

No. 719,577.

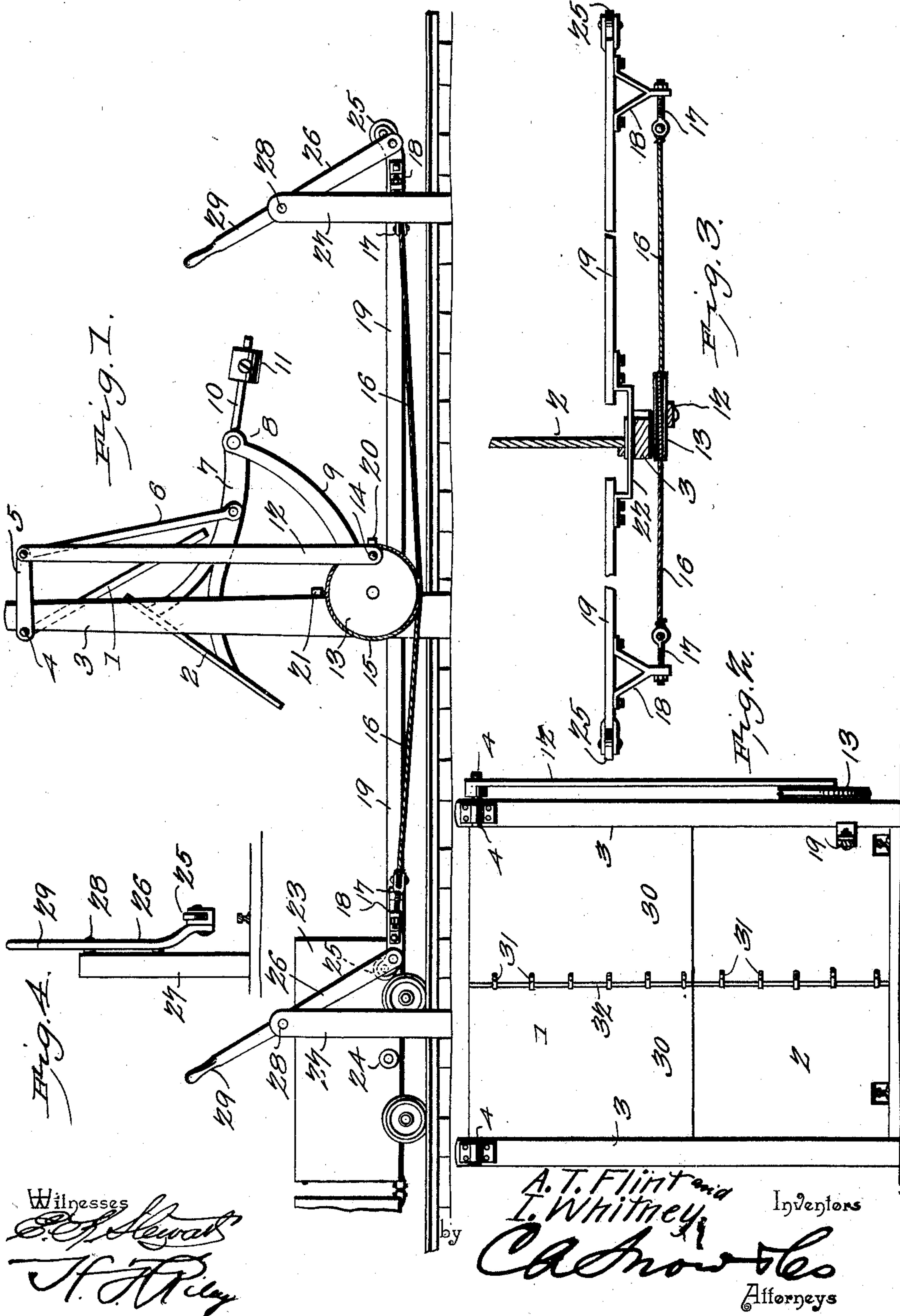
PATENTED FEB. 3, 1903.

A. T. FLINT & I. WHITNEY.  
MINE CAR OPERATED DOOR.

APPLICATION FILED MAR. 15, 1902.

NO MODEL.

3 SHEETS—SHEET 1



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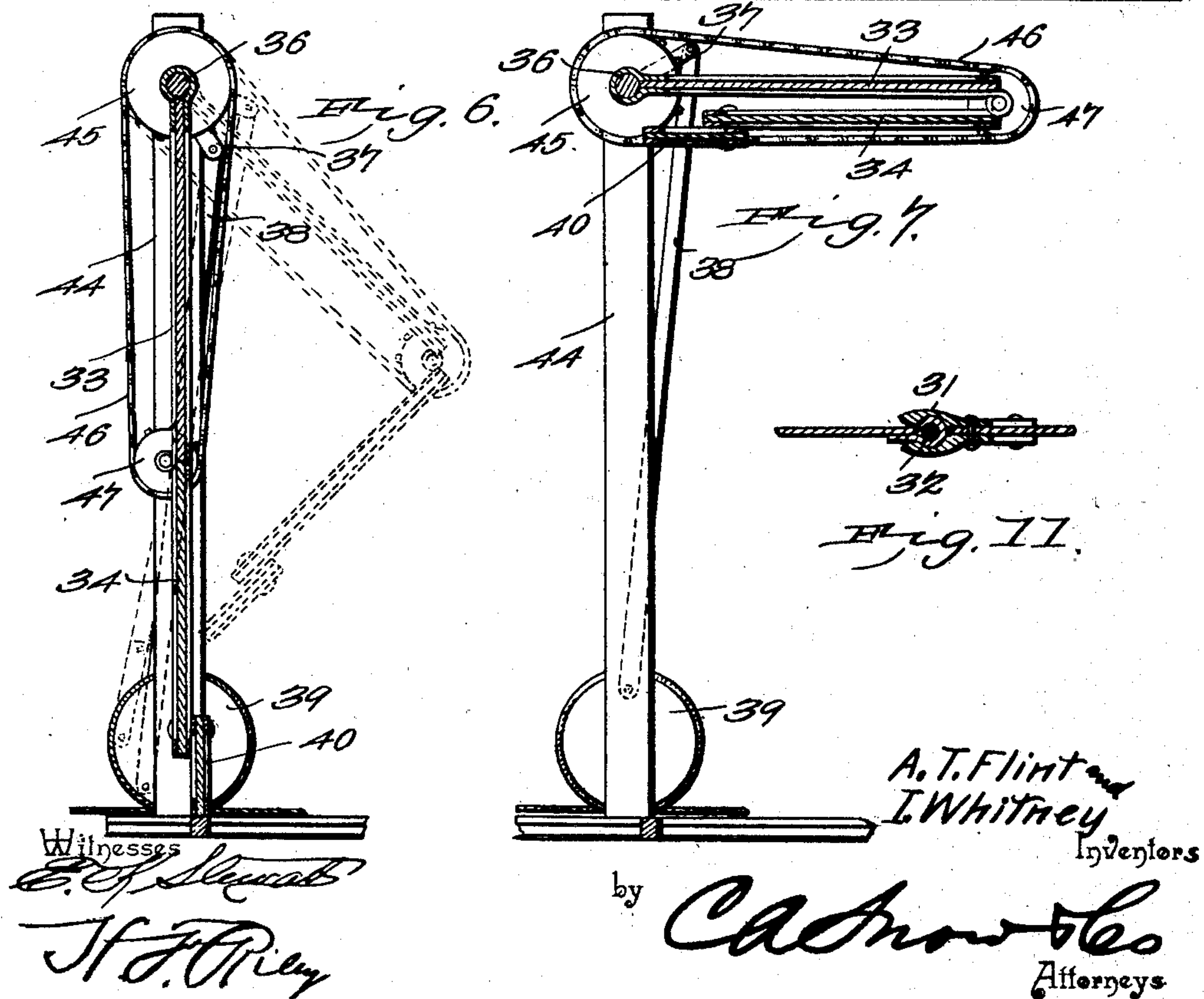
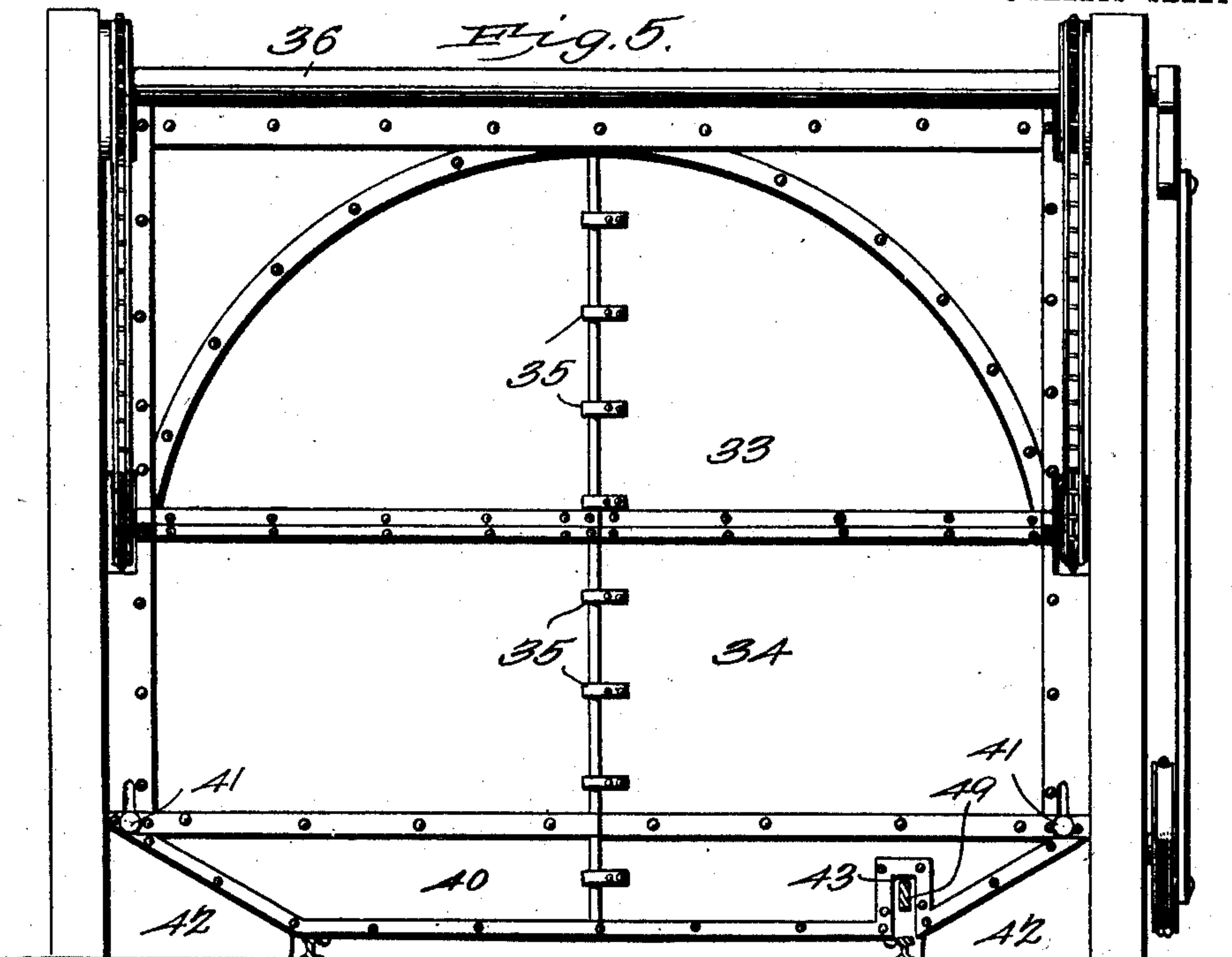
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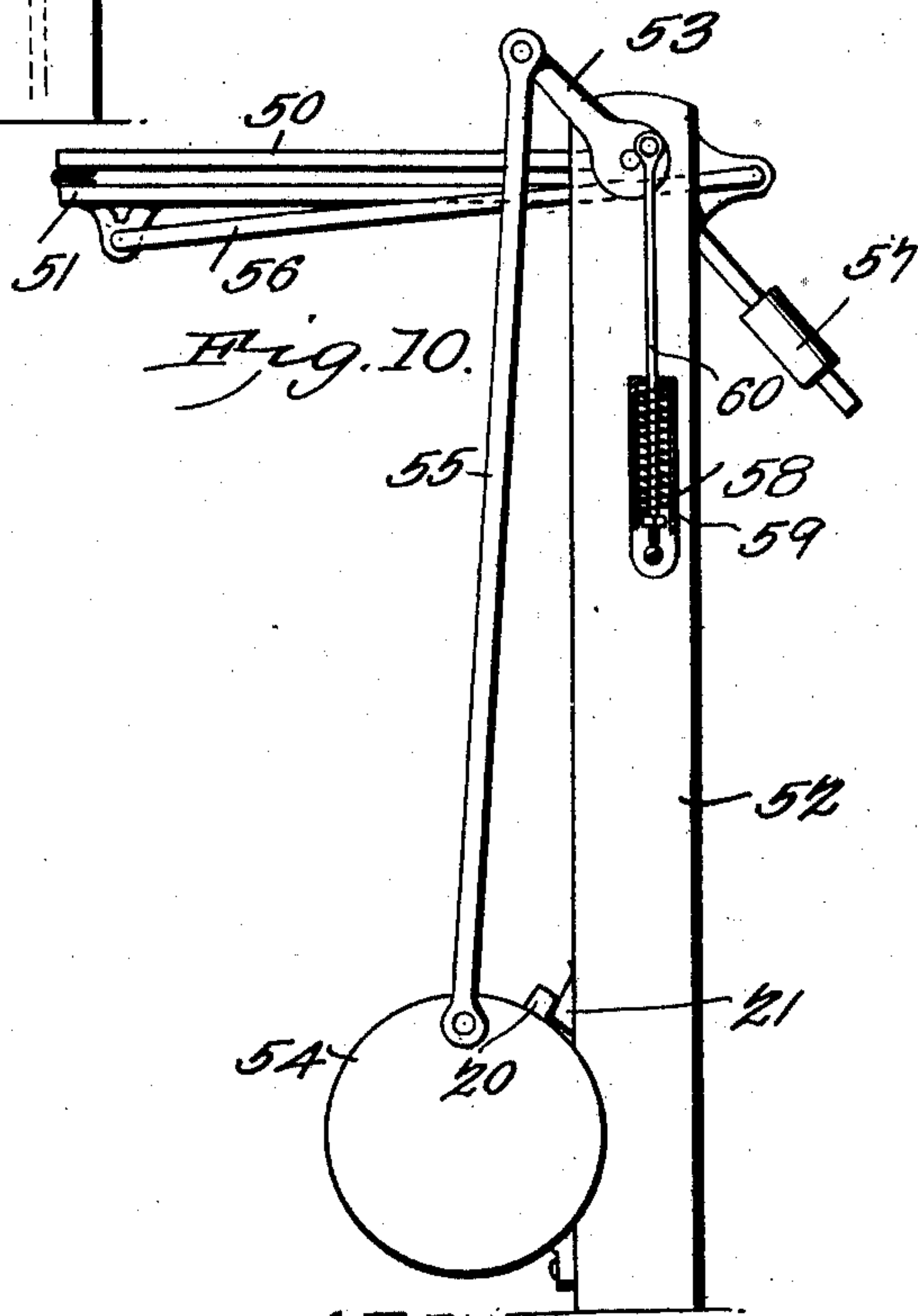
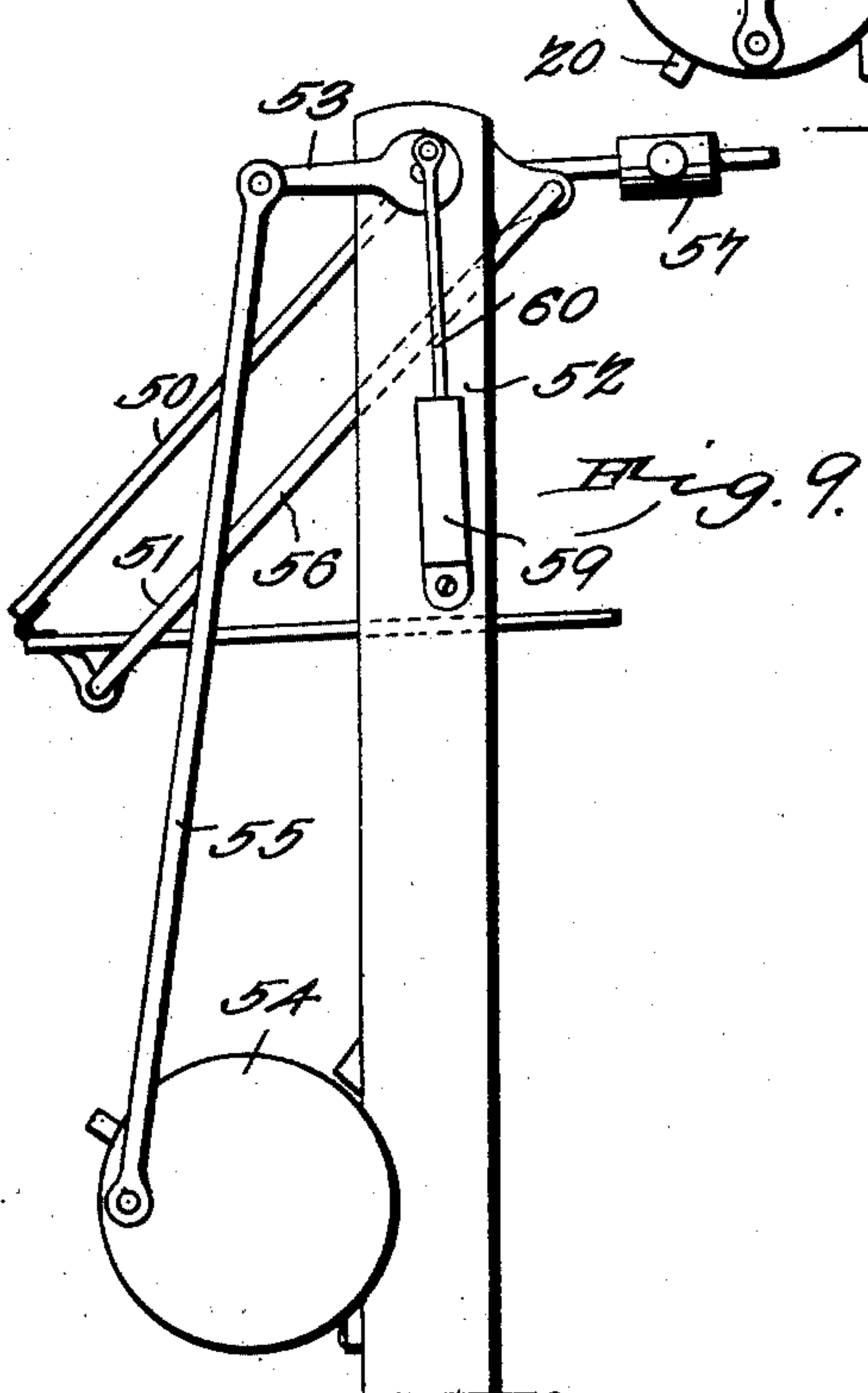
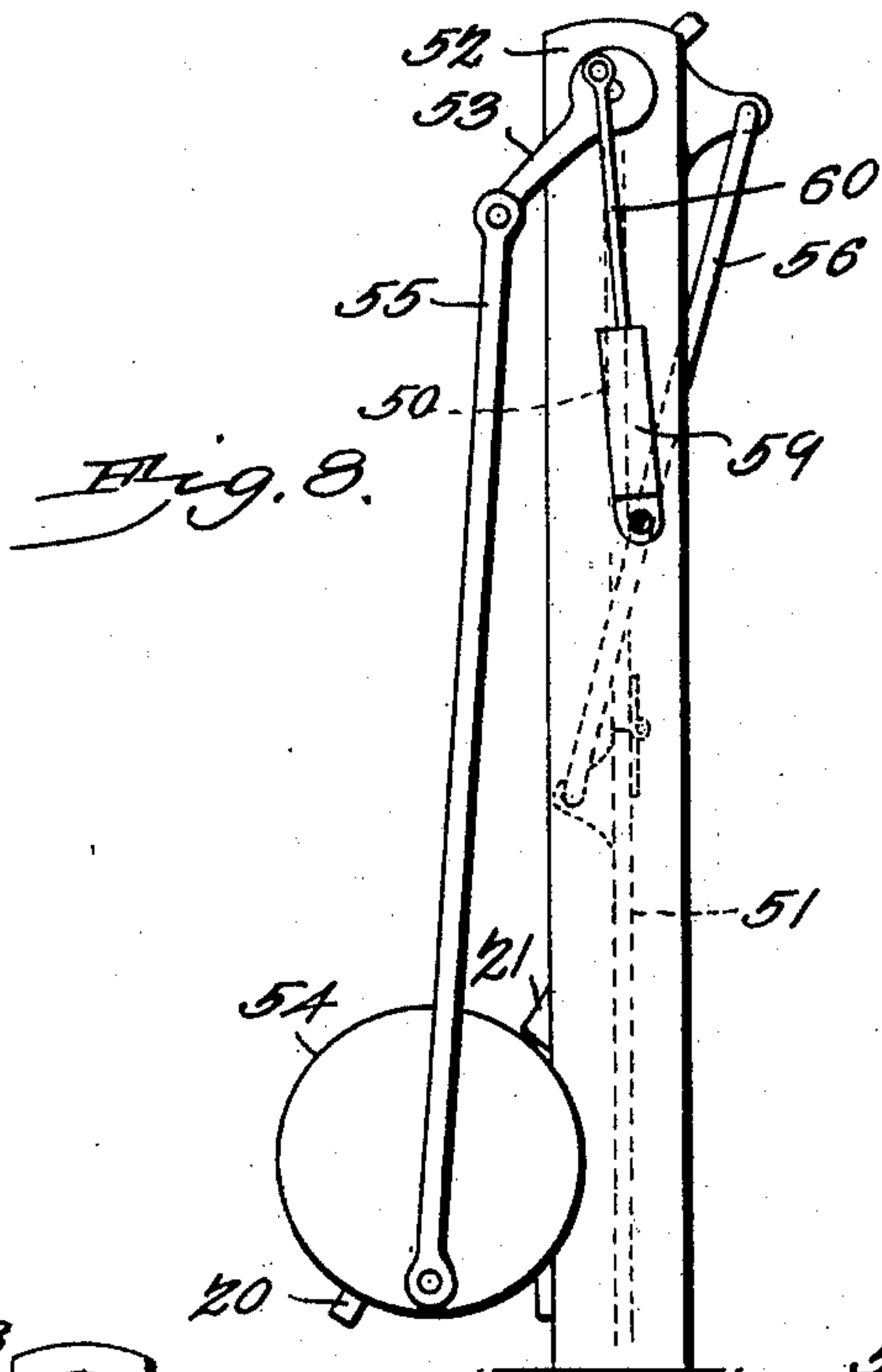
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3 SHEETS—SHEET 3.



Witnesses  
*E. J. Stewart*  
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A. T. Flint & I. Whitney, Inventors  
by *C. A. Snow* Attorneys



# UNITED STATES PATENT OFFICE.

ALONZO T. FLINT AND ISAAC WHITNEY, OF OSKALOOSA, IOWA.

## MINE-CAR-OPERATED DOOR.

SPECIFICATION forming part of Letters Patent No. 719,577, dated February 3, 1903.

Application filed March 15, 1902. Serial No. 98,401. (No model.)

*To all whom it may concern.*

Be it known that we, ALONZO T. FLINT and ISAAC WHITNEY, citizens of the United States, residing at Oskaloosa, in the county of Mahaska and State of Iowa, have invented a new and useful Mine-Car-Operated Door, of which the following is a specification.

The invention relates to improvements in mine-doors.

10 The object of the present invention is to improve the construction of that class of mine-doors for controlling the air which is forced through the shafts and drifts to expel foul gases and keep the air pure and to provide a simple and comparatively inexpensive one capable of being automatically opened by a car in sufficient time to permit the draft-animal to pass safely through it and adapted to close automatically after the car has passed.

20 A further object of the invention is to provide a mine-car door of this character which when subjected to the pressure of air at either side will be capable of equalizing the same, whereby such air-pressure will not interfere with the opening and closing of the door or tend to force the door open.

30 The invention also has for its object to provide a door which should the operating mechanism become broken or otherwise ineffective will permit the draft-animal to pass through it, whereby the animal will be prevented from being crushed between a car and the door.

35 The invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and pointed out in the claims hereto appended.

40 In the drawings, Figure 1 is a side elevation of a mine-door constructed in accordance with this invention and shown partly open. Fig. 2 is a front elevation of the same, the rails and the operating-bar being in section. Fig. 3 is a horizontal sectional view of one side of the apparatus. Fig. 4 is a detail view illustrating the manner of fulcruming the levers which support the reciprocating operating-bar. Fig. 5 is an elevation, partly in section, of a mine-car door, illustrating a modification of the invention. Fig. 6 is a vertical sectional view of the same, the door being closed in full lines and partially open in dotted lines. Fig. 7 is a similar view, the door being open. Fig. 8

is a side elevation of a mine-car door, illustrating another form of the invention, the door being closed. Fig. 9 is a similar view, the door being partly open. Fig. 10 is a side elevation, the door being open. Fig. 11 is a detail view of one of the clamps for detachably connecting the flexible portions of the door.

Like numerals of reference designate corresponding parts in all the figures of the drawings.

1 and 2 designate upper and lower sections of a door designed for use in drifts of mines for controlling the air, and the upper section is hinged at the top between a pair of posts or uprights 3 by means of a transverse shaft 4, but any other means may be employed for hinging the upper section 1 to the posts or supports. The shaft 4 is arranged in suitable bearings at the tops of the posts or uprights 3 and has rigidly connected to it arms 5, which are adapted to be swung upward to open the upper section of the door and which are connected by short links 6 with arms 7 of levers 8. The levers 8, which are fulcrumed between their ends on supporting arms or brackets 9, carry the lower section 2 of the door, and their arms 10 are provided with adjustable weights 11, adapted to be moved inward and outward on the arms to counterbalance the door for enabling the same to be opened and closed at the expenditure of a minimum amount of power. The upper section of the door swings upward to a horizontal position, and the lower section is swung upward to a point directly beneath the upper section, and both sections are adapted to lie compactly at the top of the drift, as will readily be understood. The arms 7 of the levers 8 are forked to provide diverging arms or sides to which the lower section of the door is secured, and when the sections are arranged in a vertical position any pressure of the air or wind on the door tending to open the upper section will operate to hold the lower section firmly in its closed position, as the lower section in opening must swing upward against such pressure, and by this arrangement the operation or effect of the force of the air will be equalized. The pressure of the air on the opposite side of the door will be equalized in a similar manner, as it will operate to hold the upper



section closed and will tend to force the lower section upward, so that one section will counteract the effect of the air on the other. The posts or uprights are designed to be provided at their inner faces with suitable strips or stops, against which the sections abut when closed, and the latter are adapted to exclude the air effectually.

One of the arms 5 of the upper section of the door is connected by a pitman 12 with a crank-wheel 13, having an eccentrically-arranged wrist-pin 14 and adapted to be partially rotated by the means hereinafter described, whereby motion is communicated to the sections of the door to carry the same from their closed to their open position, and vice versa. The crank-wheel is provided with a grooved periphery and is arranged in a bight or coil 15 of a flexible connection 16, consisting, preferably, of a wire rope or cable and connected at its ends by suitable tension devices 17 with arms or brackets 18 of a longitudinally-movable operating bar or member 19. The movement of the disk or wheel 13 is limited by a lug 20, extending from the disk or wheel, at the periphery thereof, and arranged to engage a stop 21 of the adjacent post or upright. The stop or projection 21 is mounted on the post or upright 3 at a point above the center of the disk or wheel 13, and the lug or projection 20 is arranged at the bottom of the latter when the door is closed. The longitudinally-movable operating-bar may consist of a single continuous bar and extend through a notch in the door, as illustrated in Fig. 5 of the accompanying drawings, or it may consist of separate sections and a connecting-piece 22, bent at an angle adjacent to its ends to clear the door and extending through an aperture of the adjacent post or upright. The said operating-bar is located directly above the adjacent rail in the path of the wheels at that side of a car 23 and is adapted to be engaged and moved longitudinally by the front wheel until the bar, which is supported by links, swings upward to a point above the wheels and permits the latter to pass beneath it. This movement of the operating-bar partially rotates the crank disk or wheel through the flexible wire rope or cable and the door is opened before the draft-animal reaches the same. The car is provided with an antifriction roller or wheel 24 to support the longitudinally-movable operating-bar in an elevated position, and any suitable device may be employed instead of the wheel for engaging and operating the bar 19. Each end of the operating-bar is provided with an antifriction-wheel 25 and is extended upward slightly, as shown, and in order to retain the operating-bar parallel with the track the ends of the said bar are pivotally connected to a pair of supporting-links 26, connected at their upper portions to suitable posts or supports 27 by pivots 28 and preferably provided with upwardly-extending arms 29, forming operating-levers for enabling the door to be readily

opened by hand. The operating-bar may be made of any desired length to secure the desired operation of the door in opening and closing, so that the said door will be opened in ample time to permit a mule, horse, or other draft-animal to pass through it without coming in contact with either section, and any number of supporting-links may be employed for suspending the longitudinally-movable operating-bar above a rail. The arms or brackets 18 are approximately Y-shaped, as shown, and are provided at their outer portions with apertures for the reception of the tension devices, which may consist of eyebolts, as clearly illustrated in Fig. 3, but which may be constructed in any other desired manner. The door is readily counterbalanced by the adjustable weight to enable it to be easily operated, and as the resistance of the air to the opening and closing movement of the sections is equalized the operation of the gate is greatly facilitated; also the shock or jar incident to the engagement of the car with the operating device is reduced to a minimum by the easy operation of the parts. After the operating-bar has been actuated by a car and the latter has left the same the said bar will run back by gravity to its initial position, and thereby close the door. The lower portions of the supporting arms or links 26 are bent outward or deflected to offset the posts or supports 27 a sufficient distance from the adjacent rail to enable the cars to clear it. The crank disk or wheel causes the sections of the door in opening and closing to start slowly and increase in rapidity until they approach the limit of their movement, when the speed is decreased, and this operation is effected by the arrangement of the crank or wrist pin at the top and bottom of the disk or wheel when the door is opened and closed.

The sections of the door may be constructed of any suitable material; but they are preferably made of canvas, and each consists of side portions 30, connected at the center by suitable clamps 31, as clearly illustrated in Fig. 11 of the accompanying drawings. The edge of one side portion is enlarged by a cord or other suitable filling, which is arranged within a casing 32, formed by folding the canvas back on itself, as shown. The clamp is composed of two jaws constructed of any suitable resilient material, preferably spring metal, and provided at their inner engaging faces with suitable recesses conforming to the configuration of the enlarged portion or edge formed by the casing 32 and its filling. The adjacent vertical edges of the side portions of each section fit closely together and provide practically an air-tight connection, and the clamps which detachably connect the vertical edges permit the same to separate should the operating mechanism fail to work and the draft-animals come in contact with the closed door. This will prevent the draft-animal from being crushed or otherwise injured between the door and a car.



In Figs. 5 to 7 of the accompanying drawings is illustrated a modification of the invention provided with a door composed of upper and lower sections 33 and 34, constructed of canvas and provided with centrally-arranged clamps 35, similar to those heretofore described, and connecting the side portions of the canvas to permit a draft-animal to readily pass through the door should the operating mechanism fail to operate. The upper section is mounted on a shaft 36, having a crank-arm 37 and connected by a pitman 38 with a crank disk or wheel 39, which is precisely similar to the wheel 13 and is operated by the devices heretofore described. The lower section of the door is hinged at its upper edge to the lower edge of the upper section, and as the upper section swings from the vertical position (illustrated in Fig. 6 of the drawings) to the horizontal position (illustrated in Fig. 7) the lower section swings in an opposite direction and is folded beneath the upper section, as illustrated in Fig. 7. This opposite swinging movement of the sections of the mine-door equalizes the pressure on the door and prevents the pressure of the air from operating to open the door or interfere with the movement of the sections in opening and closing the door. The lower section of the door is provided with a supplemental vertically-movable lower or bottom section 40, composed of side portions and connected by a slot-and-pin connection 41 with the lower hinged section of the door and adapted to permit the door to close without being affected by a lump of coal or other accumulation beneath the door. In practice an oppositely-beveled strip or bar 42 will be arranged to receive the bottom of the door and will be adapted to throw any accumulation away from the door; but with the construction illustrated in Fig. 5 the bottom section is adapted to move upward should it come in contact with any substance or obstruction. One side portion of the bottom section is provided with a notch 43, arranged to receive the operating bar or device and located directly above the adjacent rail.

The door illustrated in Fig. 5 is supported by posts or uprights 44, to which are secured wheels or disks 45, preferably provided with sprocket-teeth and receiving sprocket-chains 46, which extend from the disk or wheel 45 to sprocket wheels or pinions 47 of the lower hinged section of the door. As the door-section 33 is swung upward from the position illustrated in Fig. 6 of the drawings to that shown in Fig. 7 some of the links at the upper portion of the rear flight or side of the sprocket-chain will be wound on the sprocket-wheel 45 and a corresponding number of the links at the upper portion of the front flight of the sprocket-chain will be unwound from the sprocket-wheel 45 and a corresponding movement of the links at the sprocket-pinion 47 will be produced. This movement will be

sufficient to partially rotate the sprocket-pinions 47 and swing the lower section of the door from the position shown in Fig. 6 to that illustrated in Fig. 7, and when the upper section of the door is swung downward from a horizontal to a vertical position the lower hinged section will be partially oscillated and returned to its initial position.

In Figs. 8 to 10, inclusive, is illustrated another form of the invention, in which the upper and lower sections 50 and 51 are hinged together at their adjacent horizontal edges, the upper section being hinged between a pair of posts or supports 52 and provided with an arm 53, which is connected with a crank disk or wheel 54 by a pitman 55. The crank disk or wheel is operated by the means heretofore described and is adapted to swing the upper section of the door upward and downward, the lower section being automatically folded and unfolded by a pair of links 56, connected with the posts or uprights and with the lower section 51, as clearly shown in Figs. 9 and 10. The door is balanced by an adjustable weight 57, and the door shown in Figs. 5 to 7 may be similarly balanced. The sections of the door are designed to be constructed similarly to those before described. The door is held firmly in its closed position by a coiled spring 58, arranged within a pivoted casing 59 and connected with the arm 53 by a rod 60, eccentrically pivoted to the arm above the shaft and slightly beyond the dead-center, as illustrated in Fig. 8 of the drawings, when the door is closed. The spring is then under tension and is adapted to hold the door firmly in its closed position; but when the door is opened the pivot of the rod 60 is quickly carried by the opening movement over the dead-center, whereby the spring is caused to assist the opening movement of the door at the time when power is most required, as the weight of the door must be lifted and the force of the wind overcome. As the door approaches the limit of its opening movement the spring becomes entirely relaxed, so that the weight of the door is supported entirely by the longitudinally-movable operating device, which is adapted to fall and close the door as soon as a car or train of cars leaves it. The closing movement of the door caused by the dropping of the longitudinally-movable operating-bar will be cushioned by the spring and the weight so that there will be no liability of the door being accidentally broken or otherwise injured in closing.

The mine-car-operated door moves substantially vertically in closing and in starting the opening movement, so that any accumulation surrounding the bottom of the door will not interfere with its operation.

It will be seen that the car-operated door for mines is exceedingly simple and inexpensive in construction, that it is adapted to be automatically opened by a car approaching it from either direction, and that it will re-



main in its open position until a car or train of cars has passed through the doorway and beyond the operating device. It will also be apparent that either end of the longitudinally-movable operating-bar is adapted to be engaged by a car and that should the door fail from any cause to open the draft animal or animals will be permitted to pass through the same without being crushed between it and the cars.

What we claim is—

1. In an apparatus of the class described, the combination of a mine-door composed of upper and lower sections, the upper section being hinged at the top and the lower section being mounted independently of the upper section and movable in the opposite direction, whereby the pressure of air on the door will be equalized, and means for connecting the sections to cause the same to move in unison and for actuating the said sections, substantially as described.

2. In an apparatus of the class described, a mine-door constructed of flexible material and composed of portions detachably connected and adapted to separate under pressure, and means for opening and closing the door, substantially as described.

3. In an apparatus of the class described, a mine-door constructed of flexible material and consisting of separable portions, one portion being provided with clamps detachably engaging the other portion and adapted to permit the portions to separate under pressure, to permit a draft-animal to pass through the door without injury should the latter fail to open, and means for opening and closing the door, substantially as described.

4. In an apparatus of the class described, the combination of a mine-door, a longitudinally-movable operating device arranged to be engaged by a car, a disk or wheel, a pitman connected with the disk or wheel and with the door, and means for communicating motion from the operating device to the disk or wheel, substantially as described.

5. In an apparatus of the class described, the combination of a mine-door, a disk or wheel, a pitman eccentrically connected with the disk or wheel and also connected with the door, and a longitudinally-movable operating device connected with and adapted to rotate the disk, said operating device being arranged over one of the rails of the track in position to be engaged by the wheel of a car, whereby it is operated and supported in an elevated position, substantially as and for the purpose described.

6. In an apparatus of the class described, the combination of a mine-door, a crank disk or wheel, a pitman connected with the crank disk or wheel and with the door, a longitudinally-movable operating device arranged to be engaged by a car, and a flexible connection carried by the operating device and arranged to rotate the disk or wheel, substantially as described.

7. In an apparatus of the class described, the combination of a mine-door, a disk or wheel, a pitman connected with the disk or wheel and with the door, a longitudinally-movable operating device arranged in the path of the car and provided with means for connecting it with the disk or wheel, and levers supporting the bar, and extended to form handles, substantially as described.

8. In an apparatus of the class described, the combination of a mine-door composed of upper and lower sections movable in opposite directions to equalize the pressure of the air, a longitudinally-movable operating device arranged in the path of the car, connections between the sections to cause the same to move in unison, a disk or wheel connected with the door, and a flexible connection for communicating motion from the operating device to the disk or wheel, substantially as described.

9. In an apparatus of the class described, the combination of a mine-door composed of upper and lower sections, the upper section being hinged at the top, arms pivotally mounted on suitable supports and carrying the lower section, crank-arms connected with the upper section and with the said arms, and means for oscillating the crank-arms, substantially as described.

10. In an apparatus of the class described, the combination of a mine-door composed of upper and lower sections, the upper section being hinged at the top and provided with a crank-arm, an oscillating arm pivotally mounted on a suitable support and connected with the lower section, a link connecting the said arms, and means for actuating the same, substantially as described.

11. In an apparatus of the class described, the combination of a mine-door composed of upper and lower sections, the upper section being hinged at the top and provided with a crank-arm, a lever fulcrumed between its ends and supporting the lower section and provided with a counterbalancing-weight and connected with the crank-arm, and means for actuating the crank-arm, substantially as described.

12. In an apparatus of the class described, the combination of a mine-door, a longitudinally-movable operating device composed of sections, and an intermediate connecting portion offset from the door to clear the same, a disk or wheel connected with the door, and a flexible connection carried by the operating device and arranged to actuate the disk or wheel, substantially as described.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in the presence of two witnesses.

ALONZO T. FLINT.  
ISAAC WHITNEY.

Witnesses:

S. W. McLAIN,  
WM. S. RANDOLPH.