G. O. DEGENER.

COMPUTING MACHINE.

APPLICATION FILED NOV. 8, 1910.

1,013,378.

Patented Jan. 2, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

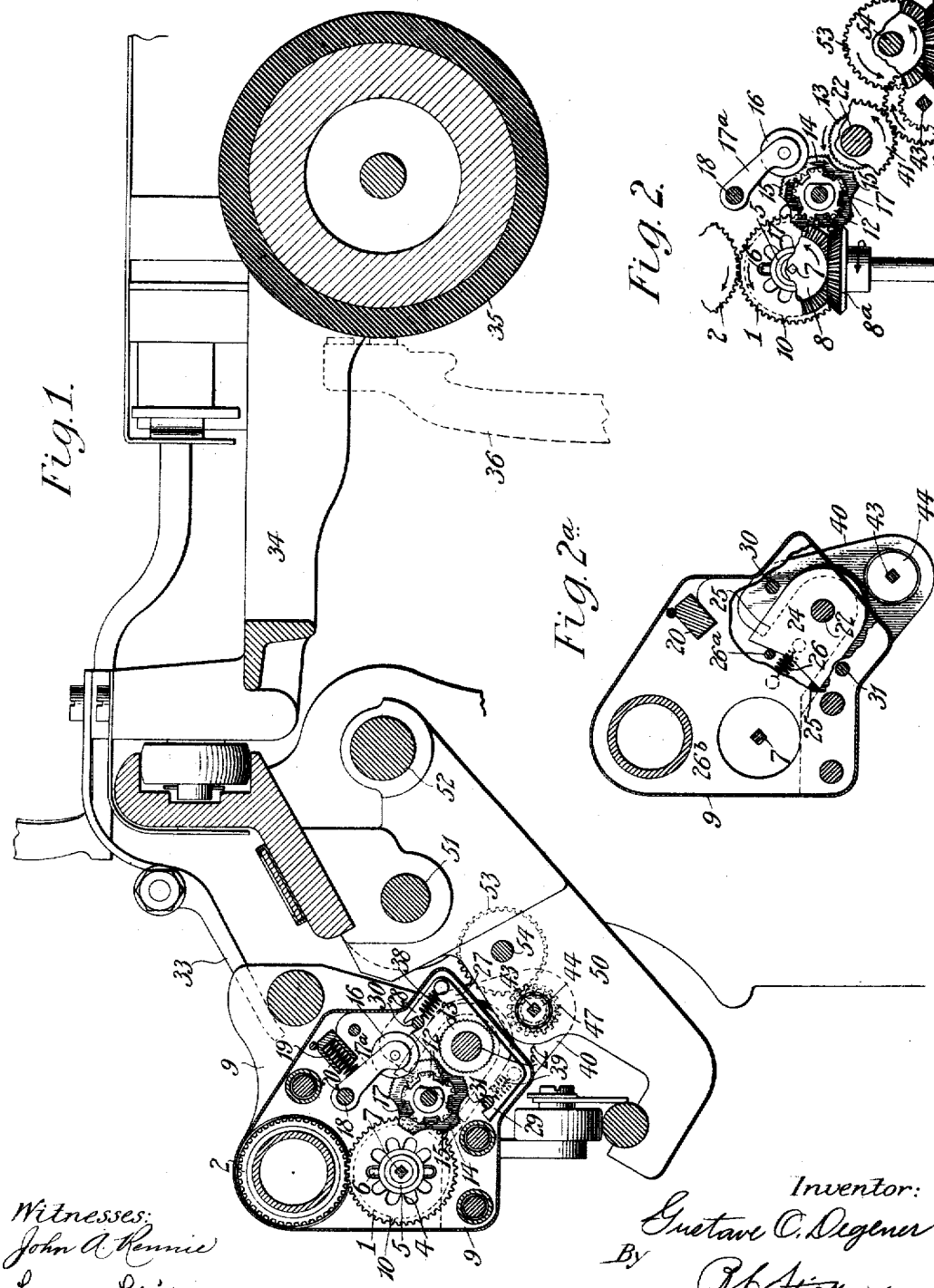

Fig. 2.

Fig. 2a.

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2 SHEETS—SHEET 2.

Fig. 3

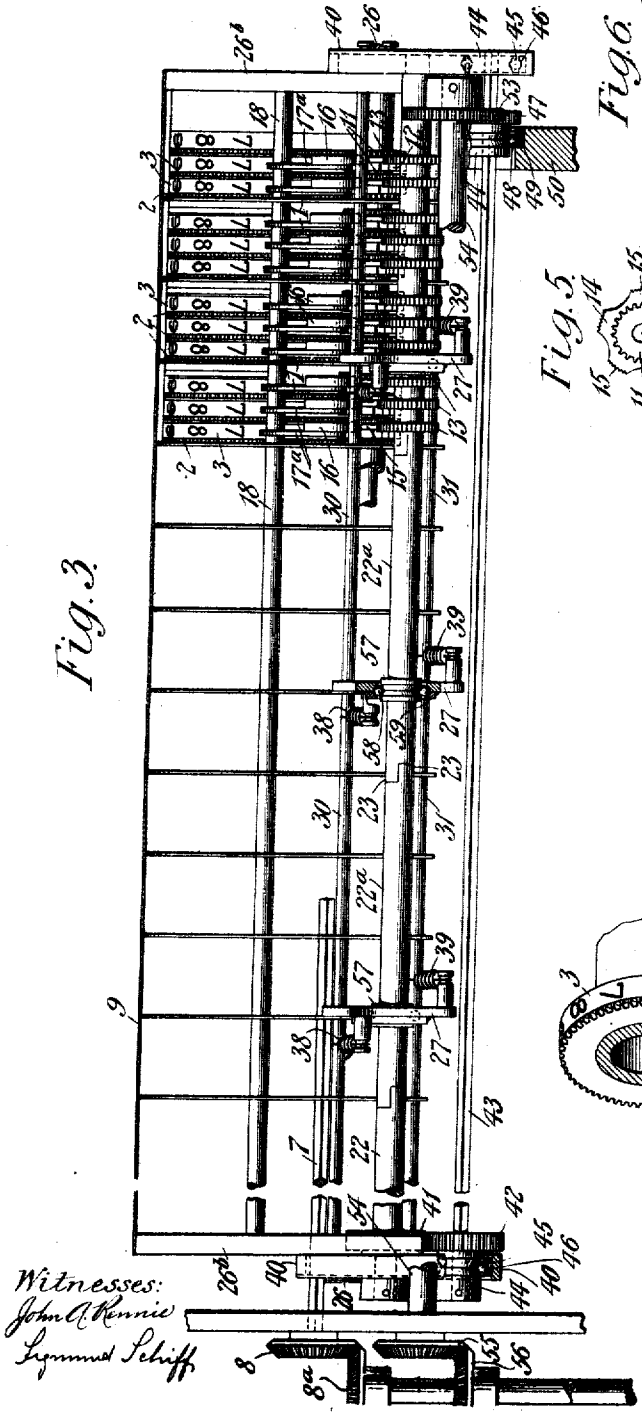

Fig. 6

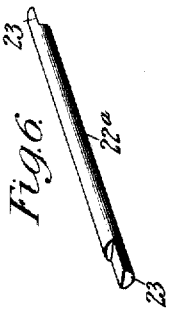

Fig. 5

Fig. 4

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UNITED STATES PATENT OFFICE.

GUSTAVE O. DEGENER, OF NEW YORK, N. Y., ASSIGNOR TO UNDERWOOD COMPUTING MACHINE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

COMPUTING-MACHINE.

1,013,378. Specification of Letters Patent. Patented Jan. 2, 1912.

Application filed November 8, 1910. Serial No. 591,269.

To all whom it may concern:

Be it known that I, GUSTAVE O. DEGENER, a citizen of the United States, residing in New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Computing-Machines, of which the following is a specification.

This invention relates to the tens-carrying mechanism of computing devices, particularly those of the kind disclosed in the application of Walter Wright, No. 485,046, filed March 22, 1909, also application of Walter Wright and Gustave O. Degener, No. 543,603, filed February 12, 1910, in which a constantly revolving device is called upon intermittently to assist in carrying tens from one computing wheel to the next. As set forth in said applications, each main computing wheel is provided with a special tooth, which turns a pinion that is in mesh with the computing wheel of next higher denomination, to the end that said higher computing wheel may make one-tenth of a revolution. The movement of this tens-carrying pinion is assisted by a constantly revolving soft-rubber roll; the pinion having a set of points or lugs to engage said roll to be turned thereby, whereby sufficient assistance to the tens-carrying pinion is assured.

In my co-pending application No. 590,839 filed November 5, 1910, there is employed, in place of the soft rubber roll aforesaid, a set of yieldingly mounted pinions having fine teeth adapted to engage teeth provided upon the assisting lugs fixed to the aforesaid tens-carrying pinion. Normally, the constantly revolving pinion is out of mesh with the teeth on said assisting lugs; but at the proper time the movement of the main computing wheel will cause one of said assisting spurs or lugs to mesh with the constantly revolving pinion, whereby the latter is enabled to assist in the turning of the tens-carrying pinion. Since the constantly revolving pinions are yieldingly mounted, they are sure to mesh properly with the teeth of the aforesaid assisting lugs, since they will yield if the lug teeth are improperly presented to them.

The object of the present invention is to provide an improved construction of yielding auxiliary pinions for the tens-carrying mechanism, with a view to rendering the device more reliable and substantial, more easily manufactured and kept in order, and more serviceable. I employ, in place of the solid shafts shown in other constructions, upon which to mount the auxiliary pinions, a spring-pressed shaft which is made up of a series of sections connected end to end by any suitable universal joints, several of the auxiliary pinions being preferably mounted on each section. This sectional construction permits one pinion to yield at the tens-carrying operation, without rendering it necessary for all the pinions to yield; and only that section upon which the particular pinion is mounted is substantially affected by the pressure at the tens-carrying operation, while it of course remains connected at its ends to the unaffected sections, so that all the sections may revolve together at all times. Separate springs may be provided for returning the shaft sections to normal positions after displacement thereof.

Other features and advantages will hereinafter appear.

In the accompanying drawings, Figure 1 is a sectional side elevation of the carriage of an Underwood front strike writing machine, showing, a computing carriage connected to the typewriter carriage and provided with the present improvements; the construction corresponding in large part with that shown in said applications. Fig. 2 is a view to illustrate the connection of the drive gears with the computing devices seen at Fig. 1. Fig. 2ª shows the end of the computing carriage. Fig. 3 is a rear elevation of certain portions of the mechanism on the computing carriage, including the constantly rotating shaft and the auxiliary tens-carrying pinions thereon. Fig. 4 is a perspective view of a train consisting of a single number wheel, two computing wheels, a pinion for carrying tens from one computing wheel to the next, an auxiliary pinion to assist at the tens-carrying operation, a flexible shaft on which the auxiliary pinion is carried, and certain of the yielding journal boxes for said flexible shaft. Fig. 5 is a view of the tens-carrying pinion, showing an auxiliary lobed wheel fixed thereto; this view being taken from the opposite side from that shown at Fig. 4. Fig. 6 is a perspective view of one of the sections that form the auxiliary tens-carrying shaft.

Each primary computing wheel 1 is in

the form of a gear in mesh with a gear 2, the latter fixed upon a number wheel 3. Each computing wheel 1 has a series of ten interior notches 4, whereby it is rotated. The rotation is effected by an interior master wheel 5, having opposite teeth 6 working in the notches 4; said master wheel fixed upon a shaft 7 rotated by a gear 8. Rotation of the gear 8 is effected or controlled by keys in any suitable manner, as for instance in the manner illustrated in said applications. The gangs of computing and number wheels are mounted in carriage 9 to travel step-by-step, to enable the master wheel 5 to operate consecutively upon the primary computing wheels 1, as set forth in said applications; said gear 8 being in mesh with the gear 8^a that is connected to the power-driven key-controlled escapement.

Once in each revolution of each primary computing wheel 1, a special tooth 10 thereon sets in motion a tens-carrying pinion 11, which is in mesh with the primary wheel 1 of next higher denomination, whose diameter is twice that of the pinion; said pinion being provided for this purpose with a set of five equally spaced projections 12, engageable consecutively by said special tooth 10, at successive revolutions of the computing wheel 1. The tooth 10 does not necessarily turn the pinion 11 through an entire one-fifth of a revolution, and hence does not necessarily turn the next computing wheel 1 through one-tenth of a revolution. The necessary movement of the pinion 11 and of the next higher computing wheel 1 is assisted or in part effected by one of a series of power-driven and usually constantly revolving auxiliary pinions 13; each pinion 11 being provided, for this purpose, with a series of five lugs, spurs or lobes 14, forming an auxiliary wheel; the tips of the lobes or points 14 having teeth or serrations 15 to match those of the pinion 13. A detent roll 16 is seated in one of five notches 17 between the points or lobes 14. Said roll 16 is carried on an arm 17^a, pivoted at 18, and held by a compression spring 19, occupying a hole in a bar 20. The movement of the tens-carrying pinion 11, originally effected by the special tooth 10 of the computing wheel, is sufficient to bring a point or lobe 14 into mesh with the auxiliary pinion 13. Since the latter is in constant motion, it will operate to drive the pinion 11 positively in the same direction until the latter completes its movement through one-fifth of a revolution. The movement of the tens-carrying pinion 11 is completed by said detent roll 16, and the teeth 15 are carried out of mesh with 13, the latter normally occupying one of the recesses 17, as shown.

The pinions 13 are spaced at intervals along a constantly revolving flexible shaft 22, extending along the gang of tens-carrying pinions 11, said shaft constantly rotated by any suitable source of power, as set forth in said application No. 543,603. Said shaft 22 is formed of a series of independently yieldable sections placed end to end and connected by universal joints, so that they all revolve together as one shaft; a simple but suitable universal joint for this purpose consisting of overlapping ends 23 formed on the ends of the sections, making a loose plain rabbeted scarf joint, as shown.

The outer tips of the end sections of the shaft 22 are journaled in boxes 24, working in fixed guides 25, to slide in a direction to carry the shaft to and from the axes of the tens-carrying pinions 11. Springs 26 hold these shaft sections as near said pinions 11 as they can go; the movements of the boxes caused by said springs being limited by stop pins 26^a projecting from the ends 26^b of the carriage 9. Each of the intermediate sections 22^a is also journaled between its ends in a sliding box 27, having upper and lower slotted portions or hooks 28, 29, to engage horizontal rods 30, 31, fixed in the carriage 9, on which the computing wheels are mounted; (said carriage being connected by an arm 33 to the typewriter carriage 34 carrying the platen 35, on the front of which strike the types 36). Said sliding boxes 27 are movable in the same direction as the end boxes 24, and are normally pressed forward by upper and lower springs 38, 39, the bottoms of the hooks or slots in said boxes bearing against the rods 30, 31, whereby these middle sections 22^a of the shaft are held in alinement with end sections 22.

It will be seen that the guides 25 consist of the edges of a slot formed in a plate 40, one of these plates 40 being fixed to each end 26^b of the computing carriage, upon the outer face thereof.

The flexible shaft 22 is driven by a pinion 41 on its left-hand end, which meshes with a revolving pinion 42, the latter fixed upon the end of a square shaft 43, and this is mounted in the ends 26^b of the computing carriage 6; each end of said shaft is provided with a collar or boss 44, peripherally grooved to run upon rolls 45, which run in a suitable raceway 46 in each of the plates 40. Said square shaft 43 is rotated by a pinion 47, splined thereon, which has a peripherally grooved hub to receive balls 48, the latter mounted in a race 49 provided in a bracket 50, which is fixed to and pendent from rods 51, 52 about midway of the length of the latter (said rods usually extending horizontally across the upper front portion of the frame of an Underwood typewriting machine). It will be seen that this bracket or arm 50 lies between the plates 40, in which the square shaft 43 is journaled.

The pinion 47 is rotated by a gear 53, fixed upon a horizontal shaft 54, mounted

upon the framework and carrying at its other end a bevel pinion 55, meshing with a bevel pinion 56, which is kept in constant rotation by any suitable means, as an electrical motor, as set forth in said applications. The directions of movement of the parts are indicated by arrows at Fig. 2.

Whenever any of the auxiliary tens-carrying pinions 13 is forced back by one of the lobes 14, the pinion, together with the section of the shaft upon which it is mounted, yields together with the journal box 24 or 27 upon which said section of the shaft is mounted; such yielding being permitted by the flexibility of the shaft, which is secured by reason of the sections being connected and supported as shown. The springs 26 or 38 immediately restore the shaft section and pinion to normal positions, and the pinion aids in the tens-carrying operation in the manner set forth.

It will be seen that all the parts are made of metal, which is reliable and durable and can be accurately manufactured; and that such parts may be made small and light, as required in computing mechanism which is combined with typewriting mechanism.

It will be seen that for short adding heads, the shaft 22 may be made all in one piece and yieldingly supported only in the end journal boxes 24. The flexible shaft is especially useful with long adding heads, so that only a few auxiliary pinions are disturbed at any time, thereby minimizing the resistance to the movement of the lobed wheel 14 and its connections.

Each shaft section 22 may, if desired, have a collar 57 grooved like the collar 44, and similarly running upon balls running in a raceway in the sliding journal box 27 similar to those in the end bars 40. At Fig. 3, it will be seen that the balls running in this collar 57 are designated as 58, and that the journal box 27 is provided with a removable plate 59, the parts 59 and 27 perforated to receive the collar 57, and beveled or grooved to form a raceway for the balls.

Variations may be resorted to within the scope of the invention, and portions of the improvements may be used without others.

Having thus described my invention, I claim:

1. In a computing machine, the combination with main computing wheels of high and low denominations, of a tens-carrying device extending from one of said wheels to the other, and a power-driven auxiliary pinion element; said tens-carrying device provided with an auxiliary element having drive teeth normally out of mesh with said auxiliary pinion element, and movable by said computing wheel of low denomination into mesh with said auxiliary pinion element, to enable the latter to assist in the tens-carrying operation; a shaft or axle; one of said auxiliary elements mounted upon said shaft or axle; and a yielding bearing for said shaft or axle.

2. In a computing machine, the combination with main computing wheels of high and low denominations, of a tens-carrying device extending from one of said wheels to the other, and a power-driven auxiliary pinion element; said tens-carrying device provided with an auxiliary element having drive teeth normally out of mesh with said auxiliary pinion element, and movable by said computing wheel of low denomination into mesh with said auxiliary pinion element, to enable the latter to assist in the tens-carrying operation; a shaft or axle having bearings constructed to permit yielding movement thereof, and means to restore said shaft or axle to normal position; one of said auxiliary elements mounted upon said shaft or axle.

3. In a computing machine, the combination with a gang of main computing wheels, of tens-carrying devices extending from wheels of lower denominations to wheels of higher denominations in said gang, and a series of power driven auxiliary pinions mounted upon a yielding shaft; said tens-carrying devices provided with drive teeth normally out of mesh with said pinions, and including devices for moving said drive teeth into mesh with said pinions, to assist in the tens-carrying operations.

4. In a computing machine, the combination with a gang of main computing wheels, of tens-carrying devices extending from wheels of lower denominations to wheels of higher denominations in said gang, and a series of power-driven auxiliary pinions mounted upon a shaft; said tens-carrying devices provided with drive teeth normally out of mesh with said pinions, and including devices for moving said drive teeth into mesh with said pinions to assist in the tens-carrying operations; bearings being provided for said shaft to permit a yielding movement thereof, and a spring device being provided to return the shaft to normal position.

5. In a computing machine, the combination with a gang of main computing wheels, of tens-carrying devices extending from wheels of lower denominations to wheels of higher denominations in said gang, and a series of power-driven auxiliary pinions; said tens-carrying devices provided with drive teeth normally out of mesh with said pinions, and including devices for moving said drive teeth into mesh with said yielding pinions, to assist in the tens-carrying operations; a shaft on which said pinions are mounted, independently movable journal boxes for the ends of said shaft, to permit the shaft to yield and springs to restore said journal boxes to normal positions.

6. In a computing machine, the combination with a gang of main computing wheels, of tens-carrying devices extending from wheels of lower denominations to wheels of higher denominations in said gang, a series of auxiliary pinions, and a power-driven flexible shaft whereon said pinions are mounted; carrying devices provided with drive teeth normally out of mesh with said pinions, and including devices for moving said drive teeth into mesh with said pinions, to assist in the tens-carrying operations.

7. In a computing machine, the combination with a gang of main computing wheels, of tens-carrying devices extending from wheels of lower denominations to wheels of higher denominations in said gang, and a series of auxiliary pinions, and a power-driven flexible shaft whereon said pinions are mounted; said tens-carrying devices provided with drive teeth normally out of mesh with said pinions, and including devives for moving said drive teeth into mesh with said pinions to assist in the tens-carrying operations; said shaft comprising a series of sections loosely connected end to end.

8. In a computing machine, the combination with a gang of main computing wheels, of tens-carrying devices extending from wheels of lower denominations to wheels of higher denominations in said gang, a series of auxiliary pinions, and a power-driven flexible shaft whereon said pinions are mounted; said tens-carrying devices provided with drive teeth normally out of mesh with said pinions, and including devices for moving said drive teeth into mesh with said pinions to assist in the tens-carrying operations; said shaft comprising a series of sections loosely connected end to end, and means for supporting the sections for independent yielding movements.

9. In a computing machine, the combination with a gang of main computing wheels, of tens-carrying devices extending from wheels of lower denominations to wheels of higher denominations in said gang, a series of auxiliary pinions, and a power-driven flexible shaft whereon said pinions are mounted; said tens-carrying devices provided with drive-teeth normally out of mesh with said pinions, and including devices for moving said drive-teeth into mesh with said pinions, to assist in the tens-carrying operations; said shaft comprising a series of sections loosely connected end to end by rabbeted scarf joints comprising overlapping projections provided upon the section ends.

10. In a computing machine, the combination with a gang of main computing wheels, of tens-carrying devices extending from wheels of lower denominations to wheels of higher denominations in said gang, a series of auxiliary pinions, and a power driven flexible shaft whereon said pinions are mounted; said tens-carrying devices provided with drive-teeth normally out of mesh with said pinions, and including devices for moving said drive-teeth into mesh with said pinions, to assist in the tens-carrying operations; said shaft comprising a series of sections loosely connected end to end, journal boxes being provided for the ends of said flexible shaft, and intermediate journal boxes being provided for the intermediate sections of the shaft.

11. In a computing machine, the combination with a gang of main computing wheels, of tens-carrying devices extending from wheels of lower denominations to wheels of higher denominations in said gang, a series of auxiliary pinions, and a power-driven flexible shaft whereon said pinions are mounted; said tens-carrying devices provided with drive-teeth normally out of mesh with said pinions, and including devices for moving said drive-teeth into mesh with said pinions, to assist in the tens-carrying operations; said shaft comprising a series of sections loosely connected end to end, journal boxes being provided for the ends of said flexible shaft, and intermediate journal boxes being provided for the intermediate sections of the shaft; all of said journal boxes having springs for returning them to normal positions, and means for limiting their movements under the tension of said springs.

12. In a computing machine, the combination with a gang of main computing wheels, of tens-carrying devices extending from wheels of lower denominations to wheels of higher denominations in said gang, a series of auxiliary pinions, a power-driven flexible shaft whereon said pinions are mounted; said tens-carrying devices provided with drive-teeth normally out of mesh with said pinions, and including devices for moving said drive-teeth into mesh with said pinions, to assist in the tens-carrying operations; said flexible shaft comprising independently yieldable end sections, and a series of intermediate sections yieldable independently of one another and of said end sections.

13. In a computing machine, the combination with a gang of main computing wheels, of tens-carrying devices extending from wheels of lower denominations to wheels of higher denominations in said gang, a series of auxiliary pinions, a power-driven flexible shaft whereon said pinions are mounted; said tens-carrying devices provided with drive-teeth normally out of mesh with said pinions, and including devices for moving said drive-teeth into mesh with said pinions, to assist in the tens-carrying operations; said flexible shaft comprising independently yieldable end sections, and a series of intermediate sections yield-

able independently of one another and of said end sections, journal boxes for each of said end sections and said intermediate sections, said journal boxes movable independently of one another, and springs for restoring the shaft sections and journal boxes to normal positions.

14. In a computing machine, the combination with a gang of main computing wheels, of tens-carrying devices extending from wheels of lower denominations to wheels of higher denominations in said gang, a series of auxiliary pinions, a power-driven flexible shaft whereon said pinions are mounted; said tens-carrying devices provided with drive teeth normally out of mesh with said pinions, and including devices for moving said drive teeth into mesh with said pinions, to assist in the tens-carrying operations, and a spring device for restoring said flexible shaft to normal condition.

15. In a computing machine, the combination with a series of main computing wheels, of tens-carrying mechanism including a power-driven spring-pressed shaft which is made up of a series of sections, joints connecting said sections end to end, and a series of tens-carrying pinions, several of said pinions being mounted on each section of the shaft.

16. In a computing machine, the combination with a series of main computing wheels, of tens-carrying mechanism including a power-driven spring-pressed shaft which is made up of a series of sections, universal joints connecting said sections end to end, and a series of tens-carrying pinions, several of said pinions being mounted on each section of the shaft, separate springs being provided for returning the shaft sections to normal positions.

17. In a computing machine, the combination with a gang of main computing wheels, of tens-carrying devices extending from wheels of lower denominations to wheels of higher denominations in said gang, a series of auxiliary pinions and a power-driven flexible shaft whereon said pinions are mounted; said tens-carrying devices provided with drive-teeth normally out of mesh with said pinions, and including devices for moving said drive-teeth into mesh with said pinions, to assist in the tens-carrying operations; said shaft comprising a series of sections loosely connected end to end, a series of journal boxes upon which certain of said sections are mounted, said journal boxes having slotted portions or hooks, fixed rods engaged by said slotted portions or hooks, and springs connected to said journal boxes near said slotted portions to restore the same to normal positions after displacement.

18. In a computing machine, the combination with a gang of main computing wheels, of tens-carrying devices extending from wheels of lower denominations to wheels of higher denominations in said gang, a series of auxiliary pinions and a power-driven flexible shaft whereon said pinions are mounted; said tens-carrying devices provided with drive teeth normally out of mesh with said pinions, and including devices for moving said drive teeth into mesh with said pinions, to assist in the tens-carrying operations; said shaft comprising a series of sections loosely connected end to end, a series of journal boxes upon which certain of said sections are mounted, said journal boxes having slotted portions or hooks, fixed rods engaged by said slotted portions or hooks, and springs connected to said journal boxes near said slotted portions to restore the same to normal positions after displacement, said flexible shaft being mounted in said journal boxes by means of ball bearings.

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