

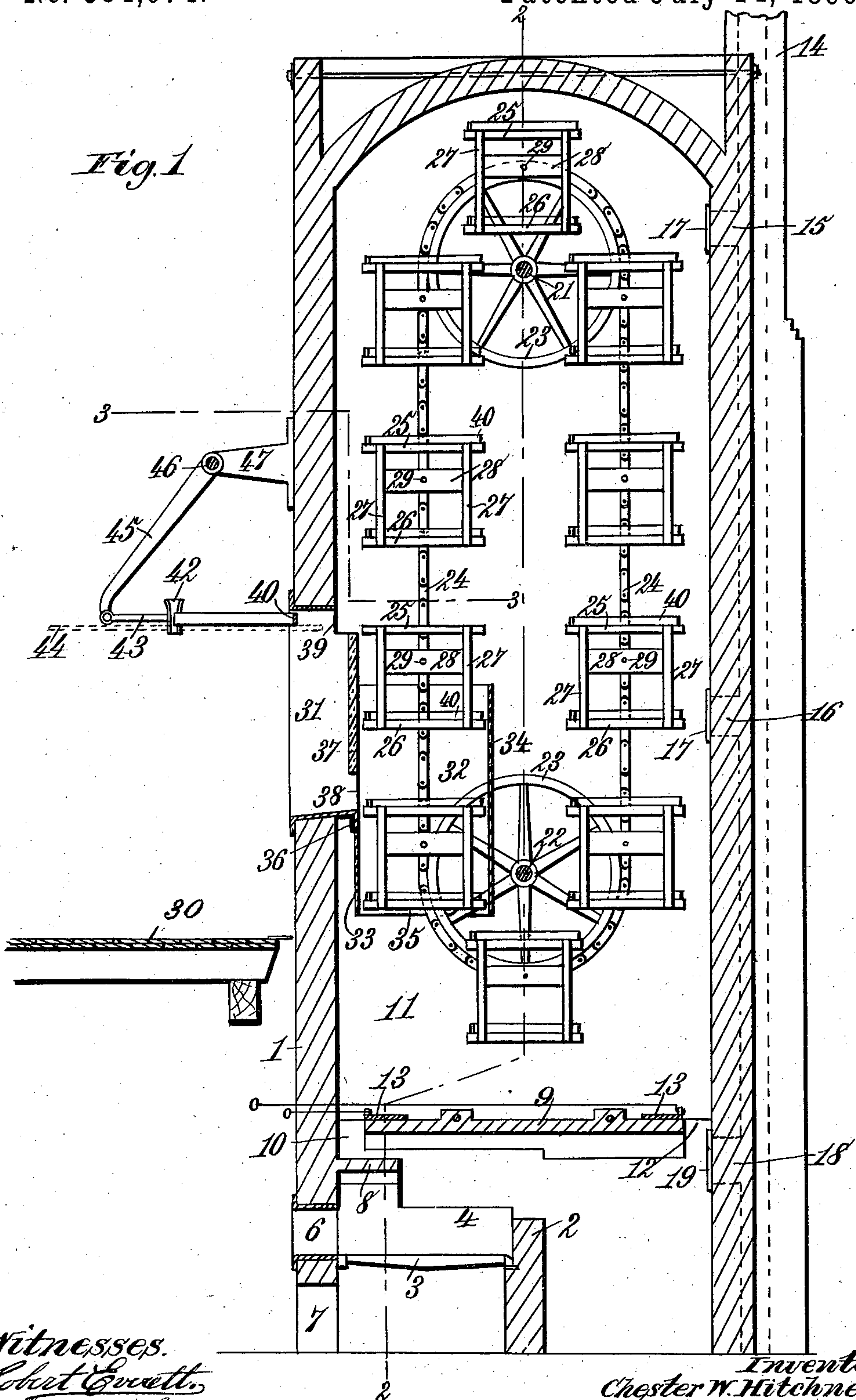
(No Model.)

4 Sheets—Sheet 1.

C. W. HITCHNER.
AUTOMATIC BAKE OVEN.

No. 564,074.

Patented July 14, 1896.



Witnesses.
Robert Everett.
Thos. A. Green

Inventor,
Chester W. Hitchner.
By *James L. Norris.*
Atty.

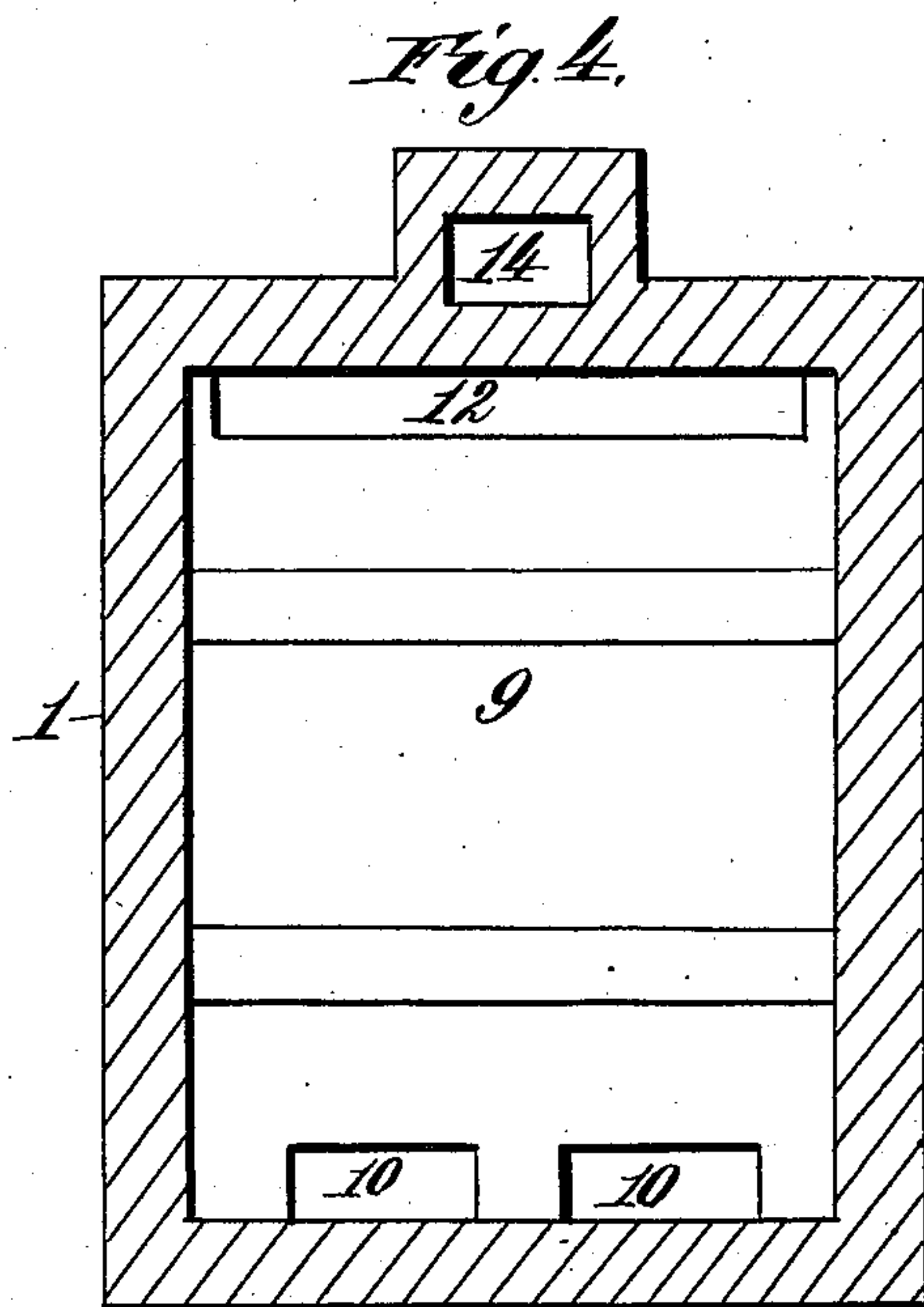
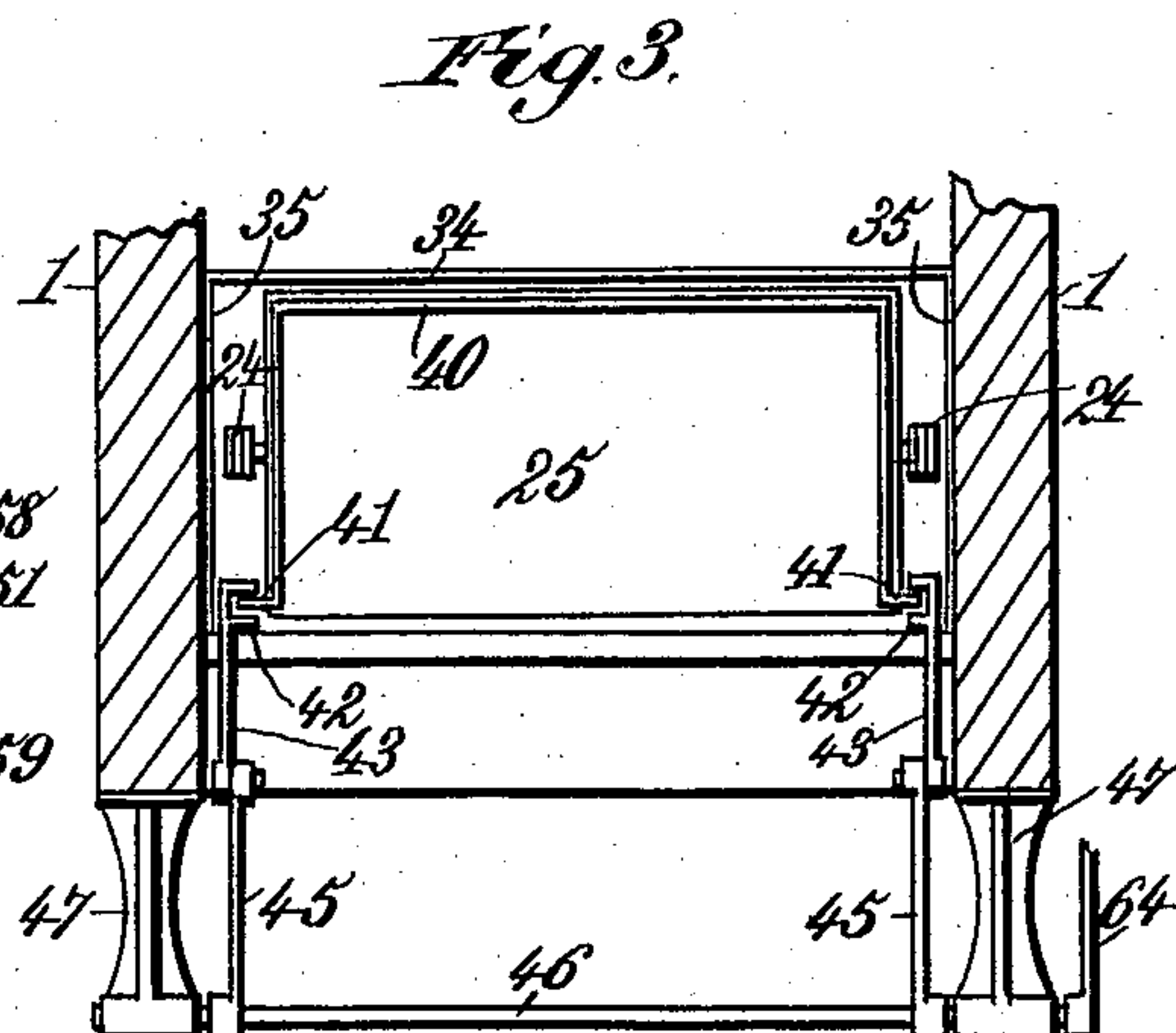
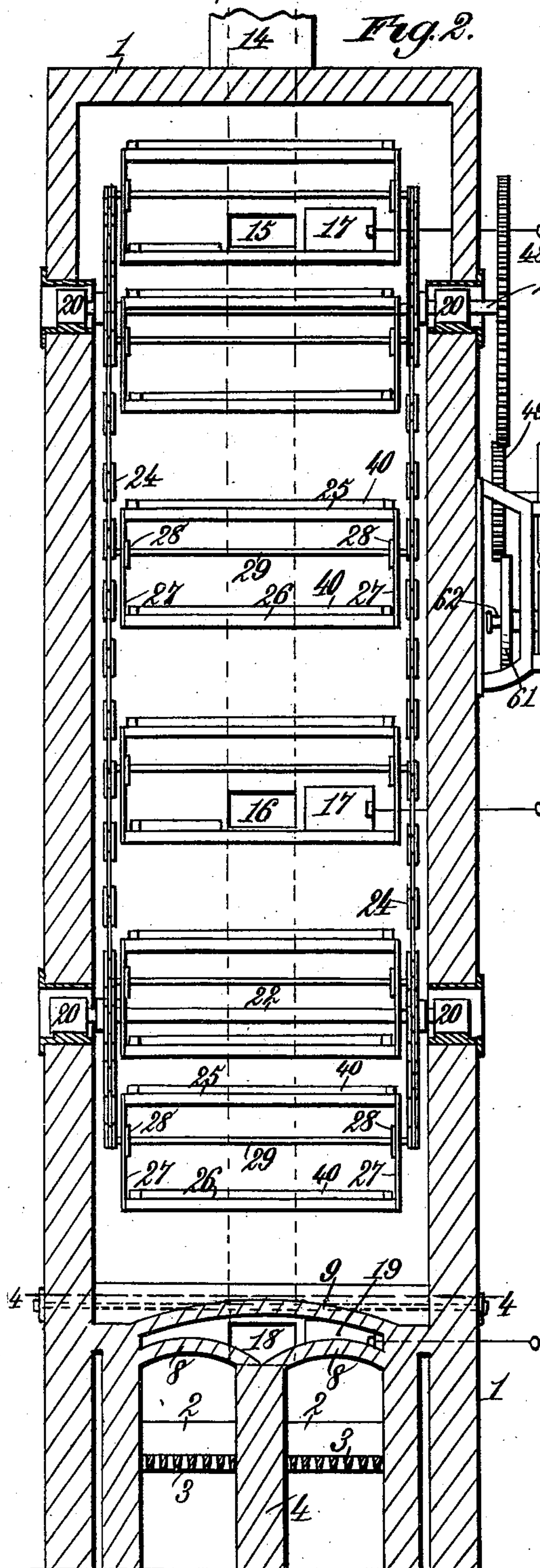
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4 Sheets—Sheet 3.

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Fig. 5.

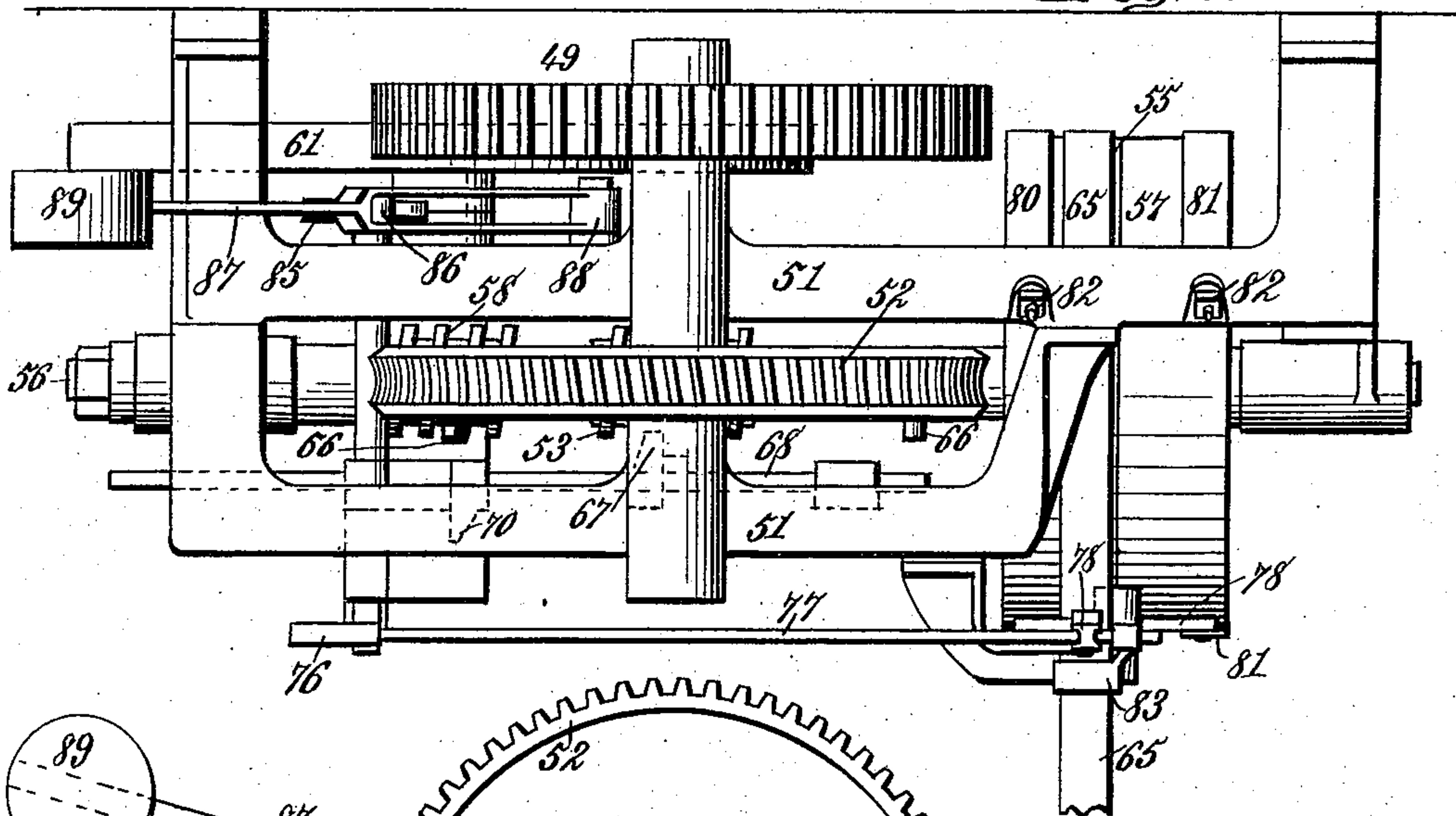
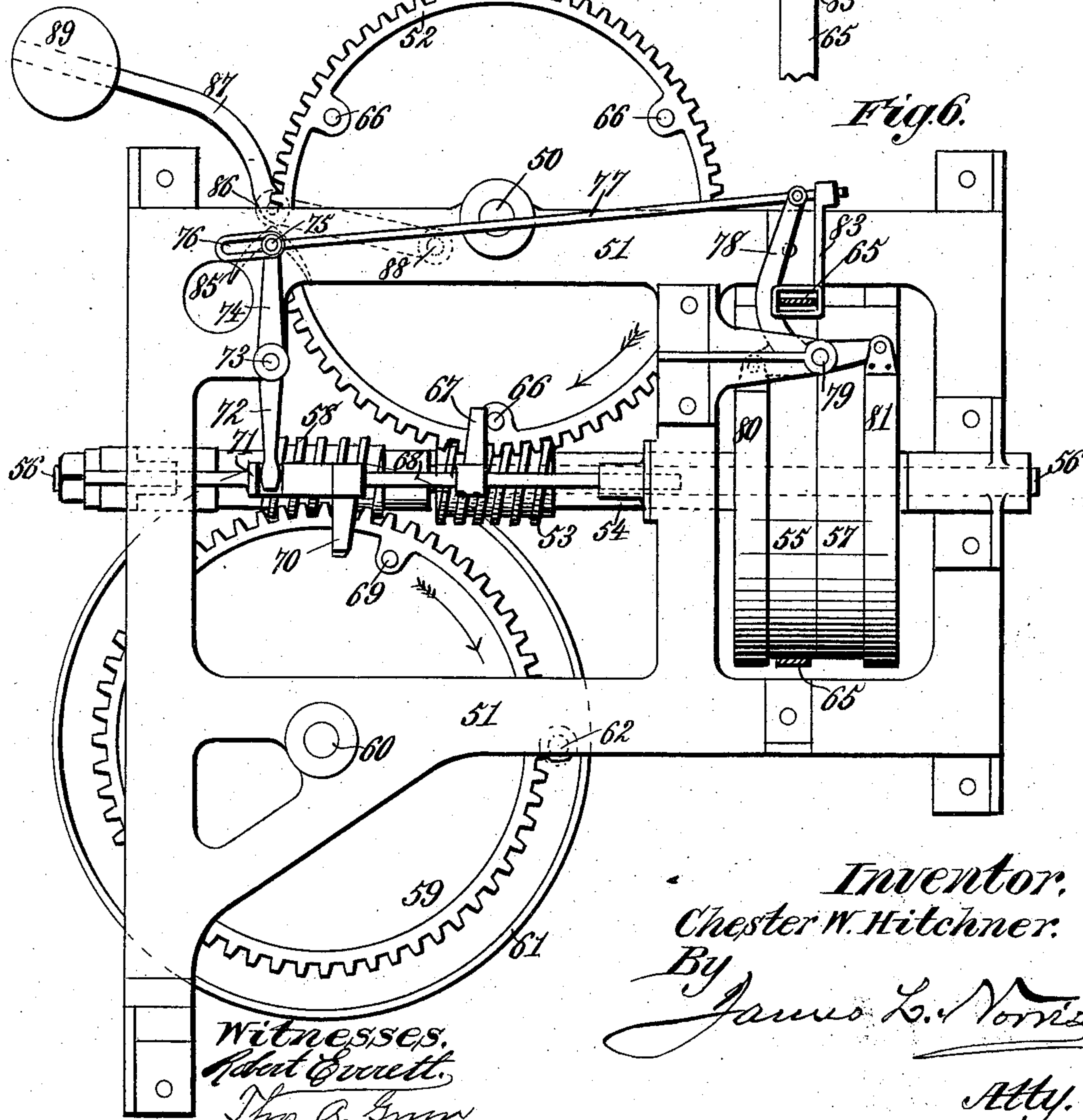


Fig. 6.



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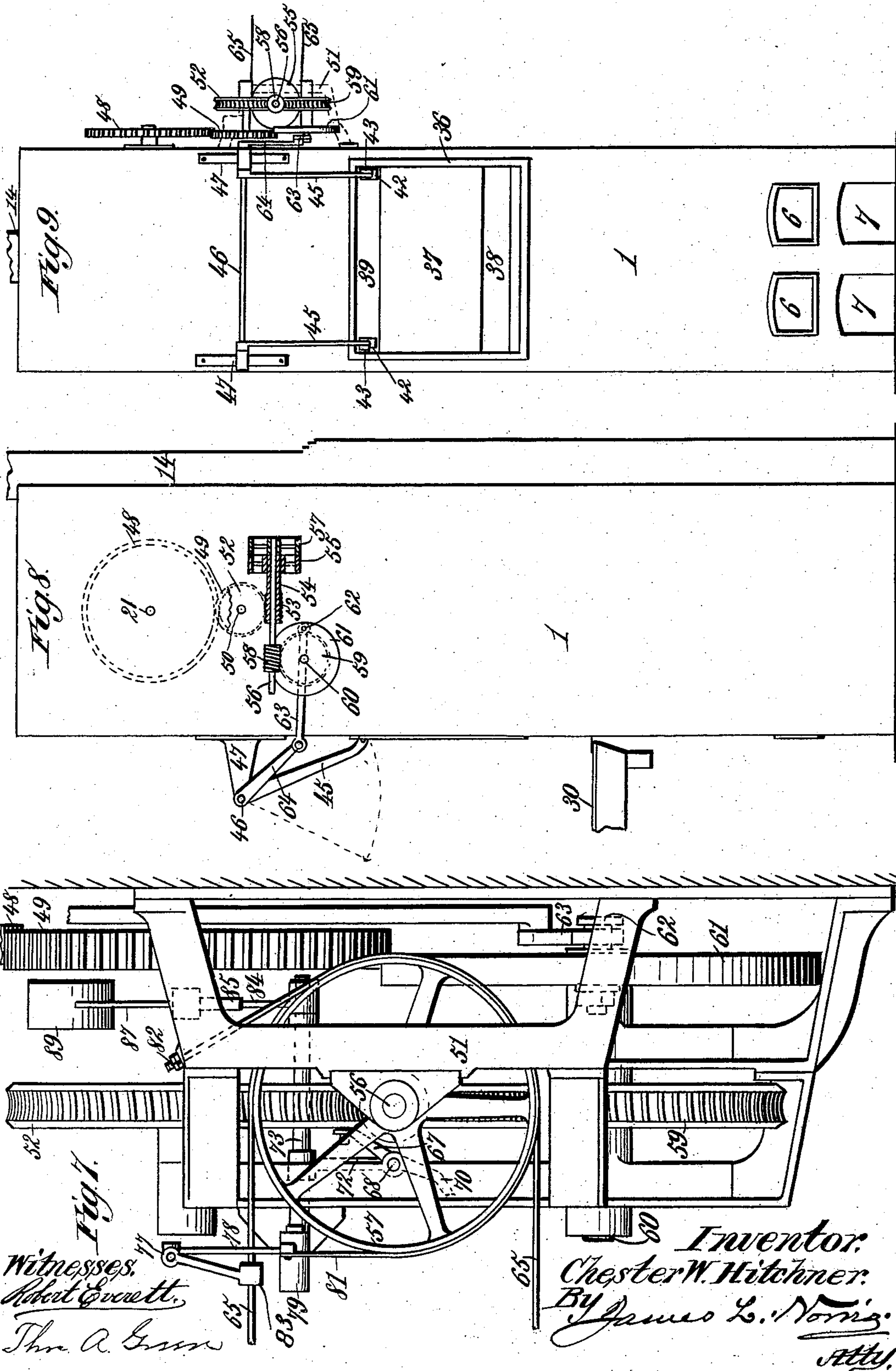
(No Model.)

4 Sheets—Sheet 4.

C. W. HITCHNER.
AUTOMATIC BAKE OVEN.

No. 564,074.

Patented July 14, 1896.



UNITED STATES PATENT OFFICE.

CHESTER W. HITCHNER, OF SCRANTON, PENNSYLVANIA, ASSIGNOR TO
CALVIN W. PARSONS, OF SAME PLACE.

AUTOMATIC BAKE-OVEN.

SPECIFICATION forming part of Letters Patent No. 564,074, dated July 14, 1896.

Application filed September 11, 1895. Serial No. 562,161. (No model.)

To all whom it may concern:

Be it known that I, CHESTER W. HITCHNER, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented new and useful Improvements in Automatic Bake-Ovens, of which the following is a specification.

My invention relates to an automatic oven especially adapted to the baking of crackers and similar goods, and has for its objects to secure a very large capacity with much less floor-space than is ordinarily required; to improve the construction of the furnace and oven so that the goods will not be exposed to the direct radiation of heat from the furnace-fire; to provide means for regulating the distribution of heat throughout the baking-chamber; to provide improved mechanism for automatically controlling the movements of a series of traveling bake-pans or shelves; to provide for an automatic discharge of the baked or finished goods; to prevent the escape of hot gases at the door through which an attendant introduces fresh goods, thus greatly improving the sanitary conditions of the work, and to generally improve the construction and operation of this class of ovens.

The invention consists in the features of construction and novel combinations of parts in an automatic oven, as hereinafter more particularly described and claimed.

In the annexed drawings, illustrating the invention, Figure 1 is a sectional side elevation of my improved automatic oven. Fig. 2 is a vertical transverse section of the same on the line 2 2 of Fig. 1. Fig. 3 is a horizontal section on the line 3 3 of Fig. 1. Fig. 4 is a similar section on the line 4 4 of Fig. 2. Fig. 5 is a plan of driving mechanism for automatically controlling the movements of the bake-pans or shelves and the automatic discharge of their contents. Fig. 6 is a side elevation of said automatic driving mechanism. Fig. 7 is an end elevation of the same. Fig. 8 is a side elevation of the automatic oven, parts of the automatic stopping and starting mechanism being in section and other parts removed. Fig. 9 is a front elevation of the same.

Referring to the drawings, the numeral 1

designates the walls of a vertically-elongated oven-furnace that is so constructed and arranged as to occupy comparatively little floor-space in proportion to the height and capacity of the baking apparatus. The lower part of the furnace is divided transversely by a bridge-wall 2, Figs. 1 and 2, between which and the furnace-front are located the grates 3. There are preferably two grates, separated longitudinally by a wall 4. At the front upper side of each grate is the usual door 6, and below this is a door 7, communicating with the ash-pit.

Above the front portion of each grate 3 is a short arch 8, extended only partly rearward. A short distance above the small arches 8 is a large arch 9, that is extended from side to side of the furnace, but not quite from front to rear. At the front of the arch 9, above the arches 8, are openings 10, Figs. 1 and 4, for the passage of hot air into the oven or baking-chamber 11, located above the main arch. The short arches 8 serve to prevent a direct radiation of heat, through these openings 10, into the baking-chamber. At the rear end of the main arch 9 is an opening 12, Figs. 1 and 4, also leading to the baking-chamber, for the passage of hot air thereto. These openings 10 and 12 may be closed or controlled by means of sliding plates or dampers 13, so that the heat from the fire may be directed to the front or back of the baking-chamber in any proportion that may be desired. The heat and products of combustion will fill the whole baking-chamber when the dampers 13 are opened, and may be allowed to escape into the chimney 14, through openings 15 and 16, controlled by dampers 17, as required. Another opening 18, controlled by a damper 19, is provided below the arch 9 and is to be used as a passage to the chimney 14 when starting the fires and when the dampers 13 are closed for cooling the oven or for other purposes.

In the side walls of the baking-chamber 11 are mounted bearings or journal-boxes 20, Fig. 2, that receive the ends of transversely-arranged shafts 21 and 22, Fig. 1, on which are secured sprocket-wheels 23 near the ends of said shafts. There are two sprocket-wheels on the upper shaft 21 and two on the

lower shaft 22, and the wheels on these shafts are connected by chains 24, running vertically and parallel with each other. This arrangement enables the baking-chamber or oven 11 to be extended to a considerable height and gives it a large capacity with great economy of floor-space.

The goods to be baked are placed upon shelves or pans 25 and 26, arranged in pairs, one above another, and suspended between the chains 24, that travel on the sprocket-wheels. These shelves 25 and 26 consist of thin sheet-iron plates, strengthened by suitable frames of angle-iron and connected in pairs by rigid vertically-arranged bars 27 at the ends of the plates or shelves. A horizontally-arranged bar 28 connects the vertical bars 27 at each end of the shelves, and through each pair of bars 28 is passed a transversely-arranged rod 29, to the ends of which are connected the chains 24, the horizontal bars 28 being arranged nearer to the upper pan or shelf in each pair, so that the suspended shelves will maintain a horizontal position. All the shelves in the series are at equal distances apart.

At a suitable elevation in front of the baking-chamber 11 is a floor or platform 30 for an attendant to stand upon. Above this floor or platform 30 there is provided in the front of the baking-chamber 11 an opening 31, through which access is had for loading and unloading the vertically-traveling shelves. There is arranged inside the opening 31 and within the chamber 11 an air-lock 32, Fig. 1, consisting of a front plate 33, a rear plate 34, and side plates 35, the said air-lock being thus in the form of a rectangular tube or vertical box open at its top and bottom for passage of the traveling shelves. The opening 31 in the front of the oven may be provided with a flanged casing or framing 36, extended partly into the baking-chamber, and the plate 33 at the front lower portion of the air-lock is preferably extended to and connected with this casing. The larger part of the opening 31 is separated from the air-lock 32 by a screen or partition 37, extended between the sides of the casing 36, and preferably constructed from some material that is a non-conductor of heat. Below the screen 37 there is left an opening or passage-way 38 for use in loading the traveling shelves and which may be designated as the "loading-door." Above the screen or partition 37 is an opening or passage-way 39, that may be termed the "unloading-door," through which the baked contents of the pans or shelves are to be automatically discharged into any suitable receptacle. (Not shown.)

The baking is accomplished while the goods on the shelves 25 and 26 make a circuit from the loading-door 38, around the oven to the unloading-door 39, once vertically around the oven being ordinarily sufficient. Some kinds of goods will require more time than others for proper baking. For these the speed of the traveling shelves will be reduced, or the

shelves may be allowed to make several circuits before the goods are discharged; but the apparatus as here shown is adjusted to allow the goods to make one circuit only.

It will be observed that the box or air-lock 32 is of such height as to inclose two or more of the shelves at one time. The interior dimensions of this box or air-lock 32 are just sufficient to permit free passage of the series of shelves, one or more of which serve at all times to cut off communication between the charging or loading door 38 and the interior of the baking-chamber. Thus little or no gas can escape at the charging-door. The escape of gas at the unloading-door 39 may be disregarded, as it will not seriously inconvenience the attendant. It is evident that the air-lock could be extended to prevent escape of gas at the upper door, but it is deemed unnecessary.

The shelves are arranged at equal distances apart, and, being suspended in the manner described, they will readily maintain a horizontal position throughout all parts of the circuit and during the operations of loading and unloading.

By suspending the shelves in pairs, as shown, they may be hung and operated much closer together than if they were hung singly. In practice it is found that the space required between successive shelves to enable them to clear each other properly when passing around the sprocket-wheels (the width of the shelves being the same in both cases) is about one-half more when they are hung singly than when they are hung in pairs, as shown. The height of the baking-chamber required for a given capacity is thus greatly reduced.

For the purpose of removing the finished goods from the oven each shelf 25 and 26 is provided with a scraper 40, Fig. 3, which is extended around the rear side and the two ends of the shelf and is provided with laterally-extended lugs 41 at its front ends. The scraper 40 thus surrounds three sides of the shelf-top and serves as a rim to retain the goods in place. As the shelves successively descend into position at the discharging-door 39 the lugs 41 on the scraper 40 enter grooves 42 in the ends of bars 43, adapted to slide on guides 44, and which bars 43 are pivotally connected to levers 45, keyed to a rock-shaft 46, mounted in bearings 47 at the front of the oven. This rock-shaft 46 is vibrated by mechanism hereinafter described, and thus at the proper time the levers 45 are swung outward, as shown in Fig. 1, thereby dragging the scraper 40 off from the shelf, so as to cause it to scrape the finished goods through the door 39 and into a suitable receptacle.

The sprocket-wheels, chains, and shelves are moved intermittently by mechanism that starts and stops automatically, and the discharging-scraper is actuated by automatically-operating mechanism, while the shelves are at rest.

On the shaft 21 of the upper sprocket-wheels

is secured a spur-gear 48, Figs. 2, 8, and 9, located outside the oven. This gear 48 is driven by a pinion 49 on a short shaft 50, journaled in suitable bearings on a bracket 5 or frame 51, secured to the outside of the oven. On the same shaft with the pinion 49 is secured a worm-wheel 52, driven from a worm 53, mounted upon a sleeve 54, to which a belt-pulley 55 is also secured. The sleeve 10 54 is supported on a shaft 56, having a belt-pulley 57 secured thereon alongside the belt-pulley on said sleeve. On the shaft 56 is a worm 58 for driving a worm-wheel 59 on a shaft 60, to which a crank-arm or crank-wheel 15 61 is also secured. The crank-wheel 61 carries a wrist-pin 62, connected by a rod 63 to a lever 64 on the rock-shaft 46, through which the discharging-scrapers 40 are automatically actuated.

20 The worms 53 and 58 are driven alternately as the belt 65 is shifted from the pulley 55 to the pulley 57 and back.

The worm-wheel 52 carries a series of stop-pins 66 for engaging an upward-projecting 25 finger or tappet 67, secured to a horizontally-sliding rod 68, for which suitable guide-supports are provided on the frame 51, in which the several parts of the automatic driving mechanism are mounted. On the worm-wheel 30 59 is carried a stop-pin 69, for engaging a depending finger or tappet 70, secured on the sliding rod 68. This sliding rod 68 is provided at a suitable point with collars 71, engaging the bifurcated lower end of an arm 72, Fig. 6, depending from a rock-shaft 73, journaled in the frame 51. On the rock-shaft 73 35 is an upward-extended arm 74, provided at its upper end with a pin 75, engaged in an elongated eye 76, formed in one end of a rod 40 77, the other end of which is supported by the upper end of a three-armed lever 78, fulcrumed at 79, Fig. 6, to the frame 51. To the lower arms of the lever 78 are attached brake-straps 80 and 81, that are passed partly around 45 the pulleys 55 and 57 and may be tightened and adjusted by means of nuts 82, Figs. 5 and 7, at the points where said straps are attached to the frame 51. On the end of the rod 77, adjacent to the brake-lever 78, is carried a 50 belt-shifter 83 for moving the belt 65 from one pulley to the other.

The rock-shaft 73 carries an upward-projecting arm 84, Fig. 7, having on its upper end an inverted-V-shaped cam 85, Fig. 6, engaged by a roller 86, mounted on a weighted 55 lever 87, one end of which is fulcrumed at 88, while a weight 89 is mounted on the other end.

The worm-wheels 52 and 59 are rotated in 60 opposite directions, as indicated by the arrows in Fig. 6. The wheel 52 operates to move the shelves of the oven. The wheel 59 drives the crank-pin 62, which operates the mechanism for scraping the finished goods 65 off from the oven-shelves.

While the driving-belt 65 is on the pulley 55, as shown in Fig. 6, the worm 53 will cause

rotation of the worm-wheel 52, and one of the pins 66 thereon will be carried into engagement with the upward-projecting finger 67, 70 thereby moving the rod 68 longitudinally. Through this movement of the rod 68 the arm 72 will be caused to rock the shaft 73 and the arms 74 and 84 thereon, the pin 75 will be moved along in the slot or eye 76 of the rod 75 77, and the apex of the cam 85 will be brought directly beneath the roller 86 on the weighted lever 87, as shown in Fig. 6. As the rotation of the wheel 52 is continued, the apex of the cam 85 will pass to one side of the roller 86, 80 and the consequent fall of the weight 89 will immediately force the rock-shaft arms to the limit of their movement. The slot or elongated eye 76 in the rod 77 permits the rock-shaft arms to move to mid-stroke without 85 moving the belt-shifter 83 and brake-lever 78, but the movement of the cam 85 and its supporting rock-shaft arm from the center line moves the rod 77 a sufficient distance to at once shift the belt 65 onto the other pulley. 90 At the same time the movement of the rod 77 rocks the three-armed lever 78, and thereby tightens the brake-strap 80 of pulley 55 and loosens the brake-strap 81 of pulley 57 just as the belt 65 is shifted. The wheel 52 and 95 its actuating-worm 53 thus come to rest immediately as soon as the belt 65 is shifted from the pulley 55 to the pulley 57, and the amount of movement thus given to the wheels 52, 49, and 48 is sufficient to bring the shelf 100 into position before the discharging-door 39 in readiness for unloading.

As soon as the driving-belt 65 is shifted onto the pulley 57 the shaft 56 and worm 58 will be rotated, thereby causing a rotation of 105 the worm-wheel 59 in the direction of the arrow shown in Fig. 6, while the worm-wheel 52 remains at rest. By the rotation of the worm-wheel 59, shaft 60, and crank 61 thereon the wrist-pin 62 will be caused to move the 110 rod 63, lever 64, and rock-shaft 46 in such direction that the levers 45 on said rock-shaft will draw on the bars 43, Figs. 1 and 3, so as to drag the scraper 40 outward and thereby automatically discharge the finished goods 115 from off the shelf at the unloading-door of the oven. The continued rotation of the wheel 59, crank 61, and pin 62 will cause a rocking of the shaft 46 in reverse direction and thereby return the scraper 40 to its shelf. 120 The stop-pin 69 on the worm-wheel 59 will now engage the depending finger 70, Fig. 6, the rod 68 will be moved back, thereby rocking the shaft 73 and attached arms in a reverse direction, and the roller 86 will drop 125 down the opposite side of the cam 85 and thereby cause the rod 77 and belt-shifter 83 to promptly shift the belt 65 from the pulley 57 to the pulley 55, the lever 78 at the same time slackening the brake-strap 80 and tightening the brake-strap 81, whereupon the 130 wheel 59 will be stopped and the wheel 52 caused to resume its operation and set the oven-shelves in motion. Thus the wheel 52,

through which the oven-shelves are actuated, revolves only until the cam 85 reaches mid-stroke, when the weighted lever 87 promptly acts to cause the belt to be shifted onto the pulley 57 and thereby starts the worm 58 and worm-wheel 59 to revolving. The motion of the wheel 59 continues until the cam 85 and weighted lever 87 can shift the belt back onto the pulley 55. When the belt-shifter is moved, the brake-strap on one pulley is at the same time slackened and the strap on the other pulley is tightened, thus bringing the previously-moving parts promptly to rest.

During the intervals that the oven-shelves are at rest the automatic discharging mechanism is at work removing finished goods from the shelf at the unloading-door 39, and the attendant is occupied in placing fresh goods upon a shelf at the charging or loading door 38. The proportion of time allowed for these operations before the oven-shelves are again automatically set in motion is determined by the relative number of teeth in the wheel 59 and those included between the pins 66 on the wheel 52.

It is not essential that the gears 48 and 49 be employed. The wheel 52 may take the place of these gears by mounting said wheel 52 on the shaft 21 of the upper pair of sprocket-wheels, but the arrangement shown is preferred because it permits the automatic driving mechanism to be mounted altogether in an independent frame 51, which permits adjustment to compensate for any warping or distortion of the brickwork by heat.

It will be seen that in the operation of the oven the attendant has only to place fresh goods upon the shelves, the removal of the finished goods and the starting and stopping of the shelves being accomplished automatically. The labor of one man is thus saved and a higher and more uniform speed is made practicable.

It will be obvious that the air-lock, the construction of the furnace and fire-arches, the suspension of the shelves in pairs, the provision of a scraper on each shelf, serving also as a rim, and the automatic mechanism for moving the shelves and working the scrapers may, severally or all, be applied to advantage in any form of oven in which the shelves or bake-pans are designed to have a traveling movement.

What I claim as my invention is—

1. In an oven, a series of shelves rigidly connected in pairs, and suspended at equal distances between and from endless movable chains, substantially as described.

2. In an oven, a series of shelves connected in pairs by rigid frames, in combination with transversely-arranged rods extended through said frames near the under side of the upper shelf in each pair, and endless movable chains to which the ends of said rods are attached and whereby the shelves are suspended between said chains and maintained in horizontal position, substantially as described.

3. In an oven, the combination with endless traveling chains, and a series of shelves, of vertical frame-bars rigidly connecting said shelves in pairs, horizontal frame-bars connecting each pair of vertical bars and arranged nearest the upper shelf in each pair, and transversely-arranged rods journaled to said horizontal bars, and attached to the endless chains, to suspend the shelves between said chains, substantially as described.

4. In an oven having a charging-door, the combination with said door and with a series of vertically-traveling shelves located in the oven, of an air-lock communicating with said door and through which the shelves are arranged to pass, the said shelves being adapted to cut off direct communication between the oven and said door to prevent the escape of gases, substantially as described.

5. In an oven, the combination with a series of vertically-movable shelves, and a charging-door and an unloading-door located one above the other, of an air-lock located in the oven adjacent to and communicating with the charging-door and through which air-lock the shelves are arranged to pass, the said air-lock and one or more shelves therein being adapted to cut off communication between the oven and the charging-door and prevent the escape of gas, substantially as described.

6. In an oven, the combination with a series of traveling shelves, of a scraper carried on each shelf, and automatic mechanism adapted to engage each scraper in succession and cause it to discharge or remove the contents of the shelf.

7. In an oven, the combination with a series of traveling shelves and scrapers carried on said shelves and partly surrounding the same to retain their contents, of automatic mechanism adapted to engage the scrapers in succession and cause them to discharge or remove the shelf contents, substantially as described.

8. In an oven, the combination with a series of vertically-traveling shelves, and scrapers carried on said shelves, and each provided with lugs, of a pair of sliding bars or arms having vertical grooves to engage the lugs of said scrapers in succession, a rock-shaft having lever-arms connected to said sliding bars, and automatic mechanism for operating said rock-shaft to actuate and return the scraper, substantially as described.

9. In an oven, the combination with a series of traveling shelves suspended from and between endless vertically-movable chains, sprocket-wheels on which said chains are mounted, and scrapers carried on said shelves, of a worm-wheel for driving the shaft of the upper sprocket-wheels, a sleeve having mounted thereon a worm engaging and adapted to drive said worm-wheel, a belt-pulley on said sleeve, a shaft on which said sleeve is loosely mounted, a belt-pulley and a worm on said shaft, a worm-wheel engaged with and adapted to be driven by said last-named

worm, a crank on the same shaft with said last-named worm-wheel, mechanism adapted to successively connect said crank with the scrapers on the oven-shelves, a sliding rod 5 provided with projecting fingers, stop-pins carried by the worm-wheels to engage said fingers and move the sliding rod alternately in opposite directions, a belt-shifter, a brake-lever, and mechanism connecting said sliding 10 rod with the belt-shifter and brake-lever to shift a driving-belt from one pulley to the other and alternately actuate the traveling shelves and scraping mechanism, substantially as described.

15 10. In an oven, the combination with a series of shelves, endless movable chains from which said shelves are suspended, and scraping mechanism for discharging the contents of the shelves, of driving mechanism for alternately actuating the shelf-carrying chains 20 and the scraping mechanism, and means for automatically starting and stopping the said driving mechanism, substantially as described.

25 11. In an oven, the combination with series of shelves, and endless vertically-movable chains from which said shelves are suspended, of scrapers 40 carried on said shelves and provided with lugs 41, the rock-shaft 46 30 having arms 45 and 64, the bars 43 connected to said arms 45 and provided with grooves 42 to engage lugs 41 on the scrapers, the shaft 60 having thereon a crank 61 provided with wrist-pin 62, the rod 63 connecting the pin 35 62 and rock-shaft arm 64, gearing for intermittently actuating the shaft 60 and the chains that carry the oven-shelves, and means for alternately driving the said shaft and the shelf-carrying chains, substantially as described. 40

12. In an oven, the combination with the series of traveling shelves and their scraping mechanism, of the worm-wheel 52 provided with pins 66, the worm-wheel 59 provided 45 with a pin 69, gearing for connecting the worm-wheel 52 with the shelf-carrying de-

vices, a crank 61 mounted on the same shaft with the worm-wheel 59 and connected with the scraper mechanism; intermittently-actuated worms 53 and 58 engaged with and 50 adapted to alternately drive the worm-wheels 52 and 59, a sliding rod 68 having fingers 67 and 70 to be engaged by the pins on the said wheels 52 and 59, belt-pulleys 55 and 57 connected to the worms 53 and 58, the brake- 55 lever 78 having brake-straps 80 and 81 bearing upon said pulleys, the rock-shaft 73 having arms 72, 74 and 84, one of said arms being connected with the sliding rod 68, a rod 60 77 connected with the brake-lever 78 and with a pin on the rock-shaft arm 74, the belt-shifter 83 carried by said rod 77, a cam 85 on the rock-shaft arm 84, and the weighted lever 87 having a roller 86 engaged with said cam, 65 substantially as described.

13. In an oven, the combination with the intermittently-traveling shelves and their scraping mechanism, and the alternately-operated gearing for actuating the shelves and scrapers, of the belt-shifter 83, the rod 77 70 having an eye 76, the rock-shaft 73 provided with arms 74 and 84, a pin 75 carried on the arm 74 and engaged in the eye 76, the cam 85 on the arm 84 the lever 87 provided with roller 86 and weight 89, and means for oscillating the rock-shaft 73 from the driving- 75 gears, substantially as described.

14. In an oven, the combination with the baking-chamber and the grate, of the arch 9 having openings 10 and 12 at its front and 80 rear ends, respectively, the dampers 13 for controlling said openings, and the arches or shields 8 beneath the front openings, substantially as described.

In testimony whereof I have hereunto set 85 my hand in presence of two subscribing witnesses.

CHESTER W. HITCHNER.

Witnesses:

WM. F. BOYLE,
CHAS. E. OLVES.