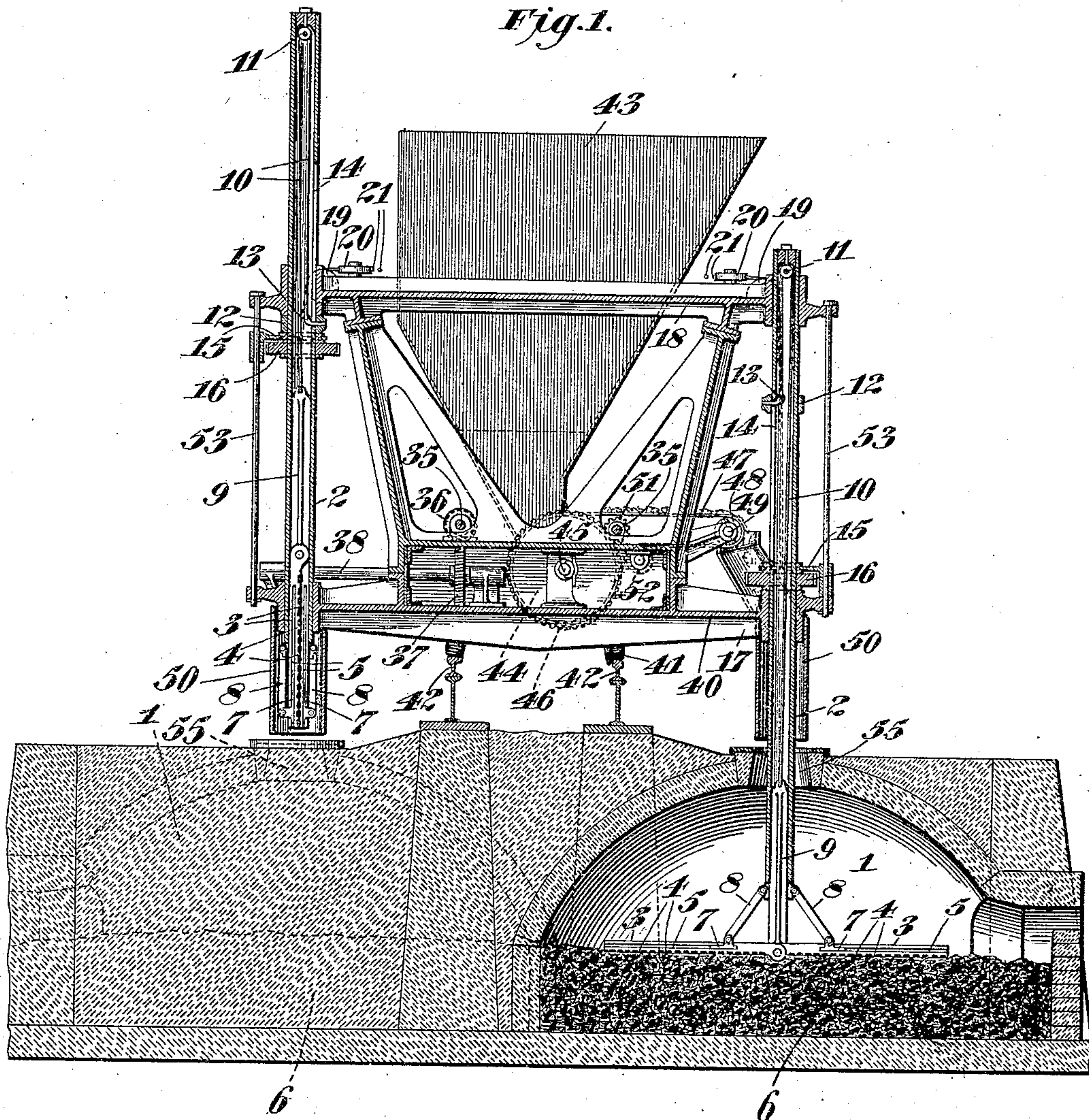


No. 841,868.

PATENTED JAN. 22. 1907.

C. L. HOWER.
LEVELING APPARATUS.
APPLICATION FILED SEPT. 26, 1906.

3 SHEETS—SHEET 1.



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3 SHEETS—SHEET 2.

Fig. 2.

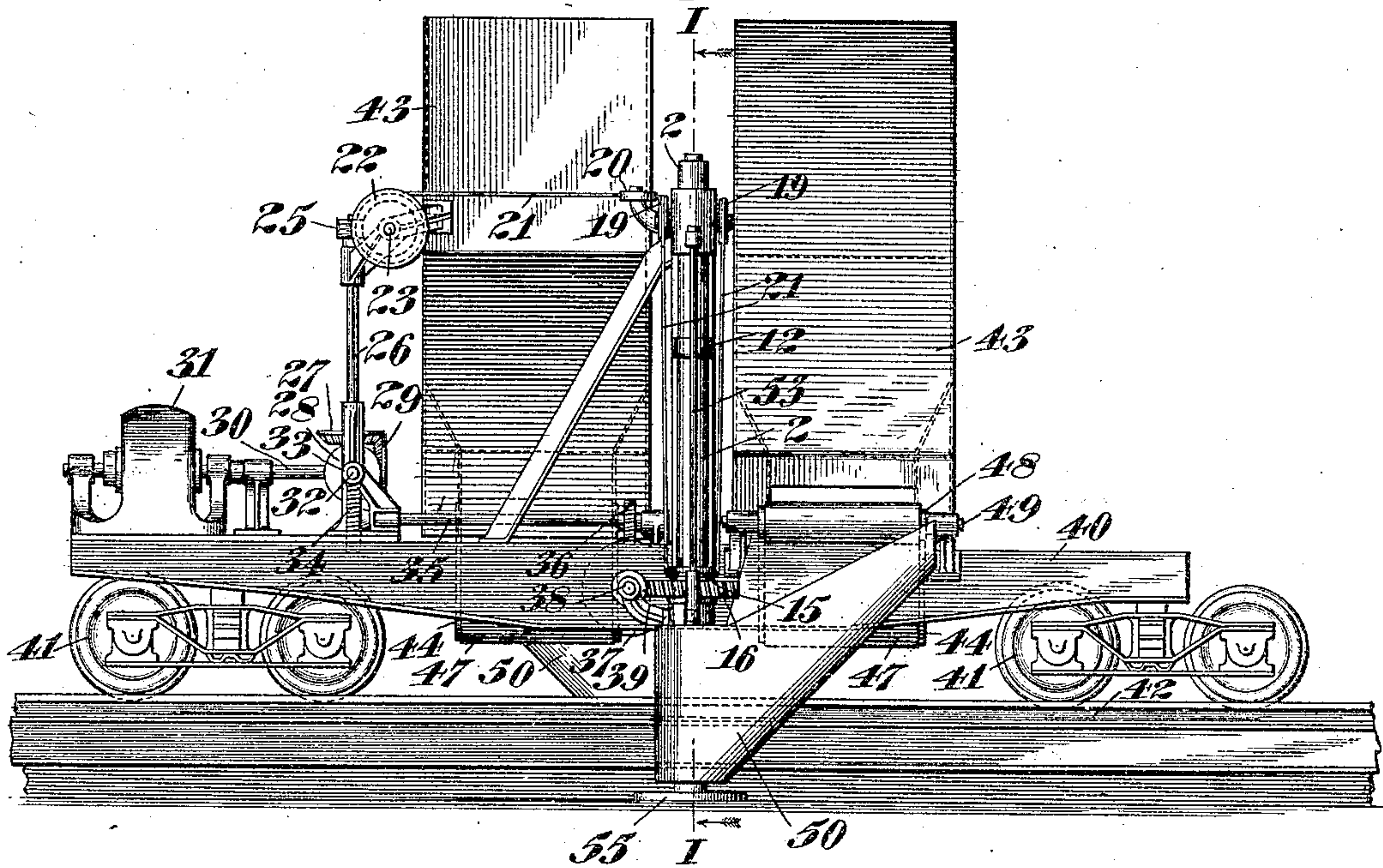
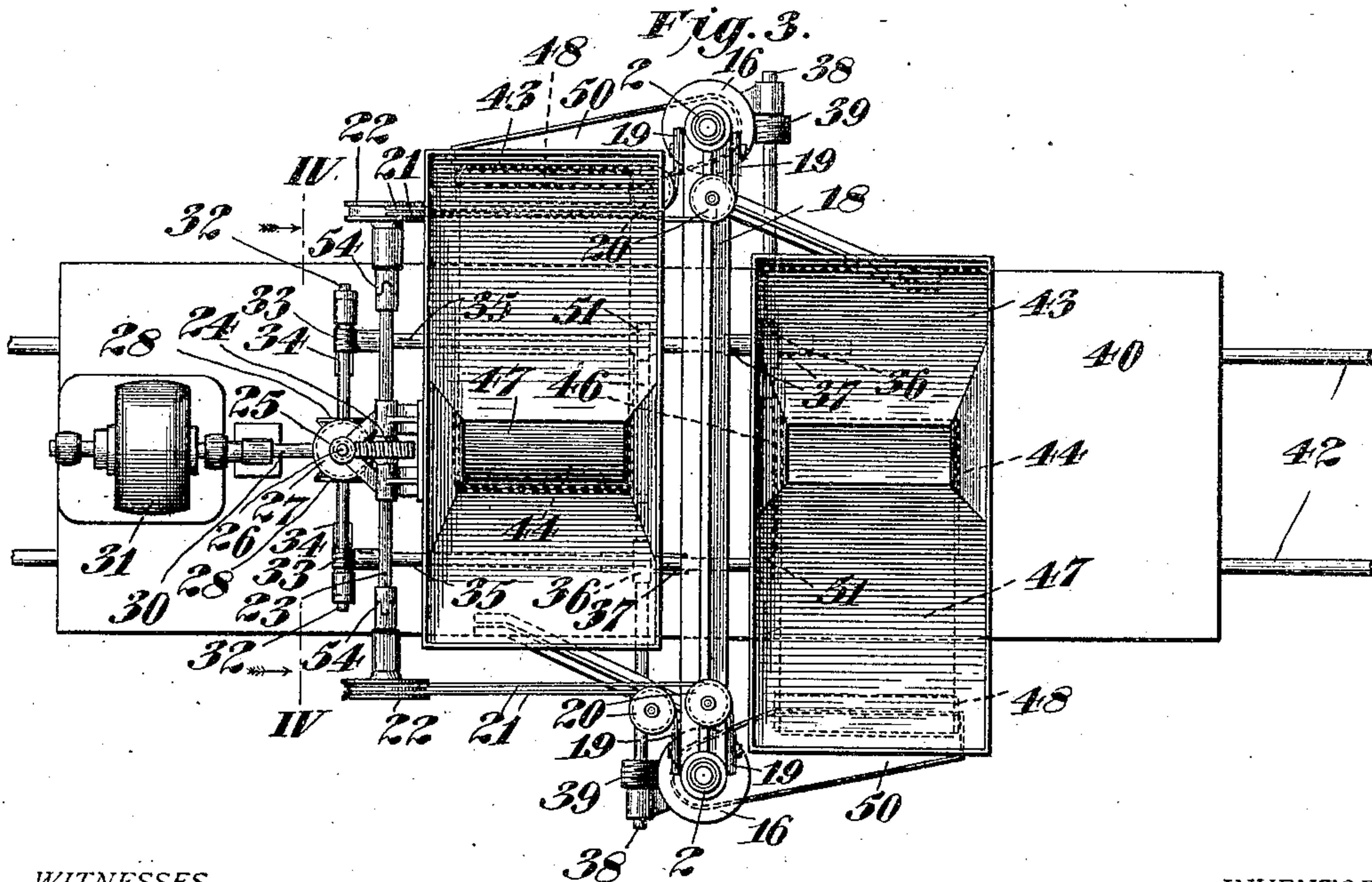


Fig. 3.



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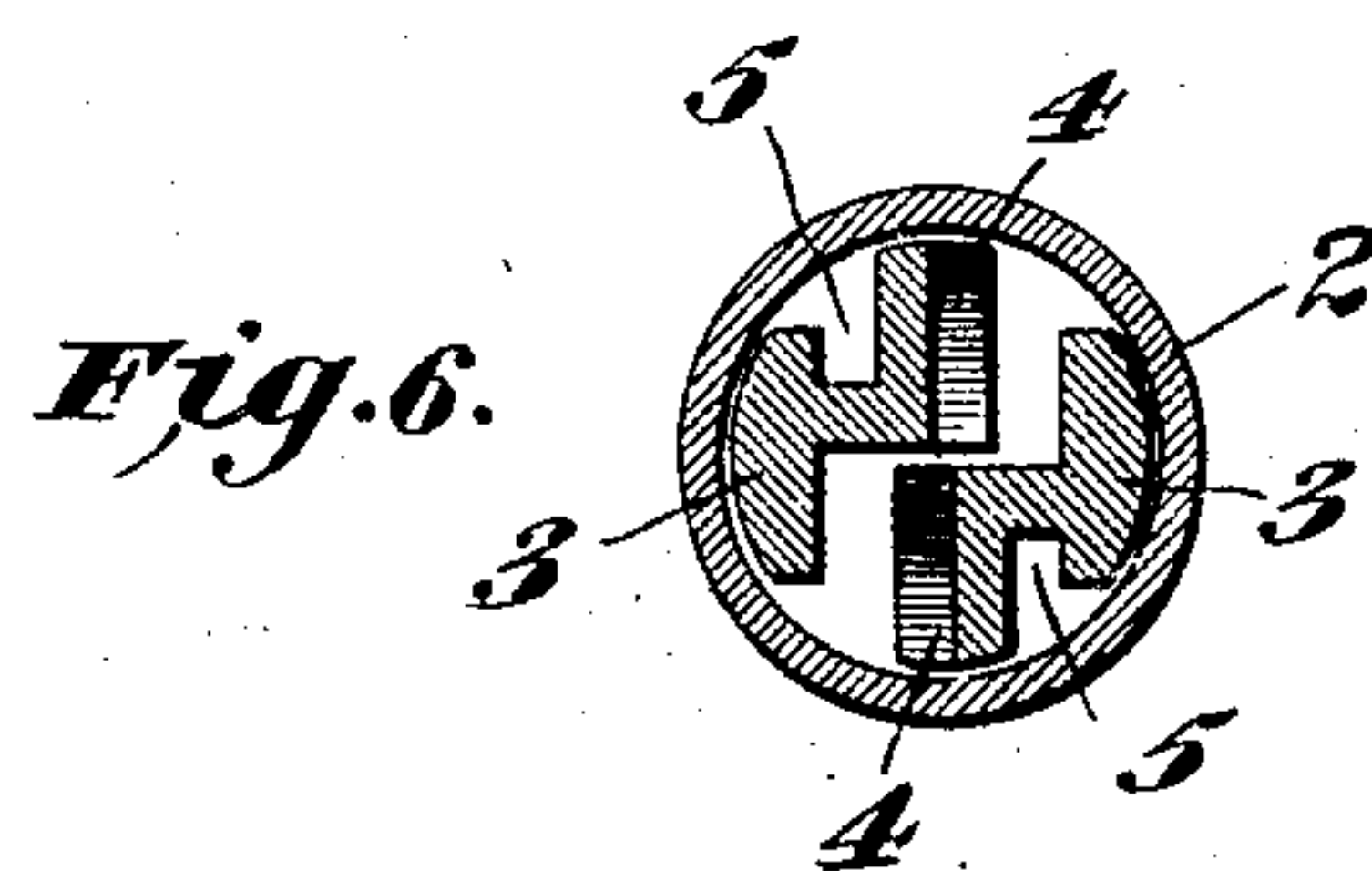
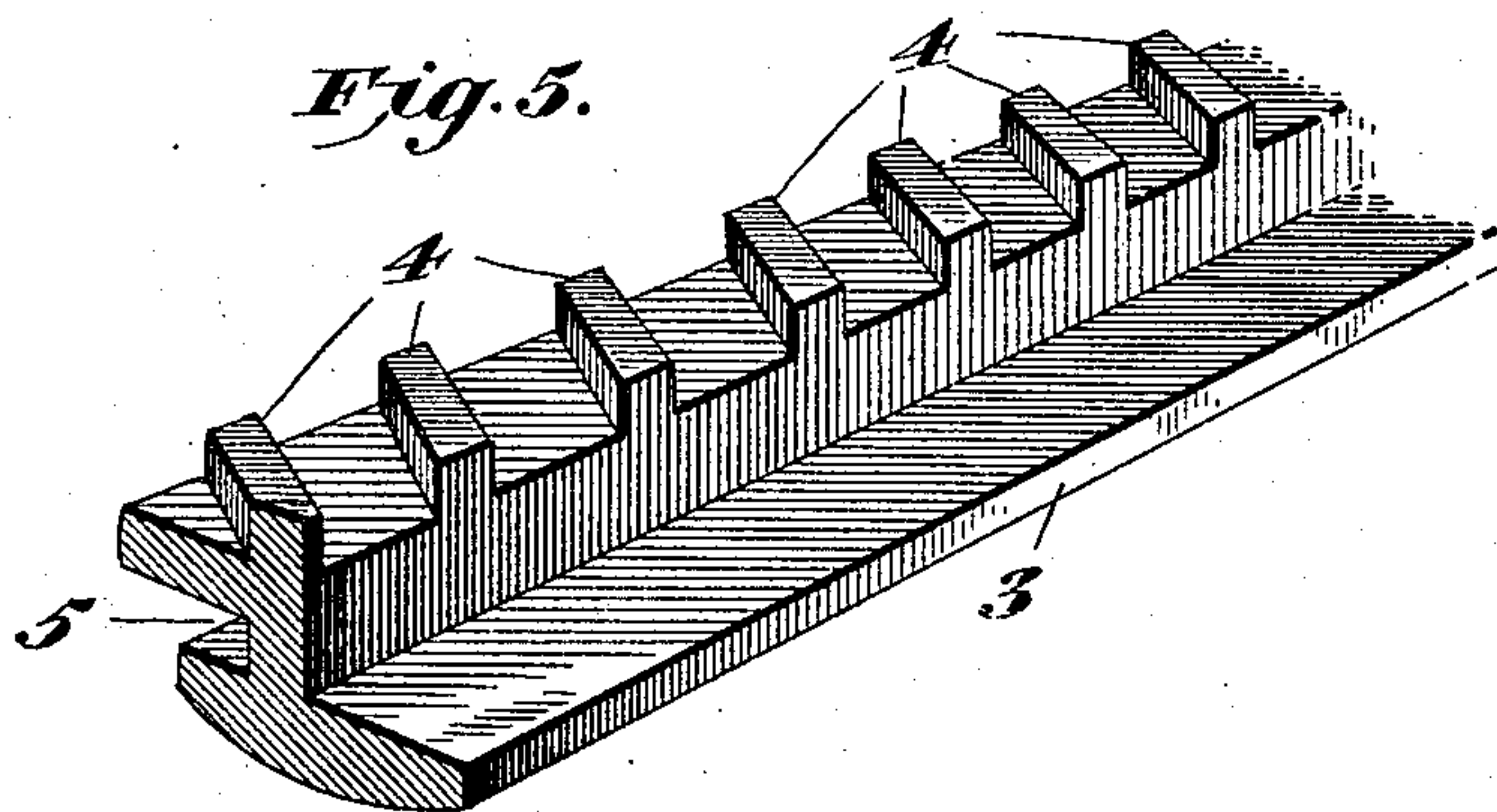
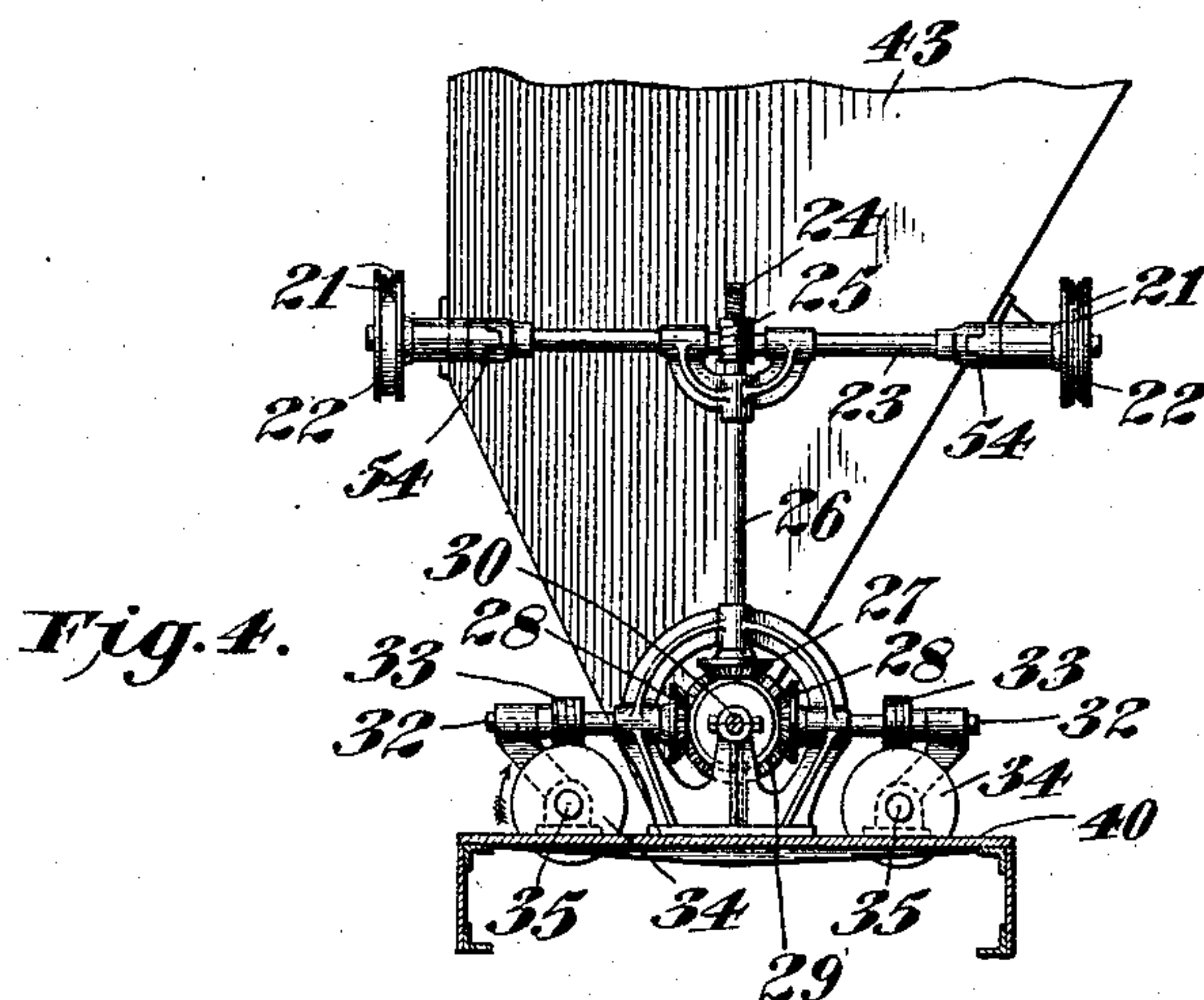
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3 SHEETS—SHEET 3.



WITNESSES,

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UNITED STATES PATENT OFFICE.

CHARLES L. HOWER, OF VINTONDALE, PENNSYLVANIA.

LEVELING APPARATUS.

No. 841,868.

Specification of Letters Patent.

Patented Jan. 22, 1907.

Application filed September 26, 1906. Serial No. 336,245.

To all whom it may concern:

Be it known that I, CHARLES L. HOWER, a citizen of the United States, residing in the town of Vintondale, in the county of Cambria and State of Pennsylvania, have invented certain new and useful Improvements in Leveling Apparatus; 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 consists generally of an apparatus for leveling granular materials which have been deposited in a pile by dumping from a car or otherwise and is particularly adapted to the leveling of coal when it is or after it has been discharged into a coke-oven, and a particular feature of my invention is that the leveling apparatus is designed to fold together to admit of its introduction into or withdrawal from the oven through a small opening in the top thereof.

Although my apparatus is adapted for use in connection with various kinds of receptacles, ovens, or furnaces which treat substances which are composed of large or fine particles, I will for the purpose of simplifying the illustration and description confine the specification to its use in connection with a beehive coke-oven.

Heretofore it has been customary to level the coal in a beehive coke-oven after it has been discharged therein through the tunnel-head, thereby forming a somewhat pyramidal pile, by introducing through the upper portion of the side doorway a tool similar to a rake or a long-handled hoe and working same backward and forward by manual labor, which is an expensive, tedious, and laborious operation.

My apparatus consists, essentially, of a substantially vertical and preferably hollow revoluble shaft, to the lower end of which are pivoted a pair or more of collapsible arms or paddles which when extended in a substantially horizontal position are of slightly less length than the diameter of the oven at the parts where the leveling is to be effected. These arms are capable of being held horizontally and extended and may also be swung upward or downward, as expedient, to a position substantially parallel with the axis of the shaft on which they are mounted, so that they may be introduced into and withdrawn from the interior of the oven through

the small opening in the top thereof, which is known as the "tunnel-head" and through which opening the coal is ordinarily charged from a dumping-car called a "lorry."

By means of my invention the fine coal which is dumped into a beehive coke-oven from the lorry through the tunnel-head is leveled as the charging proceeds by the revolution of the aforesaid arms or paddles, and when the oven is filled level to the height desired the leveling mechanism is withdrawn through the tunnel-head after collapsing the arms, as referred to hereinbefore, so that they may pass through the small opening of the tunnel-head. Means are provided for raising and lowering the shaft which carries the collapsible arms or paddles and means for revolving same as desired. For the purpose of avoiding duplication of the car or similar parts to carry my apparatus I prefer to mount my apparatus on the lorry which carries the coal to the coke-oven; but this is not essential, as I may carry it on another car or otherwise if expedient or desirable.

In the present illustration and description of my invention I have shown it in connection with a double coal-lorry—that is, one which has two hoppers or bins, one supplying one row of ovens and the other supplying the adjoining row—and, as illustrated herein, the lorries are provided with a belt conveyer and funnel to carry the fine wet coal therefrom to the tunnel-head of the coke-ovens. This special form of lorry, including the belt conveyer, is no part of my present invention, but is shown in connection therewith in order to give a complete understanding of the matter.

It will of course be understood that my leveling apparatus may be used in connection with any kind of a lorry or with other means for discharging coal into the oven.

Having thus given a general description of my invention, I will now in order to make the matter more clear refer to the annexed three sheets of drawings, which form part of this specification, and in which like characters refer to like parts.

Figure 1 is a transverse vertical sectional elevation through a line of coke-ovens, showing my apparatus, the section of same being taken on the line I I of Fig. 2. Fig. 2 is a side elevation of a lorry, showing my improved leveling apparatus mounted thereon; but as the lower portion of my apparatus is shown in another view it is omitted from this

one for the sake of clearness of illustration. Fig. 3 is a top plan view corresponding to Fig. 2. Fig. 4 is a partial transverse sectional elevation on the line IV IV of Fig. 3, showing details of various portions. Fig. 5 is an enlarged perspective view of a portion of one of my leveler-arms, showing the preferred form thereof with inclined teeth or ribs in its lower surface. Although I have illustrated this form particularly, I wish it understood that the lower surface of the arm may be smooth or otherwise, if desired. Fig. 6 is an enlarged detail cross-section of the leveler-arms when folded within the adjustable hollow tube or shaft which carries them.

Referring now to the various characters of reference on the drawings, 1 indicates a beehive coke-oven.

2 is an adjustable tube or hollow shaft, which is capable of being moved up or down or of being revolved for the purpose of operating the leveler-arms 3.

4 represents inclined teeth or ribs on the lower surface of the leveler-arms 3, which aid in leveling the coal by transferring it from the center of the oven to the other parts thereof after the fashion of a plow; but I may, as aforesaid, make the lower surface of said leveler-arms smooth or of other form, as desired.

5 represents a way and groove in the leveler-arms, in which are mounted the slides 7, which slides are pivoted to the connecting-links 8, said connecting-links being pivoted at their other ends to the lower portion of the adjustable tube or hollow shaft 2, as shown.

9 is a bar slidably mounted within the hollow shaft 2, to which bar the inner ends of the leveler-arms are pivoted, said bar thus serving as a support for the inner ends of these leveler-arms in their various positions.

In the right-hand portion of Fig. 1 my leveler-arms are shown in extended position for operation within the coke-oven, whereas the companion leveler (illustrated on the left-hand side of said drawing) is shown as folded upward, the leveler-arms in this case being collapsed and withdrawn into the adjustable tube 2, the tube and the inclosed leveler-arms being in their upper positions and free from the coke-oven.

10 indicates a flexible connection or rope for connecting sliding bar 9 with the eyebolt 13, which eyebolt is secured to a slidable ring 12, mounted on the hollow shaft 2, as shown.

14 indicates a vertical slot in the hollow shaft or tube 2 to permit the vertical movement of the ring 12 and its attached eyebolt 13 when same slide along the shaft for the purpose of adjusting the position of the leveler-arms by the motion of the bar or slide 9.

11 indicates a pulley mounted in the top of the adjustable tube 2 for carrying the rope or flexible connection 10.

16 represents a worm-wheel secured on the hollow shaft 2, the upper portion of said

worm-wheel being provided with a grooved collar, as shown. Within the groove in this collar is fitted a lifting and guide arrangement 15, one portion of which incloses said collar, while permitting said collar to revolve, said lifting and guide arrangement being provided with a hub attached thereto, as shown, which is capable of sliding upward or downward on the guide-rod 53. It will therefore be seen that this lifting-guide arrangement has one portion mounted within the groove of the collar of the worm-wheel 16 in such a way that the worm-wheel may revolve without revolving the guide. Attached to the sides of the said guide is a pair of flexible connections or ropes 21 for lifting or lowering the adjustable tube and its connections. The flexible connections 21, which are attached at their lower ends to the lifting and guide portion 15, thence pass over the vertical sheaves 19, thence around the horizontal sheaves 20, and their ends are secured to the winding-drums 22.

23 is a shaft on which the winding-drums are mounted. 24 is a worm-wheel on said shaft.

25 is a worm for driving the worm-wheel 24.

26 is a vertical shaft on which the worm 25 is mounted.

27 is a bevel-gear at the lower end of the shaft 26, which meshes with corresponding bevel-gears 28, secured to the horizontal shafts 32.

29 is a bevel-gear on the main drive-shaft 30, which drive-shaft is connected with the motor 31, which motor is capable of revolution in either direction and of being stopped at any point in its revolution as desired.

The shafts 32 are provided with the worms 33, which turn the shafts 35 by means of worm-gears 34.

36 represents worms on the other ends of the shafts 35, which mesh with the worm-gears 37, mounted on the shafts 38, as shown.

39 represents other worms on the shaft 38, which mesh with the gears 16, this train of mechanism from the motor thus serving to revolve the hollow shaft 2, and with it the leveler-arms, as desired.

54 indicates clutches on the shaft 23 for operating the winding-drums 22 as desired, for the purpose of raising or lowering the adjustable tube and the attached parts.

51 represents spur-pinions on the shafts 35, which mesh with the spur-wheels 46 for operating the conveyer-belts 47.

44 represents large belt-pulleys mounted on the shafts 45 for carrying the belts 47, and 48 represents corresponding small belt-pulleys mounted on the shafts 49, around which the conveyer-belts pass, said belts being adjusted by means of the idler-rollers 52.

6 indicates the coal in the oven as it is leveled.

17 is the lower part of the frame of the

coal-lorry carrying my apparatus. 18 is one of the upper members of the frame thereof.

40 is the car on which the lorry and my apparatus are mounted. 41 represents the trucks of said car.

42 indicates the rails on which the car is run, and 43 represents the coal-hoppers of the lorry.

50 represents funnels through which the coal is discharged into the oven through the tunnel-heads 55.

The operation of my apparatus is as follows: After the bins of the lorry are charged with fine coal the lorry is transported to the ovens to be filled and stopped in a position, as shown in the left-hand view of Fig. 1, with the vertical hollow shaft 2 directly over the center of the opening of the tunnel-head 55, and at this time the collapsible arms or paddles 3 are folded within the hollow shaft 2, which carries them. When in this position, the collapsible arms 3 are held within the hollow shaft 2 by the flexible connection 10, acting through the sliding bar 9, said flexible connection being secured to the eyebolt 13, mounted in the sliding ring 12, which ring in this position abuts against the hub on end of the frame 18, as shown, or is held by the eyebolt 13, abutting against the top of the slot 14. The hollow shaft 2 is then lowered by causing the winding-drums to turn in the proper direction, as a result of which the sliding bar 9 is caused to be lowered within the hollow shaft 2, thus lowering the collapsible arms 3, and a continuation of this lowering process causes said arms to be extended to the positions shown in the right-hand side of Fig. 1. The coal is then discharged from the lorry through the funnel 50, passing thence through the tunnel-head 55 of the oven, and the arms 3 are caused to be revolved by the revolution of the hollow shaft 2 by means of the worm-wheel 16 and its connections to the motor. As the coal continues to discharge in the oven the arms or paddles 3 are revolved, thus leveling the coal, and to aid in this process the teeth 4, which are inclined after the fashion of a screw, assist in moving the particles of coal from the center toward the other portions of the oven, as will be understood.

After the operation of leveling is completed the apparatus is withdrawn by a reversal of the motions heretofore described, whereupon it is ready for operation in another oven. By reason of the link and slide connection of the collapsible arms 3 the manner of pivoting said bars and the construction of the supporting arrangement therefor through the sliding bar 9, the flexible connection 10, the pulley 11, the eyebolt 13, secured to the sliding ring 12; and the slot 14 in the hollow shaft, the lowering and raising and the opening and closing of said level-

arms is automatically performed as the sliding tube is lowered or lifted, all as may be understood from the previous description and by reference to the drawings.

Although I have shown and described my leveling-arms as mounted on a hollow shaft from which they may be extended to operative position and within which they may be retracted, I do not limit myself to this particular form of shaft, as I may also use a solid one against the outside of which the arms may be folded, the minor details of the connections being slightly modified for this purpose, as will be readily understood.

The particular arrangements of the lorry-hopper 43 and the belt conveyer leading therefrom to the funnel 50 are so designed for the purpose of using fine wet coal which has been washed and which consequently will not run freely from the lorry-hopper, this arrangement thus giving a positive discharge from the lorry-hopper to the oven.

Notwithstanding the fact that I have illustrated my invention in connection with a lorry provided with a belt conveyer and funnel I may of course use it in connection with an ordinary lorry which discharges coal directly therefrom by means of a chute to and through the tunnel-head of the oven, or, in fact, I may use my apparatus in connection with any method of supplying coal to the coke-ovens.

Although I have shown my collapsible arms or paddles as provided with inclined teeth on the lower surfaces thereof to facilitate the spreading and leveling of the coal as heretofore described, I may make the lower surface of the bar smooth or of other form, as I do not wish to limit myself to the precise details of inclined ribs.

Although my apparatus can be used with any size or style of coke-ovens, it is particularly well adapted to beehive coke-ovens of large diameter, as the labor in attempting to level these by hand is excessive and almost impracticable, and particularly so when fine wet coal is used, all of which will be readily understood by one skilled in this art.

Although I have shown and described my improvements in considerable detail, I do not wish to be limited to the exact and specific details shown and described, but may use such substitutions, modifications, or equivalents thereof as are embraced within the scope of my invention or as pointed out in the claims.

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

1. A leveling apparatus comprising one or more arms pivotally mounted on a shaft, means for lowering and raising said shaft and for lowering and raising the inner ends of said arms relative to said shaft, thus extend-

ing or collapsing the arms aforesaid and means for revolving said shaft and the arms mounted thereon.

2. A leveling apparatus comprising one or more collapsible arms pivotally mounted on a shaft, means for lowering and raising said shaft, means for automatically extending or collapsing said arms concurrent with the downward or upward movement of the shaft aforesaid and means for revolving said shaft and the arms pivoted thereto.

3. The combination with a coke-oven, of a leveling apparatus comprising one or more arms pivotally mounted on a shaft, means for lowering and raising said shaft and for lowering and raising the inner ends of said arms relative to said shaft, thus extending or collapsing the arms aforesaid, means for revolving said shaft and the arms pivoted thereto, the said apparatus being comprised in small compass when the arms are collapsed or folded to admit their introduction into the coke-oven through a small opening in the top thereof, and after their introduction said arms being extended to accomplish the leveling of the coal in the oven by their revolution as desired.

4. In a leveling apparatus, one or more collapsible arms, grooves or ways in said arms, connecting-links pivoted at one end to slides mounted in said ways and at their other ends to a hollow revoluble shaft, the inner ends of said arms being pivoted to a sliding bar mounted within said shaft, means for withdrawing said sliding bar within the hollow shaft thereby collapsing said arms and retracting them within said hollow shaft and means for operating said sliding bar in the reverse direction to extend said arms.

5. In a leveling apparatus comprising one or more arms pivotally mounted on a revoluble shaft, means for lowering and raising said shaft and for lowering and raising the inner ends of said arms relative to said shaft, thus extending or collapsing the arms aforesaid; a gear-wheel secured on said shaft and means for revolving said gear and its attachments as desired.

6. The combination with a lorry of a leveling apparatus mounted thereon, said appa-

ratus comprising one or more arms pivotally mounted on a shaft, means for lowering and raising said shaft and for lowering and raising the inner ends of said arms relative to said shaft, thus extending or collapsing the arms aforesaid and means for revolving said shaft and the arms mounted thereon.

7. In a leveling apparatus a revoluble shaft, one or more arms pivotally mounted on the lower end thereof, means for extending or collapsing the arms aforesaid, said means including a sliding bar mounted within the hollow shaft and pivoted at its lower end to the inner ends of the arms aforesaid, a flexible connection attached to the other end of said sliding bar, passing thence over a pulley and secured to a sliding ring mounted on the exterior of said shaft, a slot in said shaft through which said flexible connection is attached to the external ring, all so arranged that the arms aforesaid are collapsed or extended by the upward or downward movement of the shaft aforesaid.

8. In a leveling apparatus comprising one or more arms pivotally mounted on a revoluble shaft, means for lowering and raising said shaft and for lowering and raising the inner ends of the said arms relative to said shaft, thus extending or collapsing the arms aforesaid, inclined ribs on the lower surfaces of said arms to assist in spreading and leveling the material to be operated upon by the plow-like action of said ribs.

9. A leveling apparatus comprising one or more collapsible arms mounted on a hollow shaft, means for lowering and raising said shaft and for extending or collapsing said arms by the downward or upward movement of the shaft aforesaid, means for revolving said shaft and the arms pivoted thereto, said apparatus being mounted on a car whereby it may operate within any one of a series of coke-ovens as desired.

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

CHARLES L. HOWER.

Witnesses:

ALBERT BRAUNSCHWEIGN.

ELMER SEAVEY.