

M. C. CRAWLEY.
 ADDING ATTACHMENT FOR TYPE WRITING MACHINES.
 APPLICATION FILED JULY 28, 1908.

1,050,347.

Patented Jan. 14, 1913.

4 SHEETS—SHEET 1.

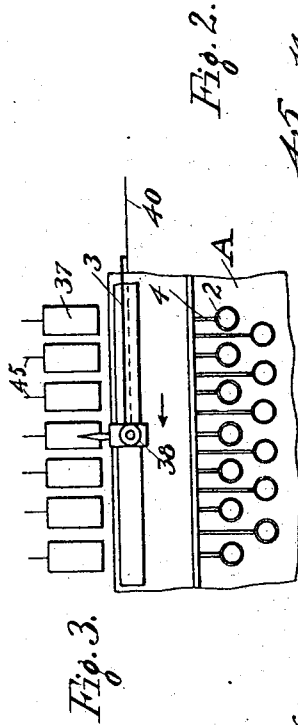


Fig. 2.

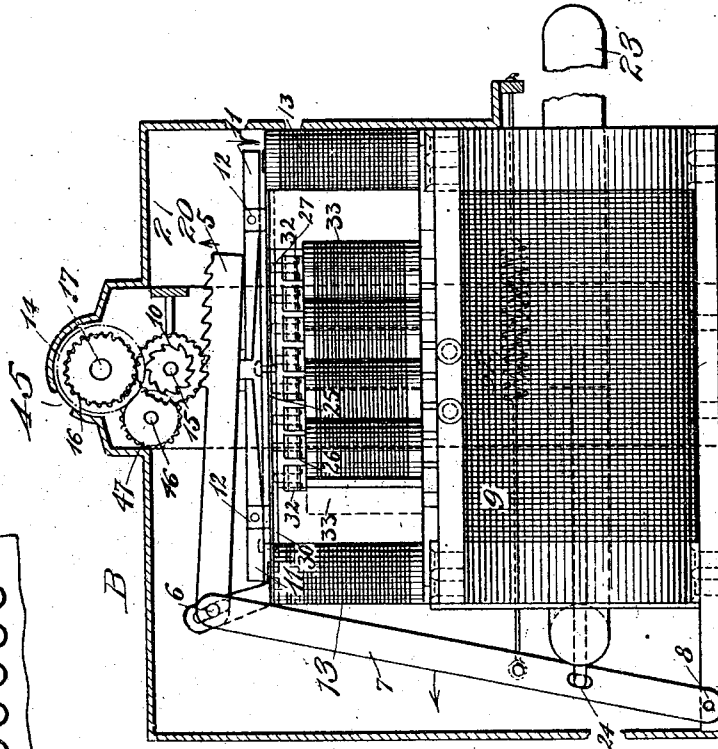
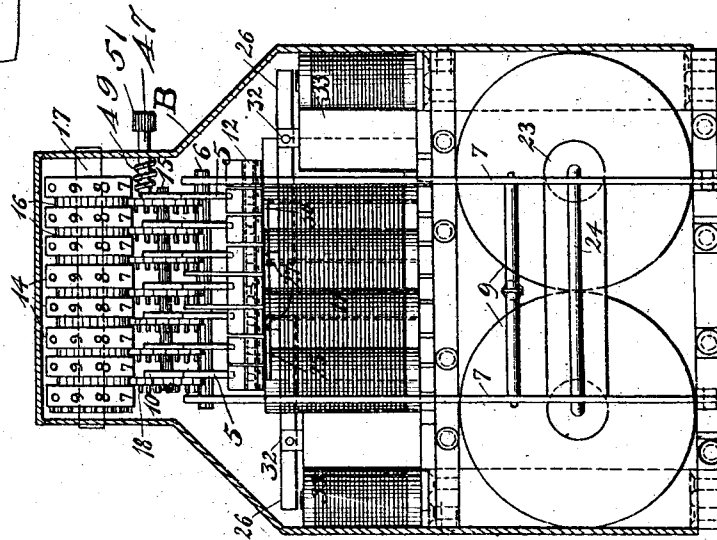


Fig. 1.



WITNESSES

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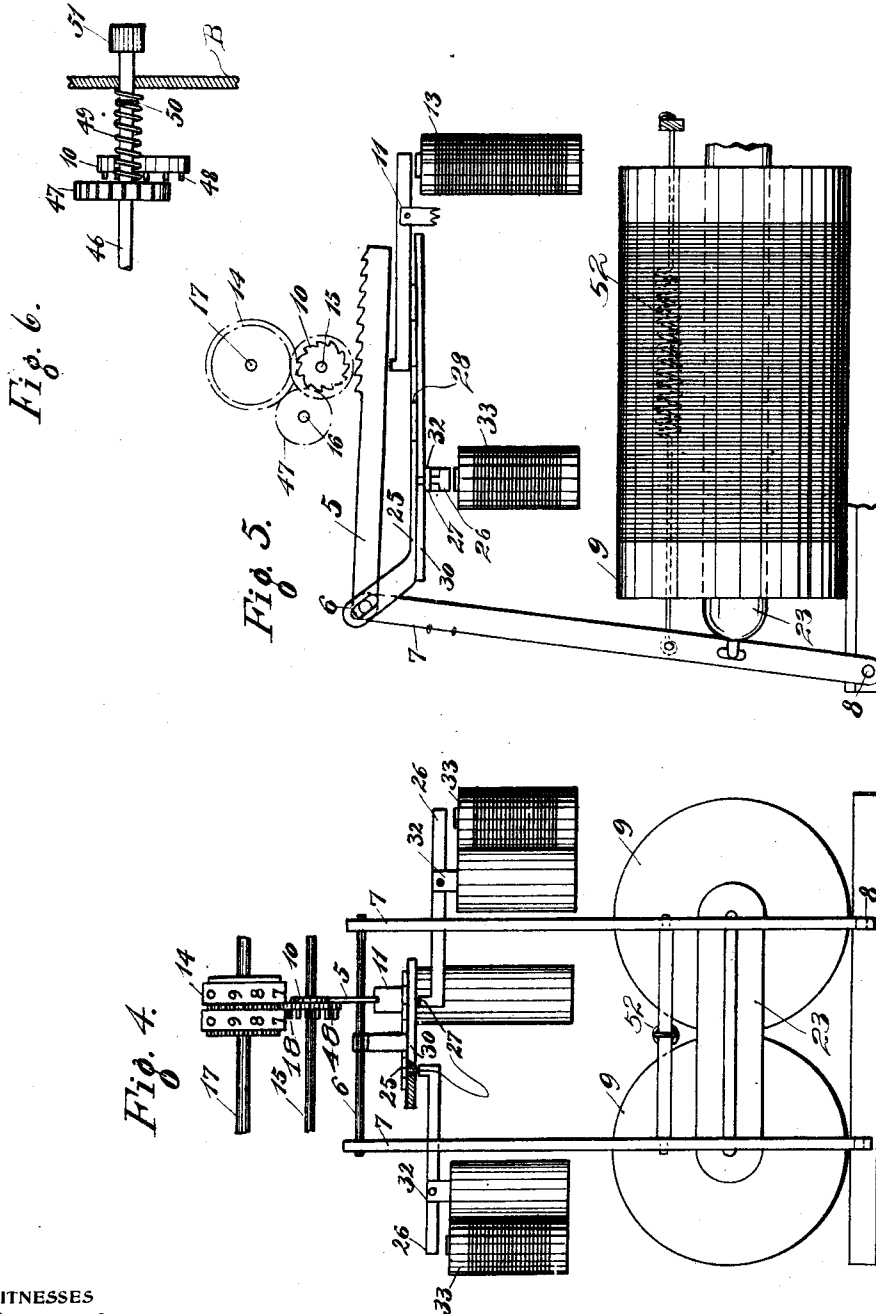
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4 SHEETS—SHEET 2.



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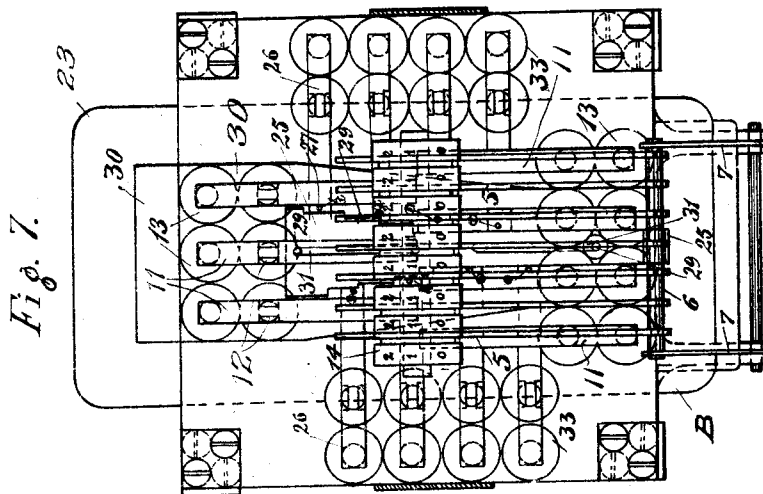
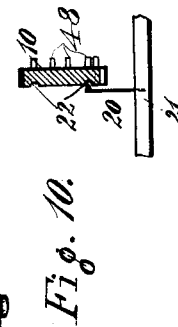
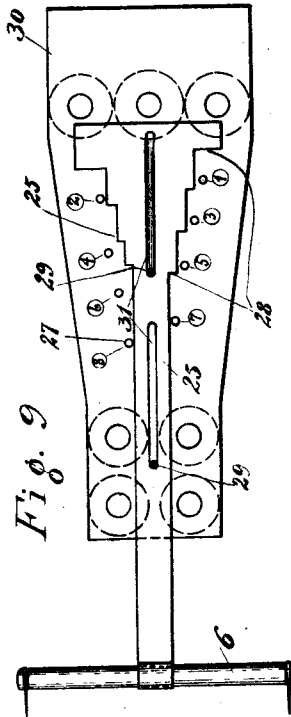
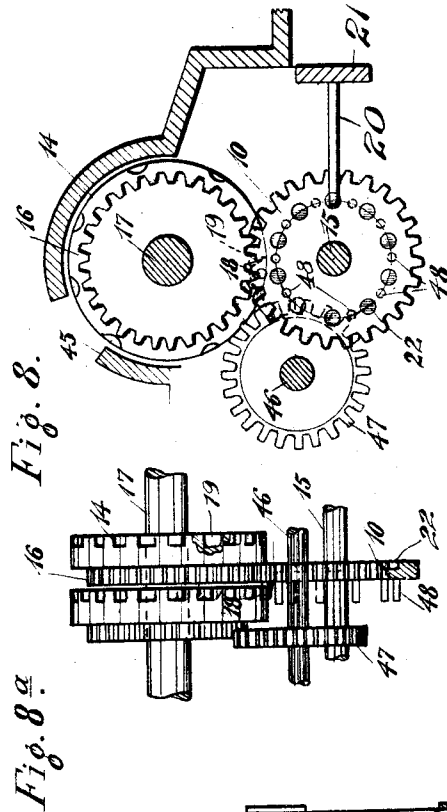
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4 SHEETS—SHEET 3.

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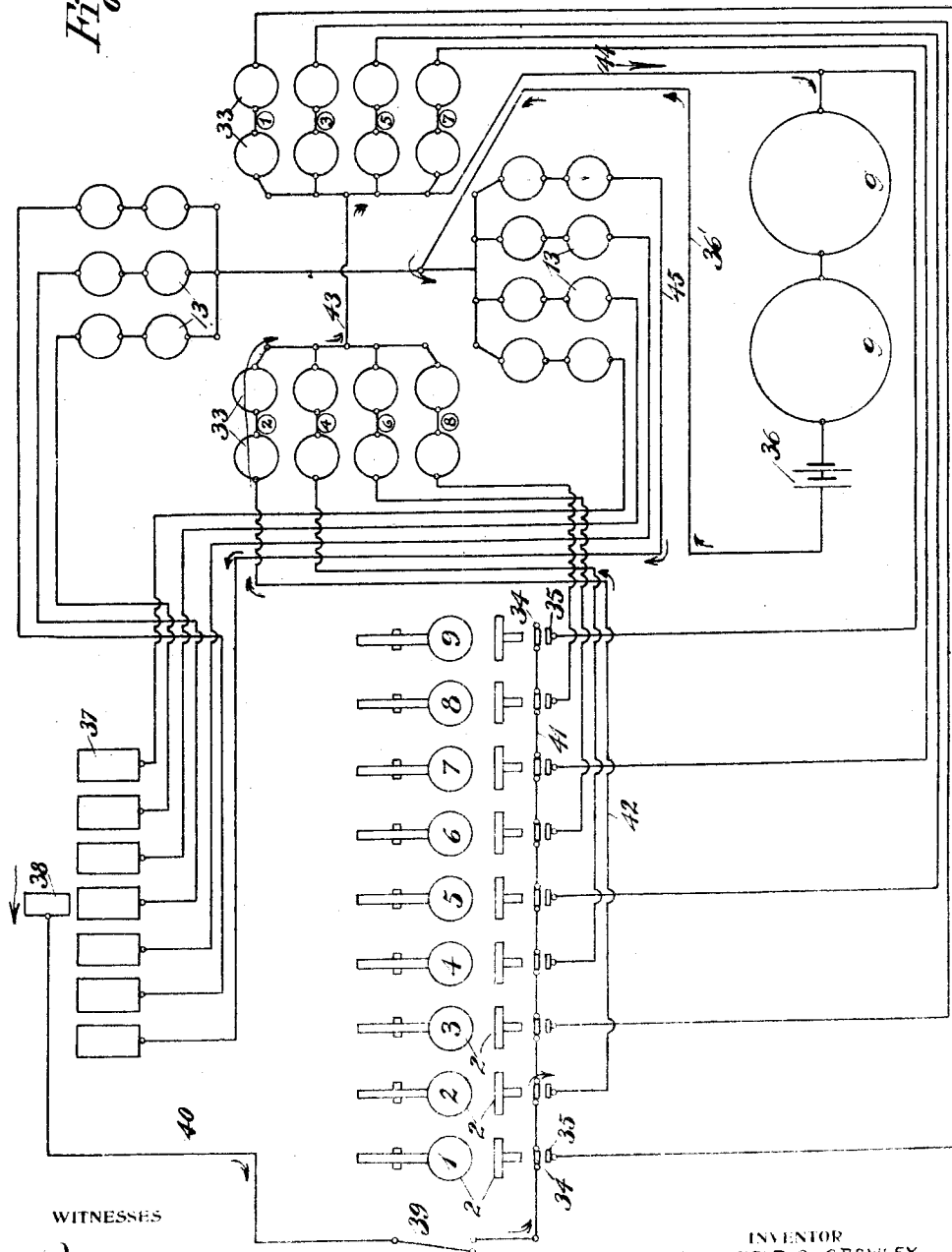
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4 SHEETS-SHEET 4.

Fig. 11.



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UNITED STATES PATENT OFFICE.

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ADDING-ATTACHMENT FOR TYPE-WRITING MACHINES.

1,050,347.

Specification of Letters Patent.

Patented Jan. 14, 1913.

Application filed July 28, 1908. Serial No. 445,702.

To all whom it may concern:

Be it known that I, MANSFIELD C. CRAWLEY, citizen of the United States, residing at Orcutt, in the county of Santa Barbara and State of California, have invented new and useful Improvements in Adding Attachments for Type-Writing Machines, of which the following is a specification:

This invention relates to adding machines, and pertains particularly to a mechanical adding attachment for an ordinary typewriting machine.

The object of my invention is to provide an adding machine which may be attached to any typewriter having a keyboard and sliding carriage, and which will automatically add and carry the total of any list of figures that may be printed by the typewriter; and which will allow the numerals on the keyboard of the typewriter to be used in printing figures on any part of the sheet; which will be electrically operated, and will be provided with suitable means whereby any number of any denomination may be automatically brought into operation when the carriage comes into position to close the electric circuit, to print the proper figure in the proper column; which machine will not in any way interfere with the typewriter to which it is attached, but will allow the typewriter to be used for any and all purposes for which it might be used were the adding machine not attached thereto; and which adding apparatus will be simple, practical, reliable in operation, and not liable to get out of order.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a front elevation, the case being in section. Fig. 2 is a side elevation. Fig. 3 is a fragmentary plan of a keyboard and contact elements. Fig. 4 is a detail of the control levers, in side elevation. Fig. 5 is a detail of the rack operating elements. Fig. 6 is a detail of the resetting gear. Fig. 7 is a general plan of the attachment. Fig. 8 is a diagrammatic view of the pin-gear

and associated elements. Fig. 8^a is a side view of same. Fig. 9 is a plan of the stop action. Fig. 10 is a detail of the brake. Fig. 11 is a diagram showing the electric circuits.

A represents the frame of an ordinary typewriting machine provided with the usual keys 2 and the sliding carriage 3. The keys 2 connect with operating levers 4 by which the type, not shown, are operated in a manner well known in the art.

The adding attachment forming the essential feature of the present invention comprises a suitable frame or casing B housing the adding and computing mechanism, and electrically connected with the keys and carriage of the typewriter in the manner as hereinafter substantially described.

The frame or casing B may be of any suitable size, shape or material, and may be entirely independent of the typewriter, it being designed to stand on the table or desk near the typewriter.

The adding and computing mechanism includes a series of rack-bars 5, there being as many of these rack-bars as there are denominations and numerals. That is to say, there is a unit rack-bar, a tens rack-bar, a hundreds rack-bar, and so on; the unit rack-bar being arranged at the extreme right, as herein shown, and increasing up to the millionths denomination to the extreme left. Manifestly there could be any number of these rack-bars, according to the desired capacity of the machine. These rack-bars are loosely fulcrumed at 6 to a rocking frame 7, which latter is fulcrumed at 8 and is oscillated by means hereinafter described, on the energizing of a main magnet or magnets 9. Each rack-bar has an oscillating movement independent of every other rack-bar and toward and from a respective denomination pinion 10; the oscillation of each rack-bar being accomplished by suitable means, as a lever 11 fulcrumed to a fixed stud 12 and operated on the energization of a respective coil 13. The reciprocation of the bars 5 is accomplished by the oscillation of the frame 7, and the oscillatory movement of any particular bar 5 to

carry it into mesh with its respective denomination pinion 10 being accomplished by a respective lever 11 and coil 13. There is a denomination pinion 10 for each rack-bar, and each denomination pinion controls a corresponding count-wheel 14. The denomination pinions 10 are loosely mounted on a shaft 15, and with these pinions meshes a corresponding gear 16 on a respective count-wheel, the several count-wheels being loose on the count-wheel shaft 17, and denominationally arranged in train.

The number of teeth on the rack-bar 5 and on the respective intermeshing pinions 10-14 is such that a complete reciprocation of a rack-bar will serve to turn both its denomination pinion and its count-wheel nine-tenths of a revolution; and suitable connections are made between each of the count-wheels, so that a full revolution of the unit wheel will turn the tens wheel one-tenth of a revolution, and correspondingly a full revolution of the tens wheel will turn the hundreds wheel one-tenth of a revolution, and so on. This inter-drive of the count-wheels is done by a small pin 18 on each denomination pinion adapted to intermesh at each full revolution of that pinion with a notch 19 in the rim of the next adjacent count-wheel.

Any suitable form of brake or click may be employed to limit the movements of the various count-wheels and denomination pinions, as, for example, the spring click 20 mounted on bar 21 and engaging depressions 22 on one side of the denomination pinions 10. There are ten of these depressions, and at each one-tenth of a revolution the knob on the end of the brake 20 engages in a depression and tends to limit its further movement.

There is an armature lever 11 and respective coil 13 for each rack-bar 5, and whenever a coil 13 is energized the armature end of the lever is pulled down, and the other end lifted to carry its particular rack-bar into mesh with its pinion 10. If the coil 9 is then energized, the core 23 of the latter, which core has a non-magnetic connection 24 with the frame 7, will be drawn into the coil, and the frame 7 will be oscillated to reciprocate all the bars 5. However, the only rack-bar which will operate any pinion is the one which is lifted by its particular lever 11, and the operation of this lever is controlled by a particular key on the keyboard of the typewriter, as will be shortly explained.

Each rack-bar 5 is designed to be reciprocated only a distance, however, corresponding to the numeral represented by the key struck on the keyboard of the typewriter. That is to say, suppose "129" is to be struck on the typewriter and represented on the adding machine. "1" is in the hundreds

column or denomination, "2" is in the tens column, and "9" is in the units column. Since the several racks 5 correspond to denominations of numbers, the levers 11 also correspond to these denominations, and when the key for numeral "1" is struck, the hundreds lever 11 will be lifted to carry the hundreds rack 5 into mesh with the hundreds denomination pinion 10. But since the hundreds count-wheel should only register "1", it is, therefore, necessary to limit the reciprocating movement of the rack 5, so that the hundreds denomination pinion and the hundreds count-wheel will only be given one-tenth of a revolution. This is done by limiting the length of reciprocation of the bars 5 specially, in accordance with the particular number struck on the keyboard of the typewriter, by means of a limiting plate 25 and a series of magnetically operated levers 26 having pins 27 which are interposable in the path of respective shoulders or abutments 28 on plate 25, the operation of which plate will shortly be described. When the key for the number "2" in the tens column of the sum "129" above referred to is struck, the tens lever 11 will be lifted to operate the tens rack-bar 5 and correspondingly operate the tens denomination pinion and count-wheel; the length of the reciprocation of the tens rack-bar being limited by the plate 25 to two-ninths of a full reciprocation. When the "9" key on the keyboard is struck, representing the units, the units lever 11 and its rack-bar 5 and corresponding units pinion 10 and count-wheel will be operated similarly; there being no need of a limiting lever 26 and pins 27 for the "9" key because bar 25 moves its full stroke then and is only limited by the pins 29.

The plate 25 is pivotally connected with the fulcrum bar 6 to which the several rack-bars 5 are pivoted, and the plate 25 reciprocates in unison with the rack-bars. The plate is guided in its reciprocating movements by suitable means, as the pins 29 fixed to the bed-plate 30 and operating in the slots 31 in plate 25.

There are only eight of the pins 27, corresponding to Figs. 1 to 8 inclusive, while the pins 29 serve for the numeral "9". The pins 27 which are carried by the levers 26 operate through holes in the bed-plate 30, and normally all these pins 27 are depressed below the plane of plate 25, so that if the magnet 9 is energized, the plate 25 and rack-bars 5 would make a full reciprocation. The pins 27 are disposed, however, in such staggered relation, as shown in Fig. 9, that pin representing numeral "1", if raised into the path of its respective shoulder 28 on plate 25, will allow the plate 25 to make only one-ninth of a reciprocation, and so

on, with each succeeding pin. In order graphically to illustrate the operation of this check mechanism, I have numbered the pins corresponding with their numerical value by means of a small circle inclosing the numeral represented by the particular pin; thus: ①, ②, etc. The levers 26 which carry the limiting or stop pins 27 are fulcrumed to a fixed standard 32 and are acted on by respective magnets 33. The manner of operating these several magnets and accomplishing the desired results, is effected from the keyboard of the typewriter by suitable electrical connections, as follows:

Arranged beneath each key bar 4, corresponding to the numerals 1 to 9 inclusive, is a respective spring contact member 34; all these contact members 34 being electrically connected in series and normally insulated from the remainder of the apparatus. Each contact member 34 has a complementary contact member 35 toward and from which it is movable to close a circuit. Each contact member 35, except the contact for key "9", is electrically connected with a corresponding limiting coil 33. The other terminal of all the coils 33 connects with the main magnets 9, and the current thence passes through the batteries 34 by a wire 36' through the denomination magnets 13; the other terminals of these denomination magnets are connected with respective contact points or commutator sections 37 insulated from and carried by the frame of the typewriter. These contact surfaces or commutator sections 37 are arranged with relation to an adjustable contact point 38 mounted on, and insulated from, and slidable lengthwise of, the typewriter carriage 3. This contact point 38 is adapted to be moved over the several commutator sections 37, and whenever the contact point 38 is over any particular section and switch 39 closed, a current will be sent through the apparatus corresponding to the particular commutator section 37 on which the point 38 is resting; the point 38 having suitable electrical connections 40 with the several contacts 34. The object of the switch 39 is to disconnect the adding apparatus from the typewriting machine and allow the typewriter to be operated without closing any circuits or actuating the adding machine.

The commutator sections 37 represent various denominations in sequence from left to right, as units, tens, hundreds, etc., just as the magnets 13, rack-bars 5, pinions 10 and count-wheels 14 represent various denominations.

The operation of the invention is as follows: Assuming that a column of figures is to be tabulated on the typewriter, and the sum of the column determined: The carriage is shifted so as to permit printing on

any desired portion of the sheet, and the pointer 38 moved so that it will stand over the unit section 37 whenever the carriage is in position to have a unit numeral printed on the sheet. The direction of movement of the carriage in printing is indicated by the arrow adjacent to pointer 38. Fig. 3. The switch 39 is closed; and then assuming that a set of figures such as "2" and "19" are to be added together, the carriage is in position so that the unit number "2" will be printed in the right place. This also means that the pointer 38 is over the unit section 37. The key on the typewriter indicating the figure "2" is then struck, and the circuit closed, which may be traced as follows, by reference to the diagrammatic Fig. 11, Pressing down on key "2," which for the time being is of the units denomination, its respective contacts 34—35 are moved to close the circuit between the bus-wire 41 and a wire 42 which leads through a respective "2" limiting magnet 33, thence across by wire 43 to a wire 44, through the main magnets 9, thence through the battery 36, through wire 36', through the unit denomination magnet 13, thence by a wire 45 to the unit section 37, and through pointer 38 to the place of beginning. The circuit thus traced first energizes the "2" limiting magnet 33 to pull down on its lever 32 and project its "2" pin 27 up through a hole in the plate 30 and in the path of a corresponding shoulder 28 of the limiting plate 25. The current energizes the main magnet 9, actuating its core 23 to rock the frame 7 and reciprocate the rack-bars 5 simultaneously in one direction. These rack-bars 5, however, can only move two tooth spaces, owing to the obstruction afforded by the "2" limiting pin. At the same time that the limiting magnet 33 and the main magnet 9 are energized, the unit denomination magnet 13 is also energized to pull down unit lever 11 and lift the unit rack-bar 5 into engagement with the unit denomination pinion 10. Consequently, when the circuit is completed the unit count-wheel 14 will indicate "2" through a suitable window opening 45 in the adding machine casing. As soon as the pressure on the unit key "2" is released, a spring 52 acts to retract the core members 23, rock the frame 7, and thereby throw the rack-bars 5 back to initial position; the releasing of the key having interrupted the circuit in all the coils so that the bars 5 drop down clear of the pinions 10 and do not act on these pinions in being returned to initial position by the action of the spring 52. The next number to be written being "19", the carriage is backed up so that the "1" will be printed in the tens column, and the operation is repeated. This time when the key "1" is struck in tens

column it will act through a similar circuit as before to register on the tens count-wheel; but when the "9" key is struck, there is no need for a limiting magnet in the "9" key circuit, because the bar 25 may now go its full stroke, limited only by the pins 29. As each set of figures is written, one set under the other in column form, the total is represented in a manner well understood, on the count-wheels and through the window 45. When it is desired to print the total, the switch 39 is opened so that the count-wheel will not be disturbed for the time being, and the total is then written in on the typewriter in the usual fashion. The switch 39 is intended to remain open at all times, except when it is actually desired to tabulate or determine the sum of any column of figures.

The counting attachment can be set back to zero at any time by suitable means, as the shaft 46 and pinion 47 adapted to engage with the long pins 48 on the several denomination pinions 10. The shaft 46 is suitably mounted in the frame of the adding attachment and has a limited sliding movement to carry the teeth on the spur gear 47 into and out of the range of action of the pins 48; a spring 49 normally maintaining the gear 47 in neutral inoperative position, and a collar 50 limiting the movement of the shaft which carries the gear 47 into engagement with the pins 48. The shaft 46 is turned in either direction by suitable means, as the milled head 51. There are but nine of the pins 48, although there are spaces for ten around a circle. That is to say, two of the pins are separated from each other by an arc of 72° , while the other pins are separated by arcs of 36° each; this wider space allowing the gear 47 to be moved up close to its respective denomination pinion 10, and to be turned without touching any of the pins 48; this open space corresponding to zero on the count-wheels. In consequence of this construction, all the count-wheels can be set at zero at any time by simply pulling over on the shaft 46 to carry the several gears 47 toward their respective denomination pinions 10; and then by turning the shaft 46 only those denomination pinions which have been moved, and which do not already stand at zero, will be turned; and the moment that any count-wheel comes to zero it will stop, because its respective resetting gear 47 is turning free in an open space between a set of pins 48.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. The combination with a typewriter and the carriage thereof, of a typewriter key, a computing wheel, means including a rack

bar for operating the computing wheel, and electro-magnetic connections through the carriage and controlled by the key for operating said bar, said rack bar pivoted at one end, a sliding stop plate moving in unison with the rack bar, and means for varying the limit of sliding movement of said plate.

2. The combination with a typewriter carriage and an operating key, of a computing wheel, means including an oscillating rack bar for operating the wheel, a kicker for throwing the rack bar into operative relationship with the computing wheel, and electro-magnetic connections through the carriage and controlled by the key for actuating said kicker and reciprocating said bar, a sliding stop plate moving in unison with the rack bar, and means for varying the limit of sliding movement of said plate, said last named means including selective stop pins, and means for controlling the action of the pins.

3. The combination with a typewriter carriage and an operating key, of a computing wheel, means including a rack bar for operating said wheel, a sliding stop plate and coacting stops for limiting the reciprocating motion of the rack bar, and electrical connections controlled by the key for actuating the rack bar and said stop mechanism coördinately.

4. The combination with a typewriter carriage, of a series of numbering keys, a series of count-wheels, denominationally arranged in trains for units, tens, hundreds, etc., mechanical means for actuating said count-wheels, electrical connections with the carriage and controlled by the keys for actuating said count-wheel operating means, and selective mechanism for the count-wheel operating means controlled by the carriage, said selective mechanism comprising a sliding stop plate, and pins movable into and out of the path of said stop plate.

5. The combination with an operating numbering key, of a series of count-wheels denominationally arranged in train for units, tens, hundreds, etc., a denomination pinion for each count-wheel, a reciprocating rack bar for each denomination pinion, said rack bars movable toward and from the respective pinions, electro-magnetic means controlled by said key for operating the several rack bars, and selective mechanism by which only the rack bar of the particular denomination will be operated at one actuation of said key, said selective mechanism comprising a sliding stop plate, and pins movable into and out of the path of said stop plate.

6. The combination with an operating key, of a plurality of count-wheels denominationally arranged in train, denomination pinions corresponding thereto, rack bars en-

gageable and disengageable with respective of said pinions, mechanism controlled by the key for engaging and disengaging the rack bars with said pinions, and selective mechanism whereby only the rack bar corresponding to the denomination of the number struck by the key will be engaged with the pinion, said selective mechanism comprising a sliding stop plate, and pins movable into and out of the path of said stop plate.

7. The combination with an operating key, of a plurality of count-wheels denominationally arranged in train, denomination pinions corresponding thereto, rack-bars engageable and disengageable with respective of said pinions, mechanism controlled by the key for reciprocating the rack bars, mechanism controlled by the key for engaging and disengaging the rack bars with said pinions, selective mechanism whereby only the rack bar corresponding to the denomination of the number struck by the key will be engaged with the pinion, and means for limiting the reciprocating movement of said rack bar, said last named means including a sliding stop plate with stops corresponding to the rack bars and movable into and out of the path of the stop plate.

8. The combination of an operating key, a count-wheel, a denomination pinion connected with said count-wheel, a rack bar engageable and disengageable with said pinion, electro-magnetic means and electrical connections controlled by the key for reciprocating said rack bar, electro-magnetic means and connections controlled by the key for engaging the rack bar with said pinion, and electro-magnetic means and connections controlled by said key for limiting the reciprocating movement of said rack bar, said last named means and connections including a reciprocating stop plate with stops corresponding to the rack bars and movable into and out of the path of the stop plate.

9. The combination of a series of denomination pinions, count-wheels arranged denominationally in train and operative by said pinions, pivoted rack bars engageable and disengageable with said pinions, electrically-operated means for reciprocating the rack bars, and electrically operated means for independently engaging and disengaging the several rack bars with their respective pinions, said last named means including a pivoted kicker bar, and a magnet operative thereon to throw the rack bars into engagement with their pinions.

10. The combination of a series of denomination pinions, count-wheels arranged denominationally in train and operative by said pinions, rack bars engageable and disengageable with said pinions, electrically-

operated means for reciprocating the rack bars, electrically operated means for independently engaging and disengaging the several rack bars with their respective pinions, and electrically operated selective mechanism for limiting the movement of said rack bars, said selective mechanism comprising a sliding stop plate, and pins movable into and out of the path of said stop plate.

11. The combination of a series of denomination pinions, count-wheels arranged denominationally in train and operative by said pinions, a rocking yoke, rack bars pivoted to the yoke and movable in unison therewith, a sliding stop plate carried by the yoke and movable in unison with the rack bars, staggered stop pins corresponding to the rack bars and interposable successively in the path of the stop plate, a key-board, means to move the racks into engagement with their pinions; and electrical connections operating through the keys on the key-board and through said yoke and stop pins and the means for engaging the racks with the pinions, the yoke will be operated and the particular count-wheel will be operated corresponding to the keys struck.

12. The combination of a series of denomination wheels, a series of pinions related thereto, rack bars effective upon said pinions, and means for controlling the reciprocation of said bars, said means including a reciprocating plate having staggered shoulders engageable with stops which limit the reciprocation.

13. The combination of a series of wheels, a series of pinions operative upon said wheels, a device for actuating the pinions, said device including a rack carrier severally engageable with the pinions, means for controlling each rack, and a mechanism for limiting the reciprocation of the racks, said mechanism including a plate connected to the frame and a series of pins engageable with the plate.

14. The combination of a series of denomination wheels, pinions operative upon said wheels, a reciprocating frame, racks connected thereto engageable with the pinions, a plate connected to the frame and having lateral shoulders, and stop pins engageable with said plate to limit the movement of the plate.

15. The combination in an adding machine, of a plurality of denomination wheels, means for actuating said wheels, and a device for controlling the actuating means, said device including a plate having staggered, lateral projections, and movable stops engageable with said projections.

16. The combination with a typewriting machine, of a computing mechanism including count-wheels, instrumentalities for ac-

tuating said wheels, and a device for limiting the actuations of said wheels, including a plate having lateral, staggered shoulders on opposite edges adapted to engage stops.

- 5 17. The combination in a computing mechanism of denomination wheels, reciprocable, tiltable racks for actuating same, a reciprocating plate having staggered, lateral shoulders on its edges connected to the

racks, and selective pins for limiting the movement of the plate.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

MANSFIELD C. CRAWLEY.

Witnesses:

H. G. BUNOUS,

A. L. STILLMAN.

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