J. M. DALY.

TONNAGE EQUATING MACHINE.

APPLICATION FILED AUG. 15, 1905.

956,688.

Patented May 3, 1910.

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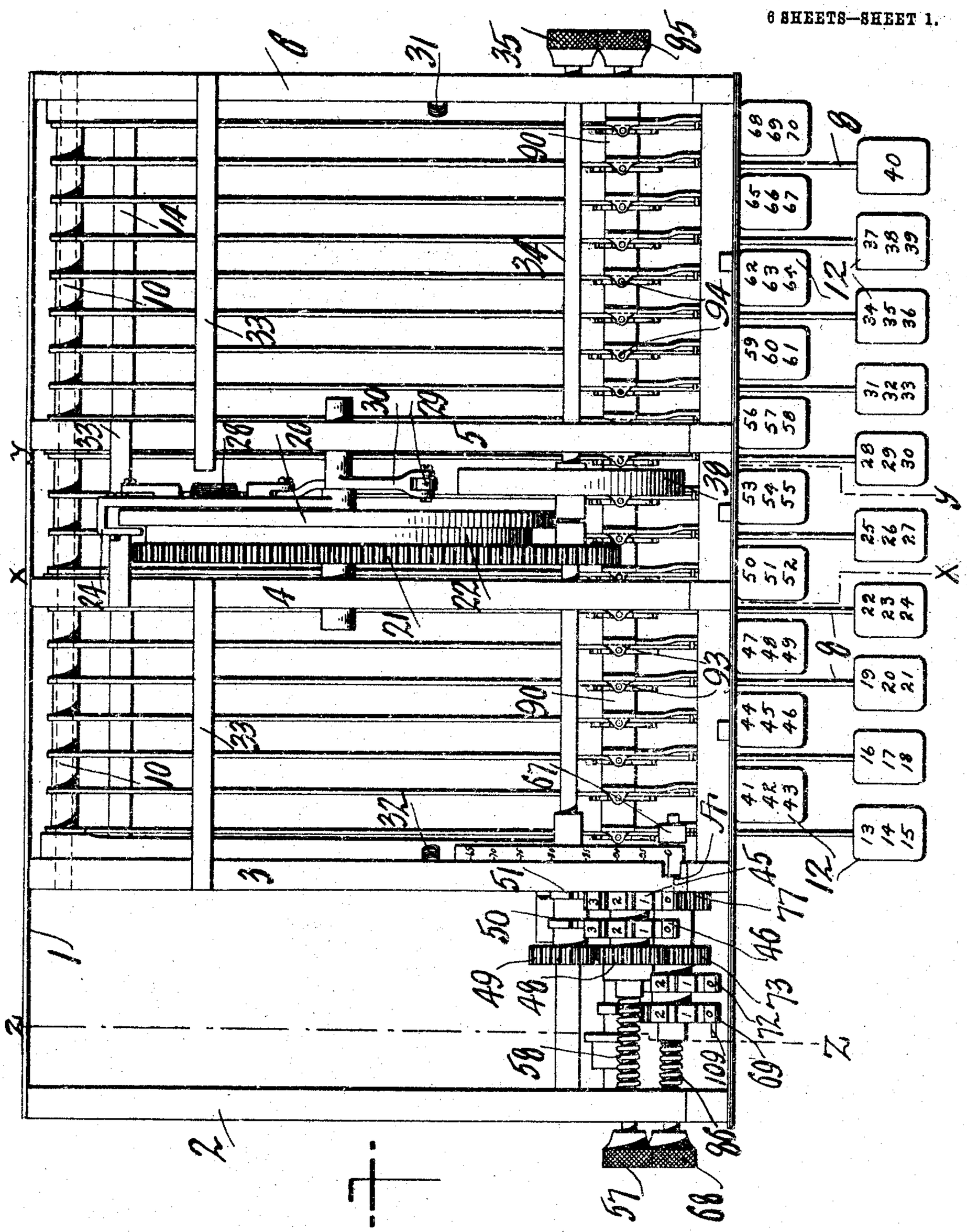

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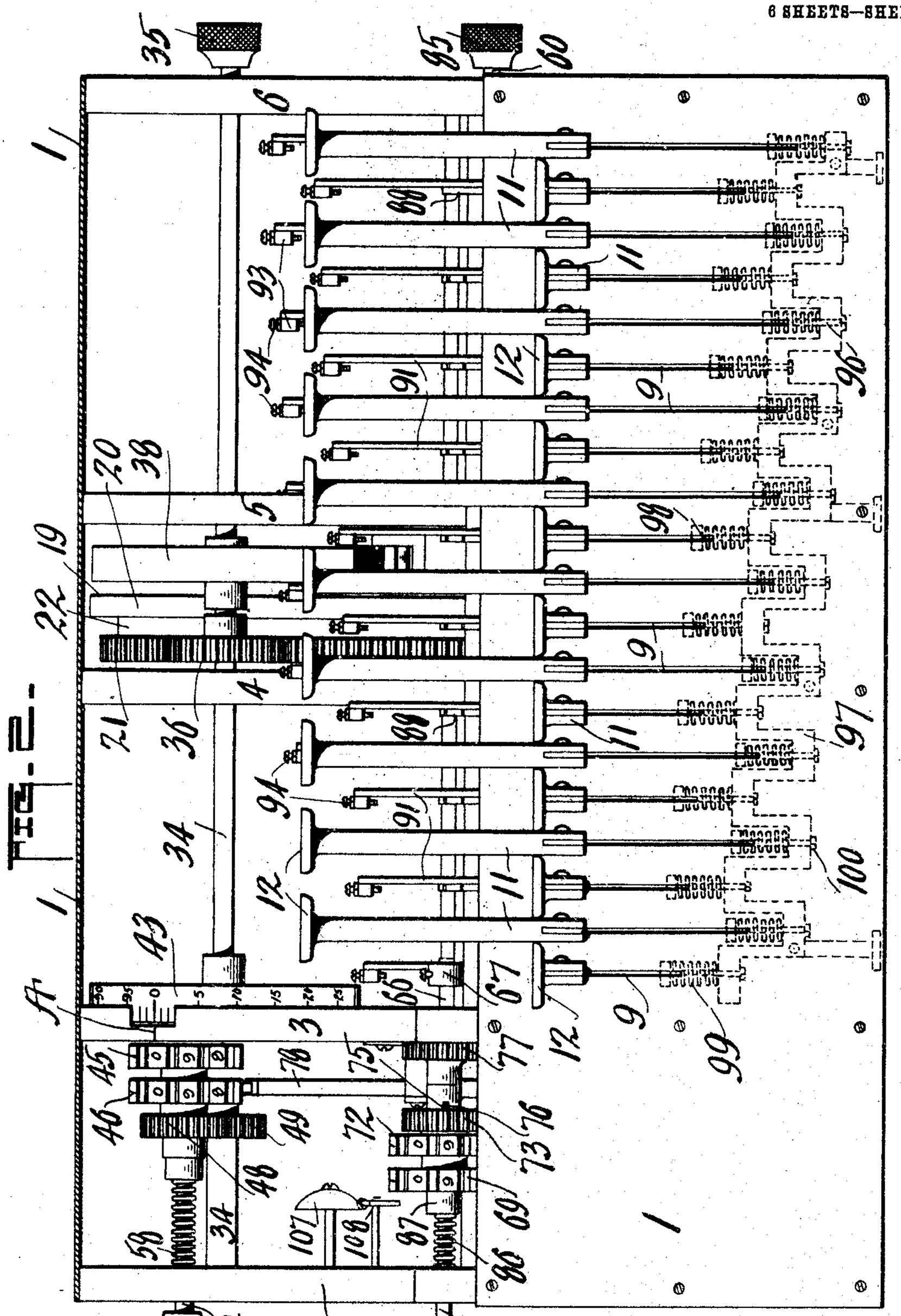

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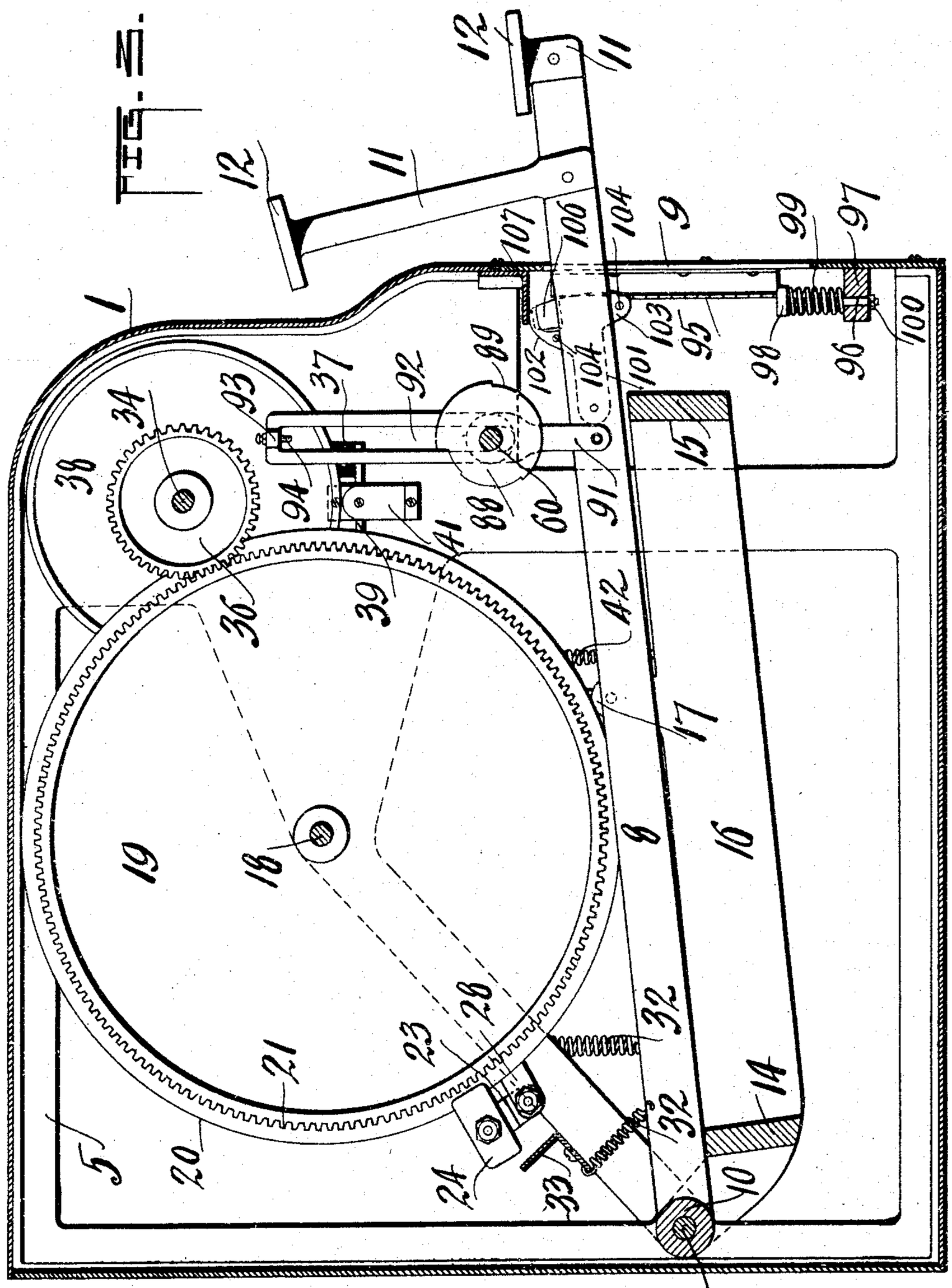

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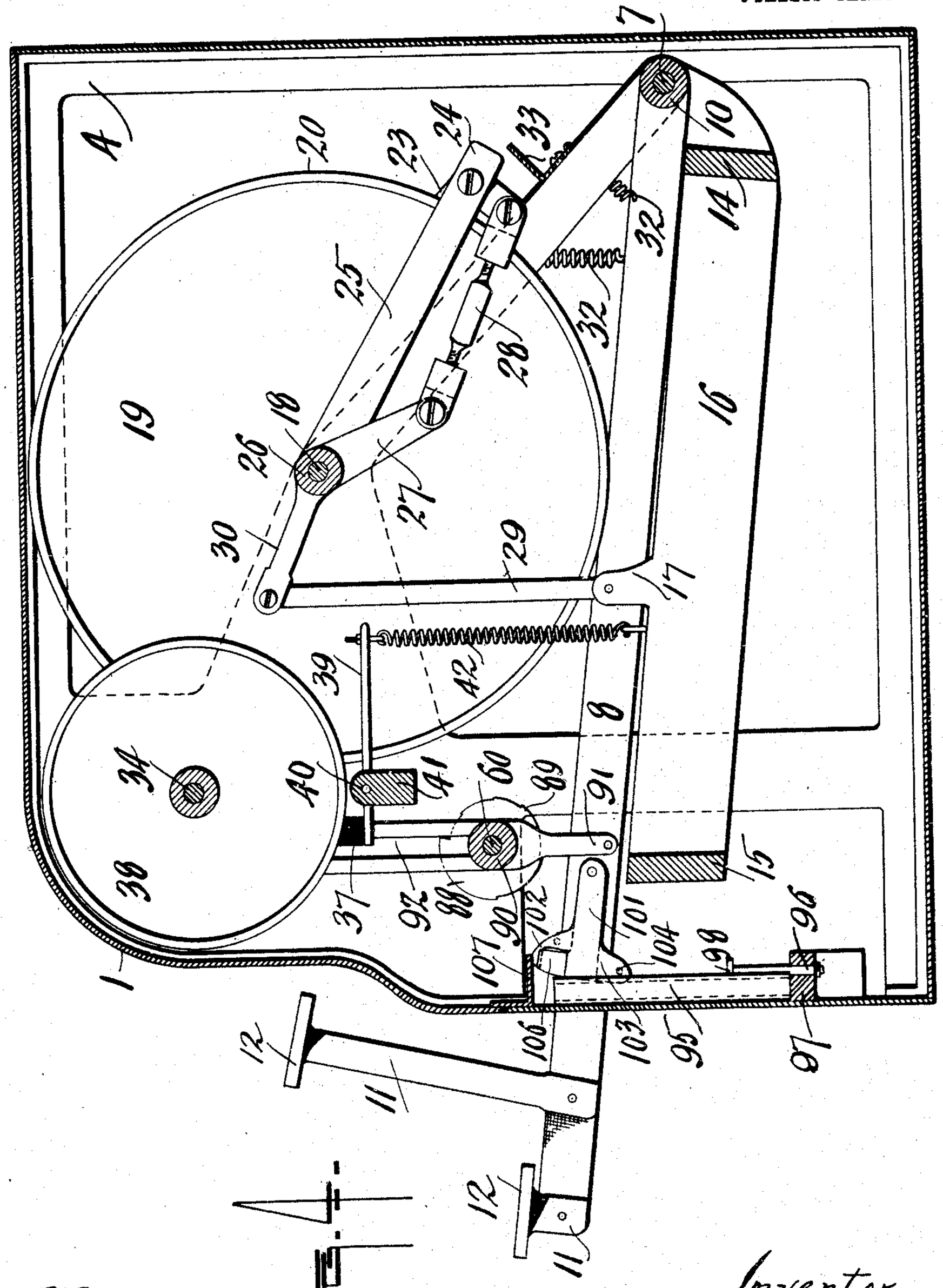

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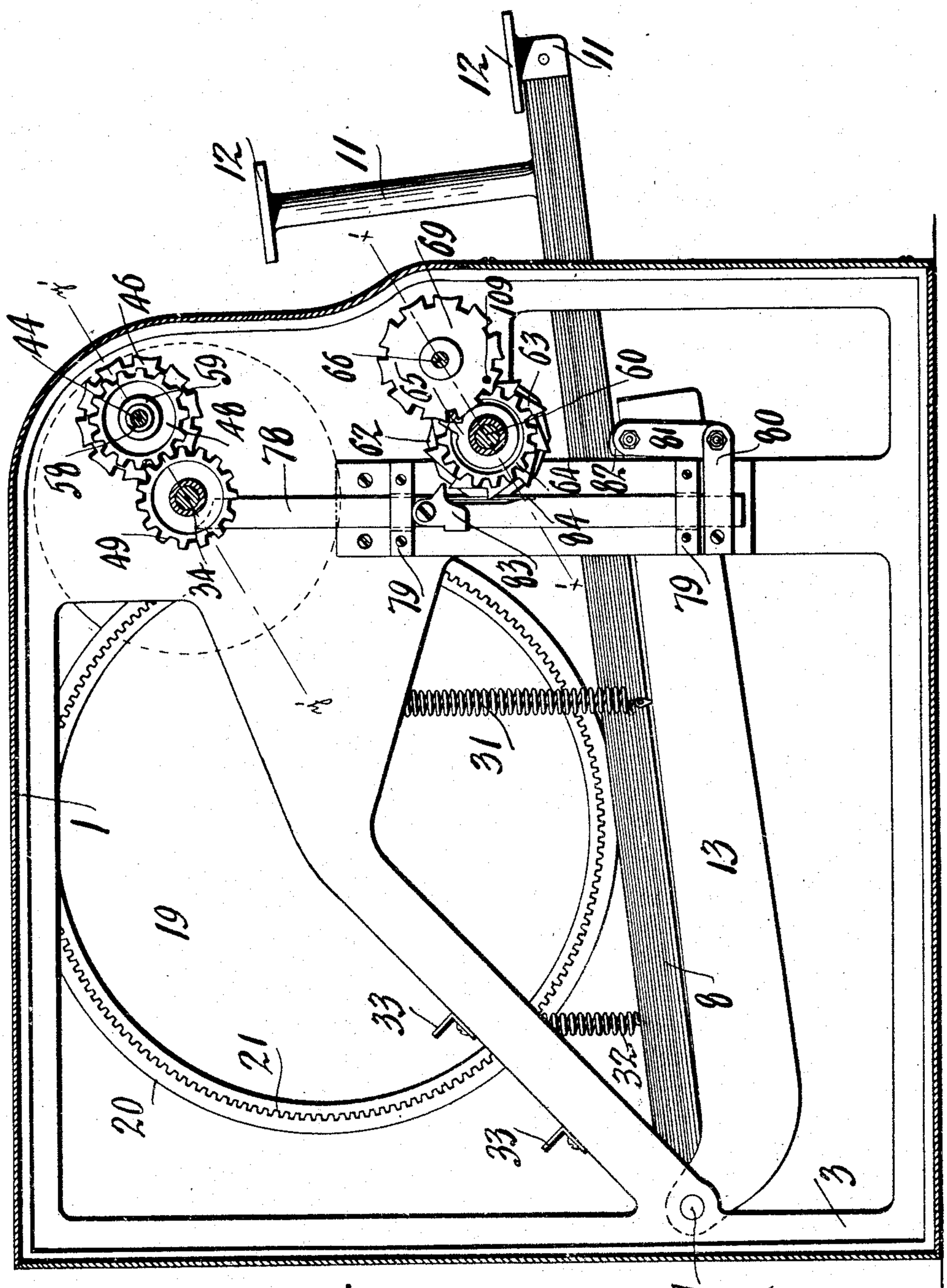

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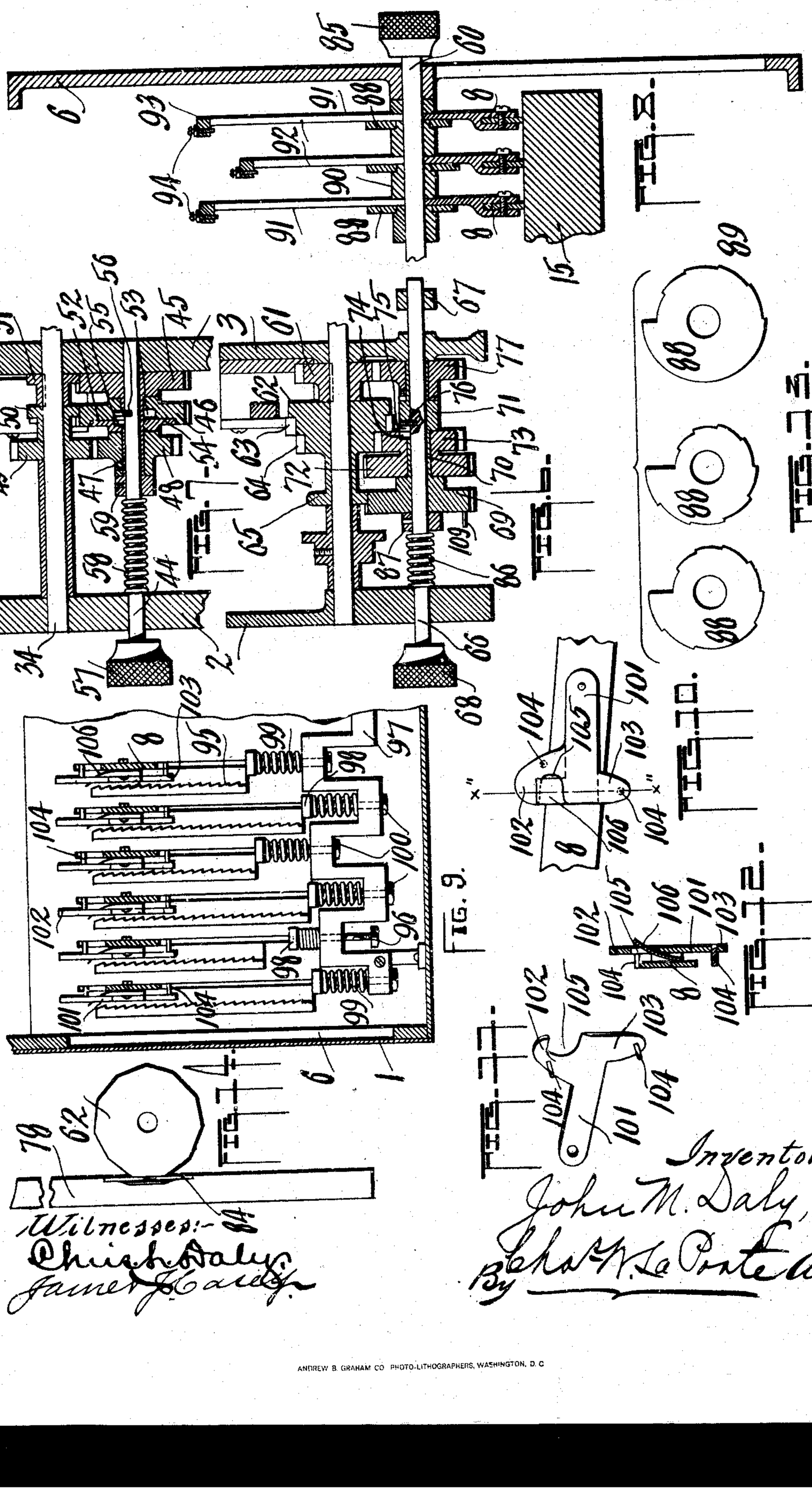

FIG. 9.

FIG. 1.

FIG. 2.

FIG. 10.

FIG. 12.

FIG. 11.

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UNITED STATES PATENT OFFICE.

JOHN M. DALY, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO CHRISTOPHER L. DALY, OF PEORIA, ILLINOIS.

TONNAGE-EQUATING MACHINE.

956,688. Specification of Letters Patent. **Patented May 3, 1910.**

Application filed August 15, 1905. Serial No. 274,342.

To all whom it may concern:

Be it known that I, JOHN M. DALY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Tonnage-Equating Machines; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention has reference to a computing machine, and has for its object the equaling of train tonnage or for computing the tonnage resistance in railway trains, a further object being to reduce or adjust the loading of engines from an actual weight, to a draw-bar pull.

Attention is called to several patents issued to me on Dec. 2, 1902, two of which are numbered 715,199 and 715,201, which illustrate and describe a "system for computing the tonnage resistance of railway trains", and while the results to be obtained by the present invention are somewhat similar to the patents referred to, the method of and the construction of the mechanism is vastly different. Attention is further called to two applications for patent filed on April 11, 1904 for computing machine bearing Serial Numbers 202,552 and 202,553, in which a mechanism for computing the tonnage resistance in railway trains is found, containing substantially the subject matter of this application with the exception of the means actuated by the key-bars for imparting movement to the registering devices; means for insuring the full stroke of the key-bars for the purpose of governing the actuation of the registering mechanism to prevent the operation of the key-bars without registering the amounts appearing thereon or arbitrary amounts which are at variance with the numbers on said key-bars, and to various other details which will more fully appear in the following specification.

The method in vogue on railroads for making up trains or loading engines prior to about 1897, was to place a given number of loaded and empty cars in train, reducing empty cars to a loaded car basis. On some roads they considered two (2) empty cars equal to one (1) loaded car, hence an engine rated at twenty-five (25) loads would haul twenty (20) loads and ten (10) empty cars. On other roads, they used a basis of three (3) empty cars equal to two (2) loaded cars, others, five (5) empty cars equal to three (3) loads, etc. At that time, this method was reasonably accurate, as cars were of almost uniform capacity and weight, viz: fifteen (15) and twenty (20) ton capacity. With the introduction of large engines, and the reduction of grades about 1897, came the large capacity car of fifty (50) ton capacity, against the standard fifteen (15) and twenty (20) ton capacity cars, making it impractical to rate and load engines on the car-haul basis.

The gross-tonnage car and contents plan was next tried, this plan has on several roads proved a failure and frequently results in overloading the engine, thereby causing delay to train and creating additional chances for accidents. The manifest or waybill that accompanies loaded cars shows the tare, net and gross weight of car and contents. Empty cars have the tare weight stenciled on body of car and from this source, yardmaster or yardmen switch together and build up trains on the tonnage basis.

The gross tonnage plan is not a correct basis, for the reason, that it does not recognize or provide for the additional power required to haul a ton of car as compared to a ton of contents, although all experts concede that the same engine can haul a greater gross tonnage of large capacity heavy loaded cars than it can haul in small capacity light loaded cars, for the reason there are elements of friction due to the number of cars used in taking care of a given tonnage of contents. For example: An engine rated at twenty-one hundred (2100) gross tons is attached to train composed of thirty (30), seventy (70) ton cars equal to twenty-one hundred tons, will have no difficulty in hauling such a train, in fact it should have six hundred or seven hundred tons more. On the next trip over the same grade, the same engine has twenty-one hundred (2100) gross tons of fifteen (15) ton cars. It cannot possibly haul it. Again on another trip over the same grade, the same engine has twenty-one hundred (2100) tons of forty (40) gross tons in fifty-three (53) cars. It

is able to haul the train in the allotted time. Each standard freight car has eight (8) wheels, eight (8) journals and measures about forty (40) feet in length over all. Hence when twenty-one hundred (2100) tons is in seventy (70) gross ton cars we have only thirty (30) cars, two hundred and forty (240) wheels and journals and twelve hundred (1200) feet of train. In forty (40) ton cars we have fifty-three (53) cars, four hundred and twenty-four (424) wheels and journals and twenty-one hundred and twenty (2120) feet of train and if in fifteen ton cars, we have one hundred and forty (140) cars, eleven hundred and twenty (1120) wheels and journals and fifty-six hundred (5600) feet of train.

With seventy (70) gross ton cars, we have friction on two hundred and forty (240) journals and at wheel to rail on two hundred and forty (240) wheels; we have twelve hundred (1200) feet of surface for wind resistance; we have the benefit of momentum when one half the train passes over the summit of grade to help over an adjacent grade again; we have only twelve hundred (1200) feet of train to bind in one (1) or two (2) curves at one time, which is also a train resistance feature.

The same engine hauling fifteen (15) ton cars has forty (40) to fifty (50) per cent. greater resistance or draw-bar pull; this has been practically demonstrated on a number of roads and is a matter of record. This ratio does not exist to the same per cent. on heavy grades where the rating is five hundred (500) to one thousand (1000) gross tons as where the grades are light and engines are rated at fifteen hundred (1500) to twenty-five hundred (2500) tons, for the reason, that the smaller the rating, the less cars are required and the less friction, wind resistance and resistance due to distance of weight from power.

Having shown the fact that a ton of car has a greater draw-bar pull than a ton of contents, I wish now to show that the draw-bar pull or train resistance will vary on heavy and light cars according to their location in train or distance from the engine. For example: in switching together and making up a train at the starting point they place fifty (50) light fifteen (15) ton cars next to engine and twenty (20) heavy seventy (70) ton cars at rear of train next to the caboose, we have a total gross tonnage of twenty-one hundred and fifty (2150) tons. The weight of the seventy (70) ton cars at the rear of train will prevent engine from getting the advantage of momentum on down grades until after two thirds of the entire train has passed over the summit of grade; again, when the heavy cars are placed at the rear of train near caboose and light cars placed at head end near the engine, the heavy cars at rear draw hard and tend toward straightening out train in curves creating additional friction of wheel flange to rail. The reverse effect is felt when the heavy cars are hauled near the engine. Hence in order to equalize, adjust and load an engine on the equated tonnage or draw-bar pull basis, it is necessary to not only provide for the difference in the resistance between light and heavy cars, but, to also provide for the difference in the resistance or draw-bar pull due to location of each weight of car in the train and the distance of the weight from the engine.

In order to provide for the difference in resistance of light and heavy gross weight cars, my plan is, to test the engines with train composed of cars all of one gross weight, say forty (40) gross tons each. After arriving at a proper rating on forty (40) ton cars, determine the resistance of fifteen (15), twenty (20), twenty-five (25) ton, etc., at different locations in train. For example, on a rating of two-thousand (2000) tons, fifty (50) cars of forty (40) tons each, we place fifteen (15) cars fifteen (15) tons each, next the engine and forty (40) cars of forty (40) tons each next the caboose, we have a total of eighteen hundred and twenty-five (1825) tons or one hundred and seventy-five (175) tons less than rating, although the draw-bar pull on both trains is the same; again, put the forty (40) cars of forty (40) tons each next the engine and the fifteen (15) cars of fifteen (15) tons each next the caboose and the engine can haul seventy-five (75) additional tons or a total of nineteen hundred (1900) tons. In the first case, when light cars were next the engine we conceded twelve (12) additional tons per car to the engine for increased resistance of a fifteen (15) to a forty (40) ton car, also for the additional resistance due to heavy cars at rear end. In the second case, with the light cars at rear, we reduce that feature of the concession and allow the engine six (6) tons per car on the fifteen (15) light cars for difference in weight compared to forty (40) ton car, no concession made for light cars ahead.

When cars of greater weight than the testing unit are used, the effect is the reverse. For instance, a train rated at two thousand (2000) tons has forty (40) cars of forty (40) gross tons each next to engine, it should haul nine (9) cars of seventy (70) tons each equal to twenty-two hundred and thirty (2230) tons on a rating of two thousand (2000) tons, based on forty (40) ton testing unit. If the seventy (70) ton cars are placed next to the engine, it should haul one (1) additional seventy (70) ton car or a total of twenty-three hundred (2300) tons on a rating of two thousand (2000) tons. Again, when an engine is tested on basis of

forty (40) ton cars and rated at, say, sixteen hundred (1600) tons, no concession is made for any car of forty (40) gross tons put in train between the first and fortieth car, as the engine demonstrated its capacity to haul full rating of such cars up to a limit of forty (40) cars; however, when a forty (40) gross ton car is placed in train at the rear of forty other cars on a sixteen hundred (1600) ton rating, it must receive an additional allowance according to its location behind the fortieth (40th) car, due to length of train resistance and also to the resistance due to placing cars of less than forty (40) tons ahead of the fortieth (40th) car.

The invention has for its further object, a machine for equating the draw-bar pull of cars of different gross weight at different locations in train, preferably, from the actual weight of car and contents as shown on the manifest or way-bill that accompanies each car; by means of a suitable registering device or display, having a series of keys for operating the same, which said keys have an invariable movement for a pre-determined number of strokes, and a variable stroke at pre-determined intervals.

The keys of the machine are each provided with characters in numerical arrangement representing cars of a certain gross tonnage. And the arrangement of the keys in this instance is, that each key shall represent the weights of three different cars, although it is understood that I do not limit myself to this peculiar construction. The object being, that if an operator presses down the first key which is provided with the numbers 13, 14 and 15, ten (10) consecutive times, it registers on the registering device one hundred seventy (170) tons, instead of one hundred fifty (150) tons; two tons being allowed for each car on account of their representing tons less than the testing unit. Press the same key ten (10) additional times and the registering device will register one hundred eighty (180) tons or three tons per car additional, allowing one ton additional per car for the length of the train or the distance from the power. Press the same key ten (10) additional times and it registers on the registering device two hundred (200) tons or two additional tons, which is allowed for the increased distance from the power; this ratio is based on an engine which is rated at sixteen hundred (1600) to two thousand (2000) tons. If the engine is rated at seven hundred (700) to twelve hundred (1200) tons, the allowance in each instance would be less; but if rated two thousand (2000) to twenty-five hundred (2500) tons, a greater allowance per car would be made. Again, if after the placing of the thirty light cars in the train, such is indicated by the key, you add five (5) cars of forty (40) tons each, to register this additional tonnage, you would press the forty (40) ton key five (5) times, which will register on the registering device an even two hundred (200) tons, which is in addition to that previously registered by pressing the key first mentioned, no allowance being made for the car which represents the testing unit. The next five (5) cars added to the train, if of seventy ton cars, the seventy (70) ton key is pressed and at each pressure of the said seventy (70) ton key, there will be registered on the registering mechanism, sixty-two (62) tons, making a total of three hundred ten (310) tons. Placing the seventy (70) ton car in the train at the point just referred to, and pressing the said key, it registers sixty-two (62) tons, instead of seventy (70) tons, that being the draw-bar pull as compared to a forty (40) ton testing unit. We now have forty (40) cars in the train which is rated at sixteen hundred (1600) tons of forty (40) ton unit cars. If you add ten (10) more forty (40) ton cars, which will place them forty-first (41st) to fiftieth (50th) cars from the engine, by pressing the key number forty (40) ten (10) times, it will register on the registering device four hundred ten (410) tons or one (1) extra ton per car for distance from power, nothing allowed for light weight as it is the testing unit.

In order to provide for the different draw-bar pull of same weight of car at different locations in the train, I provide a registering device contained within a casing wherein is a suitable registering mechanism or display which is adapted to be actuated by a series of independently movable keys; each of said keys arranged to have a given stroke for a pre-determined number of strokes and the stroke of each and all of the said keys adapted to be lengthened at pre-determined intervals and so retained for a given number of strokes. The controlling devices which regulate the stroke of the keys to obtain the movements thereof as specified, are so arranged and combined that the adjustment for the increased length of stroke of one or all of the keys is automatic, and the stroke of all the keys are automatically adjusted simultaneously after pressing any one key a pre-determined number of strokes or by pressing a series of different keys amounting in the aggregate to the number of strokes for which any one key is adjusted. The adjustment of the keys may be such that the increase in their stroke may be after five (5) successive strokes on one key or upon five (5) different keys or adjusted to suit any number of strokes from one on up, as may be desired and as will be required for different ratings.

For a further and full description of the invention herein and the merits thereof, and also to acquire a knowledge of the details of

construction of the means for affecting the result, reference is had to the following description and drawings hereto attached.

While the essential and characteristic features of the invention are susceptible of modification, still the preferred embodiment of the invention is illustrated in the accompanying drawings, in which:—

Figure 1 is a plan view of my improved tonnage equating machine with the top or cover thereof removed; Fig. 2 is a front elevation of the machine with a portion of the front wall or the cover thereof removed showing in elevation mechanism contained within the said machine; Fig. 3 is a vertical sectional elevation of the machine looking into the same from the left hand side, taken on a line approximately *x*—*x* of Fig. 1; Fig. 4 is a vertical sectional elevation of the machine looking into the same from the right hand side, taken on a line approximately *y*—*y* of Fig. 1; Fig. 5 is a vertical sectional elevation of the machine looking into the same from the left hand side, taken on a line approximately *z*—*z* of Fig. 1; Fig. 6 is a longitudinal and sectional plan view taken on the line *x'*—*x'* of Fig. 5; Fig. 7 is a longitudinal and sectional plan view taken on the line *y'*—*y'* of Fig. 5; Fig. 8 is a vertical sectional elevation through the casing and working parts of the machine at the right hand side thereof, looking toward the front; the view intended to show a stop member shaft, stop members suitably carried thereon, several levers in cross section resting on a portion of a link frame and vertically movable members co-acting with the stop members connected with the key-bars; Fig. 9 shows in detail a vertical sectional elevation through the casing at the right hand side of the machine, looking toward the front and showing the mechanism for controlling the downward pressure of the key-bars to insure their being pressed their full limit before their release to return to their normal positions; Figs. 10, 11 and 12 show in detail a side elevation, a perspective view and a cross section of parts illustrated in Fig. 9, adapted to be connected with the key-bars for governing the downward pressure of the key-bars; the cross section in Fig. 12 taken on a line *x''*—*x''*; Fig. 13 illustrates in elevation and detached, three different forms of stop members representing respectively, reading from the left to the right, a twenty (20) ton stop member, a nine (9) ton stop member and a ten (10) ton stop member, adapted to co-act with key-bars representing the corresponding numerals; and, Fig. 14 is an elevation in detail of a reciprocating member or plunger, the same retaining a spring plate adapted to engage and control an irregular shaped wheel and a shaft on which the said wheel is carried.

Like numerals of reference indicate corresponding parts throughout the figures.

In the drawings, 1 denotes a casing which may be of suitable form and in which the operative parts of my device are contained, as well as suitable supports for such parts. These supports, in the main, consist of open work castings 2, 3, 4, 5 and 6, the outlines of which is substantially the contour of the casing 1. The castings 2 and 6 are the end castings, and 3, 4 and 5 are suitably positioned between the two first named. The device may be portable as shown in the drawings, or otherwise, as may be desired and of a size most convenient.

7 denotes a longitudinally disposed shaft or rod positioned in the lower rear part of the casing and journaled in the castings 3, 4, 5 and 6; and 8 refers to a series of key-bars having their inner ends pivoted on the shaft 7. The said key-bars extend forwardly, inclined slightly upwardly and pass out of the front wall of the casing through vertically arranged slots 9, in which the key-bars have vertical movement. The key-bars are laterally spaced apart on the shaft 7 by means of the spacing collars 10 carried on the said shaft 7.

Owing to the peculiar result to be obtained by my device upon the actuation of the different keys, in this instance, I have arranged the keys in two rows, an upper and a lower row. The lower row representing all keys indicating the gross weight of cars below the testing unit and the testing unit car, and the upper row indicating the gross weight of cars above the testing unit. The vertical movement of the lower row of keys is not so great as the keys of the upper row, hence the keys having the greatest throw, are arranged in the upper row. It will be understood of course, that the main body of the key-bars within the casing, are arranged substantially alike and that it is the arms 11 to which are attached the keys or buttons 12, which are alternately short and long; the slots 9 in the casing for the respective key-bars being in length to correspond to the movement of the various key-bars. Upon the face of the keys or buttons 12 of each key-bar, is stamped or otherwise suitably placed, one or more characters, preferably numerals which represent the gross weight of certain cars, as called for by the way-bill or manifest, which will be further described.

Each and every one of the respective key-bars are adapted to act upon a link frame, which in turn will impart movement to certain tonnage registering mechanism and a car tallying device through the medium of certain devices to be described. This link frame consists of two parallel and transverse beams 13 disposed within the casing 1 and adjacent to the castings 3 and 6 and their

rear ends hung on the shaft or rod 7. These beams, near their connection with the rod 7, are connected by the longitudinal brace-beam 14, and their forward ends connected by the brace-beam 15 corresponding to the beam 14; and 16 denotes an intermediate beam somewhat similar to the beams 13 and connected to the brace-beams 14 and 15, the said beam 16 having an upwardly extended ear 17, see Fig. 4. The disposition of the brace-beams 14 and 15 connecting the beams 13, is beneath the key-bars 8 as shown in the drawings, so that, in depressing any one of the key-bars, the same will engage the brace-beams 14 and 15 and depress the same together with the beams 13 and 16 connected to the same, which oscillate on the shaft 7 to which the beams 13 are pivotally connected.

18 denotes a short longitudinal shaft journaled in suitable bearings in the castings 4 and 5 and at a point in the machine substantially as shown in the figures. On this shaft is carried a wheel 19 having a smooth clutch periphery 20, the wheel being also provided with an annular ring gear 21 which is integral with the clutch portion 20 thereof and spaced a short distance from the same by means of the flange extension 22. Adapted to have a clutch engagement with the peripheral face 20 of the wheel 19, is a clutch pawl 23 pivotally connected in the yoke portion 24 of a reach or arm 25 extending from a hub 26 on the shaft 18. Also extending from the hub 26 is an arm or reach 27 to the free end of which is pivotally attached an adjustable coupling rod 28, which has its opposite end pivotally connected to an extension of the clutch-pawl 23. And connecting the link-frame with the hub 26 is a bar 29 pivotally attached to the ear 17 of the brace-beam 16 and having its upper end pivotally connected to an arm 30 extending from the hub 26, see Fig. 4.

Pressing down any one of the key-bars 8 will depress the link frame and it carries with it the bar 29 which will rock the hub 26 on the shaft 18 through the connection of the arm 30. Rocking the hub will, through the reach 27 and the coupling rod, oscillate the clutch-pawl 23 causing it to firmly engage or impinge the face 20 of the wheel 19 and impart rotary movement to the said wheel 19 and the gear 21. The connection and adjustment of the parts just described with the link frame is such that simultaneous with the movement imparted to the link frame through any one of the key-bars, movement will be imparted to the wheel 19 in the manner specified; and as the key-bar and the link frame return to their normal positions, the clutch-pawl 23 is released from the face 20 of the wheel 19, by reason of the reverse movement imparted to the coupling rod 28 through the connection of the bar 29 therewith in the reverse movement of said link-frame. The key-bars 8 and the link frame are depressed through a direct movement imparted to the same by an operator pressing on the buttons 12 of the key-bars, and to return both the key-bars and the link frame to their normal positions, I employ springs.

To the beams 13 of the link frame, is connected the lower ends of coil springs 31, which have their upper ends suitably attached to the castings 3 and 6. And to each of the key-bars 8 is attached the lower ends of coil springs 32 which have their upper ends attached to cross-braces 33 secured to the castings 3, 4, 5 and 6. In Fig. 1 there will be seen in plan, three braces 33. The reason for this is, that the clutch parts which engage the wheel 19 would interfere with extending the main brace 33 through the machine, hence the necessity for placing a section of the brace 33 to the rear of the clutch parts.

Extending longitudinally through the machine in the upper forward portion thereof, is a shaft 34, the same passing through and having bearing in the castings 2, 3, 4, 5, and 6, and on the outer end of the said shaft, adjacent to the casting 6 is a hand wheel 35. On this shaft is a gear wheel 36 which is in mesh with the ring gear 21 of the wheel 19 and receives its power from said ring gear and imparts the same to its carrying shaft. For governing the rotation of the shaft 34 to limit its movement to the rotation imparted to the same through the actuation of a key-bar and the clutch device described, I employ a brake-shoe 37 adapted to engage the peripheral face of a disk or wheel 38 carried by said shaft 34. This brake-shoe is caused to engage the face of the wheel 38 upon each depression of the link frame through a bar 39 to which the brake-shoe 37 is attached and which is pivoted at 40 to a support 41 from the casting 5; and connected with the free end of the bar 39 is a coil spring 42 which has its lower end secured to the brace beam 16 of the link frame. Thus it will be seen, as the link frame is depressed through the yielding connection of the spring 42, the brake shoe 37 will engage the wheel 38 and prevent any advance motion of the same on its shaft when motion is imparted to the same through the actuation of the wheel 19.

On the shaft 34 preferably adjacent to the casting 3 is a registering wheel 43 of suitable diameter and having its peripheral face provided with units and numerals ranging from 0 to 99, and serving as a unit and tenths wheel. This registering wheel is fast with the shaft 34 and moves with each and every movement imparted to such shaft. There is provided in connection with this registering wheel 43, mechanism for registering not only from 0 to 99, but from 0 to

9999. This is accomplished in the following manner: 44 indicates a short shaft disposed longitudinally in the machine in the upper left hand forward corner thereof, with its ends having bearing in the castings 2 and 3. On this shaft is a pair of cam gear registering wheels 45 and 46, the former fast and the other loosely carried on the said shaft. The gear 45 is a numbering wheel arranged with the numerals 0 to 9, and the said gear is provided with an elongated sleeve 47, on which the gear 46 is carried, and also to which is secured a spur gear 48. The gear 48 is in mesh with a corresponding gear 49 which is loose on the shaft 34, and the gear 48 has a short sleeve extension to which is secured or made a part, a one tooth cam wheel 50 which has an intermittent engagement with tooth portions of the wheel 46. And fast with the shaft 34 is a one tooth cam wheel 51, similar to the one indicated 50, and it is adapted to have an intermittent engagement with tooth portions of the wheel 45, and when the toothed portions of the wheels 45 and 51, and 46 and 50 are not in mesh, the cam faces are coinciding, which will impart a uniform and corresponding rotation to the engaging wheels. With each complete rotation of the unit and tenths wheel 43 and its shaft 34, the tooth of the cam wheel 51 will engage a tooth of the cam gear registering wheel 45 and move the same one notch, which will bring the "1" of the wheel 45 to coincide with the "0" of the wheel 43 and the registering mechanism will indicate "100". The cam wheel 51 continues this operation with each complete rotation of the wheel 43 until after "900" is registered, when the cam wheel 50 will be brought into play to move the cam gear registering wheel 46 one notch at a time to register successively and together with the numerals on the wheels 45 and 43 from "1000" on up to "9999". For with each complete revolution of the wheel 45 and its gear 48, the cam wheel 50, through the connections described, is made to move one notch. The wheels 45 and 46 have each ten teeth, hence with each revolution of the shaft 34, the wheel 45 makes one tenth of a revolution, and with each complete revolution of the wheel 45, the wheel 46 makes one tenth of a revolution.

The construction and manner of carrying the cam-gear registering wheel 46 on the sleeve 47 to adapt its rotation as described, and the manner of reversing these parts will now be described: The gear 46 was described as being loosely carried on the sleeve extension 47 from the gear 45, and the same is provided in one of its side faces with the annular groove or depression 52, and the annular seat 53 within the depression just described, see Fig. 7. Seated in the depression 52 is a disk 54, which forms a part of the wheel 46 and is carried on the sleeve 47, and the inner face if the disk 54 is provided with a slot 55. Secured in the shaft 44 and projecting up through a slot in the sleeve 47 is a pin 56 which is revoluble with the shaft, in the seat 53 in the gear 46, and the gear 46 in rotating will rotate about the pin 56. The pin serves to connect the gear 45 with its sleeve 47 to the shaft 44 and further serves to lock the two gears 45 and 46 in their readjustment to bring the corresponding numerals on the gears to coincide, this is accomplished in the following manner. When it is desired to return the two gears to "0" or any similar readjustment, the operator will grasp a hand wheel 57 on the end of the shaft 44 outside the casing and draw the said shaft outwardly. In doing so he will cause the pin 56 of the shaft to engage the inner face of the disk 54 and draw it together with the gear to which it is attached, the gear 48, sleeve 47 and gear 45 outwardly disengaging the gears 45 and 46 from the cam wheels 50 and 51, when the gears 45, 46 and 48 may be freely turned and when corresponding numerals on the gears 45 and 46 coincide, the pin 56 will enter the slot 55 of the disk 54, when the gearing may be replaced. It is also understood that in connection with the rearranging of the gears described, the wheel 43 may be correspondingly adjusted by the operator grasping the hand wheel 35 on the outer end of the shaft 34 and readjust said shaft together with the gear 43 and the cam wheels 50 and 51, so as to cause them to properly match with the gears 45 and 46. For retaining the shaft 44 projected inwardly and the gearing thereon in their normal positions, I use a coil spring 58 on the shaft 44, bearing between the casting 2 and a collar 59 on the said shaft adjacent to the wheel 48.

I have fully described the tonnage registering mechanism, consisting essentially of the registering wheels 43, 45 and 46 and the mode of operating the same upon the actuation of any one key-bar.

I will now proceed to describe the car tallying device, which is employed for indicating the number of cars placed in a train and which is successively actuated upon the stroke of each key-bar.

60 denotes what will be hereinafter designated as a stop member shaft, the same passing longitudinally through the machine and having bearing in the castings 2, 3, 4, 5 and 6. It is disposed about midway between the top and bottom of the casing and well toward the front thereof and at a suitable point above the key-bars 8.

On the stop member shaft 60 adjacent to the outer face of the casting 3, is fixedly carried a spur gear wheel 61, and loose on the said stop member shaft adjacent to the gear 61 is a combination gear and cam wheel,

consisting of the cam wheel 62 the periphery of which is a series of flat faces giving the wheel a polygon shape; a ratchet wheel 63, a spur gear wheel 64, and separated from the spur gear 64 by an integral sleeve is a one tooth cam wheel 65. As shown in Fig. 6, the wheels 62, 63, 64 and cam wheel 65 are all integral, and inasmuch as their operations are simultaneous it is preferable to make them so.

Journaled in the castings 2 and 3 forward of the stop member shaft 60 is a short longitudinal shaft 66, on the inner end of which is a collar 67 and on the outer end is attached a hand wheel 68. 69 denotes a cam gear registering wheel on the shaft 66, the same provided with a series of ten teeth adapted to be engaged by the tooth of the cam wheel 65. Extending longitudinally on the shaft 66 from and a part of the gear 69 is a sleeve 70 having a shoulder portion 71. Adjacent to the wheel 67 is a cam gear registering wheel 72 similar to the gear 69, the same revoluble on the sleeve 70, and attached to the wheel 72 is a spur gear wheel 73 in mesh with the wheel 64 on the shaft 60. The wheel 73 has its inner face adjacent to the shoulder 71 of the sleeve 70 and its inner face is provided with a slot 74, matching a corresponding slot or groove 75 in the hub 71, in which is carried a pin 76 secured in the shaft 66 and projecting up into the slot 75. And carried on the sleeve 71, suitably secured thereto and adjacent to the casting 3 is a spur-gear wheel 77 in mesh with the gear 61 on the stop member shaft 60.

The manner of operating the gearing just described on the shaft 60 and the shaft 66 is through the actuation of any one key-bar in the depressing of the link frame previously described. The mechanism for doing this may be described as follows:

78 indicates a plunger or reciprocating bar, which is disposed vertically in the casing and movable up and down in boxings or bearings 79 secured to the casting 3. To the lower end of this bar or plunger 78 is secured a strap or bar 80 to the outer end of which is pivotally attached a link 81 which, at its opposite end is pivotally secured to a lug 82 projecting from the beam 13 of the link frame, see Fig. 5. At a suitable point on this bar or plunger 78 is pivotally attached a ratchet pawl 83 adapted in its downward movement with the bar or plunger 78 to engage with a ratchet tooth of the ratchet wheel 63 and rotate the same on the shaft 60 one-tenth of a revolution, in so doing the gear 64 will impart a similar movement to the gear 73 and it in turn will impart a one-tenth revolution to the registering gear 72. The gear 72 being a numeral wheel and provided with numbers ranging from "0" to "9" this wheel will register nine cars placed in a train in nine successive depressions of the link frame to depress the plunger 78. Upon the tenth depression of the plunger 78, the one tooth cam wheel 65 will have made a complete revolution and its tooth coinciding with a tooth of the wheel 69 the same will be caused to make one tenth of a revolution bringing the "1" of this wheel to coincide with the "0" of the wheel 72 and thereby register ten cars placed in a train. The wheel 67 is a numbering wheel similar to the wheel 72 and is provided with the numerals ranging from "0" to "9", so that the two wheels 69 and 72 combined will successively tally with each and all of the depressions given to the link frame through the actuation of the different key-bars. With each complete revolution of the cam wheel 65 to impart a one tenth revolution to the wheel 69 I impart a one tenth revolution to the shaft 60. This I accomplish through the gear 77 which is fixedly attached to the sleeve 70, and meshing with the gear 61 fixedly carried on the shaft 60, so that with each movement of the gear 69 the gear 77 will be correspondingly moved and impart a one tenth revolution to the stop member-shaft 60 through the actuation of the gear 61, for a purpose which will become apparent later on. The gears 63, 64 and cam wheel 65 being loose on the shaft 60 I control their rotation to prevent more than a one tenth revolution in the operation of the bar or plunger 78. The said plunger has attached thereto a flat spring blade 84 which frictionally engages the flat faces of the periphery of the wheel 62 and holds the said wheel and those parts integral therewith to a one tenth revolution to each depression of the bar 78 and prevents the same from traveling any farther or in advance of the movement of said bar 78, insuring a perfect tally of each depression of the several keys and the link frame.

To readjust and rearrange the wheels on the shaft 66 at any time or when starting the machine, the operator will grasp the hand wheel 68 and draw the shaft 66 forward causing the pin 56 to engage the wheel 73 to impart further longitudinal movement to the said shaft and the devices thereon, when the wheels 69, 72, 73, and 77 will be disengaged from coacting wheels on the shaft 60 and permit the shaft 66 and the wheels thereon to be freely turned and readjusted, and when the numerals on the wheels 69 and 72 coincide or correspond, the pin 76 will enter the slot 74 in the gear 73 and lock the parts together, when the shaft and its gears may be returned to their normal positions. The collar 67 regulates the longitudinal movement of the shaft 66 and prevents the dislodgement of the same. When the shaft 66 has been drawn forward disengaging the gears thereon from the gears on the shaft 60, the shaft 60 and its gears, together with

parts to be described may be readjusted and rearranged to match the rearrangement of the shaft 66 and its gears, by means of a hand wheel 85 on the right hand outer end of said shaft by means of which the same may be turned. A coil spring 86 on the shaft 66 bearing against the casting 2 and a collar 87 on the shaft 66 serves to retain the said shaft and its gears in their normal positions, as seen in Fig. 6.

The devices for governing the stroke of each and all of the key-bars will next be described. On the shaft 60 is carried a series of stops or irregular faced members 88, substantially as seen in cross-section in Fig. 8 and in elevation in Fig. 13, wherein the stop members are shown provided with irregular peripheries 89, and have extended hub portions 90 to provide a suitable bearing for the same on the shaft 60. The stop members are so arranged that they are alternately disposed with vertically movable plates or bars 91, having elongated slots 92 in their bodies through which the shaft 60 extends and to adapt the plates or bars 91 to have an extended movement across the axis of the shaft 60. The lower ends of the plates or bars 91 are connected to the key-bars 8, in a suitable manner, preferably as seen in Fig. 8. And the upper ends of the said plates or bars 91 have the lateral projections 93 in which are carried the threaded plugs or bolts 94 which engage threaded openings in the said projections; the position of the bolts 94 are in a vertical plane above the peripheral faces of the stop members 88 and are adapted to abut with the said stop members, when the keys are depressed, serving to limit the stroke of the keys. The plates or bars are of irregular length, substantially as seen in front elevation, Fig. 2, because of the variation in the stroke of the different key-bars of the series, the purpose of which and the threaded bolts 94 will be further described.

Referring again to the key-bars 8, attention is directed to Fig. 1 which shows in plan, the buttons or keys 12. These keys or buttons are each provided with suitable numerals and are adapted to register the tonnage in cars, ranging from thirteen (13) tons to seventy (70) tons. It will be observed as was stated above, that each of the keys is provided with three numerals. The first key beginning with the left hand side of the machine, represents a car weighing thirteen (13), fourteen (14) or sixteen (16) tons, respectively, and each succeeding key thereafter represent cars three (3) tons more than the preceding keys. This arrangement is made for the purpose of economizing in space and the registering device is conformed thereto, but it is not intended to put a limit on the number of keys nor what tons in car each key shall represent; for the reason, that a machine may be so constructed that a fifteen (15) ton car will be represented by one key and a thirteen (13) ton car by another key. There is no limit to this arrangement and the device here shown is to illustrate how compactly a machine may be put together, with suggestions as to the modifications which may be made.

Referring now to the stop members 88, it will be observed from the drawings, particularly Figs. 3, 4 and 13, that the irregular faces thereof vary in a great many of the members. By reason of the fact that the plates or bars 91 are of variable lengths, I am enabled to duplicate some of the stop members at different points throughout the machine, but this is immaterial as it does not matter whether the stop members are all different or whether some of them are duplicated, for the plates or bars 91 with their threaded parts 94 compensate to some extent for the shapes of the stop members. In Fig. 3, the stop member there shown may be taken to indicate a fifty (50), fifty-one (51) or fifty-two (52) ton stop member; and the stop member in Fig. 4 may be taken as indicating a fifty-three (53), fifty-four (54) or fifty-five (55) ton stop member, and yet the stop member shown in Figs. 3 and 4, are practically the same, while the plates or bars 91 vary in length. And in Fig. 13, there is seen elevations of three different stop members, the one at the left being a twenty (20) ton stop member; the middle one indicating a thirty-eight (38) ton stop member and the last one or that one at the right hand of the three, being a forty (40) ton stop member. The machine illustrated in the drawings, may be taken as one with the mechanism adjusted to a sixteen hundred (1600) ton rating, the unit of which is a forty (40) ton car; therefore, all of the stop members would be adjusted to this rating and the threaded plugs 94 of the plates or bars 91, are adjusted to correspond to the stop members with which they co-act. In other words, taking for example a forty (40) ton stop member and the position in which it is shown in the figures; if a forty (40) ton car was placed in a train, in the first forty (40) cars, going to make up such train, the stroke of a forty (40) ton key-bar would be only sufficient to move the registering wheel 43 to a point where the characters or numerals indicating forty (40) tons would coincide with the indicator A on the face of the casting 3. The depression of the forty (40) ton key-bar being determined by the distance between the lower end of the threaded plug 94 carried by the plate 91 secured to the forty (40) ton key-bar and the upper face of the forty (40) ton stop member.

In computing the tonnage resistance of

the cars as they are added to the train, I have provided, as was intimated in the forepart of the specification, to allow so much resistance for cars of different weights and in series; so that in making up a train, if ten cars of fifteen (15) tons each are placed in the train next the engine, each car will register on the registering device, seventeen (17) tons respectively or in the main one hundred and seventy (170) tons. It is at this point in the operation of the machine that the coacting gears of the shaft 60 and the shaft 66 are brought into play for automatically changing the position of the fifteen (15) ton stop member and in fact all the stop members simultaneously, so that by placing ten (10) additional fifteen (15) ton cars in the train, the movement of the fifteen (15) ton key-bar and its bar 91 will move so as to register on the registering device eighteen (18) tons for each depression of the key-bar or one ton additional for each of the ten (10) cars added to the train, amounting to one hundred and eighty (180) tons. For a further example, take the seventy (70) ton key-bar, and if in making up the train, we should place ten (10) seventy (70) ton cars next the engine, the depression of the seventy (70) ton key-bar ten (10) times, would register on the registering device six hundred (600) tons or sixty (60) tons for each car, the reasons for which have been heretofore stated. Or if in placing a sixty (60) ton car next the engine, a depression of the sixty (60) ton key-bar would register fifty-five (55) tons; or a depression of a forty-eight (48) ton key bar, the same will register approximately forty-six (46) tons; the depression of a thirty-six (36) ton key-bar will register approximately thirty-seven (37) tons; the depression of a twenty-seven (27) ton key-bar will register approximately twenty-nine (29) tons. In other words, the tonnage of cars below the unit are expanded and those above the unit, contracted, and the nearer the car comes to the testing unit, the less variation in the resistance.

The stop members are so made and the plates or bars 91 with their adjustable plugs 94 so adjusted with reference to the distance of travel to the face of the cams, that no matter in what position a car is placed in the train, the actuation of or the pressure upon a key-bar representing such a car will equate on the register its proper resistance. In the machine here shown, each of the cams are constructed on a basis of their having ten (10) irregular faces, substantially as that seen on the center stop member of the three shown in Fig. 13, which are adapted to limit and regulate the distance of travel of each of the key-bars, as they are depressed. However, by reason of the fact that the registration of the tonnage in various cars represented by the different keys, varies more or less in the keys representing cars nearer to or farther from the testing unit, some of the irregular faces of the different stop members will be longer than others, special reference being had to the three different stop members in Fig. 13 to illustrate this particular feature. The examples above given with reference to the placing of certain cars in a train, were equated on the basis of the stop members and registering mechanism as well as the car tallying device being adjusted to ten strokes of any one or ten (10) different key-bars. But I wish it to be understood that in equating the resistance in trains of cars, the machine may be adjusted to ten (10) strokes, or more or less of the key-bars. Each stop member is made to suit the requirements of its office and the plates or bars 91 with their threaded plugs 94 are made in lengths to have a stroke which will equate the proper resistance in a car whether the same is in the first series of ten (10), or wherever else it might be placed in the train or whatever tons is represented by such a car as it appears on the way-bills or manifest. In connection with the change of position of any one or all of the stop members, after ten (10) depressions of a key-bar or ten (10) successive key-bars, attention is called to the tallying mechanism heretofore described, with which is combined suitable gearing for transmitting motion from the one tooth cam wheel 65 to the numbering wheel 69, which is only actuated upon the tenth stroke of any one or ten successive keys which will impart motion to the gear 77 as described, and it in turn will impart motion to the shaft 60 through the gear 61 thereon for moving the said shaft 60 one tenth of a complete revolution. Attention being directed to the forty (40) ton stop member which is the right hand one of the three shown in Fig. 13, the periphery of this stop member is so constructed that in placing a given number of forty (40) ton cars in the train, each and all of the cars will register forty (40) tons; which is to say that if the machine is based on a sixteen hundred (1600) ton rating, forty (40) forty (40) ton cars may be placed in the train next to the engine without any variation in the stroke of the forty (40) ton key-bar and the registering mechanism will register sixteen hundred (1600) tons.

In connection with the key-bars, I have provided mechanism for locking the return movement thereof unless they complete their full downward stroke, to cause the threaded plugs 94 to coact with the stop members adjacent to the bar supporting the said plugs, which is to prevent the actuation of any one key without giving to the same its full stroke and thereby properly register on the

registering device the tons indicated by the key or keys actuated. This mechanism, to which reference has just been called, consists of a series of ratchet bars 95 which may be secured to the inner face of the front of the casing 1, and may be in variable lengths as shown in Fig. 9 of the drawings. Supported beneath the racks 95 and in alternate or staggered arrangement, is a series of plungers 96 which are movably carried in a frame work 97 and interposed on each of the plungers between a head 98 on the upper ends thereof and the body of this frame work 97, are coil springs 99 which yieldingly hold the plungers in a raised position, the upward movement of the said plungers being limited by means of the nuts 100 on the lower ends thereof adapted to engage the lower edge of the frame work 97. In Fig. 9, one of the springs is shown depressed, and the frame work 97 is shown supported from the base of the casing and also secured to the inner face of the front wall of said casing.

On each of the key-bars adjacent to the inner front wall of the casing and in proximity to the ratchet bars 95, are pivoted the fingers 101 which have the upper and lower integral extensions 102 and 103, from which extend the laterally projected pins 104, adapted to alternately engage the upper and lower edges respectively, of the key-bars 8, and the forward portion of the said finger 101 is provided with a cut-out portion or notch 105. 116 denotes a bowed spring member or plate which is suitably carried between the face of the key-bars 8 and the finger 101 and preferably secured by the means for securing the finger 101 to the key-bars 8. This bowed member or plate 106 has an extension at its forward end which operates through the cut-out portion or slot 105, substantially as seen in Figs. 10 and 12 of the drawings. The operation of the mechanism just referred to, will be better understood from the following description; the key bars being in their normal raised positions, the upper edge of extensions 102 of the fingers 101 will engage a cross plate 107, see Figs. 3 and 4, which will depress the fingers 101 until the upper pin 104 of the said fingers engage the upper edge of the key-bars 8. In so doing, the upper edge of the slots 105 in the fingers will engage the spring plates 106 and force the upper portion thereof outwardly into contact with the teeth of the ratchet bars 95. In depressing a key-bar, it will now be readily seen that unless there were some means of again elevating the fingers 101, the spring plates 106 will engage the teeth of the ratchet bars 95 at some point between their ends, if the keys are not depressed their full length, and prevent their returning to their upper normal positions, even though the tendency of the springs 32 is to return them to such position. But it is here that the plungers 96 are brought into play for releasing the spring plates 106 from the teeth of the ratchet bars 95. A key, when depressed its full stroke, will cause the lower edge of the extension 103 of the finger 101 to engage with the head 98 of the plunger disposed in the path of the movement of the extension 103 of the finger and by the time the key-bar has completed its full stroke, the plunger has been shoved downwardly or depressed sufficiently to release the spring plate 106 from the teeth of the ratchet bar 95. The engagement of the extension 103 of the finger with the head of the plunger 98, will not only depress the plunger but will raise the finger 101 into a position where the pin 104 of the extension 103 will engage with the lower edge of the key-bars 8 and cause the lower edge of the slot 105 of the finger to shove the spring plate toward the face of its supporting key-bar, when the key-bar may rise to its normal position without any danger of the spring plate engaging with the teeth of the ratchet bars 95, in the upward movement of the said key-bars.

I have provided in connection with the car tallying devices, a signal which is to call to the attention of the operator, that when the signal is sounded a given number of cars have been placed in a train or a given train length has been reached. This will be further understood by saying that on some roads, in the make-up of the trains, they have a car limit, and if that car limit is sixty (60) cars, it is desirable by some suitable signal, to call to the attention of the operator that his train length has been reached, which he might not become aware of until after the given number of cars had been placed in the train, unless by strict attention to the car tallying mechanism. The signal to which reference has been made, consists of a bell 107 suitably supported within the casing from the casting 2 and co-acting with this bell, is a sounder or knocker 108, which is pivotally secured to a support extending inwardly from the casting 2. These parts will be seen in Fig. 2. Projecting laterally from the numbering or registering wheel 69 of the car tallying device, is a finger or pin 109, and in this instance, the pin projects from the wheel 69 at a point coinciding with the numeral 6 thereon; it being assumed that the machine is in use by a road where the train length is sixty (60) cars, so that when the finger or pin 109 in the rotation of the wheel 69, rides under the free end of the knocker 108 and passing from beneath the same, will allow the end thereof to drop, causing the opposite end as it rises to engage and sound the bell 107 which will notify the operator that sixty (60) cars have been placed in the train.

In the front wall of the casing, it is adapted to have two sight openings which will coincide with the tonnage registering wheels and the tallying devices, so that an operator may readily see and take note of the number of tons being registered and the number of cars placed in a train. However these sight openings are not shown in the drawings, but it is understood that with the casing being complete on the machine, looking at the same from the front, these sight openings would be seen.

The arrangement of the stop members in the present device, is to provide for making up trains of cars from the power rearward, or when switching in cars at points remote from the power. The reverse of this may be accomplished by re-arranging the stop members or introducing substitute stop members into the machine for accomplishing this purpose, and further, to provide for the picking up of cars next to the engine or power, to save backing engine and cars into side tracks and to further save equating the cars in train, when more are added. These are only a few of the suggested changes which might be made in equating the train tonnage with devices here shown, and it is understood that I do not wish to confine nor limit myself to the specific construction here shown.

Having thus fully described my invention, what I claim and desire to secure by Letters Patent of the United States, is:—

1. In a device of the character described, a key, mechanism for limiting the stroke of said key, means for changing the position of said limiting mechanism after a predetermined number of strokes of said key, and thereby change the distance of stroke of said key, and means coöperating with said key for locking it against return movement until it has made its full stroke.

2. In a device of the character described, registering mechanism, a key for operating said mechanism, mechanism for limiting the stroke of said key, means for changing the position of the limiting mechanism after a predetermined number of strokes of said key, and thereby change the distance of stroke of said key, and means coöperating with said key for locking it against return movement until it has made its full stroke.

3. In a device of the character described, a key, means for limiting the stroke of said key, and mechanism independent of the limiting means and coöperating with said key for locking the same against return movement until it has made its full stroke.

4. In a device of the character described, a key-bar, a finger carrying a spring blade carried by said key-bar, a ratchet bar adapted to be engaged by the said blade, means adapted to engage the finger for throwing forward the blade to engage the teeth of the ratchet bar in the downward movement of the key-bar to prevent its return until the key-bar has reached the limit of its stroke, and means positioned in the path of movement of the finger whereby the finger is moved upwardly forcing the blade inwardly and out of the path of the teeth of the ratchet bar.

5. In a device of the character described, a key-bar containing one or more characters, mechanism for limiting the stroke of said key, means for changing the position of the limiting mechanism after a predetermined number of strokes of said key, and thereby change the distance of stroke of said key, a ratchet bar in proximity to the movement of said key-bar, and means carried by said key-bar adapted to engage the teeth of the ratchet bar in the downward movement of the key, and until the same reaches the limit of its stroke when the said means is automatically moved into a position to be out of engagement of said ratchet bar, in the return movement of said key-bar.

6. In a device of the character described, a casing, a key-bar pivoted in said casing, mechanism for limiting the stroke of said key, means for changing the position of the limiting mechanism after a predetermined number of strokes of said key, and thereby change the distance of stroke of said key, a registering wheel adapted to be operated by the said key-bar, and mechanism carried by the key-bar adapted to engage means in the casing for locking the said key against a return movement until after the said key reaches the lowermost point in its movement.

7. In a device of the character described, registering mechanism, a smooth faced clutch wheel, a clutch pawl adapted to engage the face of the said wheel, connections between the clutch wheel and registering mechanism, a key-bar, and means operated by the key-bar for locking the clutch pawl against the wheel, to actuate the wheel and registering mechanism simultaneous with the movement of the key-bar.

8. In a device of the character described, registering mechanism, a smooth faced clutch wheel, connections between the wheel and registering mechanism, a clutch pawl for engaging the face of said wheel, a link frame, connections between said frame and clutch pawl, and a key-bar adapted in its movement to engage and depress the link frame and thereby impart movement to the wheel and registering mechanism through the clutch pawl aforesaid.

9. In a device of the character described, registering mechanism, a smooth faced clutch wheel, a clutch pawl for engaging the face of the wheel, a link frame, a series of pivoted key-bars disposed above said frame and adapted in their movement to depress the said frame, and connections between the

link frame and clutch pawl whereby when the frame is depressed the pawl will engage the face of the wheel.

10. In a device of the character described, registering mechanism, a smooth faced clutch wheel, operative connections between said registering mechanism and said wheel, a clutch pawl adapted for intermittent engagement with the face of the wheel, a key-bar, means operated by the key-bar for throwing the pawl against the face of the wheel and thereby impart movement to the same, and a brake for controlling the movement of the registering mechanism.

11. A tonnage equating device, comprising a suitable register, a series of keys which are provided with one or more characters in numerical arrangement to denote the gross weight of different cars, means actuated by the keys for imparting movement to the register, the actuation of said register by any one of said keys adding to the register an amount different to that appearing on the said keys, and an alarm actuated at predetermined intervals for indicating a predetermined number of strokes of any one or several keys, substantially as specified.

12. A tonnage equating device, comprising a suitable register, a series of keys which are provided with one or more characters in numerical arrangement to denote the gross weight of different cars, means actuated by the keys for imparting movement to the register, the actuation of a key or keys displaying on the register the resistance of a car in lieu of the gross weight thereon, which said resistance is an arbitrary motion and different from the number appearing on the keys, and an alarm adapted when sounded to indicate train length, the same suitably actuated after a given number of strokes of any one or a series of keys.

13. In a device of the character described, the combination of a tonnage registering mechanism, a car tallying device and an alarm, a series of key-bars, means operating with the stroke of each and all of the key-bars for actuating the tonnage registering mechanism and the car tallying device, and means operating after a predetermined number of strokes of any one or a series of keys for sounding the alarm aforesaid.

14. In a device of the character described, an oscillatory key-bar, a bar attached to and movable with said key-bar, an adjustable member carried by the bar at or near its upper end, and means coacting with the adjustable member aforesaid whereby the oscillation of said key-bar may be varied and adjusted.

15. In a device of the character described, a shaft, a stop member carried on said shaft and having a series of irregular coacting portions, a key-bar, a member attached to said key-bar and movable across the axis of the said shaft, and an adjustable plug suitably carried by the member aforesaid adapted to coact with the acting portions of the stop member.

16. In a device of the character described, a shaft, a series of stop members carried on said shaft having peripheries formed with graduated depressed portions, a series of key-bars corresponding in number to the number of stop members, vertically disposed bars attached to the key-bars, lateral extensions from the vertical bars, and threaded members adjustable in the said extensions adapted to coact with the said stop members.

17. In a device of the character described, an oscillatory key-bar, a vertically disposed member attached to said key-bar and movable therewith, a lateral extension from the upper end of the said member, and a plug adjustably carried in the said extension of the member.

18. In a device of the character described, a shaft, a stop member carried on said shaft and having a series of irregular coacting portions, a key-bar extending transverse to the axis of the shaft and beneath the same, a vertically disposed bar attached at its lower end to the key-bar and having an elongated slot through which the shaft is carried and to adapt the bar to have an extended movement across the shaft, a lateral extension from the upper end of the bar, and a threaded plug adjustable in said extension and adapted to coact with the acting portions of the stop member.

19. In a device of the character described, the combination of a shaft, gearing consisting of a ratchet wheel, a spur gear and a one tooth cam wheel loosely carried on said shaft, a second shaft, a pair of numbering wheels on said shaft, one of such numbering wheels carrying a spur gear in mesh with the spur gear aforesaid, the other numbering wheel in engagement with said one tooth cam wheel, means for moving the ratchet wheel one tooth at a time and thereby the spur gear and one tooth cam wheel first mentioned, and means for imparting movement from the second mentioned shaft to the first mentioned shaft.

20. In a device of the character described, a shaft, a registering wheel thereon also a spur gear and a pair of one tooth cam wheels, one loose with the gear thereon and the other fixed to rotate with said shaft, a second shaft, a pair of numbering wheels on said shaft, one fixed to rotate therewith and the other loose, a spur gear in connection with the fixed numbering wheel and in mesh with the spur gear aforesaid, the fixed one tooth cam wheel and the fixed numbering wheel in operative connection with each other, and the loose numbering wheel in operative connection with each other, a key bar, means operated with each stroke of the

key-bar for operating the first mentioned shaft and the numbering wheel thereon also the numbering wheel fixed to the second shaft aforesaid, a predetermined number of actuations of the first mentioned shaft through the fixed numbering wheel on the second shaft and its spur gear imparting movement to the loose numbering wheel aforesaid through the gearing specified.

21. In a device of the character described, a registering mechanism, comprising a unit and tenths wheel, and a pair of numbering wheels coacting with said wheel, one a hundredths and the other a thousandths wheel, a series of key-bars, means operated by the key-bars for actuating the unit and tenths wheel with each stroke of the key-bars and the hundredths wheel with each revolution of the unit and tenths wheel, and the thousandths wheel with each complete revolution of the hundredths wheel, a car tallying device, means operated by each and all of the key-bars for actuating the said tallying device, and an alarm operated at a predetermined interval by the said tallying device.

22. In a device of the character described, a registering mechanism, comprising a combined unit and tenths wheel, and a pair of numbering wheels coacting therewith, one or more key-bars, means operated by the said key-bars for actuating the unit and tenths wheel and one of the numbering wheels with each complete rotation of the unit and tenths wheel, and the other numbering wheel with each complete rotation of the first mentioned numbering wheel, a car tallying device, and means operated by the said key-bars for actuating the said car tallying device.

23. In a device of the character described, a tonnage registering device, comprising a series of coöperating numbering wheels, a car tallying device also consisting of a series of numbering wheels, a link frame, a series of key-bars for operating the said frame, a clutch mechanism, connections between the clutch mechanism and the tonnage registering device, connections between the clutch devices and link frame, means for operating the car tallying devices from the link frame and with each actuation of the key-bars, and a brake for controlling the movement of the tonnage registering devices.

24. In a device of the character described, a tonnage registering device, comprising a series of coöperating numbering wheels, a car tallying device also consisting of a series of numbering wheels, a link frame, a series of key-bars for operating the said frame, a clutch mechanism, connections between the clutch mechanism and the tonnage registering device, connections between the clutch mechanism and link frame, means for operating the car tallying devices from the link frame and with each actuation of the key-bars, a brake for controlling the movement of the tonnage registering devices, and an alarm operated at a given interval in the operation of the car tallying device.

25. In a device of the character described, a tonnage registering mechanism, comprising a series of numbering wheels, a shaft or shafts for carrying the said wheels, a clutch wheel having a smooth periphery, an annular ring gear connected with such wheel, gearing between the ring gear and shaft or shafts aforesaid, a link frame, connections between the link frame and peripheral face of the clutch wheel, and one or more key-bars for actuating the said frame.

26. In a device of the character described, a tonnage registering device, comprising a series of coöperating numbering wheels, a car tallying device also comprising a series of coöperating numbering wheels, a link frame, a series of key-bars adapted in their movement to depress the said frame, means operated by the link frame for actuating the tonnage registering device, a vertically movable plunger, a ratchet and pawl mechanism for imparting movement to the car tallying device, the pawl carried by the plunger aforesaid, and means for controlling the ratchet and pawl mechanism.

27. In a device of the character described, a member having a series of graduated off-sets, a key adapted to have engagement with each of the off-sets of the member in succession at predetermined intervals, and means preventing the return movement of the key at each stroke thereof until after the key has engaged with the said member.

28. In a device of the character described, a member having a series of graduated off-sets, a key adapted to have engagement with each off-set of the member for a predetermined number of strokes, means operating after a predetermined number of strokes of said key for advancing successively the off-sets of the member, and means preventing the return movement of the key at each stroke thereof until after the key has engaged with the said member.

29. In a device of the character described, an oscillatory key-bar, a bar attached to said key-bar, an adjustable member carried by the bar at or near its upper end, and movably supported means co-acting with the adjustable member aforesaid, whereby the oscillation of said key-bar may be varied and adjusted.

30. In a device of the character described, an oscillatory key-bar, a bar attached to and movable with said key-bar, an adjustable member carried by the bar at or near its upper end, and movably supported means co-acting with the adjustable member aforesaid, whereby the oscillation of said key-bar may be varied and adjusted.

31. In a device of the character described, registering mechanism, two sets of keys operatively connected with said mechanism, with the keys of the two sets alternately arranged, mechanism for limiting the stroke of the several keys, and means for changing the position of the limiting mechanism, and thereby change the distance of stroke of said keys.

32. In a device of the character described, registering mechanism, two sets of keys, operatively connected with said mechanism, with the keys of the two sets alternately arranged, one or more numerals associated with each key, representing gross tons of cars and contents, mechanism for limiting the stroke of said keys, and means for changing the position of said limiting mechanism after a predetermined number of strokes of said key, and thereby change the distance of stroke of said keys.

33. In a device of the character described, registering mechanism, a link frame, two sets of key bars, each of said bars having independent motion for operating said link frame mechanism for limiting the stroke of said keys, means for changing the position of said limiting mechanism after a predetermined number of strokes of said keys, connections between the link frame and the registering mechanism, and a brake associated with said connections.

34. In a device of the character described, registering mechanism, a link frame, a series of key bars each having independent motion for operating said link frame, connections between the link frame and the registering mechanism, a tallying device for indicating each operation of the registering mechanism, and an alarm associated with said tallying device.

35. In a device of the character described, registering mechanism, a link frame, a series of key bars each having independent motion for operating said link frame, connections between the link frame and the registering mechanism, a brake associated with said connections, a tallying device for indicating each operation of the registering mechanism, and an alarm associated with said tallying device.

36. In a device of the character described, registering mechanism, a link frame, a series of key bars each having independent motion for operating said link frame, mechanism whereby the stroke of said key bars may be changed after a predetermined number of strokes thereof, connections between the link frame and the registering mechanism, a tallying device for indicating each operation of the registering mechanism, and an alarm associated with said tallying device.

37. In a device of the character described, registering mechanism comprising a plurality of inter-connected numbering wheels, a shaft, gearing connecting said shaft with certain of said numbering wheels, a link frame, a series of key bars, each having independent motion for operating said frame, connections between the link frame and the shaft aforesaid, and a tallying device for indicating each operation of the registering mechanism.

38. In a device of the character described, registering mechanism comprising a plurality of inter-connected numbering wheels, a shaft, gearing connecting said shaft with certain of said numbering wheels, a link frame, a series of key bars, each having independent motion for operating said frame, connections between the link frame and the shaft aforesaid, a brake associated with said shaft, a tallying device for indicating each operation of the registering mechanism, and an alarm associated with said tallying device.

39. In a device of the character described, registering mechanism comprising a plurality of inter-connected numbering wheels, a shaft, gearing connecting said shaft with certain of said numbering wheels, a link frame, a series of key bars, each having independent motion for operating said frame, connections between the link frame and the shaft aforesaid, a tallying device for indicating each operation of the registering mechanism, and reciprocating means associated with said link frame for operating the tallying device.

40. In a device of the character described, registering mechanism comprising a plurality of inter-connected numbering wheels, a shaft, gearing connecting said shaft with certain of said numbering wheels, a link frame, a series of key bars, each having independent motion for operating said frame, mechanism for automatically changing the stroke of said key bars, after a predetermined number of strokes, connections between the link frame and the shaft aforesaid, a tallying device for indicating each operation of the registering mechanism, and reciprocating means associated with said link frame for operating the tallying device.

41. In a device of the character described, registering mechanism comprising a plurality of inter-connected numbering wheels, a link frame, a series of key bars, each having independent motion for operating said frame, connections between the link frame and the registering mechanism, a tallying device comprising a plurality of inter-connected numbering wheels, and adapted to indicate each operation of the registering mechanism, reciprocatory means associated with said link frame for operating the tallying device, and means associated with said reciprocatory means for governing the rotation of wheels of the tallying device.

42. In a device of the character described,

registering mechanism comprising a plurality of inter-connected numbering wheels, a shaft, gearing connecting said shaft with certain of said numbering wheels, a link frame, a series of key bars, each having independent motion for operating said frame, connections between the link frame and the shaft aforesaid, a tallying device for indicating each operation of the registering mechanism, a reciprocatory member associated with said link frame for operating the tallying device, and means attached to the reciprocatory member for controlling said tallying device.

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

JOHN M. DALY.

Witnesses:

EDWARD J. REILLY,

EDWARD W. SAME.