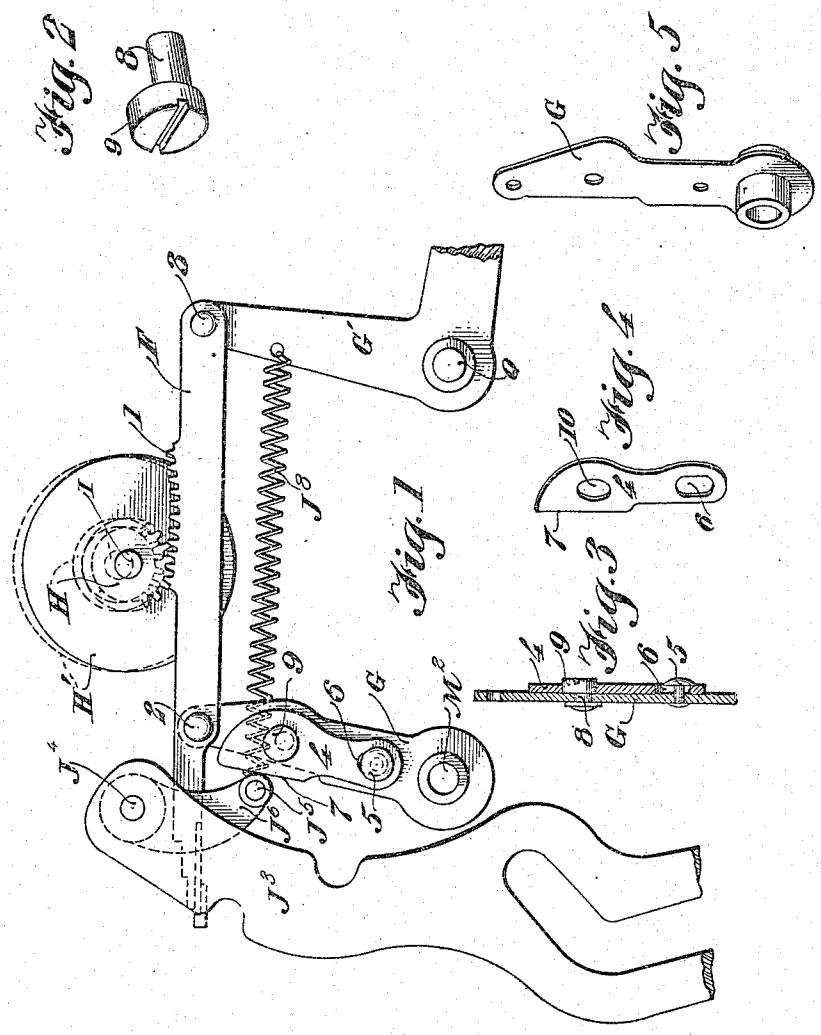
F. H. BICKFORD.

CALCULATING MACHINE.

APPLICATION FILED JULY 5, 1911.

1,228,641. Patented June 5, 1917.



WITNESSES.

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CALCULATING-MACHINE.

1,228,641. Specification of Letters Patent. Patented June 5, 1917.

Application filed July 5, 1911. Serial No. 637,018.

To all whom it may concern:

Be it known that I, FRANK H. BICKFORD, a citizen of the United States, residing at Kingston, Luzerne county, Pennsylvania, have invented new and useful Improvements in Calculating-Machines, of which the following is a specification.

This invention relates to improvements in adding or calculating machines, and more particularly to means for adjusting the relations of the parts and for preventing or taking up wear.

Such means comprises an adjustable, hardened plate having a contact face, and adapted to be secured to any part of the machine subjected to wear or battering, which part cannot be readily hardened.

The invention has been found very useful in the assembly of calculating machines, to enable the parts to be accurately lined up or adjusted, and for maintaining such adjustment by reducing wear and eliminating distortion or battering.

In the present instance, the invention is illustrated in connection with the well-known Wales calculating machine, the numeral wheels of which are turned by spring-propelled racks normally held at rest by a restoring device operated by the main or drive shaft. Upon the forward stroke of said shaft, the restoring device is withdrawn to permit the racks to drive forwardly under their spring tension until arrested by key-controlled stops previously set up in the paths of said racks.

The main shaft on its return stroke causes the restoring device to return the operated racks to their positions of rest. In the adding operation of the machine, the racks during their return, rotate the numeral wheels the proper distance to display the correct numerals at the reading line.

In taking a total of the amounts accumulated on the numeral wheels, or in clearing the machine, the wheels, by appropriate mechanism, engage said racks prior to the advance thereof, after which, and during the forward stroke of the main shaft, which withdraws the restoring member, the racks are propelled to rotate the numeral wheels to zero or starting position. The main shaft, on its return stroke, first effects the disengagement of the numeral wheels from the racks and then compels the restoration of the racks, which are ineffective to turn the counters during such restoration.

The wheels are, preferably, provided with pinions to engage the racks and it is desirable that the teeth of the pinions drop into or enter the interdental spaces of the racks accurately without rolling, which rolling might confuse the operator, though it would not affect the accuracy of the machine, and the invention, as applied in this embodiment, provides means to position the racks relatively to the pinions so that said pinions may properly mesh with said racks.

Furthermore, the contact of the restoring member with the racks or their supports was also liable to batter the parts and, by its rubbing action, would in time, cause undue wear so that said racks would not be returned quite to their former positions of rest.

Another object of this invention is to provide means tending to prevent such wear and battering of the parts.

Though the invention is illustrated in connection with a Wales calculating machine, its use is not confined thereto, nor to the particular mechanism to which it is applied.

In the accompanying drawings, Figure 1 is a detail side view of parts of a Wales adding and calculating machine provided with one embodiment of the invention.

Fig. 2 is a detail perspective of the adjusting stud.

Fig. 3 is a section showing the invention applied.

Fig. 4 is a detail perspective of the wear-resisting plate, and

Fig. 5 is a similar view of one of the rack-supporting arms to which the wear-plate is applied.

Numeral wheels H′ are mounted to turn on a laterally shiftable axle I. Pinions H fixed to turn with the wheels H′ mesh with racks 1 on rack-bars F when the axle is shifted in one direction by appropriate mechanism, not shown. Said rack-bars are pivotally supported at 2 and 3 by front and rear arms G and G′ swinging on rods M^2 and Q mounted in the frame of the machine, and are normally urged in one direction by springs J^8. A restoring bail J^5, to which the forward ends of the springs J^8 may be secured, contacts with the front arms G to

hold the racks at rest against the tension of said springs, the bail, in the present instance, being connected to turn with a rock shaft J^4 by arms J^6. The rock shaft is operated by a crank J^3 vibrated by the drive shaft, not shown. The rear ends of said springs J^8 are fastened to the rear arms G' of the several rack bars.

For a more complete disclosure of the adding mechanism of the Wales calculating machine, reference may be had to several prior patents, of which that to C. N. McFarland #842,232, issued January 29, 1907 is an example.

In the adding or accumulating operation of the machine, the forward stroke of the crank J^3 withdraws the restoring bail J^5 from the arms G of the rack bars or drive members to permit the forward ends of the racks to be advanced by their springs J^8 against key-controlled stops, (not shown), the position of which determines the amount of rotation imparted to the respective numeral wheels. Said retraction of the restoring fingers also places additional tension on the springs J^8.

After the arrest of the racks or drive member by the stops and during the forward stroke of the crank, the pinions or driven members H are meshed with said racks 1 by suitable mechanism, not shown.

The return stroke of the crank brings the restoring bail against the arms G to return the operated racks to their positions of rest. The racks during such return, by reason of their engagement with the pinions H, rotate the numeral wheels through the proper arc of travel to display the correct amount indicated by the depressed keys, at the reading line. Appropriate mechanism to return the depressed keys to normal position, is also provided.

In taking a total or in clearing the machine, the pinions H mesh with their racks at the outset of the forward stroke of the crank, and prior to the advance of the racks. The subsequent advance of the racks as the restoring bail is withdrawn, returns the wheels to starting or zero position and upon the return stroke of the crank, said pinions H are disengaged from the racks prior to the restoration of the racks by the bail J^5.

The restoring bail lies in the paths of movement of the forward rack-supporting arms G, to hold said racks normally at rest and to restore them to such position after an operation.

To insure the proper registration of the interdental spaces of the racks with their respective pinions H, especially when said pinions are meshed with the racks prior to the propulsion of the latter, an adjustment is provided, comprising, in the present instance, a take-up device applied to each arm G. Said device includes a plate 4 pivotally attached to the arm G by a pin 5 passing through an opening 6 in the plate. Said plate has a working face 7 projectable past the edge of the arm G to contact with the restoring bail. The take-up plate is adjustable to extend more or less beyond the edge of the arm and thus in effect, increase or decrease the width of said arm, to cause the rack to be forced backwardly more or less so that the interdental spaces of the rack adjacent the pinion will lie directly in line with the teeth of the pinion, to permit the pinion to mesh accurately with the rack without further adjustment or rolling contact.

Such adjustment of the plate is preferably attained by turning a stud 8 mounted in the arm G and having an eccentric head 9 fitting a hole 10 in the plate, the eccentric movement thus given the plate being accommodated by elongating the pivot opening 6 thereof. The head 9 of the eccentric stud may be kerfed to facilitate its rotation by a suitable tool, and means, as a friction washer on the stud and bearing against the arm 9, may hold the stud against accidental rotation or disengagement. By the employment of an eccentric and friction washer, the contact of the restoring bail with the plates has no effect on the adjustment, the eccentric being self locking in this respect. That is to say, the impact of the wear plates against the restraining and restoring member or vice versa, cannot shift the plate out of its adjustment because of the blow which is transmitted to the eccentric, which is locked where adjusted, by the friction washer, no additional locking means being necessary to hold the eccentric against accidental turning.

To prevent the contact of the restoring bail from battering the arms or the plates, and thereby affecting the adjustment, as well as to resist the wear caused by the rubbing of the bail along the working faces of the plates, the latter are preferably made of hardened steel.

It is obvious that by means of this adjustment any wear may be compensated for and any looseness or undue freedom of action taken up.

What I claim is:—

1. The combination with coöperating members, at least one of which is shiftable; of a plate shiftably connected to one of said members, and having its working face projectable beyond said member to be contacted by the other member; and an eccentric seated in the plate and connected to the member which supports the plate, to adjust the position of the plate, relatively to its support.

2. The combination with coöperating members, at least one of which is shiftable; of a plate shiftably connected to one of said

members, and having its working face projectable beyond said member to be contacted by the other member; and a stud journaled in the member bearing the plate, and having an eccentric head entered in an aperture in the plate, to adjust the latter.

3. The combination with coöperating members, at least one of which is shiftable, said members being required to maintain a predetermined relation; of means to compensate for the wear of one of said members and effective to maintain said predetermined adjustment; and self-locking means to adjust the compensating means and to hold it where adjusted.

4. In a calculating machine, the combination with coöperating members, at least one of which is shiftable; of an adjustment for said members, comprising a wear plate shiftably connected to one of said members for movement relatively thereto; said plate having an aperture; and an eccentric entered in the aperture to adjust the plate.

5. The combination with coöperating members, at least one of which is shiftable; of an adjustment for said members, comprising a wear plate having an elongated slot; a pin passing through the slot to connect the plate to its member; said plate having an aperture; and an eccentric entered in said aperture to adjust the plate.

6. The combination with coöperating members, at least one of which is shiftable; of an adjustment therefor, comprising a wear plate interposed between and carried by one of said members, and adapted for both longitudinal and lateral shifting; and means to adjust the plate.

7. The combination with coöperating members, at least one of which is shiftable; of a wear plate shiftably mounted on one of the members to maintain a predetermined adjustment of the members; and a self-locking means to shift the plate to, and hold it in, adjusted position.

8. The combination with coöperating members; of a wear compensator adjustably supported on one of the members and having a face projectable beyond the edge of the supporting member to be contacted by the coacting member; and an eccentric mounted in the supporting member and in direct contact with the compensator to adjust the latter relatively to the coacting member.

9. The combination with coöperating members; of a wear compensator adjustably supported on one of the members and having a face projectable beyond the edge of the supporting member to be contacted by the coacting member; and a stud journaled in the supporting member and having an eccentric head fitted in an aperture in the compensator to adjust the latter and lock it where adjusted.

10. The combination with coöperating members; of an adjustment therefor, including a compensating plate shiftably mounted on one of said members to move therewith, and contact the other of said members; and self-locking means to adjust the shiftable plate to, and hold it in, adjusted position.

11. The combination with coöperating members; of an adjustment therefor, including a wear compensator interposed between the members, and having an elongated slot; a fastening passing through the slot to pivotally secure the compensator to one of said members; the compensator having an aperture; and an eccentric entered in the aperture to adjust the compensator relatively to its supporting member.

12. The combination with coöperating members; of an adjustment therefor, including a wear compensator interposed between the members, and adapted for both a longitudinal and a lateral shifting movement; and means to adjust the wear compensator.

13. The combination with coöperating members; of an adjustment therefor, including a wear compensator interposed between the members, and adapted for both a longitudinal and a lateral movement; and self-locking means to adjust the wear compensator.

FRANK H. BICKFORD.

In the presence of:—
CHAS. V. WILGUS,
FRED ALLEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."