J. M. DALY.

COMPUTING MACHINE.

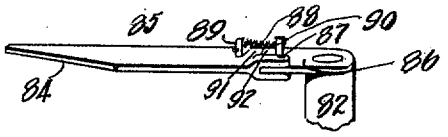
APPLICATION FILED MAR. 5, 1909.

964,495.

Patented July 19, 1910.

9 SHEETS—SHEET 1.

FIG. 30.



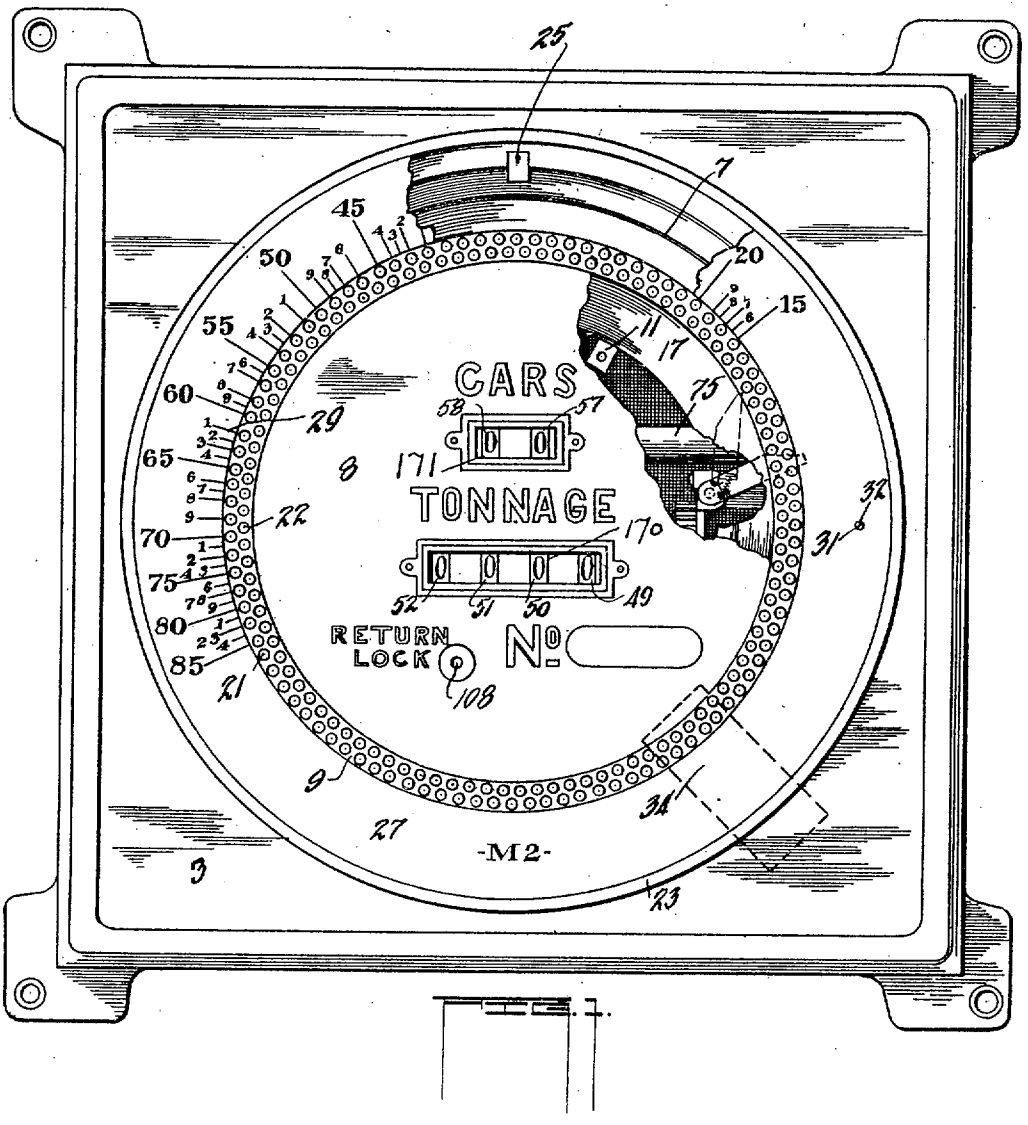


FIG. 1.

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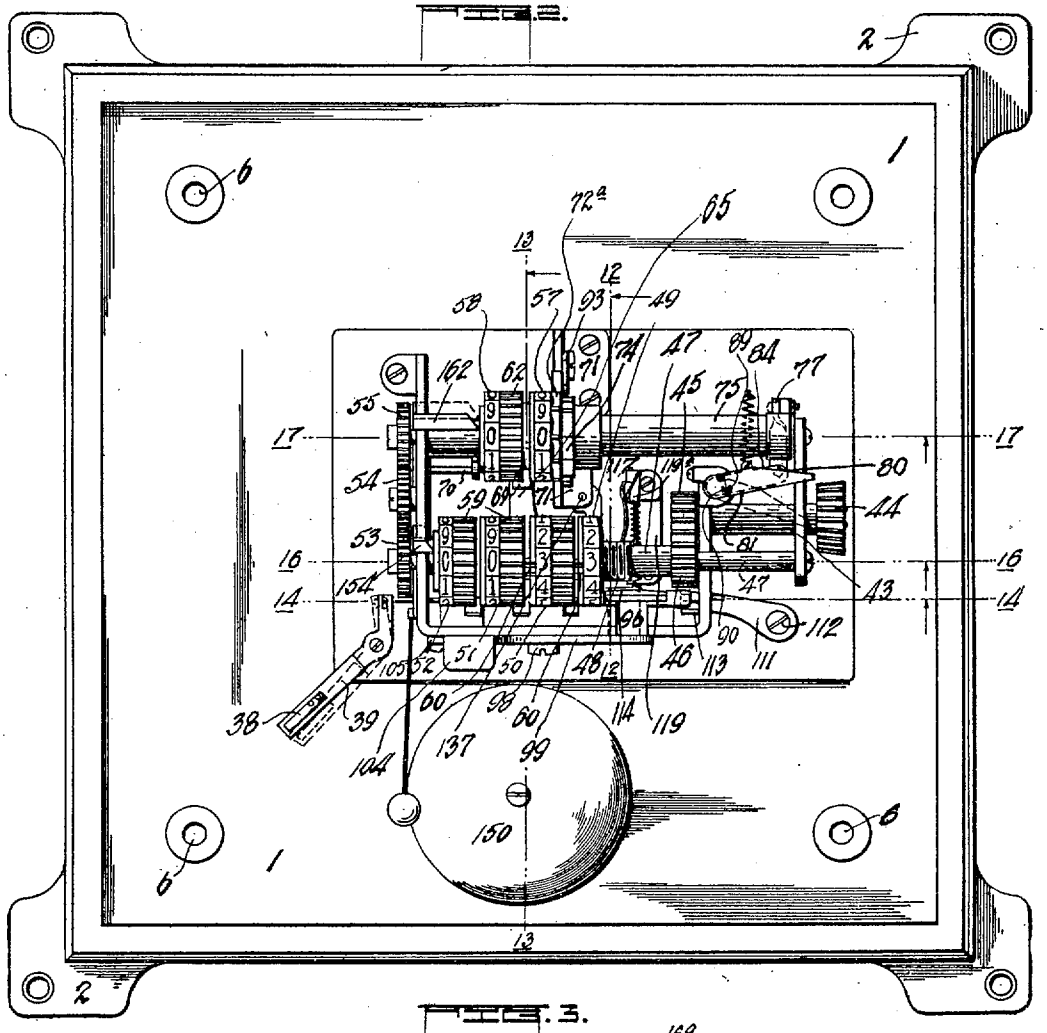
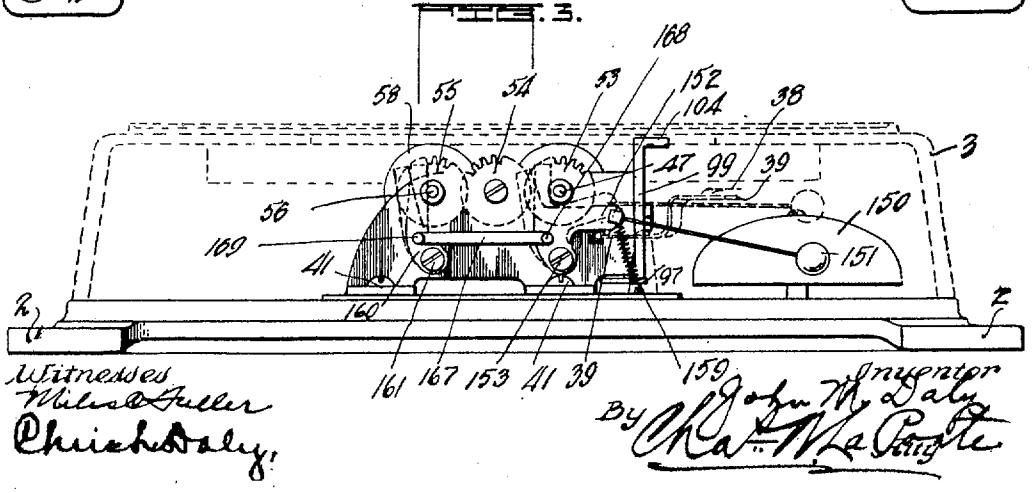
COMPUTING MACHINE.

APPLICATION FILED MAR. 5, 1909.

964,495. Patented July 19, 1910.

3 SHEETS—SHEET 2.





Witnesses
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COMPUTING MACHINE.

APPLICATION FILED MAR. 5, 1909.

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3 SHEETS—SHEET 3.

FIG. 3.

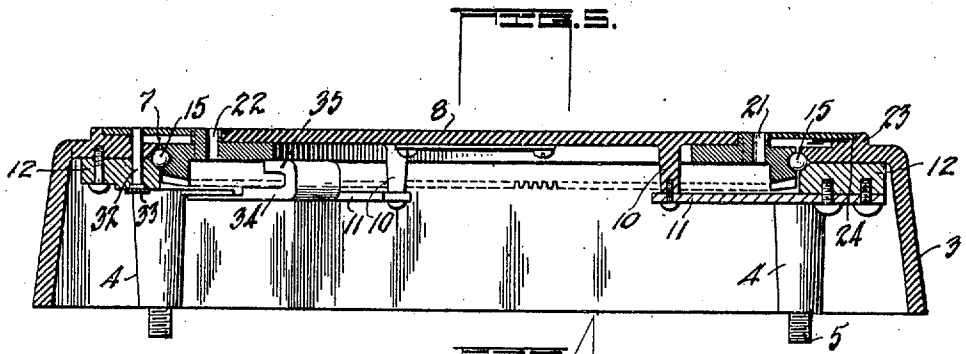
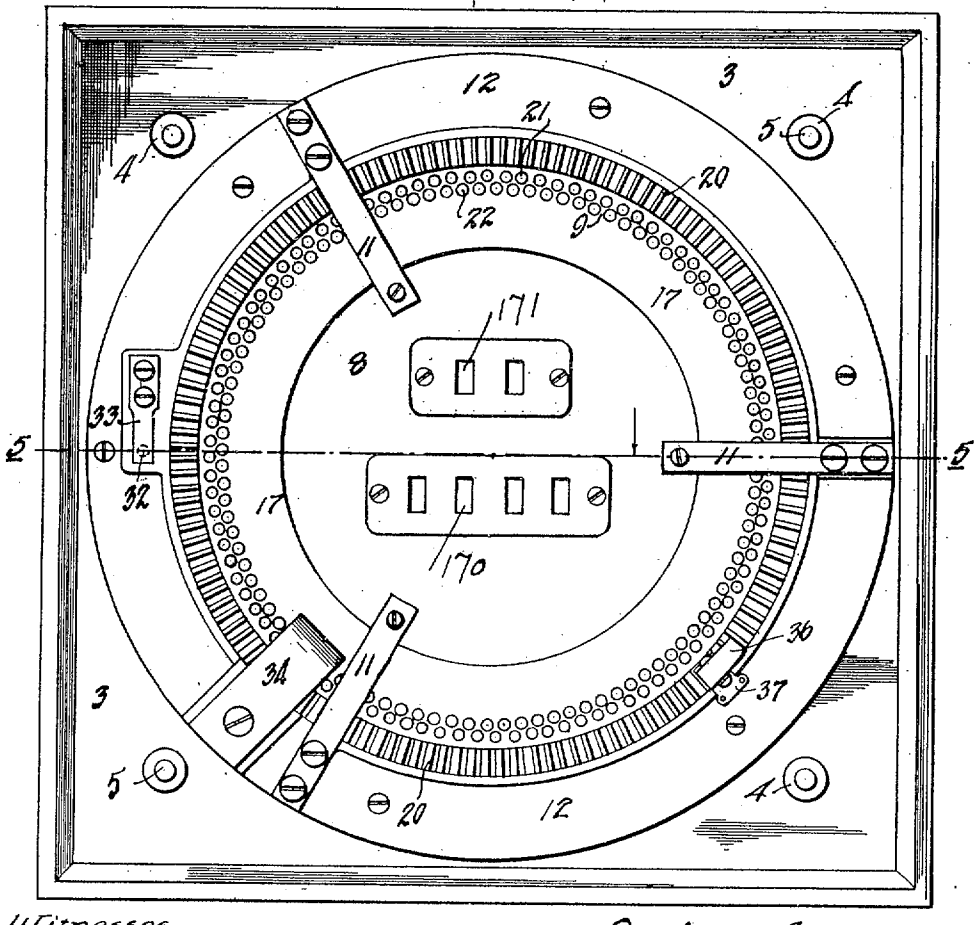


FIG. 4.



Witnesses

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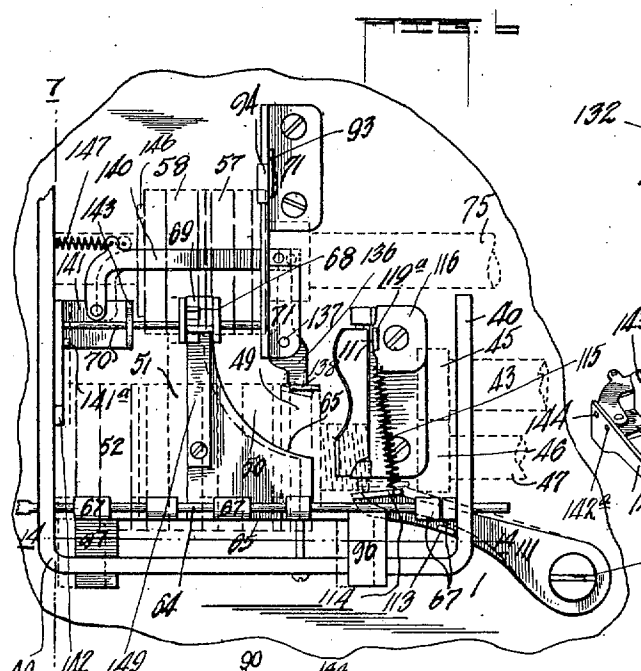
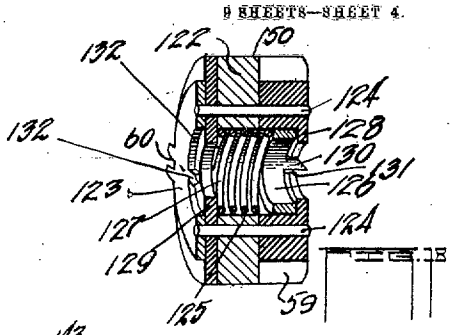
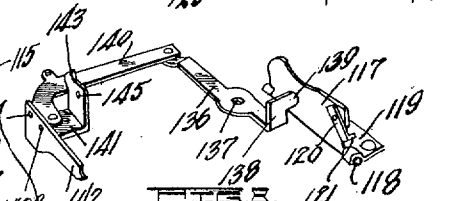
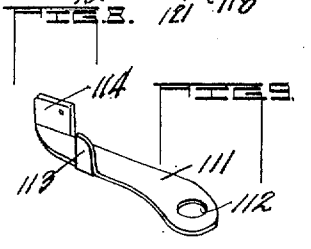
964,495. Patented July 19, 1910.

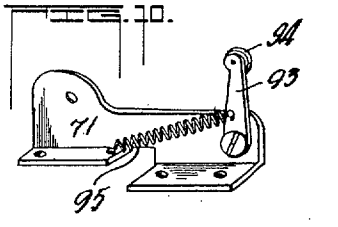
9 SHEETS—SHEET 4.

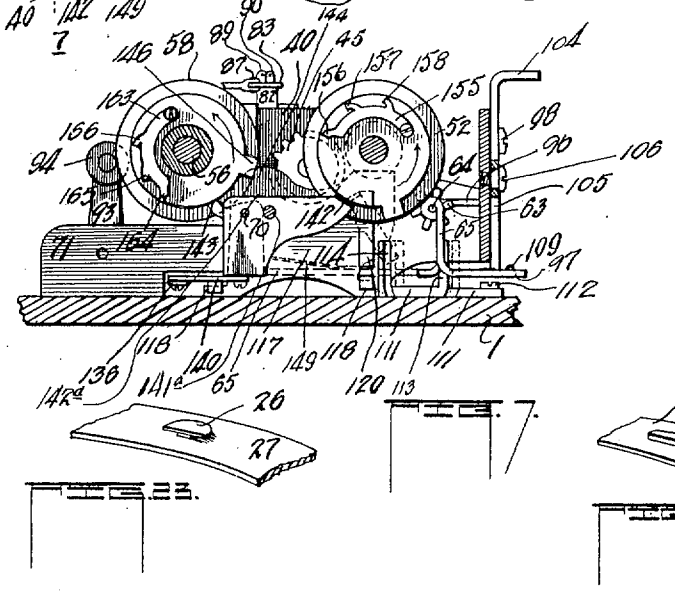


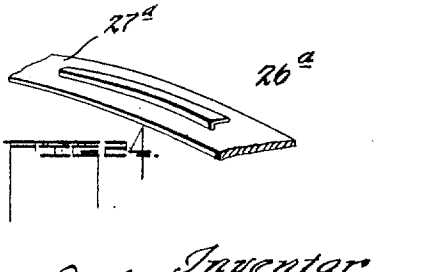












Witnesses:
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COMPUTING MACHINE.

APPLICATION FILED MAR. 5, 1909.

964,495.

Patented July 19, 1910.

9 SHEETS—SHEET 5.

Fig. 2a.

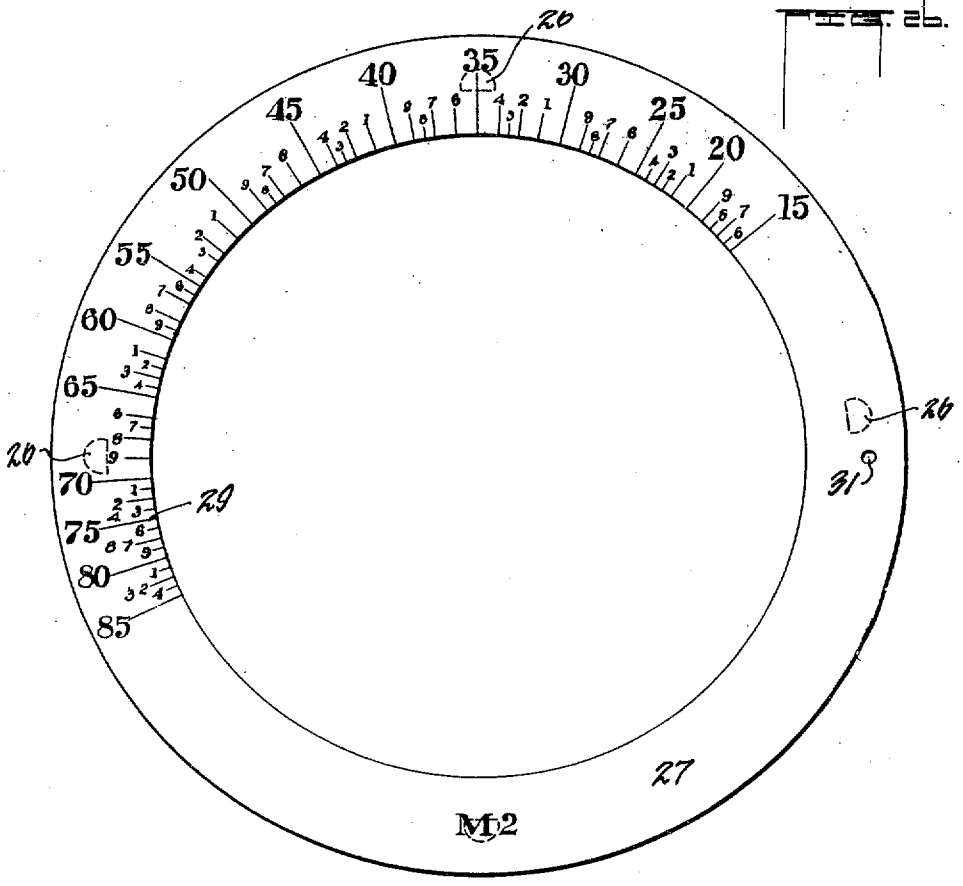
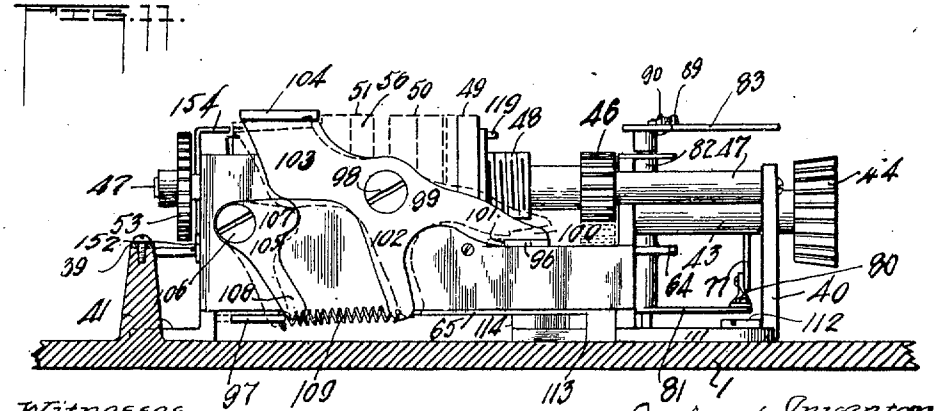


Fig. 11.



Witnesses
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COMPUTING MACHINE.

APPLICATION FILED MAR. 6, 1909.

964,495.

Patented July 19, 1910.

9 SHEETS—SHEET 6.

Fig. 27.

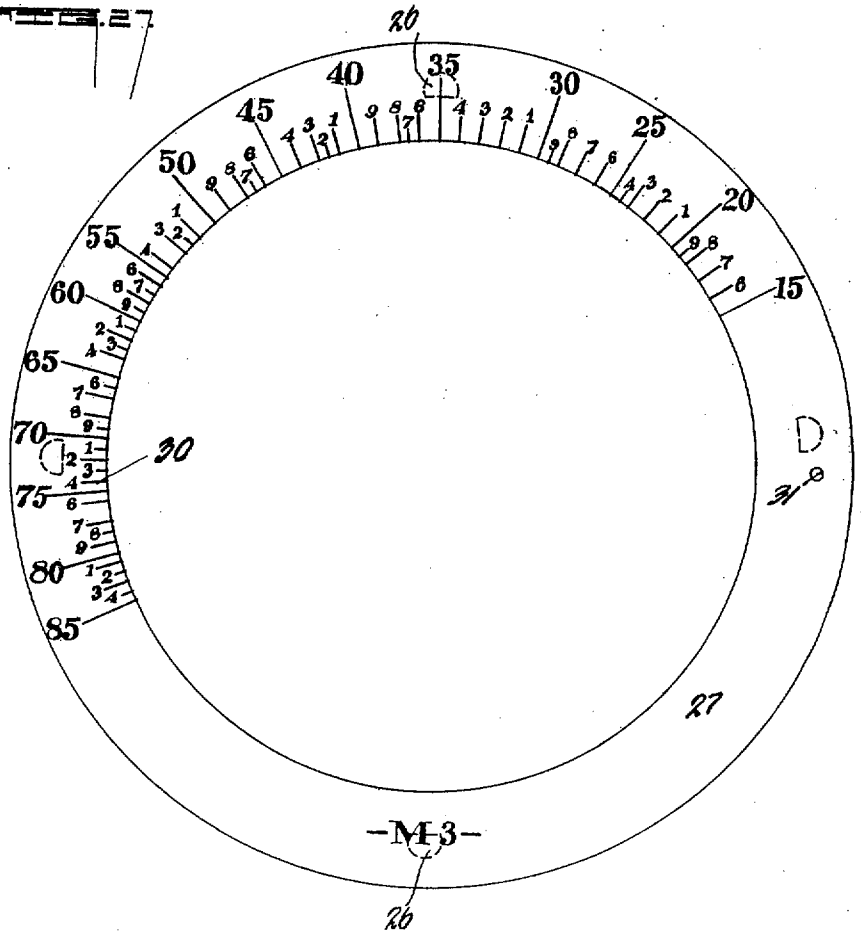
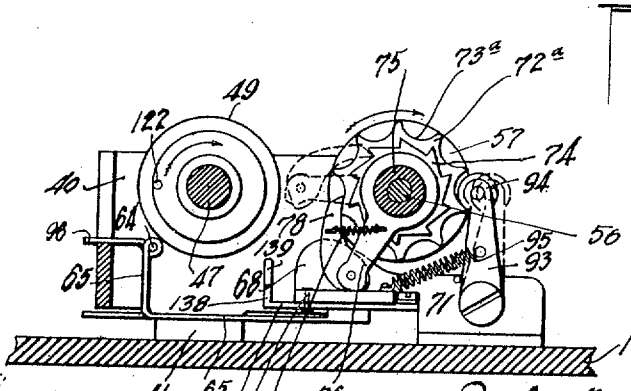


Fig. 12.



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APPLICATION FILED MAR. 5, 1909.

964,495.

Patented July 19, 1910.

8 SHEETS—SHEET 7.

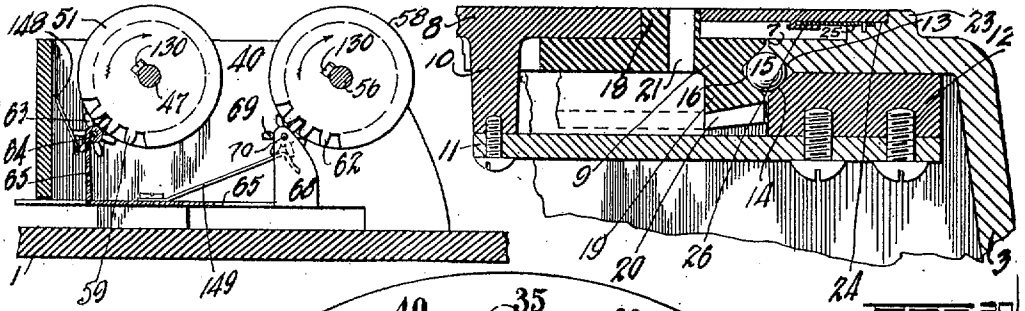

FIG. 13.

FIG. 20.

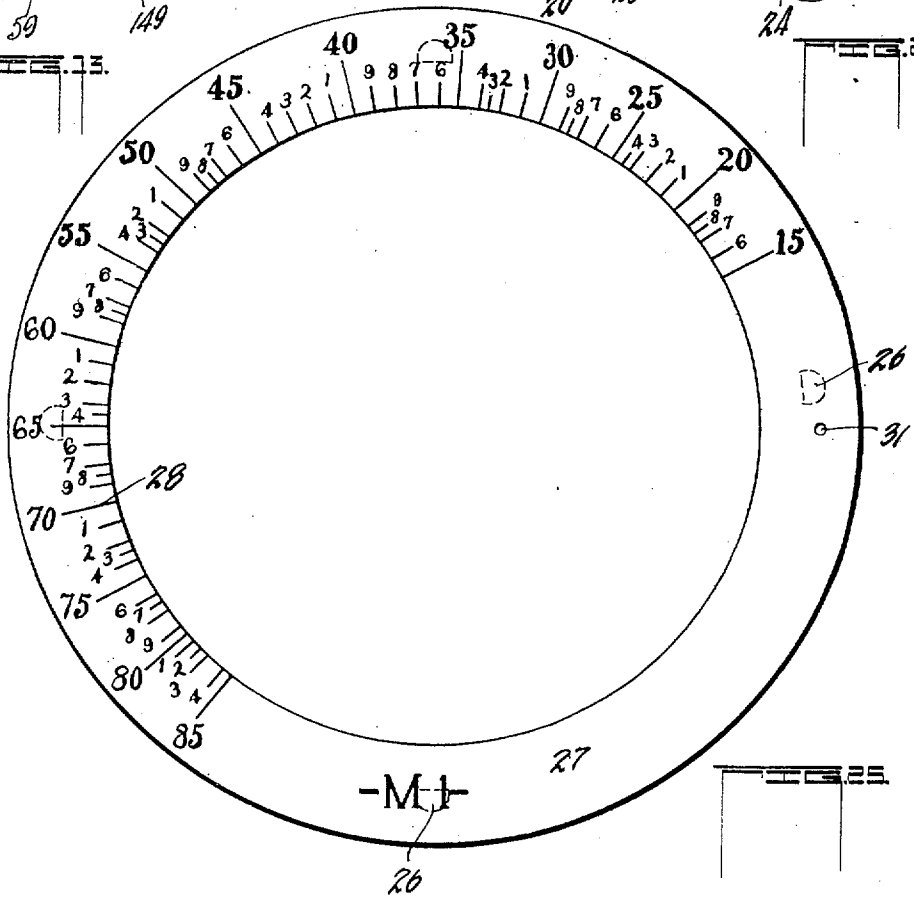

FIG. 25.

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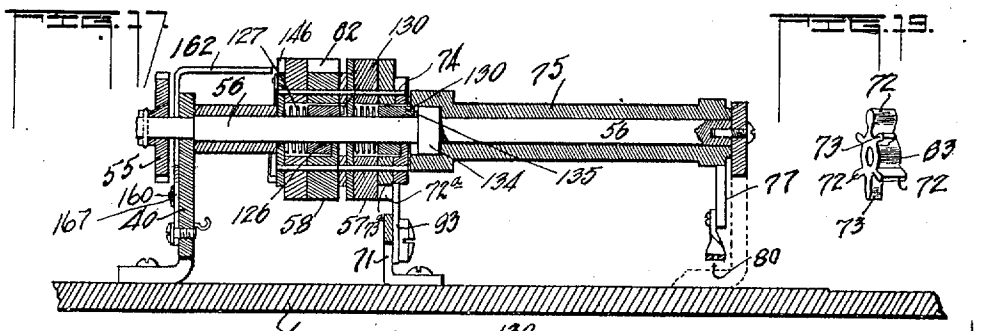
COMPUTING MACHINE.

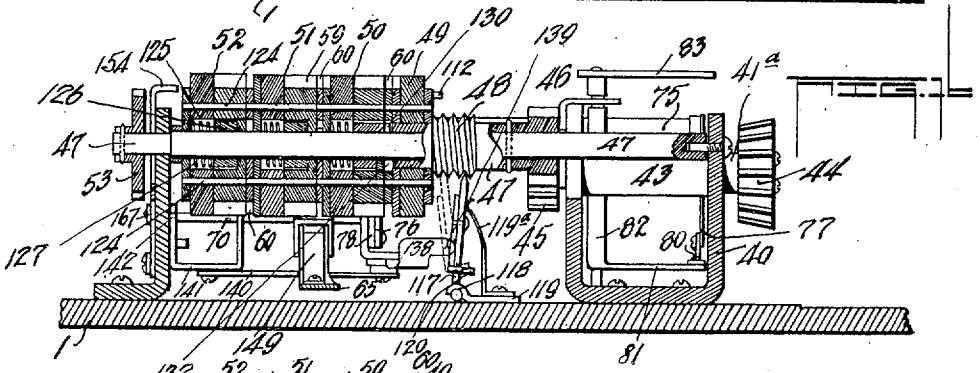
APPLICATION FILED MAR. 5, 1909

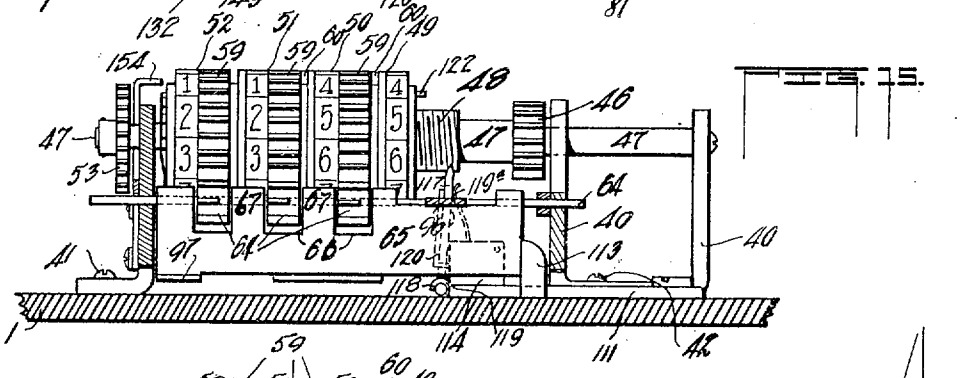
964,495.

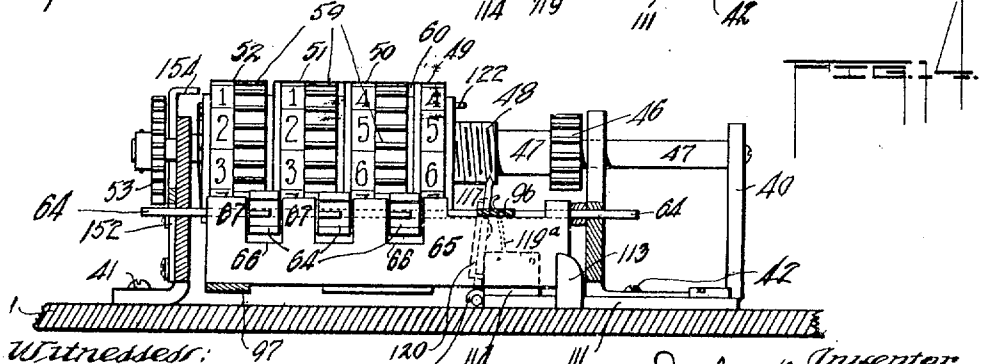
Patented July 19, 1910.

9 SHEETS—SHEET 8.









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COMPUTING MACHINE.

APPLICATION FILED MAR. 6, 1909.

964,495. Patented July 19, 1910.

9 SHEETS—SHEET 9.

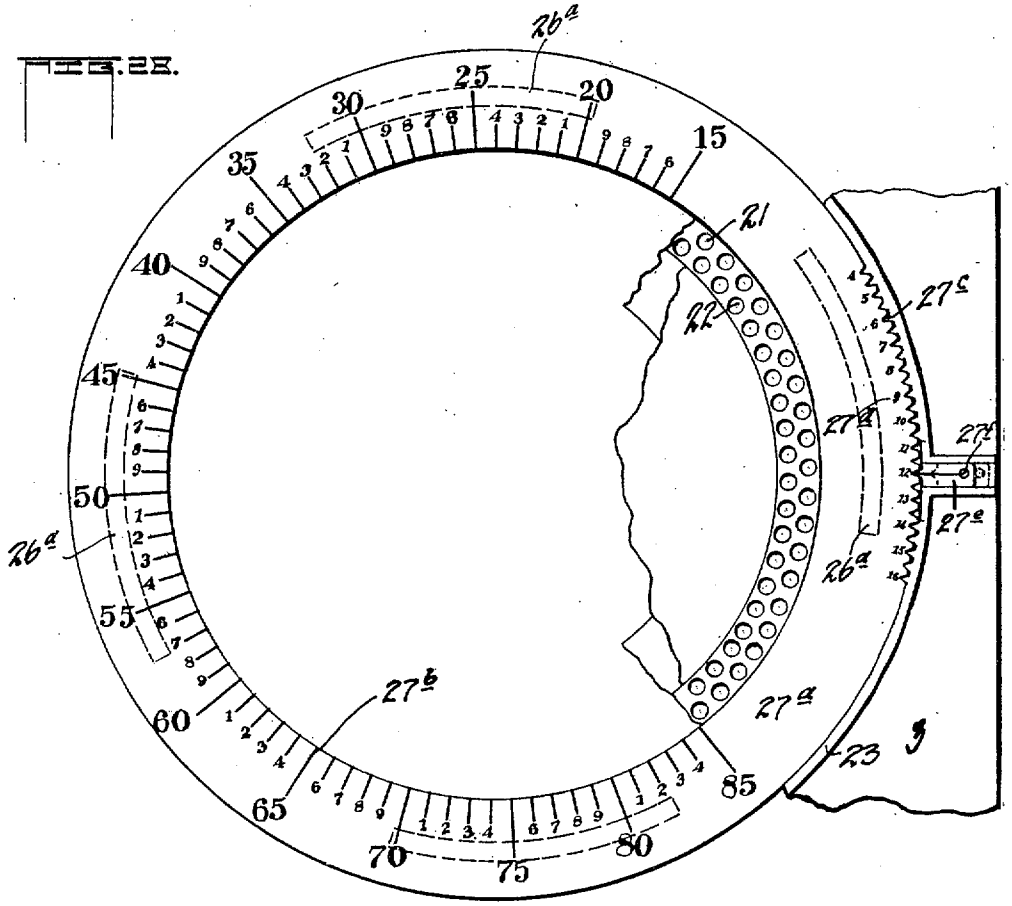


FIG. 23.

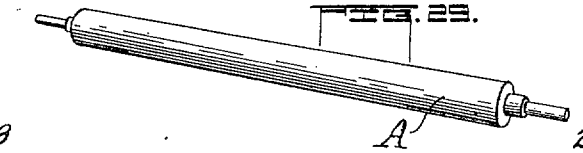


FIG. 21.

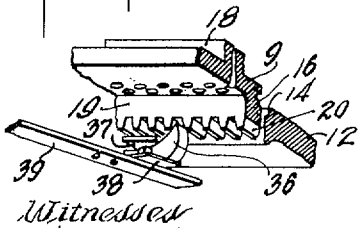
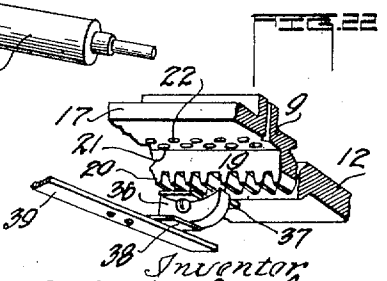


FIG. 22.



Witnesses
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UNITED STATES PATENT OFFICE.

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COMPUTING-MACHINE.

964,495. Specification of Letters Patent. Patented July 19, 1910.

Application filed March 5, 1909. Serial No. 481,511.

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 Computing-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 relates particularly to device are in most respects similar to those measuring the resistance of railway trains.

The results to be obtained by the present device are in most respects similar to those obtained by machines upon which patents have already been granted to me, and by others upon which applications for patent are now pending. The patents referred to are numbered 715,197; 715,199 and 715,201, dated respectively December 2, 1902. The applications for patent to which reference has been made were filed April 11, 1904, Serial No. 202,552 and 202,553; January 4, 1906, Serial No. 294,662; January 30, 1907, Serial No. 354,908 and April 10, 1907, Serial No. 367,449.

One of the objects of the present invention is to improve generally the structure disclosed and claimed in the application filed January 4, 1904, bearing Serial No. 294,664; to improve and enlarge upon the scope of the invention described and claimed in the application filed April 10, 1907, bearing Serial No. 367,449, which has reference to the use of interchangeable rings containing different tonnage scales, and also to improve the structure of the mechanical devices for returning the registering wheels, numbering wheels or other similar computing parts thereof, to zero, of the application filed January 30, 1907, bearing Serial No. 354,908.

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 effecting 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 top plan view of my improved machine, with the center plate and scale ring broken away to show the means for holding the scale ring in place, also to show the operating lever for actuating the tallying wheels; Fig. 2 is a top plan view of the operating mechanism, as it appears when the covering or casing therefor has been removed; the removal of said casing, removing the center plate, scale ring and register operating plate; Fig. 3 is a side elevation of Fig. 2, looking at the left hand side of Fig. 2, with the inclosing case, which is omitted in Fig. 2, shown in dotted lines; Fig. 4 is a bottom plan view of the covering or casing of the machine, showing the means for securing the center and register operating plates in place; also showing in plan the spring which coöperates with pin for locking scale ring in position; also showing plan of pawl for locking the operating plate against premature movement; Fig. 5 is a cross section on the line 5—5 of Fig. 4; Fig. 6 is an enlarged plan view, showing in detail the devices for returning the numbering wheels of the register and car tallying mechanism, to zero; said wheels being shown in dotted lines; Fig. 7 is a vertical section taken on the line 7—7 of Fig. 6; Fig. 8 is a perspective view of mechanism which operates to lock numbering wheels when they are returned to zero; Fig. 9 is a perspective view of a locking lever which operates to hold the pinions of the register numbering wheels, supported in a projected position, and during the return of the numbering wheels to zero; Fig. 10 is a detail perspective view of a support on which is mounted one of the levers shown in detail in Fig. 8, and is shown having attached thereto a retarding lever which coöperates with the tallying wheel; Fig. 11 is an enlarged front elevation of the operating mechanism seen in Fig. 2, the bell omitted; Fig. 12 is a vertical cross section as the same would appear if taken on the line 12—12 of Fig. 1, with parts of said Fig. 1 omitted; Fig. 13 is an elevation of parts as the same would appear on line 13—13 of Fig. 2,

which shows the support for the pinions which transmit motion between adjacent numbering wheels and also showing a spring lock engaging certain of said pinions; Fig. 14 is an enlarged sectional elevation as the same would appear if taken on the line 14—14 of Fig. 6, showing the numbering wheels in full lines and the position of said numbering wheels when registering, certain of the parts on Fig. 6 omitted; Fig 15 is a view similar to Fig. 4, except that the pinions coöperating with the numbering wheels have been shifted to show their position when the numbering wheels are being returned to zero; Fig. 16 is an enlarged partial longitudinal sectional view on the line 16—16, Fig. 2; Fig. 17 is an enlarged longitudinal sectional view on the line 17—17 of Fig. 2; Fig. 18 is an enlarged sectional view in perspective, showing the interior of the numbering wheels, which appear in section in Figs. 16 and 17; Fig. 19 is a perspective view of any one of the pinions which mesh with the numbering wheels; Fig. 20 is an enlarged sectional detail of parts seen in Fig. 5; Fig. 21 is a detail perspective view showing the lock for the operating ring and the manner of producing a ratchet engagement of the lock with the ring; Fig. 22 is a view similar to Fig. 17, except that the lock is released from the ring; Fig. 23 is a detail of a portion of a scale ring, such as seen in Figs. 1, 25, 26 and 27, looking at the bottom side to show one of the locking lugs thereon; Fig. 24 is a detail of a portion of a scale ring, such as seen in Fig. 28, looking at the botom side to show one of the locking lugs thereon; Fig. 25 is a face view of a scale ring and scale, the latter based on a one thousand (1000) ton rating; Fig. 26 is a face view of a scale ring and scale, the latter based on a two thousand (2000) ton rating; Fig. 27 is a face view of a scale ring and scale, the latter based on a three thousand (3000) ton rating; Fig. 28 is a face view or plan of a modified scale ring and scale, the same shown associated with mechanism adapting the ring to be adjusted, whereby the scales may be employed to arbitrarily denote the allowance of a given number of tons per car; Fig. 29 is a perspective view of a stylus, such as employed for actuating the operating ring, and Fig. 30 is a perspective view of a hinged lever, which, when actuated, will operate the car numbering mechanism.

Like numerals of reference indicate corresponding parts throughout the figures.

The frame or casing of the machine comprises a base plate 1 with ears 2 projecting from the corners thereof to provide a means for securely fastening the machine to a suitable support if it be deemed advisable and on said base are mounted, in a secure manner, the tonnage registering and car tallying mechanism, as well as certain other component parts of such mechanism, as will more fully appear.

The top or covering for the machine consists of the box like casing 3 provided with a plurality of standards 4 having the reduced threaded ends 5, which, when the casing is in position on the base plate 1 passes through openings 6 in the base plate and nuts (not shown) are screwed on to the threaded ends of said standards, which serve to secure the parts and inclose the operative parts within said casing.

The top of the casing 3 is cut out, as at 7, to form an annular opening in which are retained the fixed center plate 8 and the revoluble operating plate 9. To secure the center plate 8, I provide said plate with a plurality of depending studs 10 to which are secured bars 11, and said bars at their outer ends are secured to a ring like plate 12 fastened to the lower face of the top of the casing, see Figs. 4 and 20. The inner face of plate 12 is preferably in the same vertical plane with the wall 7 of the annular opening in said casing, and the wall 7 of the top of the casing and the inner face of plate 12 are oppositely beveled, as indicated at 13 and 14, see Fig. 20, together, serving as a bearing for rolls or balls 15 which are interposed between said bearing and a beveled face 16 of the operating plate 9. The plate 9 has the inwardly projecting flange portion 17 lying beneath and in juxtaposition to the lower face of center plate 8, and is also provided with the upwardly extending ring like portion 18 and the depending flange portion 19, said flange portion 19 provided with the teeth 20 forming a gear adapted to intermesh with and communicate motion to gearing to be described. The ring like portion 18 of the plate 9, is provided with a plurality of annular rows, preferably two, of perforations 21 and 22 which extend through the body of the plate, see Figs. 1, 5 and 20 into any one of which may be inserted the end of the stylus A, shown in Fig. 29, for rotating said plate. The perforations 21 and 22 have a staggered relation, or alternately disposed, relative to each other, as will be clearly seen from an examination of Figs. 1 and 28. The staggered arrangement of the rows of perforations 21 and 22, will be further explained in connection with scale rings, which will now be described, in connection with the means on the casing for holding said rings on the casing.

The top of the casing 3 is provided with an annular flange 23 and a shoulder or ledge 24. The distance from the upper face of

the ledge 24 to the top of the flange 23, preferably conforms to the thickness of the scale-rings, to be described, which rest upon and are secured to said ledge, which will bring the top face of the scale rings in the same plane with the top face of the center plate 8 and top face of flange 23, see Fig. 20. Projecting inwardly from the shoulder or ledge 24 are a plurality of lugs 25, although only one is shown upon any of the several views and the lower face of said lugs 25 are spaced above the top face of the casing, see Fig. 20, which allows for coöperating lugs 26 on the scale rings to ride beneath said lugs 25 to retain the scale rings in position on the casing. In Fig. 25 is shown a scale ring 27 containing a scale 28 based on a one thousand (1000) ton rating, and the lugs 26 thereon are shown in dotted lines. In Figs. 1 and 26 are shown scale rings 27 containing a scale 29 based on a two thousand (2000) ton rating. The lugs 26 are shown in dotted lines on the ring in Fig. 26, but are omitted in Fig. 1, although the scale ring in Fig. 1, is broken away to disclose one of the lugs 25 of the casing, in plan. In Fig. 27 is shown a scale ring 27 containing a scale 30 based on a three thousand (3000) ton rating, and the lugs 26 thereon are shown in dotted lines. The lugs 26 on the rings, may be best seen in the detail view in Fig. 23, where the lug is shown as a flat plate attached to and spaced from the ring, so that when the ring is placed on the casing, it may be rotated, causing the lugs 26 of said ring to ride beneath the lugs 25 on the casing, bringing the lugs 25 between the lugs 26 and the lower face of the ring and serving to retain the ring in operative position. As an additional securing means for the rings 27 on the casing and to prevent the same from becoming dislodged, which might very easily be done, through the constant use of the machine, I provide each ring 27 with a perforation 31, properly located in the various interchangeable rings, and into such perforations will enter a pin 32 which is yieldingly held projected upwardly by the spring member 33, see Figs. 4 and 5. When a ring 27 is placed on the casing, as the lugs 25 of the casing and 26 of the ring coincide to lock the ring in place, the pin 32, which has been depressed, through the engagement of the ring, will, as it coincides with the perforation 31 in said ring, be forced into the same by the action of the spring member 33. To release the ring from the casing, the stylus A is used to depress the pin 32 and upon the pin being depressed sufficiently to release the ring therefrom, the ring may be partially rotated by pressure of the end of the stylus against the wall of the perforation 31, moving the ring until the lugs 26 are free of the lugs 25, when the pressure exerted by the spring member 33 on the pin 32 will lift the plate so that an operator may remove the same and substitute others, if desired.

In Fig. 1, a machine is shown with all the parts assembled and in normal position and with a ring 27 containing a scale 29 based on two thousand (2000) tons, in place, encircling the operating plate 9 and the annular rows of perforations 21 and 22 therein. A similar ring 27 and scale 29 is shown on a much larger scale in Fig. 26. The rings 27 in Figs. 25 and 27 are in all respects similar to those in Figs. 1 and 26, except, the difference in the scales, which as shown are based respectively, on one thousand and three thousand tons. The scales on the several rings, although based on a different tonnage rating are made up of correspondingly similar characters, symbols or numerals and lines arranged radially on the face of said rings which lead to or coincide with the several characters, symbols or numerals of the scale. The different scales, as will be understood, are substituted and used when it is desired to compute the tonnage resistance in trains of cars coupled with engines of different ratings, as for instance, the machine with the scale illustrated in Fig. 1 will be used when computing the tonnage resistance in trains, coupled to an engine based on a two thousand (2000) ton rating. Each scale cooperates with the rows of perforations 21 and 22 in the operating plate 9 and also with a fixed stop member 34, with which the stylus A will engage when the plate 9 has been operated a distance to bring the stylus into engagement with said stop member 34. Each scale, when in position on the casing, is fixed as well as adjusted relatively to the stop member 34 by means of the pin 32 and the perforations 31 in the rings having the scales, so that to change the machine, to adapt it for use in connection with engines having one, two, or three thousand ton rating or larger if desired, the operator has little or no labor and no calculating to do, but all that is necessary, is to remove a ring 27 and substitute the one desired and the machine is ready for operation. Each scale is planned in accordance with certain predetermined measurements, that when placed on a machine and the parts operated in accordance with the plan of said scales, the resistances computed for cars of a given weight from points opposite corresponding characters, symbols or numerals on the scale, will register the resistance represented by the car, rather than the actual gross weight thereof.

The operating plate 9 has been described

as provided with the two rows of perforations 21 and 22, having a staggered arrangement, which arrangement is made, first, because it enables me to manufacture the machine in compact form and provide reasonable size perforations so that a stylus A having a durable engaging end may be used, and second, the staggered arrangement of the perforations provides for the registration of half tons, or in other words, I am enabled to do all the work required in a comparatively small and compact machine, which I could do if the machine was made very large and cumbersome.

The stop member 34, to which reference has been made, is preferably secured to the plate 12, extends inwardly across the face of the gear 20 on the plate 9 and is then turned upwardly and inwardly as at 35, see Fig. 5, so that the stop member lies directly beneath the plate 9 and in the path of the perforations 21 and 22, so that when the stylus A is projected through any one of the perforations 21 and 22 and the plate 9 moved, the stylus will come into contact with the member 9.

Coöperating with and adapted to have a ratchet engagement with the teeth of the gear 20 is a ratchet pawl 36 which is pivotally connected with a bracket 37 attached to the plate 12. This pawl, while it allows the operating plate 9 having the gear 20 to be moved in the direction indicated by the arrows in Figs. 1 and 4, it will prevent said operating plate 9 to be operated in a reverse direction, at least, until the pawl has been released from engagement with the teeth of the gear 20. The pawl is held normally engaging the teeth of the gear 20 by means of a spring plate 38 which is attached to an oscillatory arm 39, see Figs. 2, 21 and 22. When it is desired to reverse the operation of operating plate 9, such for instance, when it is desired to return the numbering wheels, to be described, to zero, the operator will, through certain mechanism to be described, oscillate the arm 39 from the position shown in full lines in Fig. 2 to the dotted position shown in said figure, or from that position shown in Fig. 21 to that position shown in Fig. 22, when the spring plate 38 will operate to withdraw the pawl 36 from engagement with the teeth of the gear 20.

As previously suggested, the registering and tallying mechanism as well as the means by which such mechanism is operated from the operating plate 9 and the means for returning the registering and tallying mechanism to zero, from said plate, is located and supported on the base plate 1. This mechanism is best seen in plan in Fig. 2, in elevation in Fig. 3 and the several views designated as Figs. 14 to 17, both inclusive, although details of such mechanism are seen in other and additional views, of which, reference will be made later.

40 denotes a frame bent into suitable shape to serve as support for mechanism which will be described, and said frame is fastened at points 41 and 42 to the base plate 1.

43 designates a sleeve of the frame 41 which serves as a bearing for a short shaft 41^a, see Fig. 16, and on the outer end of said shaft is a gear 44, which, when the casing and the gear 20 are in position on the base plate 1, will mesh with said gear 20 and respond to any movement imparted to said gear 20. On the inner end of the shaft carrying gear 44, is a gear 45, which is shown to be in mesh with a gear 46, carried on a shaft 47, having its opposite ends journaled in the frame 40. This shaft is provided with a threaded portion 48, for a purpose to be further explained and on this shaft intermediate the threaded portion 48 and the left hand end thereof are carried a plurality of inter-coöperating numbering wheels 49, 50, 51 and 52, the wheel 49 being affixed to the shaft 47 while the remaining three gears are carried loose on said shaft, but held against rotation in a manner to be described and subject to the movement of the wheel 49, by means to be explained. On the left hand end of the shaft 47 is fixed a gear wheel 53, movable with the shaft 47 and in mesh with an idler gear 54, which in turn is in mesh with a gear 55 affixed to a shaft 56, also journaled in the frame 40. The shaft 56 is shown spaced from and in parallelism with the shaft 47 and carries the two numbering wheels 57 and 58, which serve as the car numbering or tallying device. Said wheels are both carried loose on the shaft 56 and the wheel 57 is operated intermittently by a ratchet and pawl mechanism which I will describe and with each complete revolution of the wheel 57, the wheel 58 is given a partial revolution through interengaging means between the two gears, which will also be further explained.

The numbering wheels 50 and 51 are duplicates of each other, while the wheels 49 and 52 are slightly different. The wheels 50, 51 and 52 are each provided with the external annular gears 59, whereas the gear 59 on the wheel 49 is omitted. The wheels 49, 50 and 51 are each provided with a single tooth 60 disposed on that face of said wheels adjoining the adjacent wheels, whereas the wheel 52 does not have such a tooth, although it is provided with a blind tooth or lug 61, see Fig. 7, serving a purpose which will be explained in connection with the return of said numbering wheels to zero. The numbering wheels 57 and 58 so far as their exterior surfaces are concerned, are

in most respects similar to the wheels 49 and 50, as the wheel 58 has the external annular gear 62 corresponding to gear 59, although said wheel lacks the single tooth on the opposite face of said wheel, and the wheel 57 has the single tooth, corresponding to the tooth 60 on wheel 49, although the same does not appear on the drawings owing to the position in which said numbering wheel is shown.

63 denotes a plurality of gear pinions carried by a shaft 64 reciprocally mounted in the frame 40 and said shaft also supports a cradle or frame 65 having the cut-out portions 66 to produce guides 67 between which the pinions 63 are carried on the shaft 64, and said pinions are arranged to be constantly in mesh with the gears 59 of the respective numbering wheels 50, 51 and 52, and are also arranged to have a meshing engagement with the single teeth 60 of wheels 49, 50 and 51 with each complete revolution of said wheels 49, 50 and 51. The cradle or frame 65 is provided with vertically extended ear portions 68, see Fig. 13, between which is located a pinion 69, similar to the pinions 63, and said pinion is slidably mounted on a shaft 70 which passes through the ear portions 68 and fixed at its opposite ends in a bracket 71 and the frame 40, see Fig. 2. The pinion 69 is arranged to be constantly in mesh with the gear 62 of a wheel 58 and is also arranged to have a meshing engagement with the single tooth, not shown, on the wheel 57 with each complete revolution of said wheel 57. The pinions 63 and 69 are substantially like the pinion, referred to as 63, and designated as Fig. 19, wherein is shown a pinion provided with a plurality of full teeth 72 extending across the face of the pinion and alternately disposed teeth 73 which extend only part way across the face of the pinion.

In the position in which the numbering wheels 49, 50, 51 and 52 are shown in Figs. 2 and 14, when the gear 46 is operated, in the manner previously explained, for operating the tonnage registering wheels to register train tonnage, the wheel 49 will be rotated with the shaft 47 and the smooth peripheral face thereof will ride on alternate full teeth 72 of the first pinion 63, and when said wheel 49 has made or is completing one full revolution with the shaft 47, the single tooth 60 of the wheel 49 will mesh with the tooth 72 intermediate the teeth 73 riding against the face of wheel 49, and said pinion will be given a partial revolution and in turn impart a partial revolution to the wheel 50. The operation of the wheel 51 by the wheel 50, and the wheel 52 by the wheel 51, is in all respects similar to the operation of the wheel 50 by the wheel 49, as just described, and it is not thought it will be necessary to explain further and in detail the successive operations of the several numbering wheels 50, 51 and 52. The shifting of the cradle or frame 65 and with it the pinions 63 and 69 for the purpose of returning the register and car tallying numbering wheels, to zero, will be explained.

Having described the operation of the registering wheels 49, 50, 51 and 52, through the operation of the operating plate 9, I will now proceed to describe the operation of the car tallying wheels 57 and 58, which are actuated through mechanism operated during the forward movement of the plate 9 and engaged by the end of the stylus A, projecting through either of the perforations 21 and 22 of said plate 9. The wheel 57 has attached to its outer face, a disk 72^a provided in its peripheral face with concave depressions 73^a, and to the disk 72^a is attached a ratchet disk 74 and on the shaft 56 and extending from the disk 74 to the outer end of said shaft is a sleeve 75, which at its inner end is provided with an arm 76, and at its outer end is provided with an arm 77. To the arm 76 is pivotally attached a pawl 78 normally held in engaging position by means of a spring 79, so that as the sleeve 75 is partially rotated on the shaft 56, the pawl 78 will be moved to engage a ratchet tooth of disk 74, and partially rotate the wheel 57 on the shaft 56. When said wheel has made or is completing one complete revolution on the shaft 56, the single tooth thereof will operate in the same manner to impart movement to the pinion 69 for imparting a partial rotation to the wheel 58, as does the wheel 49 and pinion 63 for imparting motion to the wheel 50, and it is thought that it will not be necessary to go into the detail of this operation.

The arm 77 extends inwardly a suitable distance, lying beneath the shaft 56 and sleeve 75 and has pivotally connected thereto, at 80, a crank-arm 81 on the lower end of a vertically disposed stem 82, suitably journaled on the frame 40, and to the upper end of stem 82 is connected a lever 83, which normally assumes the position shown in Figs. 1 and 2 and has the beveled outer end 84. With the machine assembled, as shown in Fig. 1, the beveled end of the lever 83 lies across and beneath the rows of perforations 21 and 22 in the operating plate 9, in such a manner that the beveled edge 84 thereof will be engaged by the end of the stylus A, when used for operating the plate 9, which engagement will move lever 83 in the direction of movement of the plate 9 and oscillate the stem 82, which will in turn, through the connections between said stem 82 and the sleeve 75 on shaft 56,

partially rotate said sleeve and operate the wheels 57 and 58 in the manner described. As shown, the lever 83 will be thrown just prior to the stylus engaging the stop member 34, which limits the movement of said stylus and plate 9, and the lever 83 being beveled as at 84 allows the stylus to gradually release itself or move from engagement with said lever. With this arrangement of operating means for the wheels 57 and 58, it will be understood that with each operation of the plate 9, its movements will be tallied by the wheels 57 and 58. There can be no mistake so far as the operation of the tallying wheels are concerned, for the reason that the position of the lever 83 is such that no matter what tonnage rating a scale is adjusted to, the lever will always be in advance of the characters, symbols or numerals on said scale, as shown in Fig. 1.

The wheel 57 and coöperative parts on the shaft 56, are held against displacement by a lever 93 pivoted to the bracket 71, see Figs. 10 and 12, and on the upper end of the lever is a roller 94 which is caused to bear against and successively engage the semicircular depressions 73 in the disk 72 attached to said wheel 57, through the action of a spring 95, attached one end to the lever 93, and its opposite end attached to the bracket 71.

For purposes which I will now explain, I have constructed the lever 83 in two parts, as best seen in Fig. 30. The forward section 85 has the beveled end 84 and the inner section 86 is attached to stem 82, to which the outer section is pivoted at 87 and the two sections are held in closed position by a spring 88 connected to lugs 89 and 90 on the respective outer and inner sections of said lever. When the lever is engaged for operating the sleeve 75 to transmit motion to the wheels 57 and 58, the abutting ends 91 and 92 of the sections will engage to stiffen the lever during the operation of oscillating the same. On the other hand, if an operator when he desires to return the mechanism to zero, should insert the stylus A into any one of the perforations 21 or 22 of plate 9 between the lever 83 and stop member 34 and reversing the movement of plate 9, when the stylus engages the lever 83, said lever instead of bending or breaking, which would be the case, if the lever was made in one piece, the lever will break, as shown in dotted lines in Fig. 1, allowing the stylus to pass by the lever and the spring 88 will return the sections to their normal position.

The cradle or frame 65 is provided with the upper transverse plate 96, which overlies the upper edge of frame 40, see Fig. 11, and is also provided with the lower transverse plate 97 which extends across and below the lower edge of said frame 40, see also Fig. 11. Pivotally connected at 98 to the front face of the frame 40 is a lever 99 having the extension 100 formed with an offset 101, an extension 102 and an extension 103 formed with the right angle engaging portion 104. There is a second lever 105 pivoted at 106 to the front face of the frame 40 and this lever has the extension 107 normally lying below and in juxtaposition to the extension 103 of lever 99, and a further extension 108. To the lower end of extension 102 of the lever 99 is connected a spring 109 which has its opposite end connected to the plate 97 of the cradle, see Fig. 11. As will be seen from an examination of Fig. 11, the extension 100 of lever 99 normally overlies the plate 96 with the off-set 101 thereof engaging the left hand edge of said plate 96 which will hold the cradle or frame 40 projected to the right, looking at Fig. 11, which will retain the pinions 63 and 69 in operative relation with the plurality of numbering wheels of the tonnage registering and car tallying mechanism. When it is desired to shift or move the cradle or frame 65 to the left, which will carry with it the shaft 64 and the pinions 63 and 69 for the purpose of moving said pinions from the path of the single teeth 60 of the several numbering wheels, with which said pinions will mesh, in the manner previously described, the operator will insert the end of the stylus A through a perforation 110 in the center plate 8, which is above the engaging portion 104 of lever 99 and pressing down on the stylus will move the lever 99 from that position shown in full lines in Fig. 11 to the position shown in dotted lines in said figure, raising the extension 100 and releasing the offset 101 thereof from the plate 96 of the cradle or frame 65, at the same time the extension 103 of lever 99 will be caused to bear downwardly on the extension 107 of lever 105, moving said lever from the position shown in full lines in Fig. 11 to the position shown in dotted lines in said figure, causing the extension 108 of the lever 105 to bear against and move the plate 97 of the cradle or frame 65 and with it the cradle or frame, the shaft 64 and the pinions 63 and 69, in which position the numbering wheels which coöperate with the pinions may be returned to zero, providing the lever 39, which controls the position of the pawl 36, Fig. 21, is released from the teeth of the gear 20 that the operating plate 9 having the gear 20 may be reversed, so I connect the inner end of the lever 39, see Fig. 2, to the inner end of shaft 64, so that when said shaft is shifted with the cradle 65, it will move the lever 39 from the position shown in full lines in Fig. 2, to the position shown in dotted lines in said figure, when the pawl 36 will be released from the teeth of gear 20 and so retained until the cradle 65 and shaft 64 have been returned to their normal position, which

will, through the connection of shaft 64, return the lever 39 to its normal position and cause the pawl 36 to again move into mesh with teeth of gear 20.

When the cradle or frame 65 has been shifted to the left, as just above explained, it together with the mechanism carried thereon, must be locked until after the operator, through a reverse operation of the plate 9, has returned the numbering wheels to zero, when the parts shall be automatically returned to the position shown in full lines in Fig. 11. This lock takes the form of a lever 111, pivoted at 112 to the base plate 1, and the operating end of said lever is carried under and adjacent to the right hand end of the cradle or frame 65, looking at Figs. 2, 6, 11, 14 and 15 and is provided with the vertical projections or lugs 113 and 114, the latter having connected thereto a spring 115 which is suitably connected at its opposite end to the base 1, preferably to a plate 116 secured to said base and said spring acts to draw the inner free end of lever 111 toward the plate 116, for purposes which I will now explain. Prior to the shifting of the cradle or frame 65 to the left, looking at Figs. 6 and 11, the projection 113 lies on the outside of the cradle or frame 65, but immediately upon the cradle being shifted to the left, the spring 115 will draw the lever 111, so that the projection 113 will move across and in front of the right hand end of the cradle or frame 65 so as to engage the same and lock the cradle in its shifted position. This lever 111 is not released until all the numbering wheels assume their normal or initial positions, which is at zero, and is accomplished as follows: 117 denotes a plate, see Figs. 2, 8, 14, 15 and 16, which is hinged at 118 to a plate 119 secured to the base 1, and said plate 117 is adapted to have engagement with the threaded portion 48 of the shaft 47 and be moved back and forth by the threaded portion 48 of said shaft. The upper edge of the plate 117 is held in the position shown in Figs. 14, 15 and 16 by a spring engaging arm 119^a of the plate 116 and just as soon as the shaft 47 is operated in a reverse direction, the threaded portion 48 of said shaft will operate to move or draw the upper edge of plate 117 toward the numbering wheel 49, aided by the spring engaging arm 119^a, the object of which is to move the pivoted bar 120 carried on the plate 117, see Fig. 8, and having the right angle bent portion 121, into a position, so that when the numbering wheels are returned to zero, a pin 122 projecting from the wheel 49, will engage the upper end of bar 120, oscillate it on its pivot and raise or throw the bent portion 121 of the bar 120 outwardly, causing it to engage and bear against the projection or lug 114 of the lever 111 and throw said lever outwardly, releasing the cradle or frame 40 and it will be shifted to its normal position through the action of spring 109. As previously explained, this spring 109 was described as connected to lever 99 and the cradle 65 and when the lever 99 was depressed, to move the lower end 102 in one direction and operating to move the lower end of lever 105 in an opposite direction, which will extend said spring; but immediately upon the release of the cradle, as explained, the spring 109 tightens up, throwing the lever 99 to its normal position and also returning the cradle to its normal position. Upon the registering devices being further operated for the purpose of computing tonnage resistance of trains, the plate 117 is returned to the position shown in Figs. 14, 15 and 16, and held in position by the spring engaging arm 119, to be again taken up by the threaded portion 48 of shaft 47 and moved toward the numbering wheels, when the plate 9 and parts coöperating therewith are reversed.

I will now explain the general construction of the numbering wheels 49, 50, 51 and 52 and their interengaging mechanism, by which, on a reversal of the operation of the wheels 49, said wheels are collected and returned to zero. In Fig. 18 is shown a sectional detail in perspective of the wheels designated as 50 and 51, the remaining numbering wheels are correspondingly similar, although parts are omitted, which as will be understood, are unnecessary to the perfect operation of the machine. These wheels 50 and 51 are constructed of a plurality of sections, for convenience in manufacturing and assembling, comprising the part 122 containing the characters, symbols or numerals on the periphery thereof, the gear 59 and the part 123 having the single tooth 60, all of which are united by the plurality of securing pins 124. The gear 59 and part 122 have the enlarged hub portions 125, which, when the wheels are on the shaft 47, leave space between the exterior face of the shaft and interior face of the gear 59 and part 122. In this hub portion is carried a ring 126 and a coil spring 127, both of which will encircle the shaft, the outer face of ring 126 bearing against a shoulder 128 of the gear and the spring bearing against the ring on one side and a shoulder 129 on the other side. The ring is shown provided with a pawl 130 having a beveled end which projects through an opening 131 in the shoulder of gear 59, and said pawl projects into an annular opening 132 formed in the part 123 of the adjacent wheel, and said part 123 of each wheel, formed with such part is provided with the radially arranged tapered dog 133 adapted to coöperate with the pawl 130 of the adjacent wheel, in a manner which I will now explain. When the wheel

49 is completing a forward revolution, the tapered portion of the dog 133 thereof will engage with the beveled end of the pawl 130 in wheel 50, forcing the ring 126 back into the wheel, allowing the dog to pass the pawl during the further rotation of said wheel 49; the tooth 60 coöperating with pinions 63, in manner previously stated imparts the partial rotation to the wheel 50. This operation is continued through the rotation of the several wheels 50, 51 and 52, and each time a dog 133 passes a pawl 130, the spring 127 will immediately force ring 126 with its pawl 130 outwardly.

When the mechanism, which has been described for returning the wheels to zero, has been set, the operation will be as follows: As the wheel 49 during its reverse operation is completing a revolution, the dog 133 thereof will engage the flat face of the pawl 130 in the wheel 50, and cause said wheel, through the engagement of dog and pawl, to be taken up by the wheel 49 and rotated until the dog 133 of wheel 50 makes a similar engagement with the pawl 130 on the wheel 51, when the wheel 51 will be taken up and caused to travel or returned in unison with the wheels 49 and 50 and when the wheel 51 assumes a position where its dog 133 comes into similar engagement with the pawl 130 of wheel 52, all of said wheels will move in unison and be finally returned to zero, at which time the pin 122 on wheel 49, will engage the bar 120, in manner described for releasing the cradle or frame 65 so that the parts may be returned to their normal or initial position. The interior construction of the wheels 57 and 58 are similar to the wheel shown in Fig. 18, so far as it is necessary to employ the parts, shown in detail, in said figure, in said wheel, so that the wheel 57 may operate to transmit movement to the wheel 58 when the wheels are to be returned to zero, and it is not thought necessary to go into detail, so far as it pertains to this structure.

The shaft 56 adjacent to the outer face of the ratchet disk 71, is provided with an annular shoulder 134 formed with a lug 135, see Fig. 17, and said lug 133 seen on the wheel in Fig. 18, and it coacts with the pawl 130 of the ring 126 in wheel 57, in the same manner as the dog 133 of one of the previously described wheels, coacts with the pawl 126 of an adjacent wheel. It will be understood that any motion imparted to shaft 47 is in turn imparted to the shaft 56 through the train of gears 53, 54 and 55, previously described, so that when the shaft 47 is operated in a reverse direction, a reverse movement will be imparted to the shaft 56 through said gears 53, 54 and 55 and that when the lug 135 of the shoulder 134 on shaft 56 engages the flat face of the pawl 130 of the wheel 57, said wheel will be returned to zero, and likewise when the dog 133, not shown, engages with its coacting pawl 130 in the wheel 58, said wheel will be gathered up and returned to zero. The engaging dogs 133 and pawls 126 of the several numbering wheels are so disposed on their respective wheels, relatively to each other, that when the dog 133 of one wheel engages the pawl of an adjacent wheel, corresponding numerals on the adjacent wheels gather into alinement.

As the numbering wheels are all gathered to zero, they are locked, or rather mechanism is provided for preventing further reverse movement thereof, and such mechanism is so timed relatively to other coöperating mechanism, that the wheel locking mechanism acts simultaneously with the release of the lever 111 and return of the cradle or frame 65 to its normal position. This wheel locking mechanism comprises a horizontally disposed lever 136, see Figs. 6 and 8, and said lever is pivoted at 137 to the bracket 71. The forward end of lever 136 is bent upwardly as at 138 and then to one side as at 139, providing an extension which is arranged to be engaged by the lever 17 as said lever is operated during a reverse operation of the shaft 47, and when so engaged will oscillate the lever 136.

The lever 136 at its opposite end has connected thereto, a reach bar 140 which is in turn connected to a plate 141, having the horizontally disposed arm 142 extending toward the numbering wheel 52, and the oppositely extending arm 143, which moves in proximity to the wheel 58. To guide the plate 141 in its movement with the reach bar 140 as it is shifted with the lever 136, I pass the shaft 70 carrying the pinion 69 through perforations 144 and 145 in the respective arms 142 and 143 of plate 141, in such a manner that plate 141 may slide on the shaft 70 and be guided thereby. I also provide the guiding stud 141ª projecting inwardly from the frame which operates in an opening 142ª provided in the arm 142, which assists in guiding the plate 141 in its movement and prevents any oscillation thereof on the shaft 70. As the lever 117 is moved toward wheel 49 by the threads 48 on shaft 47, assisted by spring engaging arm, said lever 117 will engage and gradually move the lever 116, and it in turn will move the reach bar 140 and plate 141, bringing the arms 142 and 143 adjacent to the outside faces of wheels 52 and 58, so that when the several numbering wheels 49, 50, 51, 52, 57 and 58 are brought or gathered to zero, the blind tooth or lug 61 of wheel 52 will engage and lock against the end of arm 142. In like manner, a blind tooth or lug 146 on the wheel 58, see Fig. 7, will engage and lock against the arm 143. To the reach bar 140 is attached a spring 147 which is connected

at its opposite end to the frame 40 and this spring is expanded by the action of lever 117 against the lever 136 when moving the plate 141 to engaging position with the lugs 61 and 146 of the numbering wheels 52 and 58, but as the lever is returned to its normal position, as previously explained, said spring 147 will operate to move the plate 141 so that its arms 142 and 143 are out of the path of the lugs 61 and 146, leaving the wheels free to turn. Engaging the pinions 63 and 69, see Fig. 13, are retarding springs 148 and 149 suitably supported and arranged to hold the pinions to their work and prevent either the pinions or gears meshing therewith, from running loose when the gears are being reversed, which would destroy the efficiency of the machine.

I provide an alarm bell 150, suitably supported on the base 1 which may be sounded when one, two or three thousand tons have been registered by the registering wheels, or even more if desired, and said alarm is also arranged to be sounded when the tallying wheels indicate that fifty, sixty, or seventy cars, or even more, have been placed in a train. It will be found in practice that on some divisions, a car limit will be reached before the tonnage allowed the engine is reached, owing to various conditions which will limit a train to a given number of cars, and to accommodate the machine to these varying conditions, I not only provide for sounding the alarm when the required tonnage is computed by the tonnage registering wheels, but also provide for announcing that the train limit has been reached.

The clapper for the alarm bell is designated as 151 and is connected at its inner end to a frame 152, see Fig. 3 and the frame 152 is pivoted to frame 40 at 153 and has the inwardly carried projection 154 extending across the upper edge of frame 40, see Fig. 2, with its inner end in proximity to the outside face of wheel 52, to which is attached a plate 155 provided with spring engaging fingers 156, 157 and 158, see Fig. 7, which are so arranged on the wheel 52 that when one, two or three thousand tons have been registered by the tonnage registering wheels, the frame 152 will be oscillated by the engagement of said fingers with the projection 154 of frame 152, raising the clapper 151. Immediately upon the fingers 156, or 157, or 158 releasing the frame 152, it is returned by a spring 159, connected to the frame 152 and the base 1, causing the clapper to drop and engage the alarm bell 150.

160 is a plate similar to plate 152, the same being pivoted at 161 to frame 40 and is provided with the projection 162 extending across the upper edge of frame 40, see Fig. 2, with its inner end in proximity to the outside face of wheel 58, to which is attached a plate 163 provided with spring engaging fingers 164, 165 and 166, see Fig. 7, which are so arranged on the wheel 58 that when fifty, sixty or seventy cars have been placed in a train, the frame 160 will be oscillated by the engagement of said fingers with the projection 162 of frame 160. Motion is imparted to frame 152 to raise the clapper, through a reach bar 167, see Fig. 3, pivotally attached at 168 and 169 to the respective frames 152 and 160.

In Fig. 28 is shown in plan a scale ring 27^a provided with a scale 27^b, said scale ring and scale corresponding in some respects to the scale rings and scales previously described. That is to say, it is intended for use in connection with a machine having the operating plate 9 and other component parts, and when in operative position, encircles the rows of perforations 21 and 22 in the plate 9. It is provided with locking lugs or plates 26^a attached to its lower face, which said lugs or plates coöperate and have a locking engagement with the lugs 25 in manner similar to the lugs 26, previously described, except that the lugs extend a greater distance around the scale ring 27^a than do those, described as 26, for the reason that the ring 27^a, as I will explain, is rotatably adjustable on the machine, and the long lugs or plates 26^a prevents the ring from becoming dislodged during such adjustment. The scale 27^b differs from the scales on the rings previously described, in that scale 27^b is not graduated nor is it contracted at any point throughout its length, but the characters, symbols or numerals and radial lines thereof are placed equidistant from each other so that an arbitrary allowance may be made for each successive car placed in a train when making up such trains. To accomplish this, I serrate or notch the edge of the ring 27^a as at 27^c for a suitable distance and provide the ring with a chart 27^d, extending alongside of its serrated edge, which said chart consists of characters, symbols or numerals of predetermined denominations which serve as a guide to an operator in adjusting the ring to make the proper allowance to the cars placed in the train. The ring is adjustably held on the casing by a slidable lug 27^e having an engaging end 27^f adapted to enter the serrations 27^c of the ring, as shown in Fig. 28. In the position in which the ring is shown in Fig. 28, it has been adjusted to place the numeral 12 on chart 27^d opposite the engaging end of lug 27^e, which is to indicate that an arbitrary allowance of twelve (12) tons will be made to each car, with each operation of the plate 9 from any point opposite the scale 27^b. In other words, if the plate 9 is operated from a point opposite the numeral "40" on the scale 27^b, the registering mechanism instead of registering "40" tons, will register fifty two (52) tons. The plurality of registering

wheels when the casing is secured in position on the base, are disposed below sight openings 170 in the center plate 8, and the car tallying wheels are located beneath sight openings 171, also arranged in said center plate 8, so that the said wheels may be viewed by the operator during the operation of the machine.

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

1. In a computing machine, a scale ring containing a scale, a plurality of spaced members secured to the lower face of said ring, and means with which said members may coincide for locking the ring in position on said machine.

2. In a computing machine, a scale ring containing a scale, a plurality of lugs attached to the lower face of said ring, and lugs on the machine frame with which the lugs on the ring may have a sliding engagement for locking the ring in position on said machine.

3. In a computing machine, a scale ring containing a scale, and provided with a perforation, and a yielding member arranged to enter the perforation in said ring for retaining said ring in operative position on the machine frame.

4. In a computing machine, a scale ring containing a scale, and provided with a perforation, locking lugs on the machine frame, locking lugs on the ring arranged to have a sliding engagement with the lugs on the machine frame, and a yielding member arranged to enter the perforation in the ring when the lugs of frame and ring coincide.

5. In a computing machine, the combination of registering devices, a revoluble member for operating said devices, a scale ring having a scale arranged to coöperate with said member, and having a perforation, and yielding means on the machine frame adapted to enter said perforation in the ring for retaining said ring in operative position on the machine frame.

6. In a computing machine, the combination of registering devices, a revoluble plate for operating such devices, said plate having a plurality of rows of perforations in staggered arrangement, and a scale ring adapted to encircle said plate and having a scale coöperating therewith and serving as a guide to the operation of said plate.

7. In a computing machine, the combination of registering devices, a revoluble plate for operating such devices, said plate having a plurality of rows of perforations in staggered arrangement, a scale ring adapted to encircle said plate and having a scale coöperating therewith and serving as a guide to the operation of said plate, and means for detachably securing the ring to the machine frame.

8. In a computing machine, the combination of registering devices, a revoluble plate for operating such devices, said plate having a plurality of rows of perforations in staggered arrangement, a scale ring adapted to encircle said plate and having a scale coöperating therewith and serving as a guide to the operation of said plate, lugs on the machine frame, and lugs on the ring arranged to have a sliding engagement with the lugs on the machine for securing the ring to the frame.

9. In a computing machine, the combination of registering devices, a revoluble plate geared to said devices, said plate having a plurality of annular rows of perforations in staggered arrangement, for the insertion of a stylus for operating the plate, a stop member with which the stylus will engage, a scale ring and scale thereon, and means for securing said ring in position encircling said plate.

10. In a computing machine, the combination of registering devices, a revoluble plate geared to said devices, said plate having a plurality of annular rows of perforations in staggered arrangement, for the insertion of a stylus for operating the plate, a stop member with which the stylus will engage, a scale ring and a scale thereon, said ring having a perforation therein, and means on the machine frame adapted to enter the perforation for retaining said ring in operative position on said frame.

11. In a computing machine, the combination of registering devices, a revoluble plate geared to said devices, said plate having a plurality of annular rows of perforations in staggered arrangement, for the insertion of a stylus for operating the plate, a stop member with which the stylus will engage, a scale ring and scale thereon and a perforation in said ring, locking lugs on the machine frame, locking lugs on the ring adapted to have a slidable rotation with the lugs on the frame, and a yielding member adapted to enter the perforation in the ring for retaining the ring in operative position on said frame.

12. In a computing machine, the combination of suitable registering devices, a revoluble member for operating said devices, a plurality of interchangeable rings adapted to have a detachable connection with the machine frame, each ring provided with a scale based on a different tonnage rating, and also having a perforation at a suitable point therein, and a yieldable member arranged to enter the perforation in any one of said plates, and thereby retain the rings in operative position on the frame.

13. In a computing machine, the combination of suitable registering devices, a revoluble plate for operating said devices and provided with perforations for the insertion

of a stylus, a stop member with which the stylus will engage, a plurality of interchangeable scale rings adapted to have a detachable connection with the machine frame, each ring having a scale based on a different tonnage rating and serving as a guide to the operation of the plate, said rings also provided with a perforation therein, a common means on the frame adapted to enter the perforation in any one of said rings for retaining said rings in operative position on the frame, and means for locking said rings down to the machine frame.

14. In a machine for computing the tonnage resistance in trains of cars, the combination with suitable registering devices and means for operating the same, of a scale member and a scale thereon, a stop member for limiting the movement of the register operating means, a chart also arranged on said ring, and means for adjusting the ring and its chart relatively to the stop member, whereby an arbitrary allowance per car placed in a train may be made.

15. In a machine for computing the tonnage resistance in trains of cars, the combination with suitable registering devices, a plate geared to said devices and provided with perforations for the insertion of a stylus, a stop member for limiting the movement of the plate, a scale member coöperating with the plate and provided with a scale serving as a guide to the operation of said plate by means of the stylus, a chart also arranged on said scale member, and means for adjusting the scale member and its chart relatively to the stop member, whereby an increased or decreased arbitrary allowance per car placed in a train may be made.

16. In a computing machine, a register operating plate, means for locking the plate against rotation in one direction, and means for releasing said plate locking means.

17. In a computing machine, registering devices, an operating plate, a gear on said plate, gearing connecting said gear with the registering devices, means in operative engagement with the gear on the plate for locking the plate against rotation in one direction, and means for releasing said plate locking means.

18. In a computing machine, registering devices, an operating plate, a gear on said plate, means operated by the gear for transmitting movement to the registering devices, a pawl in engagement with said gear for locking the plate against rotation in one direction, means for holding the pawl against the gear, and means for moving the pawl holding means to release the pawl from said gear.

19. In a computing machine, registering devices, a revoluble plate for operating said devices, said plate having a plurality of perforations for the insertion of a stylus, means for locking the plate against rotation in one direction, and means adapted to be operated by the stylus for releasing said plate locking means.

20. In a computing machine, registering devices, a revoluble plate for operating said devices, said plate provided with a plurality of perforations for the insertion of a stylus, devices for tallying the movements of the plate, a lever for operating said tallying devices, the lever arranged to be engaged and operated by the stylus with each operation of the plate, said lever so constructed that with each forward operation of the plate, the lever will be operated and transmit motion to the tallying devices, and capable of being moved out of the path of the stylus with each reverse operation of the plate without transmitting motion to the tallying devices.

21. In a computing machine, the combination of a plurality of registering wheels, inter-coöperating means between said wheels, means for operating the wheels, an alarm bell, a clapper, and means for operating the same, and a plurality of engaging fingers on one of said wheels adapted to engage and operate said clapper operating means when said registering wheels have been operated to register certain predetermined amounts.

22. In a computing machine, the combination of a plurality of coöperating registering wheels, means for operating said wheels in one direction to register, means for locking the registering wheels against rotation in one direction, means for releasing said wheel locking means to allow said wheels to be returned to zero, and a stop to limit the movement of the wheels when said wheels are returned to zero.

23. In a computing machine, a shaft, a plurality of wheels carried on said shaft, one of said wheels secured to said shaft, an annular ring carried in the hub of the wheel loose on the shaft and provided with a pawl projecting from without the hub of said wheel, a spring in said hub and engaging said ring, a dog on the wheel fixed to the shaft and adapted to ride past the pawl of the loosely carried wheel when rotated in one direction, and adapted to engage the pawl of said loosely carried wheel for rotating said loosely carried wheel, when rotated in reverse direction.

24. In a computing machine, the combination of a plurality of registering wheels, means for operating said wheels, a sliding frame, pinions carried by said frame and cooperating with said registering wheels for transmitting motion between adjacent wheels, means for shifting said sliding frame and pinions, a lever for automatically locking said frame after it has been moved, and means operated by one of said registering wheels during the operation of returning the

registering wheels to zero, for moving the lever out of the path of the sliding frame, and means for automatically returning the frame to its normal position.

25. In a computing machine, the combination of a plurality of registering wheels, means for operating said wheels for the purpose of registering or returning the same to zero, a lock for said registering wheels in one direction, a slidable frame, pinions carried by said frame and coöperating with the registering wheels for transmitting motion between adjacent wheels, means operated by the wheel operating means when moved in one direction for releasing said lock from the wheels and for moving said lock into a position to be engaged by said wheels when moved in the opposite direction, means for moving the slidable frame and with it the pinion, a lever for automatically locking said frame when moved, means operated by one of said registering wheels during the operation of returning the registering wheels to zero, for moving the lever out of the path of the sliding frame, and means for automatically returning the frame to its normal position.

26. In a computing machine, the combination of a shaft, a plurality of numbering wheels carried thereon, a screw threaded portion attached to said shaft adjacent one of said numbering wheels, means for operating the shaft, means for communicating motion between adjacent wheels on the shaft, a lock for the numbering wheels when they are returned to zero, and means operated by the screw threaded portion of the shaft for releasing the lock when the shaft is rotated in one direction, and adapted to set said lock when the shaft is rotated in an opposite direction.

27. In a computing machine, the combination of a base plate, registering mechanism supported on said base plate, a casing for inclosing the registering mechanism on the base plate, said casing provided with an annular opening, a center plate for the openings in the casing, means for fixedly connecting the center plate to the casing, an operating plate encircling the center plate and arranged to be operated by a stylus, gearing between the operating plate and registering mechanism, a scale ring and scale thereon adapted to coöperate with the operating plate, and means for securing the scale ring on the casing.

28. In a computing machine, the combination of a casing formed with an annular opening, and having the wall of said opening beveled, an annular plate secured to the inner face of said casing and having a beveled edge, together with the beveled edge of the wall of the casing forming a retainer for roller bearings, an operating plate rotatably supported in the annular opening of said casing and having an oppositely disposed beveled edge, and roller bearings interposed between the operating plate and the beveled edges of the annular opening and plate aforesaid.

29. In a computing machine, the combination of a casing provided with an annular opening, an operating plate revolubly mounted in said opening, and roller bearings interposed between the peripheral edge of the plate and the wall of the annular opening in said casing.

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

JOHN M. DALY.

Witnesses:
CHARLES B. WINTERSMITH,
EDWARD J. REILLY.