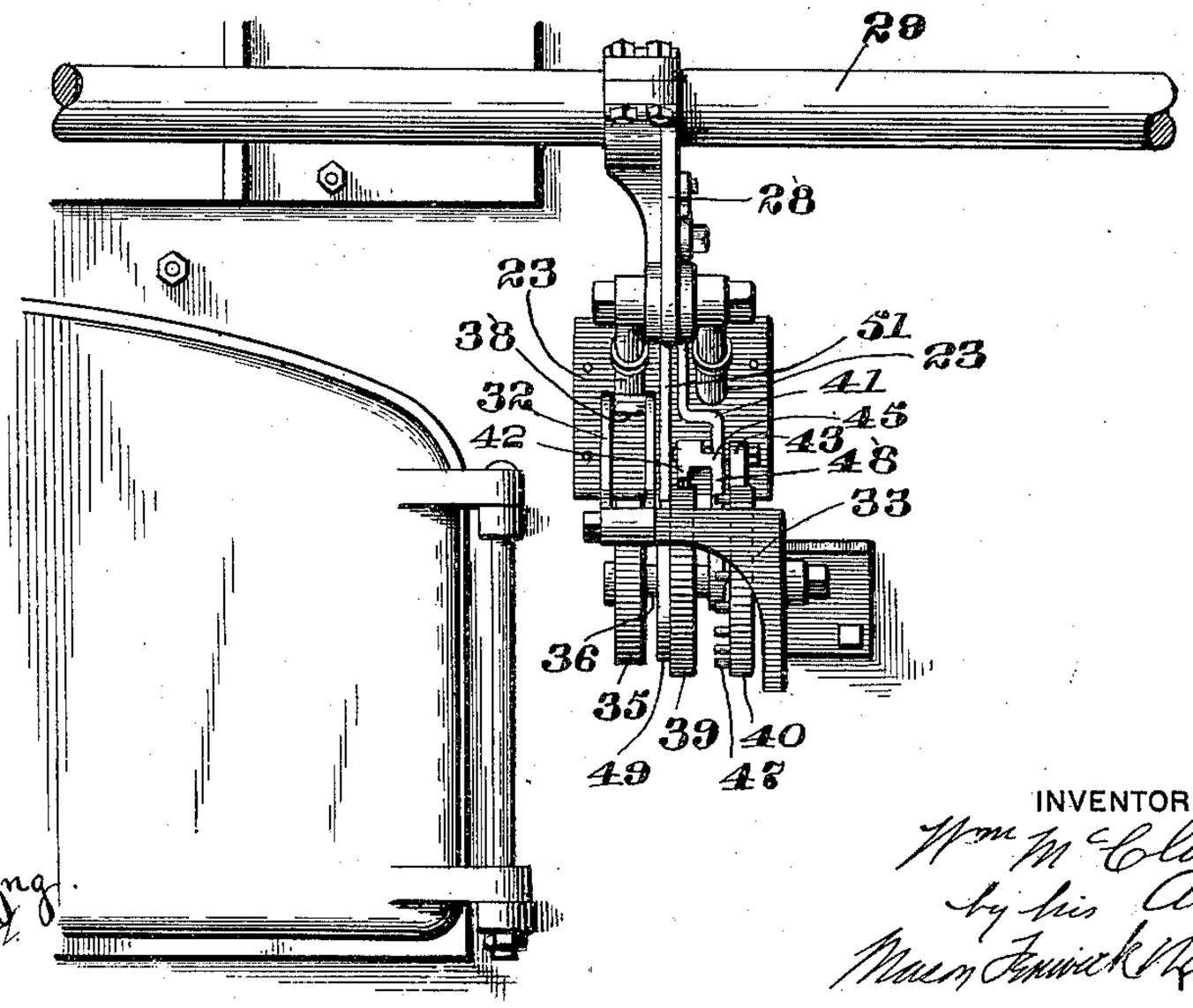


FIG. 3.



WITNESSES

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No. 646,913. Patented Apr. 3, 1900.

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GRATE.

(Application filed Oct. 10, 1899.)

(No Model.) 4 Sheets—Sheet 3.

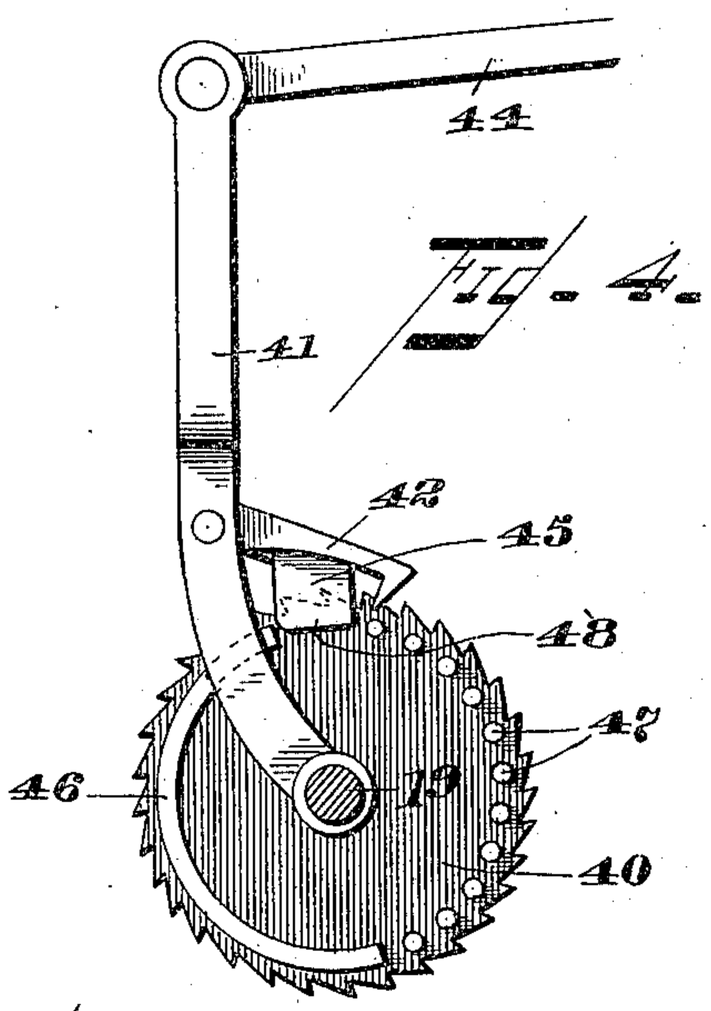

FIG. 4.

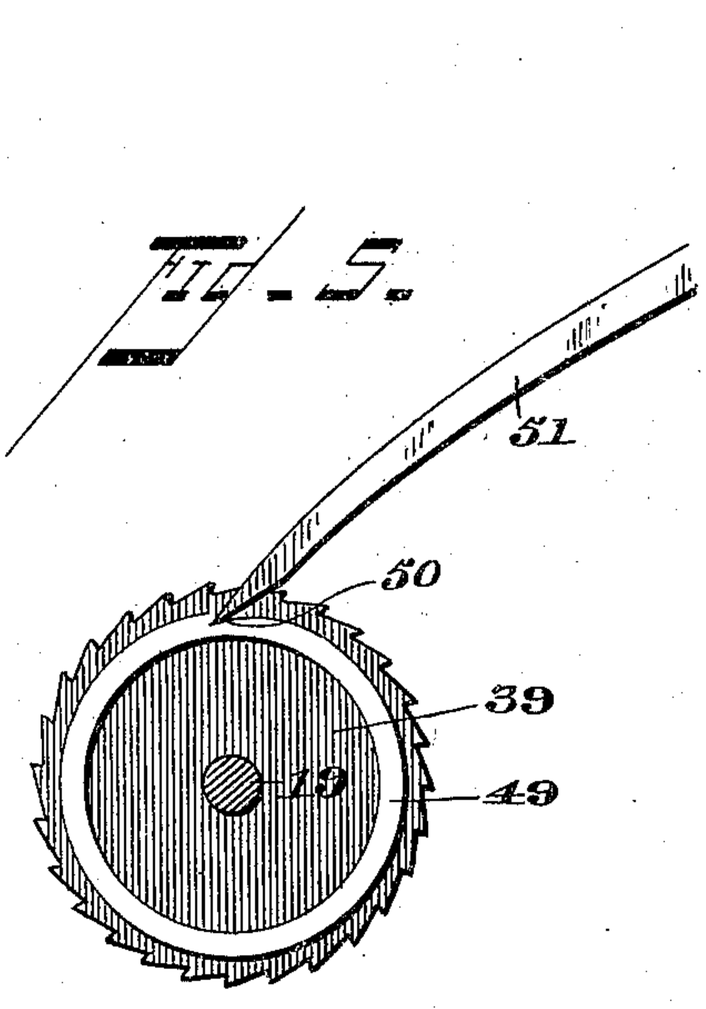

FIG. 5.

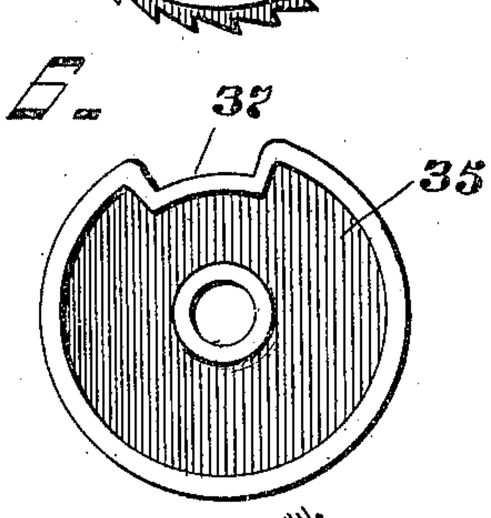

FIG. 6.

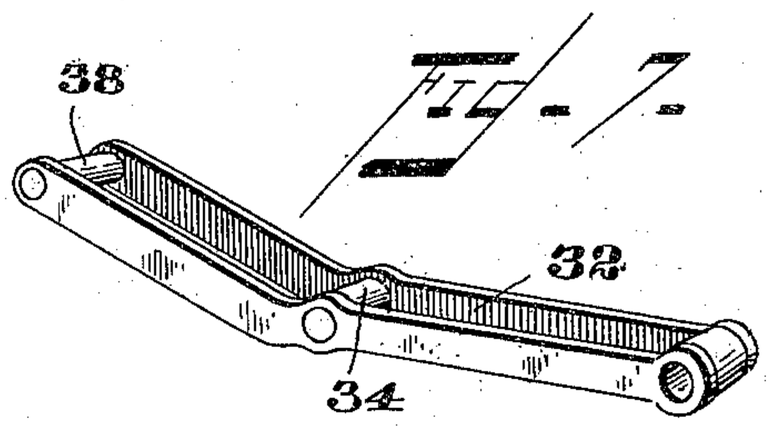

FIG. 7.

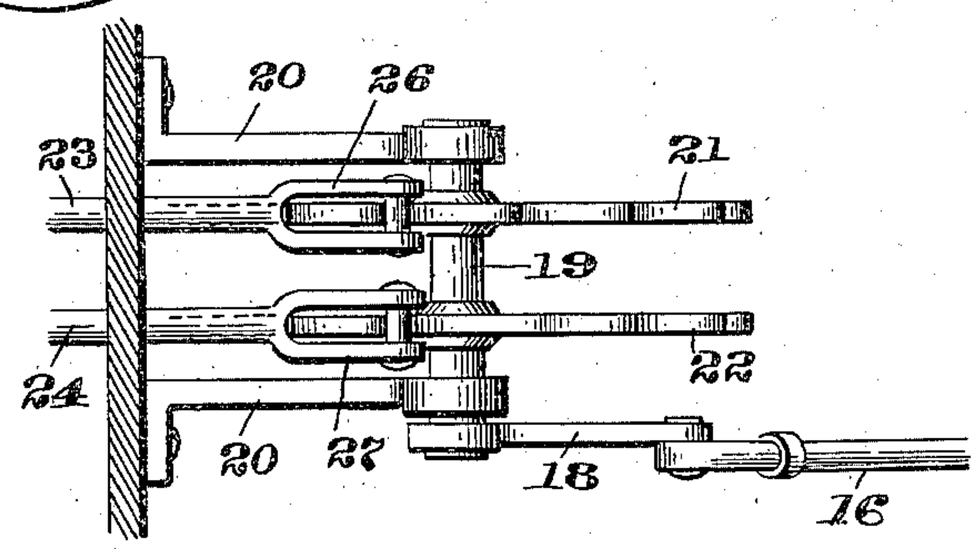

FIG. 8.

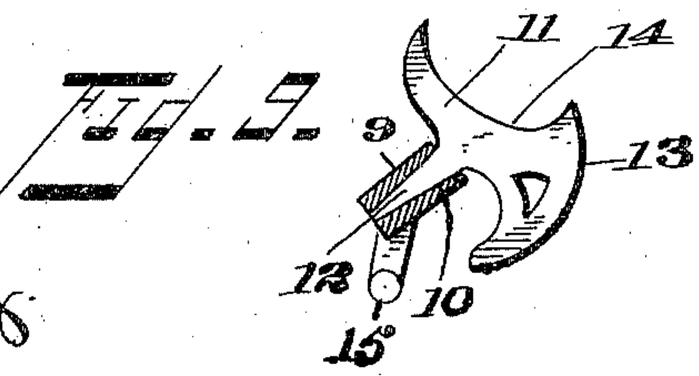

FIG. 9.

WITNESSES

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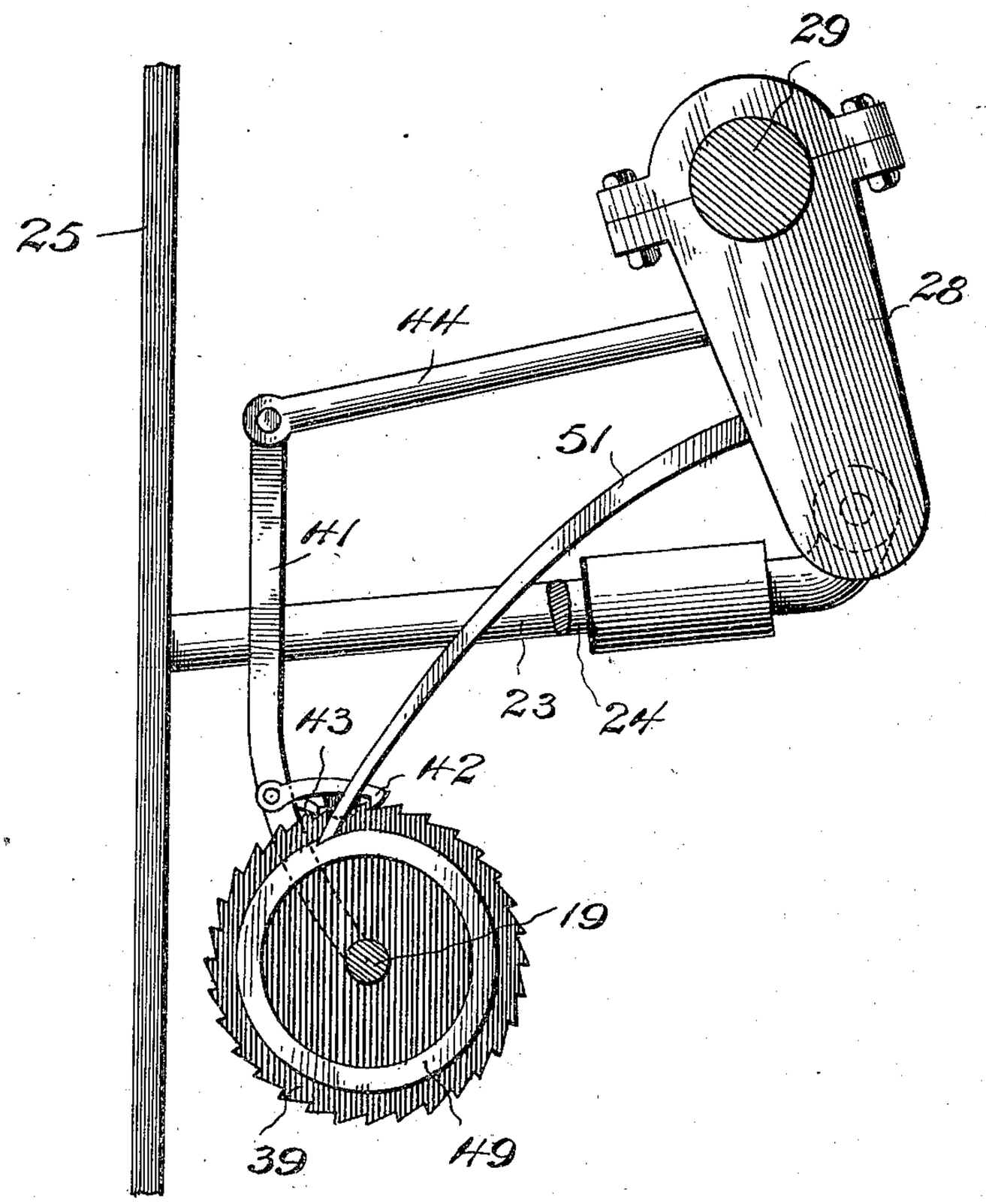
GRATE.

(Application filed Oct. 10, 1899.)

(No Model.)

4 Sheets—Sheet 4.

Fig. 10.



Witnesses
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Cassell Everance.

Inventor:
William Mc Clave,
by Munn & Fenwick & Spencer
his Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM McCLAVE, OF SCRANTON, PENNSYLVANIA.

GRATE.

SPECIFICATION forming part of Letters Patent No. 646,913, dated April 3, 1900.

Application filed October 10, 1899. Serial No. 733,137. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MCCLAVE, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented certain new and useful Improvements in Grates; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in grates, and particularly to grates having rocking cut-out bars at their lower ends for cutting out clinkers and ashes and depositing them into the ash-pit.

It consists in a cut-out mechanism for grates comprising a rocking bar, a cutting edge, and fuel-supporting surfaces on said bar, means for rocking the said bar so as to cause the cutting edge to travel upwardly and backwardly across the path of the clinkers when cutting out a portion of the same and adapted to deposit it into the ash-pit of the furnace, a ratchet mechanism upon the furnace-front for rocking the said bar, and means for connecting and disconnecting the said ratchet means with a power mechanism on the front of the furnace, said means being capable of being adjusted so as to lengthen or shorten the intervals between the periods of operation; and it also consists in a cut-out mechanism for grates comprising a rocking bar located at the lower end of a grate, a cutting edge, and supporting-surfaces on said grate, means for rocking the said bar so as to cause the cutting edge to travel upwardly and backwardly across the path of the clinkers when cutting out a portion of the same and depositing it into the ash-pit, but in such a manner as to prevent the sliding of the fuel on the grate while the cut-out is operating, ratchet mechanism mounted upon the front of the furnace, a crank operated by the said ratchet mechanism, and a rod connecting the said crank with the rocking bar, whereby the rocking cut-out may be operated at intervals of greater or less frequency.

It also consists in certain other novel constructions, combinations, and arrangements of parts, as will be hereinafter fully described and claimed.

In the accompanying drawings, Figure 1 represents a vertical longitudinal section through a furnace having a grate constructed in accordance with my invention. Fig. 1ª represents a detail sectional view of the lower part of the said grate, showing the rocking cut-out in a different position. Fig. 2 represents a detail sectional view through the front of the furnace, illustrating the mechanism for operating the rocking cut-out. Fig. 3 represents a front elevation of the same, a portion of the furnace-front being also shown. Fig. 4 represents a side elevation of one of the ratchet-wheels employed in the mechanism for rocking the cut-out. Fig. 5 represents a side elevation of another ratchet-wheel. Fig. 6 represents a side elevation of a cam used upon the ratchet mechanism. Fig. 7 represents a perspective view of a lifting-lever for disconnecting the parts. Fig. 8 represents a top plan view of the ratchet mechanism for operating the rocking cut-out; and Fig. 9 represents a detail cross-section through the rocking cut-out bar, showing one of the teeth thereof in place in its socket. Fig. 10 is an enlarged vertical sectional view through the front of a furnace, taken to one side of the ratchet-wheels which I employ in connection with the stoking mechanism, the said view also illustrating the pawls for operating the ratchets in connection with the power-shaft and arm carried thereby.

My improved mechanism for cutting out the clinkers and ashes at the bottom of a grate may be applied to any inclined grate down which the fuel is fed. I preferably, however, apply it to an inclined grate having rocking grate-bars, as illustrated in the drawings, and by which the fuel may be continually fed down the surface of the grate, the mass of the fuel passing beneath the bridge-wall at the lower end and resting upon the cut-out bar. At proper intervals it is desirable to cut out the mass of clinkers and ashes at the lower end of the bed of fire and deposit the same in the ash-pit. It is also desirable to do this in such a manner that the fuel will be held from slipping down the grate while the clinkers are being deposited in the ash-pit, and also in such a manner that no more than the usual amount of draft can enter the combustion-chamber at the lower end of the grate. It is also desirable to construct such

a cut-out and connect it with operating mechanism in such a manner that it may be rocked with any desired frequency, the construction of the parts being such that the periods between the rocking of the bar may be lengthened or shortened to suit the kind of fuel being burned in the furnace and the degree of temperature which it is desired to produce in the combustion-chamber. My improved cut-out mechanism is designed to accomplish all these purposes and in a simple and effective manner.

In carrying out the features of my invention I provide the furnace 1 with a suitable inclined grate, as 2, which is made up, preferably, of rocking grate-bars, as 3 3, adapted to feed the fuel down the inclined grate. The grate is supported upon carrier-bars, as 4, which rest at their upper ends upon brackets on the furnace-front and at their lower ends upon a bearer bar or plate, as 5, located a suitable distance below the bridge-wall 6. The bridge-wall 6 is made in such a manner as to overhang the lower end of the fire-bearing surface of the grate and preferably extends forward of the point where the rocking cut-out bar is located. It is formed in such a manner as to limit the depth of the material upon the grate as it passes under the said bridge-wall. Between the lower ends of the carrier-bars 4 is mounted a rocking cut-out bar 7, which is provided with journals, as 8, which engage bearings in the said carrier-bars. By means of the journals 8 the bar is pivotally mounted upon the said carriers and may be rocked back and forth. The rocking bar is preferably formed with a body portion, as 9, having a series of sockets, as 10, formed therein, into which fire-bearing fingers, as 11, are inserted, the said fingers having tapered shanks, as 12, which fit in the said sockets 10. The fingers 11 are provided with a convex outer periphery, as at 13, for about half their fire-engaging surface and with a concaved peripheral portion, as 14, for the remainder of the fire-bearing surface. The cut-out normally stands with the concaved peripheral portion 14 arranged upwardly, as shown in Fig. 1 of the drawings, the said concaved portion forming a pocket to receive the clinkers and ashes from the grate as the same reach the lower end of the said grate. The rocking cut-out 7 is provided with an actuating-journal, as 15, secured to the lower edge of its body portion. The journal 15 is adapted to engage the lower end of an operating-rod 16, which extends to the front of the furnace, where it is attached to the cut-out-operating mechanism. It will be seen that the cut-out extends across the path of the clinkers and the ashes and that when it is rocked rearwardly its convex peripheral portion will travel across the path of the clinkers, cutting off the lower portion thereof and carrying it backwardly until it is emptied into the ash-pit 17 beneath the grate. When it is rocked rearwardly, as seen in Fig. 1[a] in the drawings, the concaved portion of the cut-out bar is so tipped as to deposit its contents in the ash-pit, while the convex portion of the cut-out holds the fuel upon the grate from sliding down the surface of the same. When the rocking cut-out is returned to its normal position, the fuel gradually settles down into the concaved socket again. It will be seen that the clinkers are cut at a point below the bridge-wall, so that the fuel still seals the space between the lower end of the grate and the said bridge-wall, thus preventing excessive draft from entering the combustion-chamber at this point during the cutting-out operation.

The mechanism for operating the rod 16, and thereby rocking the cut-out bar, forms an important part of my invention. The upper end of the said rod 16 is secured to the wrist-pin of a crank 18, the said crank 18 being secured to the end of a short shaft 19, mounted upon a bracket 20, secured to the furnace-front. The crank 18 is located outside the bracket 20, so that it may make a complete revolution for rocking the cut-out bar. Upon the shaft 19, between the arms of the bracket 20, are rigidly mounted ratchet-wheels 21 22. Rods 23 and 24 project through the furnace-front 25 and engage with their inner bifurcated ends 27 27 the teeth of the ratchet-wheels 21 and 22. The outer ends of the said rods 23 and 24 are pivotally attached to an arm 28, mounted upon and carried by a rock-shaft 29, arranged outside the furnace-front. The rock-shaft 29 is preferably kept in continual motion, being rocked back and forth by any suitable power mechanism. The rods 23 and 24 pass through slots in the front of the furnace 25, which are closed by means of slides, as 30, so that when a forced draft is used for the furnace a portion of it may not escape through the said slots. When the rods 23 and 24 engage the teeth of the ratchet-wheels 21 and 22, the rocking movement of the shaft 29 will cause them to rotate the said ratchets, thereby turning the crank 18 and rocking the cut-out 7. It is not desirable to have the rocking cut-out working at all times, and therefore the rod 23 is adapted to be lifted out of engagement with the teeth of the said ratchet-wheel 21 by suitable mechanism, which will hereinafter be described. The ratchet-wheel 22 has one of its teeth cut away, forming a space, as at 31, which prevents the rod 24 from engaging the next ratchet-tooth until it is helped by the rod 23. Thus the rod 24 may move back and forth in the said space without actuating the cut-out mechanism when the rod 23 is lifted from its ratchet-wheel 21.

In order to raise and lower the rod 23 for disengaging or engaging the ratchet-wheel 21, I mount a lever, as 32, upon a bracket 33, secured to the front of the furnace. The said lever 32 is preferably formed of two side bars, secured together at their ends and interme-

diately thereof. About centrally of the said bar a journal, as 34, is mounted, which is adapted to rest upon the periphery of a cam-disk 35. The cam-disk 35 is mounted upon a shaft 36, secured at one end to the bracket 33. The said cam 35 is provided with a depressed portion, as 37, upon its periphery, into which the bearing 34 drops for lowering the lever 32. The free end of the lever 32 also carries a bearing 38, which is adapted to engage the under side of the rod 23, so as to raise the said rod when the bearing 34 is traveling upon the raised portion of the cam 35. When the bearing 34 drops into the recess 37, the arm 32 will be lowered and the rod 23 will be permitted to engage the ratchet-wheel 21 and impart movement thereto. As soon as the ratchet-wheel 21 has been moved one tooth the rod 24 will be carried past the space 31 and will engage the teeth of the ratchet-wheel 22 and will continue to operate the said ratchet-wheel tooth by tooth until the rod 24 engages the space 31 again. This will insure the complete revolution of the crank 18 and the returning of the rocking cut-out to its normal position. In order to regulate the length of the intervals between the rocking cut-out, I mount upon a shaft 36 ratchet-wheels 39 and 40. The ratchet-wheel 39 is secured to the cam 35 so as to turn therewith, but the ratchet-wheel 40 runs loosely upon the shaft 36, being to that extent an idler. Pivotally mounted between the ratchet-wheels 39 and 40 is an arm 41, which carries actuating-pawls, as 42 and 43. The upper end of the arm 41 is connected with an arm 28 on the rock-shaft 29 by means of a link or bar, as 44, so that the said arm 41 will be moved back and forth by the rocking of the shaft. The pawl 43 is arranged so as to push the ratchet-wheel 40 in one direction, while the pawl 42 is arranged to pull the ratchet-wheel 39 in the opposite direction. By a continued pulling of the ratchet-wheel 39 the cam 36 will be rotated so as to throw the cut-out mechanism into operation at intervals. The pawl 42 is provided with a downwardly-extending plate or projection, as 45, which is adapted to engage a ledge or rib 46 and pins 47, secured upon the inner face of the ratchet-wheel 40. The pins 47 might be extended entirely around the periphery of the ratchet-wheel 40; but I find in use that it is not necessary to have so many pins, as a less number will cause the said ratchets to be moved as frequently as it is desirable to have the cut-out operate. By reference to Fig. 4 of the drawings it will be seen that a space, as 48, is left upon the ratchet-wheel 40 without pins 47, so that when the projection 45 reaches that point it will not be supported by the said pins and will permit the pulling-pawl 42 to engage the teeth of the ratchet 39. As soon as the projection 45 engages the next piu or ledge 46 it will be raised again and cause the pawl to cease in its operation of the ratchet-wheel 39. The ratchet-wheel 40 is being continually fed around by means of the push-pawl 43, and whenever the space 48 arrives beneath the pawl 42 motion will be imparted to the cam 35 as just described. The pins 47 are preferably screw pins or bolts so inserted in the ratchet-wheel that they may be readily removed if it is desired to enlarge the space 48, and all the pins may be removed, only leaving the ledge 46 to engage the projection 45, in which case the ratchet-wheel 39 will be actuated a half-revolution at a time. By inserting some of the pins the periods between the actuations of the said ratchet may be lengthened, so as to give the desired interval between the operations of the rocking cut-out. When the arm 23 is to be lifted out of engagement with the ratchet 21, it is desirable to do so quickly, so that it may not strike the teeth of the ratchet-wheel 21 while it is being raised. For this purpose I provide means for turning the cam 35 quickly when it is about to lift the lever 32. A rib or ledge 49 is secured upon the face of the ratchet-wheel 39 adjacent to the cam 35, the said ledge being provided with a recess or depressed portion, as at 50. A pawl 51, pivoted upon the arm 28 of the rock-shaft, is adapted to have its free end ride upon the ledge 49, and when it drops into the notch or recess 50 the movement of the arm 28 will impart a quick movement to the ratchet-wheel 39 and the cam 35, attached thereto, thus causing the arm 32 to be lifted quickly and the rod 33 to be quickly disengaged from the ratchet-wheel 21.

It will be apparent from the above description that my improved cut-out may be operated at any desired interval of time automatically to rock the said cut-out upwardly and backwardly across the path of the cinders and clinkers for depositing them in the ash-pit and that after the pins in the ratchet-wheel 40 have been properly adjusted the mechanism needs no further attention, but will continually set the rocking mechanism into operation and throw the same out of operation at the proper intervals. It will be noted that the cut-out bar is preferably adapted to travel completely across the path of the cinders and clinkers; but it will be evident that it might be carried only part way across the same without departing in the least from the spirit of my invention.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In combination, an inclined grate and a cut-out, said cut-out comprising a rocking bar with two supporting surfaces and a cutting edge therebetween, said cutting edge adapted to travel upwardly and backwardly across the path of the clinkers when cutting out the same, said supporting-surfaces serving to prevent at all times the sliding of the fuel on the grate, and means for rocking said bar.

2. In combination, an inclined grate and a cut-out, said cut-out being pivotally mounted

below the bridge-wall of a furnace and considerably to the rear thereof to leave ample space above the cut-out to permit the passage of large bodies accidentally in the fuel, said cut-outs comprising a rocking bar having two supporting-surfaces, and a cutting edge between the same, said cutting edges being adapted to travel upwardly and backwardly across the path of the clinkers when cutting out the same, the said supporting-surfaces serving to prevent at all times the sliding of the fuel on the grate, and means for rocking said cut-out bar.

3. A cut-out mechanism for grates comprising a cut-out bar, a power-shaft, mechanism for transmitting motion to said cut-out bar from said shaft, means for causing said mechanism to be engaged with and disengaged from said shaft, said means being capable of being adjusted, whereby the interval of time between successive operations of the cut-out may be varied.

4. A cut-out mechanism for inclined grates, comprising a rocking cut-out bar, a shaft suitably mounted and operatively connected with said cut-out bar, a ratchet-wheel fixed on said shaft, said ratchet-wheel having a portion of its periphery without teeth, a second ratchet-wheel fixed on said shaft, a rock-shaft, rods engaging the teeth of the ratchet-wheels and reciprocated by said rock-shaft, and means, actuated by said rock-shaft, for lifting the rod engaging the teeth of the second-named ratchet, out of engagement therewith, said means being capable of being adjusted, whereby the interval between successive operations of the cut-out may be varied.

5. A cut-out mechanism for grates, comprising a rocking cut-out bar, a crank for operating the same, ratchet-wheels secured to the said crank and adapted to operate the same, one of said ratchet-wheels being provided with a space or interval between two of its teeth, operating-rods for engaging each of said ratchet-wheels and extending through the furnace-front, a rock-shaft mounted on the furnace-front, an arm secured thereto and pivotally attached to the said ratchet-operating rods, and means for raising one of the rods out of engagement with the ratchet-wheel, the construction being such that when the said rod has started the operation of the ratchet-wheels, it will be lifted out of engagement therewith and the other rod will complete the revolution of the ratchet-wheels until it engages the space between the teeth of the said wheel, substantially as described.

6. A cut-out mechanism for inclined grates, comprising a rocking cut-out bar, a shaft suitably mounted and operatively connected with said cut-out bar, a ratchet-wheel fixed on said shaft, said ratchet-wheel having a portion of its periphery without teeth, a second ratchet-wheel fixed on said shaft, a rock-shaft, rods engaging the teeth of the ratchet-wheels and reciprocated by said rock-shaft, a lever actuated by said rock-shaft for lifting the rod engaging the teeth of the second-named ratchet out of engagement therewith, said rod having an intermediate bearing for engaging a cam, and an end bearing for supporting the rod, a cam for engaging the intermediate bearing having a depression in its periphery, adjustable means for operating the said cam, whereby the interval between successive operations of the cut-out bar may be varied.

7. A cut-out mechanism for inclined grates, comprising a rocking cut-out bar, a shaft suitably mounted and operatively connected with said cut-out bar, a ratchet-wheel upon said shaft, said ratchet having a portion of its periphery without teeth, a second ratchet-wheel fixed on said shaft, a rock-shaft, rods engaging the teeth of the ratchet-wheels and reciprocated by said rock-shaft, a lever for lifting the rod which engages the teeth of the second-named ratchet out of engagement therewith, and means for adjusting the movement of the same comprising a cam for raising and lowering the said lever, a ratchet-wheel secured to the shaft of the cam, a loose ratchet-wheel mounted to one side of the cam ratchet-wheel, an arm suitably actuated pivoted between the said ratchet-wheels carrying a push and a pull pawl in operative relation to said loose and fixed ratchets respectively, said pull-pawl being provided with a projection or extension, pins carried by the face of the loose ratchet and arranged with a suitable interval between them, the extension on the pull-pawl, being arranged so as to project into the path of the said pins, whereby when the extension of the pull-pawl drops into said interval, said pawl will actuate said cam, the pins on the loose ratchet-wheel being removable so that the interval of time between successive operations of the cut-out may be varied.

8. A cut-out mechanism for inclined grates comprising a rocking cut-out bar, a shaft suitably mounted and operatively connected with said cut-out bar, a ratchet-wheel fixed upon said shaft having a portion of its periphery without teeth, a second ratchet-wheel fixed on said shaft, a rock-shaft, rods engaging the teeth of the ratchet-wheels and reciprocated by said rock-shaft, a lever for lifting the rod engaging the teeth of the second-named ratchet out of engagement therewith, means for varying the interval between successive operations of the cut-out comprising a cam for engaging said lever, a ratchet-wheel secured to said cam, a pawl actuated from the rock-shaft and in operative relation to the ratchet, adjustable means for throwing the pawl into and out of engagement with the ratchet, a ledge formed upon said ratchet, and a pawl pivoted to the arm of the rock-shaft for riding upon said ledge and engaging a recess therein, whereby when the cam is about to lift the lever and its rod it will be actuated quickly by the pawl engaging the recess in said ledge and the rod will be quickly

carried out of reach of the ratchet-teeth, substantially as described.

9. A cut-out mechanism for inclined grates comprising a rocking cut-out bar, a shaft suitably mounted and operatively connected with said cut-out bar, a ratchet-wheel fixed on said shaft and having a portion of its periphery without teeth, a second ratchet-wheel fixed on said shaft, a rock-shaft, rods engaging the teeth of the ratchet-wheels and reciprocated by said rock-shaft, means actuated by said rock-shaft for lifting the rod engaging the teeth of the second-named ratchet out of engagement therewith, said means comprising a cam adapted to engage the rod, a ratchet secured to said cam, a loose ratchet, a series of removable pins secured to said loose ratchet, means for operating said ratchets, the cam-ratchet-operating means being arranged so as to be engaged by said removable pins, whereby upon removing a greater or less number of said pins the interval between successive operations of the cut-out may be varied.

10. In a furnace, the combination with an inclined grate, of a cut-out mechanism, comprising a rocking bar located at the lower end of the said grate, a cutting edge on the said bar, a concave surface to the rear of said edge to receive clinkers and ashes, and a convex surface to the front of the said edge to support the fuel on the grate, a bridge-wall extending forward of the cut-out bar and in suitable proximity to the lower end of the said grate, the said cut-out being arranged across the path of the descending fuel on the grate, means for rocking the said bar, whereby the cutting edge of the rocking bar may be caused to travel upwardly and rearwardly across the path of the fuel when cutting out clinkers and deposit the cut-out portion in the ash-pit, while the throat between the bridge-wall and the lower end of the grate will be sealed against too great an inflow of draft at the point where the cut-out bar crosses the lower edge of the grate, substantially as described.

11. In a furnace, the combination with an inclined grate, of an overhanging bridge-wall extending beyond the lower end of the fuel-supporting portion of the grate, a cut-out mechanism, comprising a rocking bar located beneath the said bridge-wall and with considerable space left above it to accommodate the passage of large masses or foreign articles in the fuel, the said cut-out being provided with a concave portion for receiving clinkers and ashes and a convex portion for normally holding the fuel from sliding on the grate, and a cutting edge between them, means for rocking the said bar, whereby the said cutting edge will be caused to travel upwardly across the path of the fuel for cutting out a portion of the same and depositing it in the ash-pit, the arrangement being such that the main body of the fuel will be supported by the rocking bar at all times, and the throat between the bridge-wall and the lower end of the grate will be sealed against too great an inflow of draft at this point, substantially as described.

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

WILLIAM McCLAVE.

Witnesses:
M. A. SOMMAR,
E. ELDRIDGE.