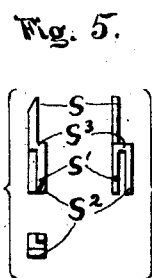
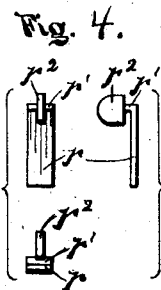
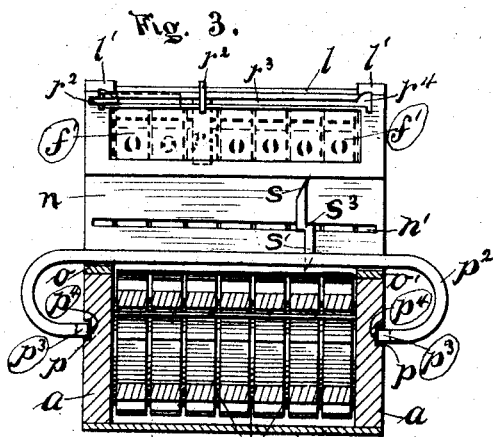
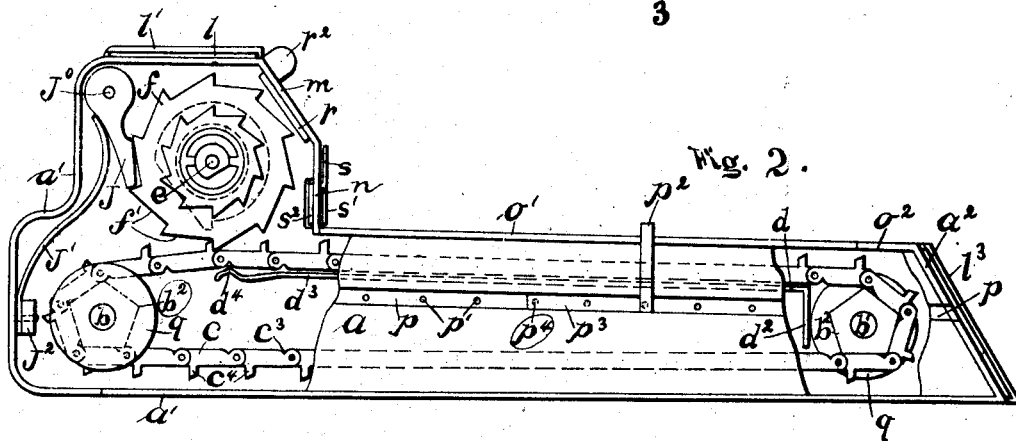
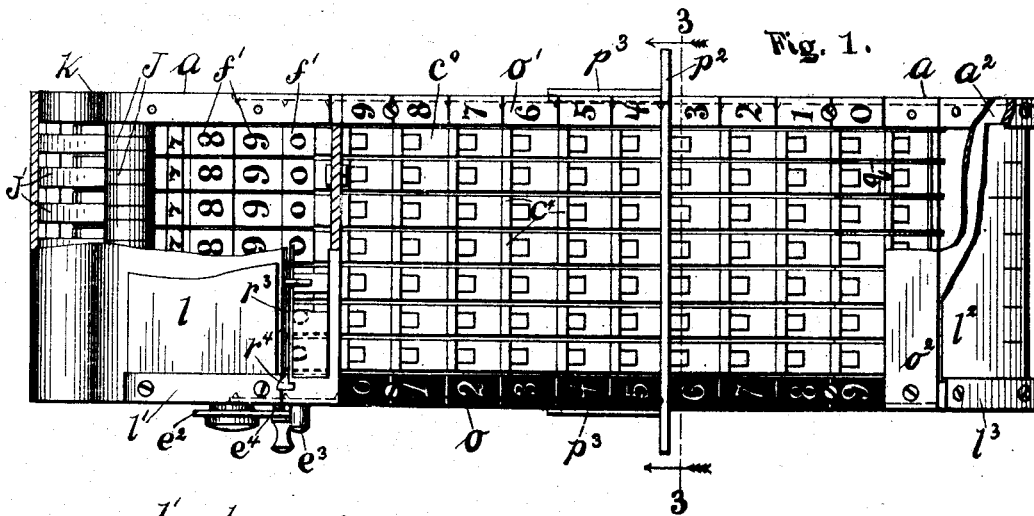


H. GOLDMAN.  
CALCULATING MACHINE.

(Application filed Jan. 25, 1897.)

(No Model.)

2 Sheets—Sheet I.



Witnesses.  
*E. G. Jaeger.*  
*J. P. Reed*

Inventor.  
*Henry Goldman*  
 by *Wm. Zimmerman*  
 Att'y.

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CALCULATING MACHINE.

(Application filed Jan. 25, 1897.)

(No Model.)

2 Sheets—Sheet 2.

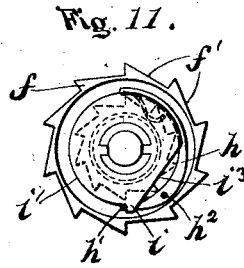
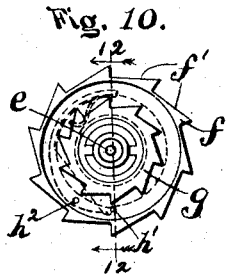
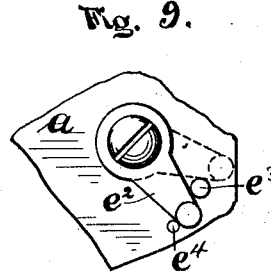
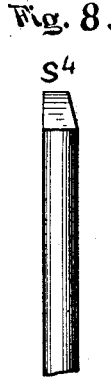
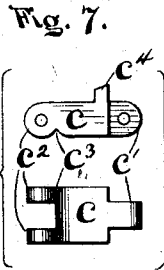
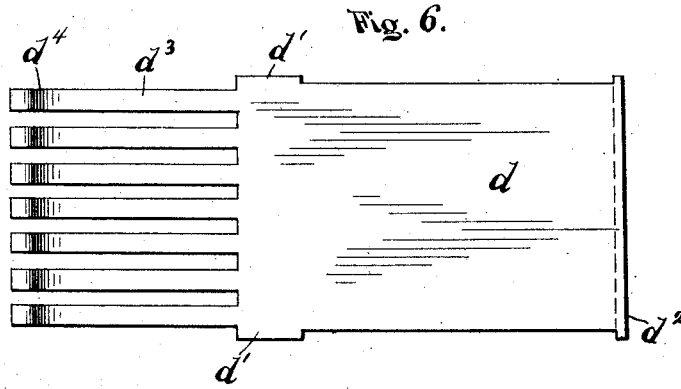


Fig. 12.

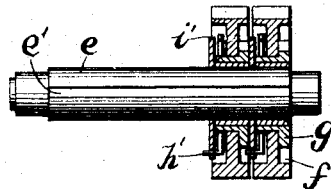
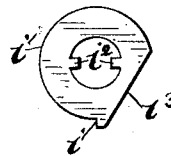


Fig. 13.



Witnesses.

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Att'y.

# UNITED STATES PATENT OFFICE.

HENRY GOLDMAN, OF CHICAGO, ILLINOIS.

## CALCULATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 617,094, dated January 3, 1899.

Application filed January 25, 1897. Serial No. 620,630. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY GOLDMAN, 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 Calculating-Machines, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof, and in

10 which—  
Figure 1 shows my said calculating-machine in plan view, with part of the covering of several parts removed to expose the mechanism below such covering. Fig. 2 shows a side view of the same with parts of the side removed to expose the mechanism hidden by said removed parts. Fig. 3 shows a transverse section of Fig. 1 on a plane 3 3. Fig. 4 shows a plan, side, and end elevation of a movable shield or shutter. Fig. 5 shows a plan, side, and end elevation of a movable pointer. Fig. 6 shows a table or carrier in plan view with a series of spring-stops to the endless chains of the machine. Fig. 7 shows a chain-link of one of a series of chains used in side elevation and under side in plan view. Fig. 8 shows a stylus to be used with the machine. Fig. 9 shows a fragment of the side of the case with crank and stops on the shaft of the registering-wheels. Fig. 10 shows in end view a digit-wheel and its inner construction from the crank end of its shaft. Fig. 11 shows the same device as that shown in Fig. 10 on its reversed side with its mechanism. Fig. 12 shows the drum or registering-wheel shaft with two digit-wheels in central longitudinal section on the plane 12 12 of Fig. 10. Fig. 13 shows a cam forming part of the elements between any two drums used to operatively connect a series of such registering-wheels.

Like letters refer to like parts.

The object of my invention is to produce a calculating-machine of more simple construction, convenient operation, and greater range of capacity within a price far more acceptable than it has heretofore been possible to produce such a device. To attain said desirable ends, I construct my said calculating-machine in substantially the following way, namely:

50 I make a case with thick sides *a*, a bottom, back, and wheel-cover *a'*, held to said sides, and a front end *a''*, forming an acute angle

with the bottom, substantially as shown. The rear end of the case is enlarged to hold special mechanism and for other required conveniences. Near each end of the case are shafts *bb'*, carrying a series of pentagonal rollers *b''*, of which each opposite pair is connected by an endless chain *c''* of links *c*, with one central hinge-lug *c'* at one end and a pair of lateral hinge-lugs *c''* at its opposite end to receive said central lug, connected by a pin, as shown. A groove *c'''* at the base of the lateral lugs extends across each link. On the top of each link is a transverse ledge or wall *c''''*, of which the top is beveled downward toward the body of the link, so as to enable the teeth of the wheels *f* to pass over and to depress it more easily. The upper part of the said endless chain is carried on a platform, plate, or carrier *d*, of which one end is divided into as many separate fingers *d''* as there are chains *c''*. Said platform is held by lugs *d'* in the sides *a* of the case at the base of the fingers and at its other end by a ledge or wall *d''*, formed by turning the end of said carrier at right angles to its plane, with its ends extending into the walls, as do the lugs *d'*. The ends of said fingers are bent upward into obtuse projections *d''''*, which enter the grooves *c'''* of the chain-links and form stops to the chain. Said fingers become springs when in place to form a check to the motion of the chain at a fixed point and at the same time lift the chain into secure contact with the digit-wheels *f*, but so as to yield to a force slightly greater than would be required to actuate the chain. Vertically over said stop *d''''* is a shaft *e*, provided with opposite grooves *e'* and journal-bearings in the sides *a* and a crank *e''* at one end with stops *e''''* to it. On said shaft are mounted a series of toothed wheels or drums *f*, each having ten teeth with larger faces *f''*, containing each one of the ten numerical Arabic digits in successive order. Each of said drums is chambered between its hub and rim from both ends and is to pass the hub of a lesser wheel, like formed and like turning, with teeth of like number and form within one of said chambers, and within the other of said chambers is a curved or crescent-shaped spring *h*, with a spur *h'*, at right angles to the plane of the spring, projecting into the chamber of the next wheel

to catch the teeth of its lesser wheel and intermediately the tooth  $i$  of the cam  $i'$ . The spur  $h'$  is held on the cam  $i'$  from contact with the teeth of the lesser wheel until the straight edge  $i^3$  is engaged, which is long enough to turn said lesser wheel and with it its lesser wheel  $f$  one tooth, so as to register the next higher order, after which it is to pass over and in front of the spur  $i$ . When the shaft  $e$  is turned forward, its completed revolution will have caught and connected all the parts  $h$  and  $i$ , and thus made all the numbers on the wheels register alike, which is so arranged that it will be zero. As the fulcrum is in the wheel  $f$  the parts will move with the cam in its forward motion; but when the shaft is revolved in the opposite direction the radial or short faces of the teeth of the wheel  $f$  are held by the pawls  $J$  while the cam  $i$  moves. The lesser wheels are shown on sleeves on the shaft  $e$ , their hubs passing through the larger wheels. The revolution of the shaft  $e$  is limited by the crank and stud  $e^3$ , as shown in the full and broken lines in Fig. 9. The short stud  $e^4$  passes under the crank-lever  $e^2$  by springing it up slightly, and so with the stud  $e^3$  locks the crank to its place. As no claim of novelty is made on said drums by themselves or the said described mechanism which operates said drums no further description is required, as said parts are old.

A dog  $J$ , actuated by a spring  $J'$ , rests its end against the radial face of one of the teeth  $f'$  of each drum, and a bar  $J^2$ , extending over the foot ends of all the springs  $J'$ , holds them to the end  $a'$  of the case. Thick washers  $k$  separate the dogs  $J$  and hold them to their place on the same shaft  $J^0$ . A part of the casing for the drums  $f$  has a horizontal top provided with a table  $tl$ , held by a clamp  $l'$ , for writing and holding figures before the eye, necessary in the performance of certain calculations. In front of said tablet is a face  $m$  at an angle of about forty-five degrees with a register-opening, within which are exposed one set of faces  $f''$ , showing their digits or numbers, and below said face  $m$  is a vertical face  $n$ , with a slot  $n'$ , resting on the top edge of the sides  $a$ . The top edges of the sides  $a$  are provided with digit-scales  $o, o'$ , extending from the face  $n$  to the top cover-stop  $o^2$ , whereof one is white and provided with the ten digits, beginning from the edge of said cover-stop with zero and ending with nine, each numeral being between two lines opposite the lines which form the upper and lower end of each chain-link. The opposite digit-scale is of a somewhat similar construction, but of black or other distinguishing color, and its numbers run in a contrary direction, forming the arithmetical complements to those of said opposite digit-scale.

On the face  $o^2$  is secured a tablet  $l^2$ , held in place by clamps  $l^3$ . Said tablet is used as a scale; for which it is ruled into unit-columns to correspond with the digit-wheels, and so

serves to keep the machine in alignment with the column of figures of an account-book and the like.

In the sides  $a$  are channels  $p$ , with conical holes  $p'$ , spaced the length of a chain-link. The ends of a stop  $p^2$  are connected to bars  $p^3$ , which move in the said grooves or channels, and they are provided with points  $p^4$ , which enter the holes  $p'$ , through which said stop is held in place, but which may be moved by applying sufficient force to cause the bars  $p^3$  to spring outward and release said spurs from said conical holes. The washers  $q$  separate the pentagonal drums  $b^2$  and the endless chains  $c^0$  on them from each other and allow freedom of motion.

Near the upper edge of the face  $m$  is a slot  $r^3$ , with enlarged end openings  $r^4$ , and in said slot is an adjustable shutter or screen  $r$ , consisting of a plate  $r$ , with a member  $r'$  at right angles thereto, which plays in the slot  $r^3$ , and on its top is a button or holder  $r^2$ , which rests on the surfaces of the sides of the slot  $r^3$ , and thus holds the shutter in place. With said shutter any particular number may shut out or any two separated by placing it between them. The enlarged ends  $r^4$  of the slot  $r^3$  allow the blade  $r$  to be turned parallel to the slot out of the way or to remove and replace it.

In the slot  $n$  are connected pointers  $s, s'$ , of which the pointer  $s$  points to the numerals on the digit-wheels  $f$  and the other pointer  $s'$  to the corresponding chain. A connecting part  $s^3$  holds the rear part  $s^2$ , which is parallel to  $s'$ . The space between the legs  $s, s^2$  is filled by the lower part of the face  $n$ . Said pointers point off figures at the register and at the same time indicate the chains on either side of the decimal point. The construction and relative adjustment of the digit-wheels and chains are such that the chains may move in either direction with great freedom. The ledges which cross the chain-links have inclined tops, so that the chains may pass more freely under the digit-wheels, the said chain-ledges thus serving both to operate the digit-wheels and to hold the pencil or stylus ends  $s^4, s^5$  or other instrument used to operate the chains.

To operate the machine, put the operating instrument, as shown in Fig. 8, on that chain and opposite the numeral of either digit-scale  $o$  or  $o'$  which corresponds to the given number and its notational place and between the ledges of the chain-link and move the chain toward the front of the machine until the stylus is stopped by the cover-stop  $o^2$ . The result will be a registration of a number corresponding to said act.

When numbers are to be repeated several times, as in multiplication or division, the adjustable stop  $p^2$  is set so as to include the intended unit of the digit-scale between it and the cover-stop  $o^2$ . Then the blunt end  $s^4$  of the stylus is placed between the ledges of the proper link and rapidly reciprocated, so as to strike each stop the required number of

times. Otherwise use the point  $s^5$  of said stylus.

In adding columns of figures the machine is most conveniently placed at the top of the column of figures, as of a day-book, ledger, &c., with its pointed end toward the operator, and allowed to slide over the column, as the operation is performed toward the person. When the last figures are indicated at the bottom of the column, the register-opening of the machine will show the result.

Subtraction is performed by a method known as "subtraction by addition," with the help of the complemental digit-scale  $o$ . The minuend is indicated according to the basic digit-scale and the subtrahend according to the complemental digit-scale after one unit of the lowest order has been deducted from it. The result thus obtained represents the difference between the given amounts increased by ten, one hundred, one thousand, &c. The figure "1," which always appears in the highest place, is shut out by the stop  $r$ . The true remainder will be the figures shown open in the register made by the digit-wheels. Multiplication being nothing more than the repeated addition of the multiplicand and division the repeated subtraction of the divisor, operations readily performed on this machine, the machine may therefore be used for these as well as all other arithmetical problems.

What I claim is—

1. The combination with a series of operatively-connected and toothed registering-wheels, of endless chains, on rollers, tangent to said wheels and mechanism on said chains for engaging the teeth of said wheels to operate the same, substantially as specified.

2. The combination with a series of operatively-connected and toothed registering-wheels, an adjustable shutter to cover registered figures and an adjustable pointer to point off the figures of said registering-wheels, of tangentially-moving mechanism to said wheels with means on said mechanism to actuate the wheels, substantially as specified.

3. The combination with a series of operatively-connected and toothed registering-wheels and pawls thereto, of endless chains with means on said chains to engage and actuate said wheels, substantially as specified.

4. The combination with a series of operatively-connected and toothed registering-wheels and pawls thereto, of endless chains with means thereon to engage and actuate said wheels and an adjustable shutter for the register to said wheels, substantially as specified.

5. The combination with a series of operatively-connected and toothed registering-

wheels and pawls thereto, of endless chains with means thereon to engage and actuate said wheels and an adjustable pointer to the register and to the actuating-chains of said wheels, substantially as specified.

6. The combination with a series of operatively-connected registering-wheels, and chains with means thereon to actuate said registering-wheels, of opposed tablets at the outer sides of said series of chains, provided with complemental digit-scales, to said chains, substantially as specified.

7. The combination with a series of operatively-connected registering-wheels and a register therefor and tangentially-moving mechanism to actuate said wheels, of a fixed stop at the lower end of said tangent mechanism and an adjustable stop intermediate said fixed stop and register, substantially as specified.

8. The combination with a series of operatively-connected registering-wheels tangentially-moving mechanism to actuate said wheels and opposed tablets at the outer sides of said wheel-actuating mechanism, provided with complemental scales with numbers, of a fixed stop at the end of said wheel-actuating mechanism and an adjustable stop over said wheel-actuating mechanism, substantially as specified.

9. The combination with a series of operatively-connected registering-wheels and tangentially-moving actuating mechanism a fixed and an adjustable stop to said actuating mechanism, of a tablet to the case, substantially as specified.

10. The combination with a series of operatively-connected registering-wheels, of endless chains, with engaging mechanism to said chains, tangent to said wheels, grooved across the chain-links, and spring-stops to said grooves, substantially as specified.

11. The combination with a series of operatively-connected registering-wheels, of endless chains tangent to said wheels with means thereon to actuate said wheels, of mechanism to lift the chains into engagement with said registering-wheels and yielding stops to said chains, substantially as specified.

12. The combination with a series of operatively-connected numbering devices, of endless and reversible and direct-moving chains, on rollers, having means for engaging the numbering devices, and tangent to said numbering devices, and a stop for the chain-moving mechanism, substantially as specified.

HENRY GOLDMAN,

Witnesses:

WM. ZIMMERMAN,  
F. P. READ.