

June 19, 1923.

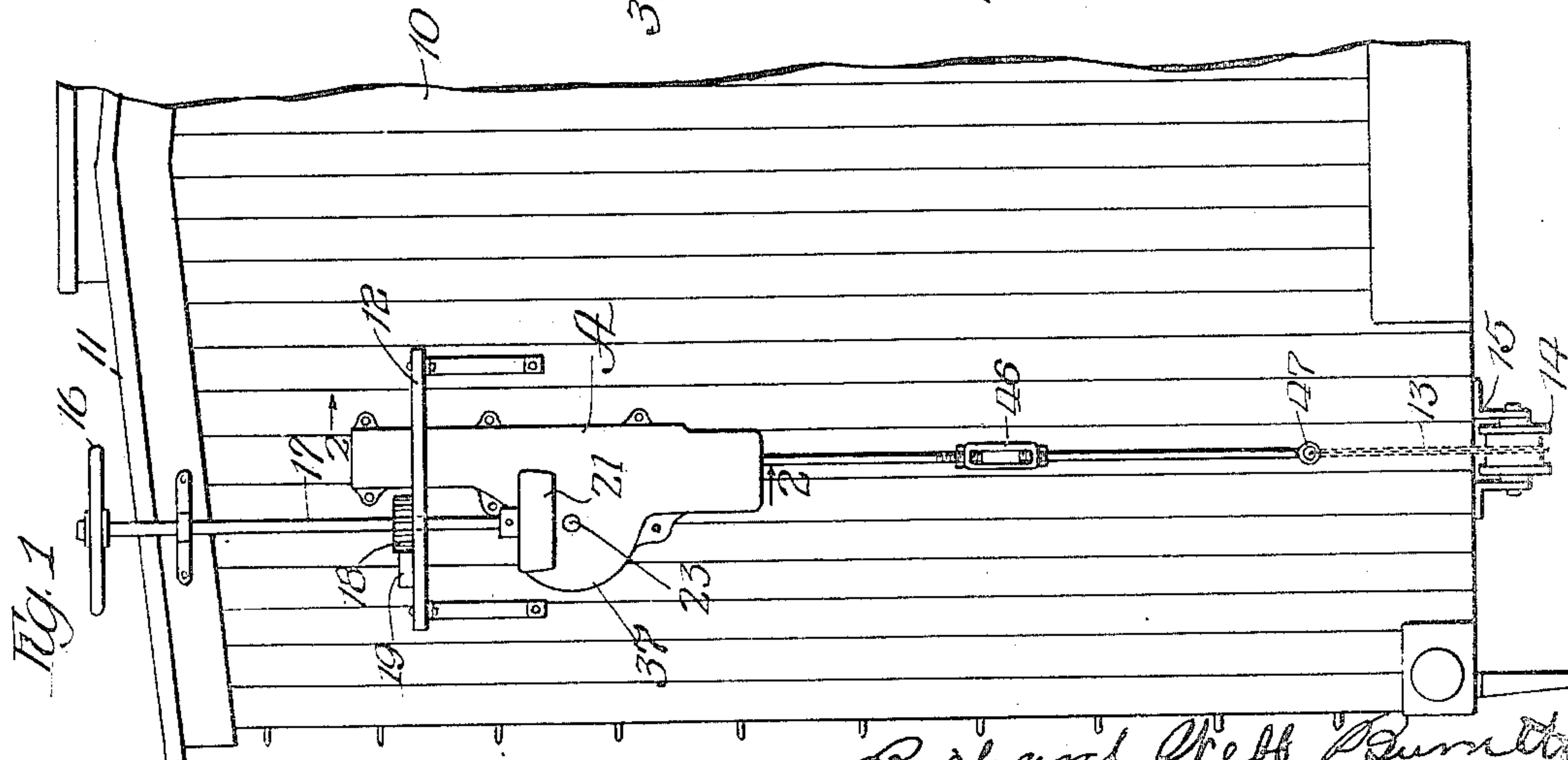
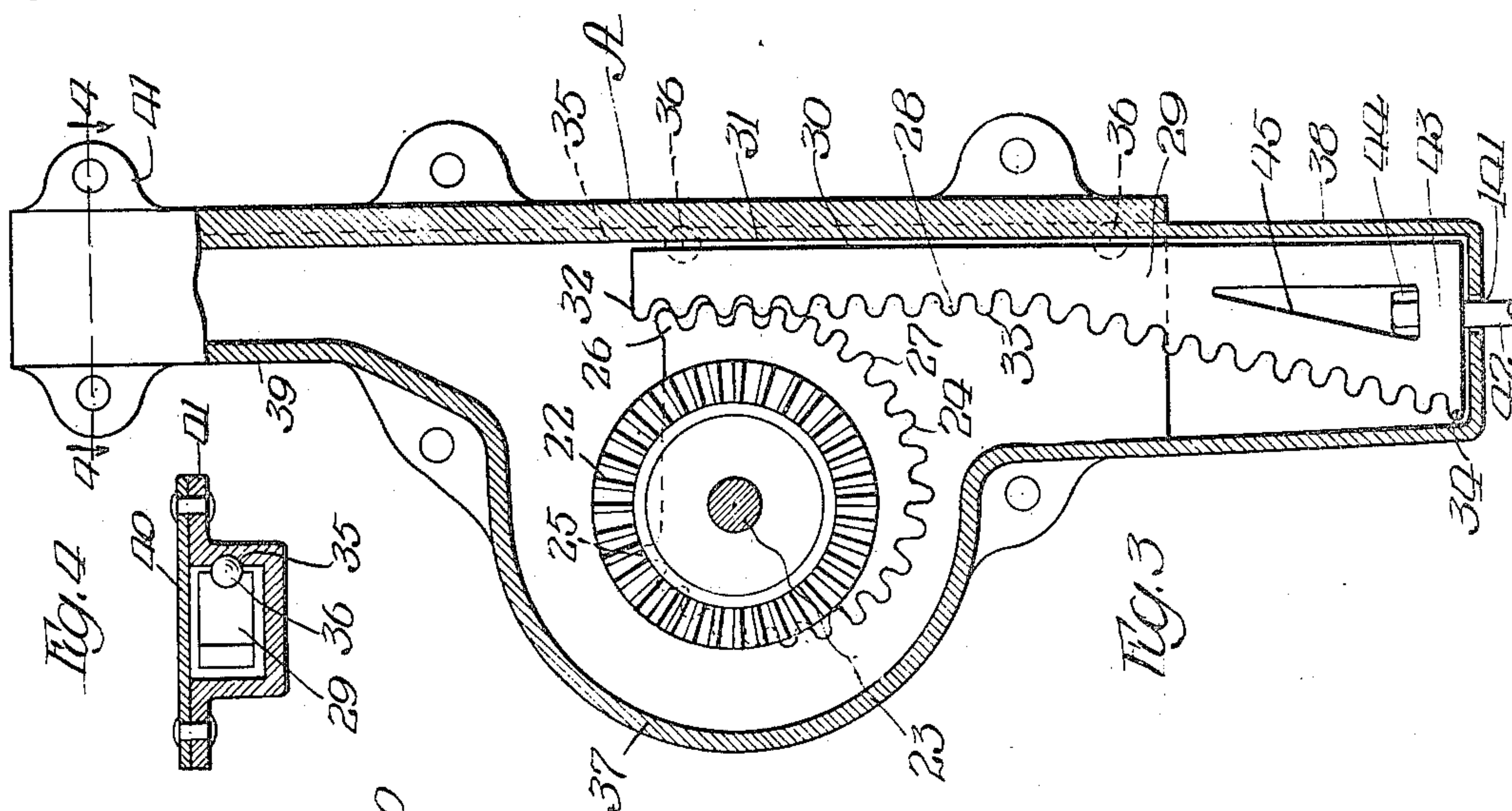
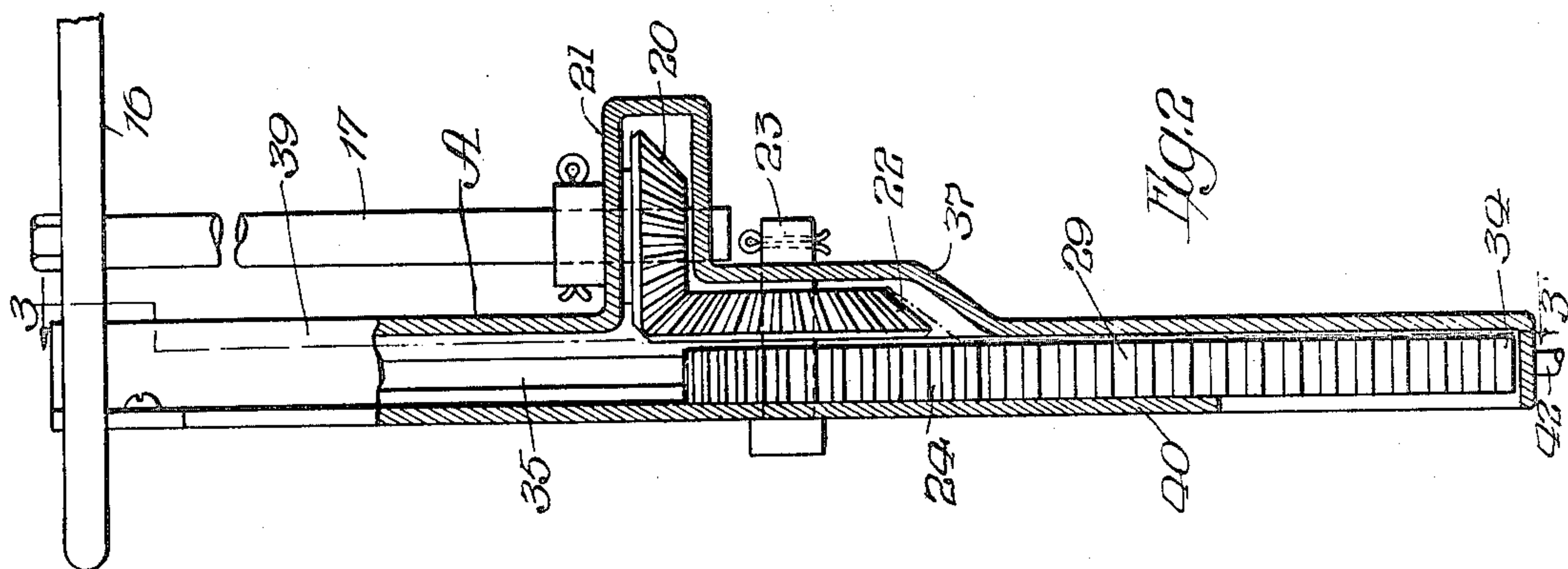
1,459,650

R. W. BURNETT

HAND BRAKE FOR RAILWAY CARS

Filed July 21, 1919

3 Sheets-Sheet 1



Richard W. Burnett  
inventor

June 19, 1923.

1,459,650

R. W. BURNETT

HAND BRAKE FOR RAILWAY CARS

Filed July 21, 1919

3 Sheets-Sheet 2

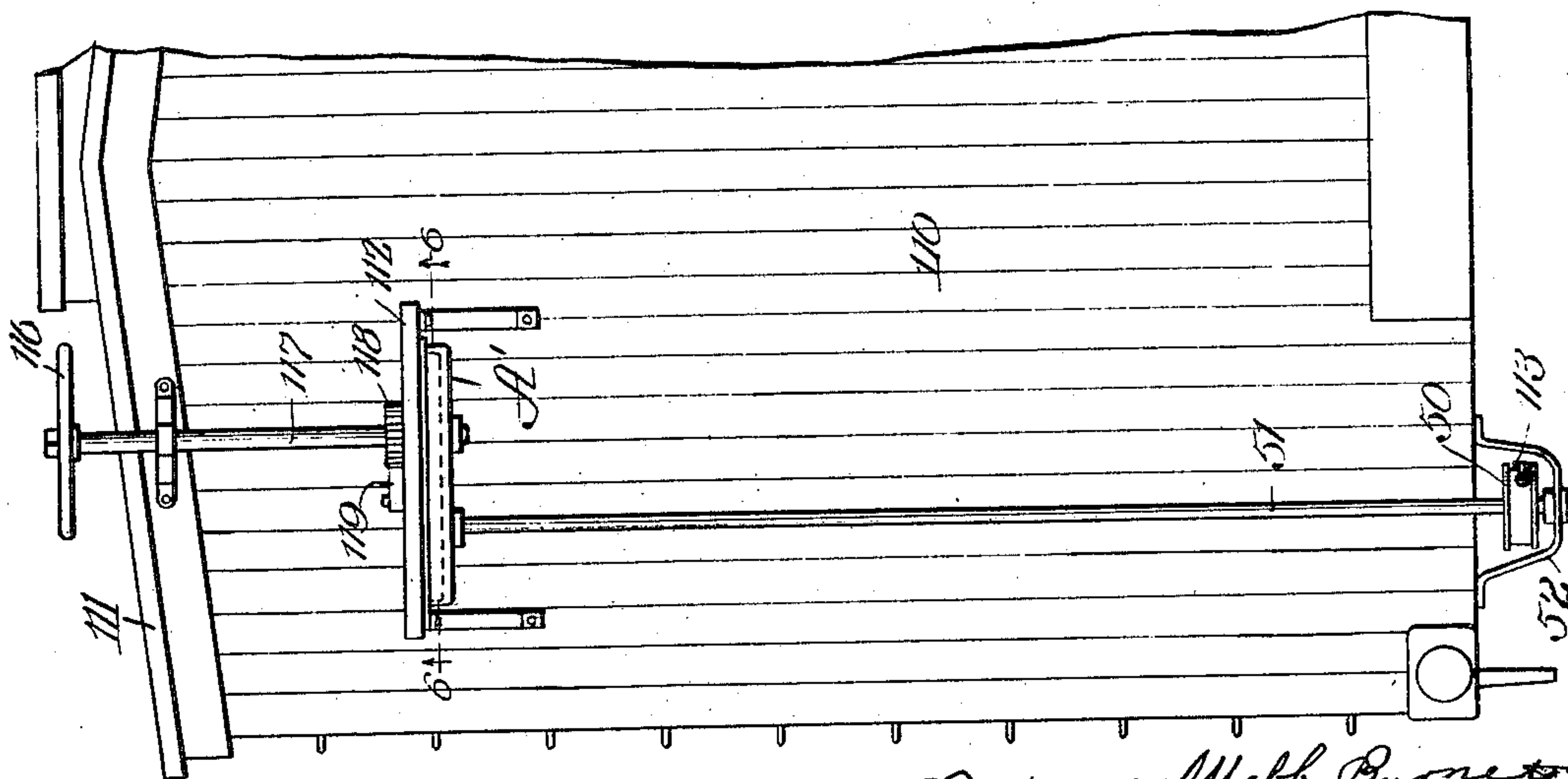
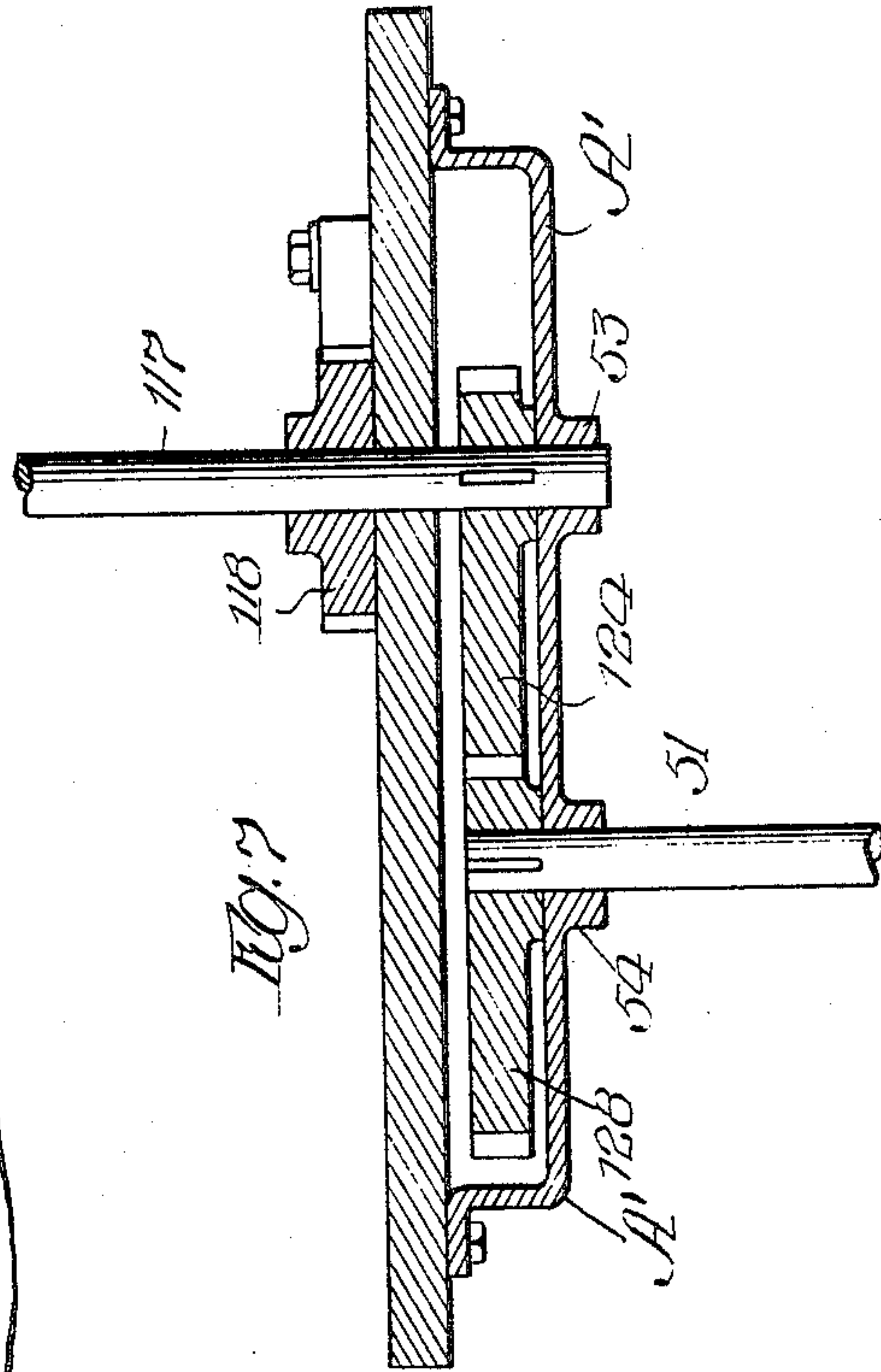
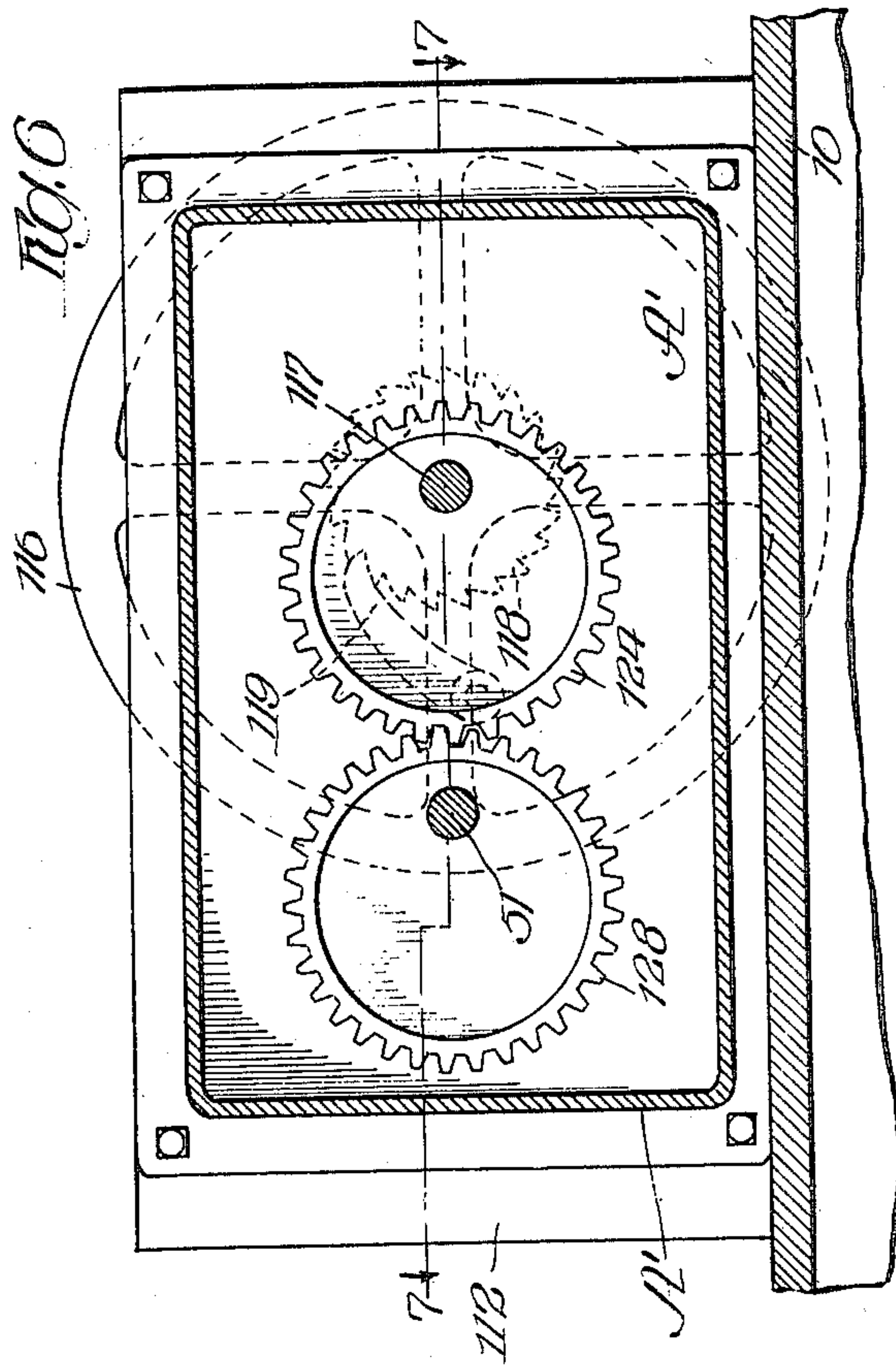


Fig. 5

Richard Webb Burnett  
Inventor

By

Atty's.



**June 19, 1923.**

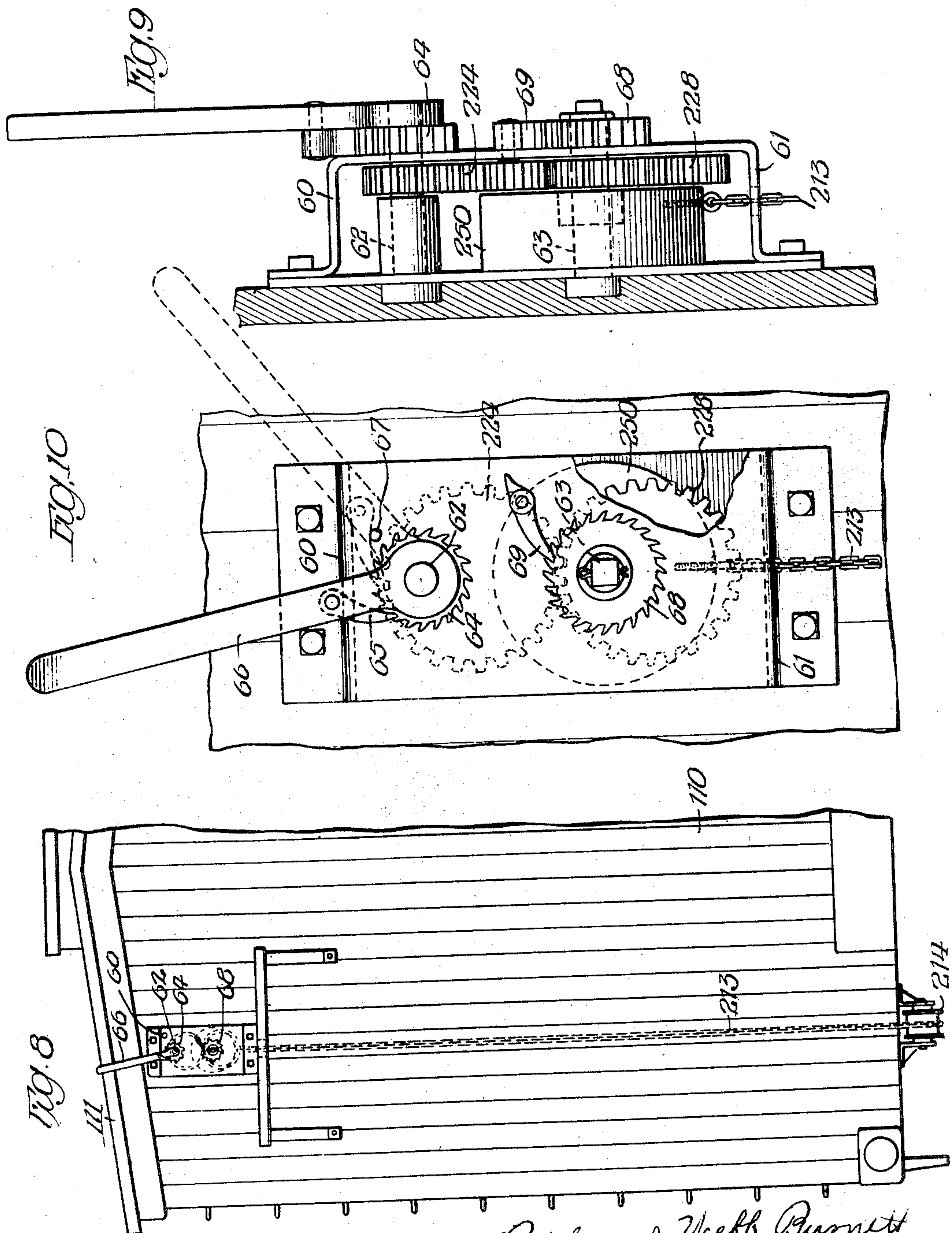
**1,459,650**

**R. W. BURNETT**

# HAND BRAKE FOR RAILWAY CARS

Filed July 21, 1919

3 Sheets-Sheet 3



Richard Webb Burnett  
Inventor

By

*Allegro*



Patented June 19, 1923.

1,459,650

# UNITED STATES PATENT OFFICE.

RICHARD WEBB BURNETT, OF CHICAGO, ILLINOIS.

HAND BRAKE FOR RAILWAY CARS.

Application filed July 21, 1919. Serial No. 312,173.

*To all whom it may concern:*

Be it known that I, RICHARD WEBB BURNETT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Hand Brakes for Railway Cars, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

This invention relates to improvements in hand brakes for railway cars.

As is well known, the general practice in the art of hand brakes for railway cars is to employ a vertical brake staff with a hand wheel at the top thereof and a ratchet wheel and locking dog, the latter being operated by the brakeman's foot while standing on the platform. Due to the heavier cars, heavier loading, and increased speed in handling of freight cars, the old form of hand brake is proving inadequate for the reason that it is difficult for the brakeman to obtain a sufficient leverage in applying the brakes, to stop the cars quickly enough while spotting them in the yards.

Numerous attempts have, of course, been made to overcome this difficulty and to obtain greater leverage ratio in applying the brakes. While increased leverage ratio has been obtained by some of the later forms of hand brakes, the same has generally been done at the expense of speed in operation and particularly with respect to the taking up of the usual slack in the brake chains before the brakes are actually applied. Some of the later forms of brakes for railway cars have involved the use of gearing so arranged that the slack of the chain is taken up at high speed with a low leverage ratio and thereafter, either automatically or by the brakeman manipulating a shifting device, the brake is applied at a slower speed but higher leverage ratio. The later constructions are subject to criticism on the ground that the change from the high speed low leverage ratio to the slow speed high leverage ratio is accomplished suddenly and often-times at a point in the application of the brake where the high leverage ratio application is not obtained quickly enough or occurs at too late a time in the setting of the brakes.

The object of my invention is to provide a

hand brake for railway cars wherein the power applied by the brakeman is gradually and automatically changed from an initial high speed low leverage ratio application of the power to a higher leverage ratio application of the power at slower speed so as to thereby obtain the maximum speed in applying the brake with greatest efficiency in the application thereof throughout the entire operation.

The invention furthermore consists in the improvements in the parts and devices and in the novel combination of the parts and devices herein shown, described and made the subject matter of the claims.

In the drawings forming a part of this specification, Figure 1 is a broken end elevational view of a box car showing my improvements in connection therewith. Fig. 2 is an enlarged vertical sectional view taken substantially on the line 2—2 of Fig. 1. Fig. 3 is a vertical sectional view taken substantially on the line 3—3 of Fig. 2. Fig. 4 is a detail horizontal sectional view corresponding substantially to the section line 4—4 of Fig. 3. Fig. 5 is a view similar to Fig. 1 illustrating another embodiment of my invention. Fig. 6 is an enlarged horizontal sectional view taken substantially on the line 6—6 of Fig. 5. Fig. 7 is a vertical sectional view corresponding substantially to the line 7—7 of Fig. 6. Fig. 8 is a view similar to Figs. 1 and 5 illustrating a still further embodiment of the invention. And Fig. 9 is a side elevational view, upon an enlarged scale of a portion of the mechanism shown in Fig. 8.

Figure 10 is an enlarged sectional view of the mechanism shown in Fig. 8.

Referring first to the construction shown in Figs. 1 to 4 inclusive, 10 denotes the end wall of a box car, 11 the roof thereof and 12 the usual platform for the brakeman's use when applying the brakes. In this form of my invention, the brake chain 13 is brought around a pulley or sheave wheel 14 mounted in suitable brackets 15 applied to the end wall of the car. The brakes are applied in the usual manner by means of a hand wheel 16 secured to the upper end of a relatively short vertical brake staff 17. The latter is provided with the usual ratchet wheel 18 with which cooperates a foot controlled pivoted locking dog 19 located immediately above the platform 12 in the usual manner.



The brake staff 17 is extended a short distance below the platform 12 and at its lower end has secured thereto a bevel gear 20 disposed within a housing designated generally by the reference A. As will be clear from an inspection of Fig. 2, the staff 17 is suitably journaled in an extension 21 of the housing A, said extension accommodating said bevel gear 20. Also mounted within the housing A is another bevel gear 22 loosely mounted on a suitable stud shaft 23 which extends horizontally and is mounted in any suitable bearings provided by the housing A. Rigid with the bevel gear 22 and rotatable in unison with the latter is a spiral gear 24, the pitch of which gradually increases from its low point indicated at 25 to the high point indicated at 26. Said spiral gear 24 will ordinarily extend through an arc of approximately 300° and in actual practice, I prefer that a portion of said spiral gear at the maximum pitch as indicated at 27 shall be of uniform pitch through an arc of say approximately 90°. It will be evident, however, that the pitch of the said gear may be uniformly increased throughout the entire length of said gear without in any wise affecting the principle of my invention.

Said spiral gear 24 meshes with a rack gear 28 formed on one edge of a suitable block or casting 29. The latter has one vertically arranged edge 30 in proximity to the corresponding vertical wall 31 of the housing A. The rack gear 28 has one section thereof, as for instance between the points 32 and 33 to cooperate with that portion of the spiral gear which is of uniform pitch. From the point 33 to the lower end of the block 29, as indicated at 34, the rack gear 28 is arranged inclined so as to make the lower end of said block 29 substantially wedge shaped. The inclination of the rack gear between the points 33 and 34 is of course designed so as to cooperate with the spiral gear 24 at all times. To decrease the friction and facilitate operation of the brake, I preferably form the wall 31 of the housing and the opposed adjacent vertical edge of the block 29 with vertically aligned grooves or raceways 35—35 to accommodate a plurality of anti-friction balls 36—36.

The housing A, preferably in the form of a casting, is formed with a semi-cylindrical extension 37 to accommodate the bevel gear 22 and spiral gear 24 as clearly indicated in Fig. 3. Said housing also has a suitable lower extension indicated at 38 to accommodate the rack block 29 and an upward extension 39 to accommodate the upper end of said rack block 29 when it is elevated. The details of construction of said housing A may of course be varied as desired but for ease of application, I pref-

erably form the same with a detachable inner plate 40 and the main portion of the housing A with laterally extended perforated ears or flanges 41 so that the housing can be bolted to the end wall of the car. The lower extension 38 of the housing A is perforated as indicated at 141 to accommodate a vertically extending rod 42 which also passes through the lower end 43 of the rack block 29 and is secured thereto in any suitable manner as by the nut 44 accommodated in a suitable recess 45 in the block 29. The rod 42 preferably has a turn buckle 46 included therein whereby to adjust the length of said rod and consequently take up slack in the brake chain 13 or let out the brake chain, it being understood that said rod 42 is attached to the brake chain as indicated at 47.

The operation is as follows. The length of brake chain or slack therein will be properly adjusted as by means of the turnbuckle 46 so that, when the brakes are off and the brake chain is in its corresponding normal position, the relation of the rack gear 28 and spiral gear 24 will be as shown most clearly in Fig. 3. To apply the brakes, the brakeman turns the hand wheel 16 in the usual manner which motion will of course be communicated through the bevel gears 20 and 22 to the spiral gear 24. As the latter rotates in a counter-clockwise direction, it is evident that the rack block 29 will be elevated and during the initial portion of the operation, said rack block 29 will be elevated at maximum speed due to the fact that that portion of the spiral gear in engagement with the rack block is of maximum pitch. Consequently, the slack in the chain will be taken up rapidly and as the slack is taken up, the speed of rotation and movement of the rack block 29 will be gradually lessened as the pitch of the spiral gear 24 gradually decreases while in mesh with the inclined section of the rack gear 28 between the points 33 and 34. In other words, while the later portions of the operation will be at slower speed the leverage ratio of the application of power will be correspondingly gradually increased so that the maximum leverage ratio in the application of the power is obtained at the last end of the operation. When the brake chain has been sufficiently tensioned the brakeman will of course lock the same in the usual manner by throwing in the locking dog 19. The brakes are released in the usual manner by throwing out the locking dog 19.

Referring to the construction illustrated in Figs. 5, 6 and 7, the end wall of the box car is indicated at 110, the roof at 111, the platform at 112 and the brake chain at 113. In this construction, the brake chain winds about a drum 15 of relatively large diameter, the diameter being such that the



full winding movements of the chain shall occur in approximately a one-half or slightly more than a one-half revolution of the vertical brake staff 51 to which the drum 50 is of course rigidly secured at its lower end. Said staff 51 is suitably journaled at its lower end in a depending bracket 52 in a well known manner. The hand wheel 116 is of the usual form and is secured to a short staff 117 that passes through the platform 112 and has secured thereto the usual ratchet wheel 118 with which cooperates the foot controlled locking dog 119.

Beneath the platform 112 and preferably secured to its under side, is a housing casting A' of shallow rectangular formation. Said housing casting A' is provided with a suitable bearing flange 53 for the lower end 117 and with another bearing flange 54 for the upper end of the staff 51. Keyed or otherwise rigidly secured to the staff 117 within the housing A' is an eccentrically mounted gear wheel 124. The latter meshes with another gear wheel 128 eccentrically mounted on and preferably keyed to the upper end of the staff 51. In this arrangement, adjustment of slack in the brake chain 113 may be obtained in any suitable manner, preferably by including an adjustable turnbuckle or link within the chain itself.

The operation of the construction illustrated in Figs. 5, 6 and 7 is as follows. The parts will be correlated so that the eccentric gears 124 and 128 will occupy the position most clearly indicated in Fig. 6 when the brake chain 113 is in its normal slack or untensioned position. To apply the brakes, the brakeman turns the hand wheel 116 in the usual manner so as to rotate the gear wheel 124 in the direction as indicated by the arrow *a* in Fig. 6. As shown in Fig. 6, the gear wheels 124 and 128, at the beginning of the brake applying operation, are so disposed that the maximum distance from the axis of the staff 117 to the point of mesh of the gear wheel 124 with the gear wheel 128 obtains, and, reversely, the minimum distance from the axis of the staff 51 to the point of mesh of the gear wheel 128 obtains. Consequently, as the gear wheel 124 is rotated the leverage ratio will be at a minimum at the beginning but the speed of rotation imparted to the gear wheel 128 will be at a maximum. This condition gradually uniformly changes as the gear wheel 128 is rotated until a one-half revolution has occurred at which point the leverage ratio of the applied power will obviously be at a maximum and the speed of rotation of the staff 51 at a minimum. The brake will be locked in the usual manner by throwing in the foot controlled dog 119.

In the construction illustrated in Figs. 8 and 9, the same general mechanism is em-

ployed as shown in Figs. 5, 6 and 7, the substantial difference being that I employ a pawl and ratchet device to be manually operated by the brakeman and the entire arrangement is applied vertically to the end wall of the car. In carrying out this form of the invention, I employ a suitable housing applied to the end wall of the car above the platform, said housing preferably consisting of two elements 60 and 61. These are so formed as to provide suitable bearings for two vertically spaced shafts 62 and 63, said shafts extending horizontally. Within the housing the shaft 62 has keyed or otherwise rigidly secured thereto an eccentrically disposed gear wheel 224 and the shaft 63 has another eccentrically disposed gear wheel 228 keyed or otherwise rigidly secured thereto. Said shaft 63 also has secured thereto a chain winding drum 250 of relatively large diameter to which the upper end of the brake chain 213 is attached. Said brake chain is passed around a sheave wheel 214 in the same manner as shown and described with respect to Fig. 1. Any suitable means for adjusting the length of the brake chain 213 will be employed as will be understood. Secured to the shaft 62 outside of the housing is a ratchet wheel 64 with which cooperates a preferably gravity controlled pawl 65 pivotally mounted on an operating lever 66. The latter is oscillatably mounted on the outer end of the shaft 62 as clearly appears from the drawing. For the safety of the brakeman and to prevent the operating lever 66 being suddenly thrown around when the brakes are released, as hereinafter described, I preferably employ a lug 67 on the outside of the housing so arranged in the path of the pawl 65 that it will automatically throw the latter out of engagement with the ratchet wheel 64 when the operating lever reaches a predetermined position as, for instance, when it is inclined upwardly and away from the brakeman at an angle of about 45° with the vertical, as indicated by the dotted position of the lever in Fig. 10.

The shaft 63 has secured thereto preferably outside of the housing a ratchet wheel 68 with which cooperates a gravity controlled locking dog 69 pivotally mounted on the housing. Said locking dog obviously can be disengaged by the brakeman's foot in a manner similar to the method of disengagement in the more common form of locking dog.

The operation of the construction shown in Figs. 8 and 9 will be understood from the previous description given of the construction shown in Figs. 5, 6 and 7, it being observed that the relative positions of the eccentric gear wheels 224 and 228 is the same as of the gear wheels in 124 and 128 when the parts are in normal or released condition.



In the structure shown in Figs. 8 and 9, the brakes are of course applied step by step by aid of the pawl and ratchet device and under some conditions is preferable to the use of the hand wheel shown in the other two forms of my invention.

Although I have herein shown and described what I now consider the preferred manner of carrying out my invention, the same is merely illustrative and I contemplate all changes and modifications as come within the scope of the claims appended hereto.

I claim:

1. In a hand brake for railway cars, the combination with the brake rigging proper; of a bracket adapted to be secured to a portion of the car; a rack slidably mounted on said bracket, said rack being operatively connected with said brake rigging proper, said rack having teeth extending at an angle to the line of movement of the rack; an eccentrically mounted gear cooperating with said rack; and manually operable means for effecting rotation of said gear, including a shaft extending parallel to said line of movement.

2. In a hand brake for railway cars, the combination with a housing bracket adapted to be secured to the end wall of a car; a rack gear vertically slidably mounted within said housing bracket, said rack gear having teeth on the operative face thereof extending at an incline to the vertical, the brake rigging proper being adapted to be operatively connected with the lower end of said rack gear; an eccentrically mounted gear cooperable with said rack gear; and manually operable means for effecting rotation of said eccen-

tric gear including a shaft extending parallel to said line of movement.

3. In a hand brake for railway cars, the combination with a housing bracket adapted to be secured to the end wall of a car; a rack gear slidably mounted within said housing bracket, said rack gear having teeth on the operative face thereof extending for a part of their length in a line parallel to the line of movement of the rack gear and for another part of their length at an incline to said line of movement, the brake rigging proper being adapted to be operatively connected with one end of said rack gear; an eccentrically mounted gear cooperable with said rack gear; and manually operable means for effecting rotation of said eccentric gear, said means including a staff, a beveled gear mounted on the staff, and a second beveled gear cooperable therewith and rotatable in unison with the eccentric gear.

4. In a hand brake for railway cars, the combination with a housing bracket adapted to be secured to the end wall of a car; a rack gear slidably mounted within said housing, said rack gear having teeth thereon arranged at an angle to the line of movement of said rack gear, the brake rigging proper being adapted to be operatively connected to said rack gear; antifriction bearings between said rack gear and the housing; an eccentric gear rotatably mounted within said housing and cooperable with said rack gear; and manually operable means for effecting rotation of said eccentric gear.

In witness that I claim the foregoing I have hereunto subscribed my name this 14th day of July 1919.

RICHARD WEBB BURNETT.