Jan. 6, 1925.

1,521,431

F. A. KAISER

TIME COMPUTING MACHINE

Filed Jan. 26, 1922

4 Sheets-Sheet 1

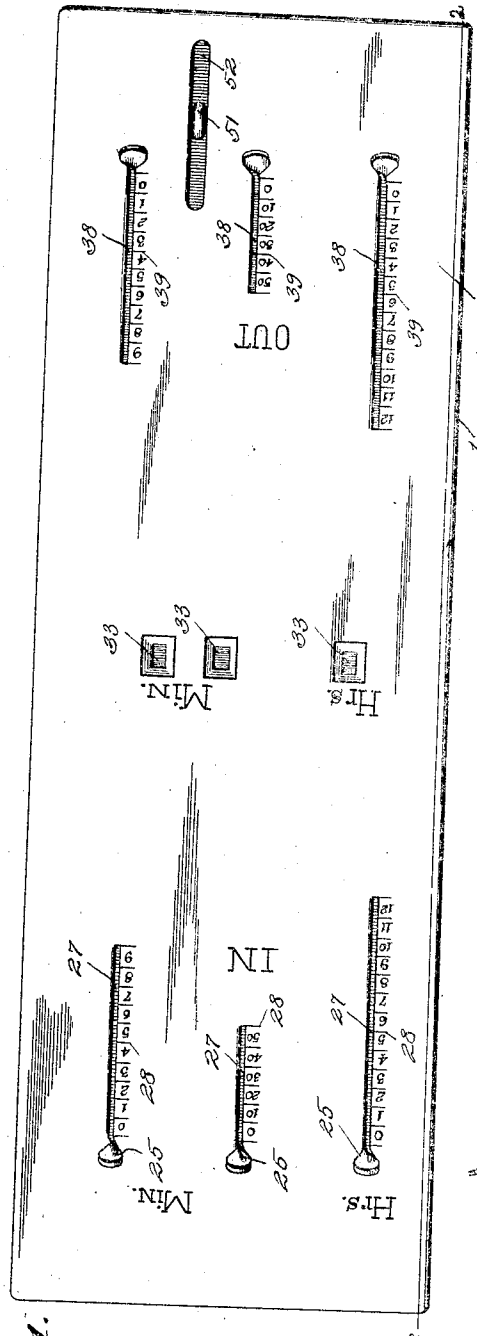


Fig. 1.

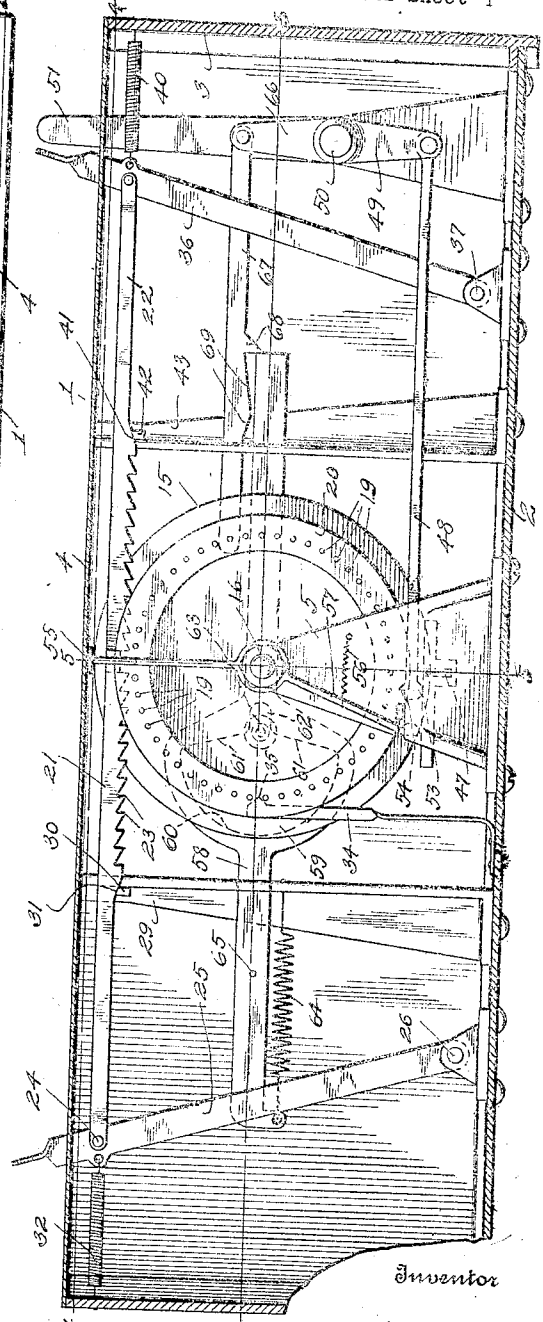


Fig. 2.

Inventor

Frederick A Kaiser

By C. C. Shepherd.

Attorney

Jan. 6, 1925.

1,521,631

F. A. KAISER

TIME COMPUTING MACHINE

Filed Jan. 26, 1922

4 Sheets-Sheet 2

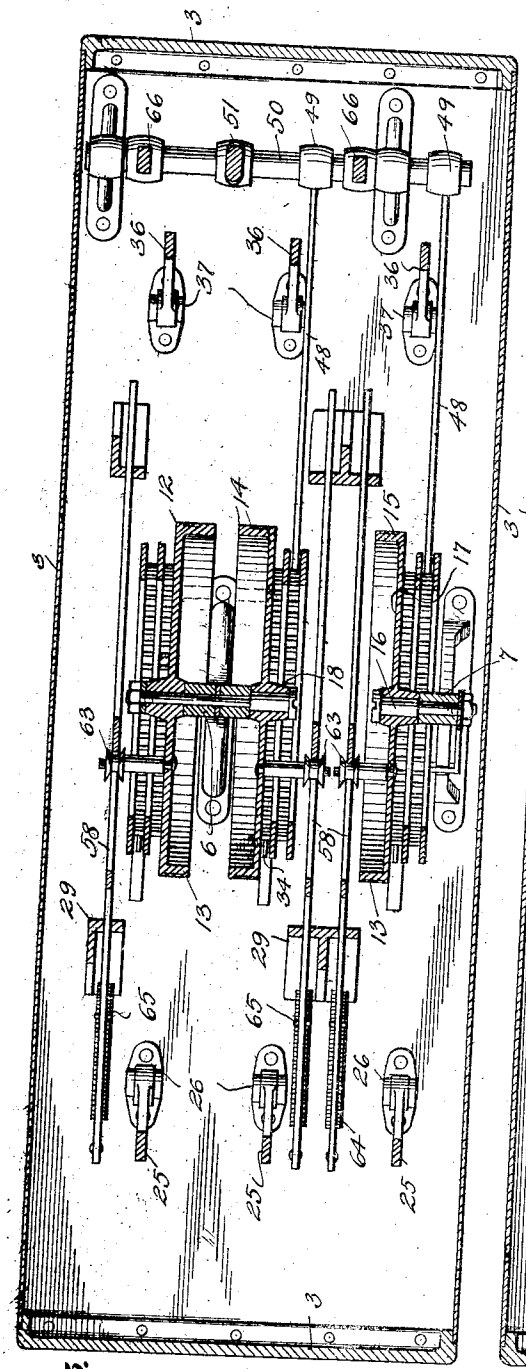


Fig. 3.

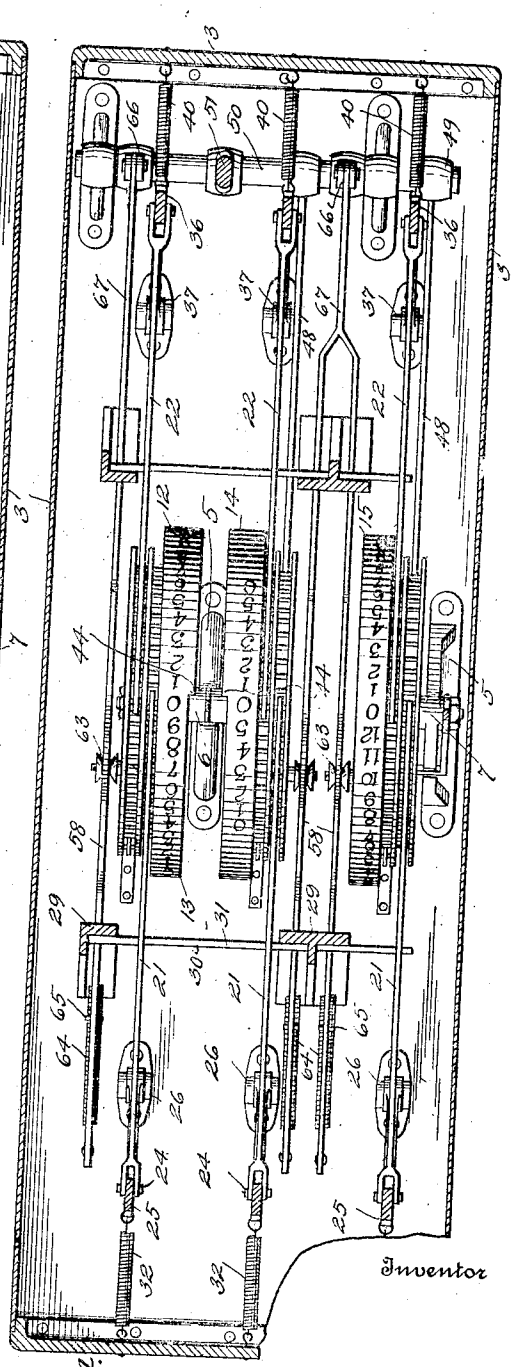


Fig. 4.

Inventor

Frederick A. Kaiser

By C. C. Shepherd

Attorney

Jan. 6, 1925.

F. A. KAISER

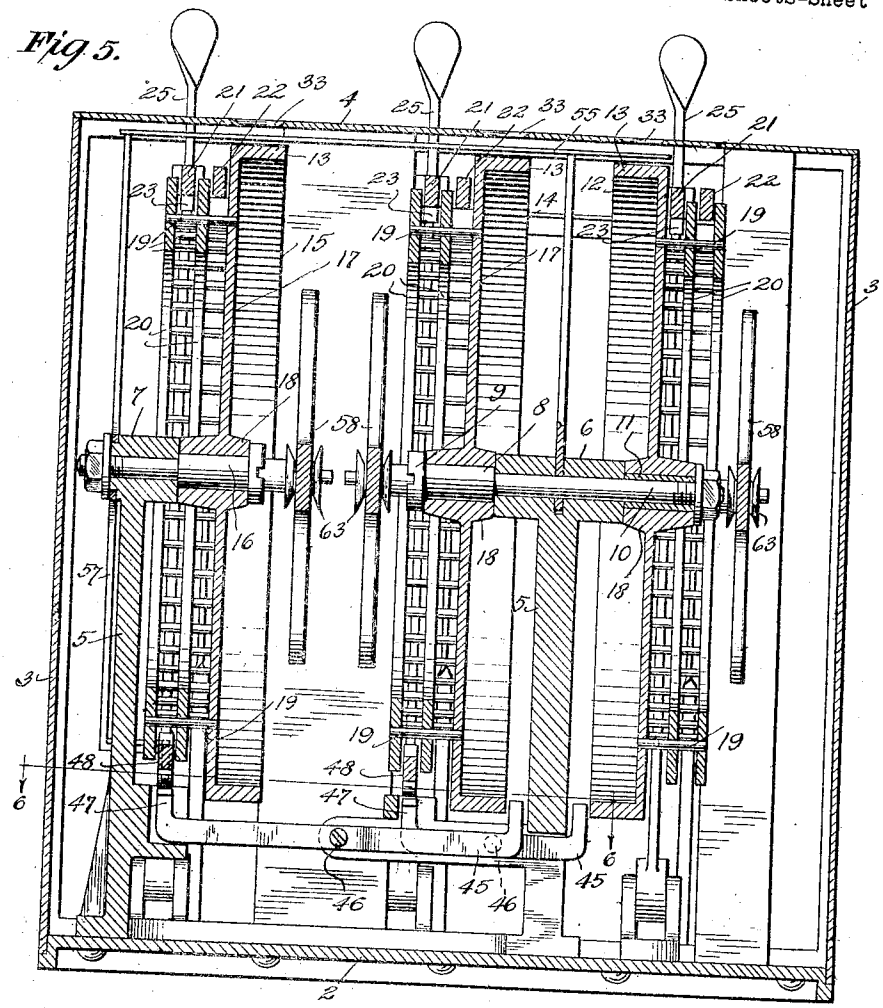
1,521,631

TIME COMPUTING MACHINE

Filed Jan. 26, 1922

4 Sheets-Sheet 3

Fig 5.



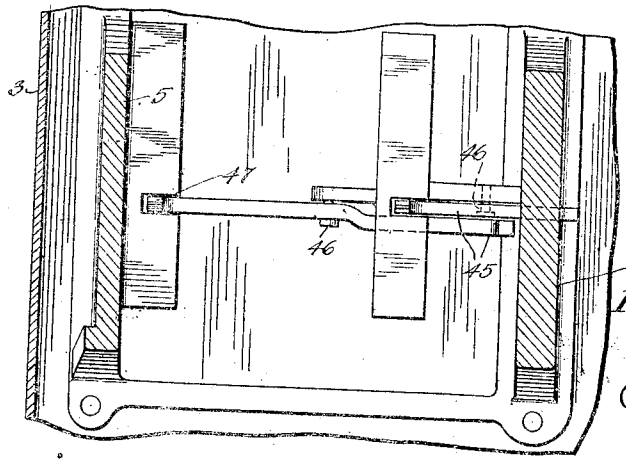


Fig 6.

Inventor

Frederick A. Kaiser

C. C. Shepherd

Attorney

Jan. 6, 1925.

F. A. KAISER

1,521,631

TIME COMPUTING MACHINE

Filed Jan. 26, 1922

4 Sheets-Sheet 4

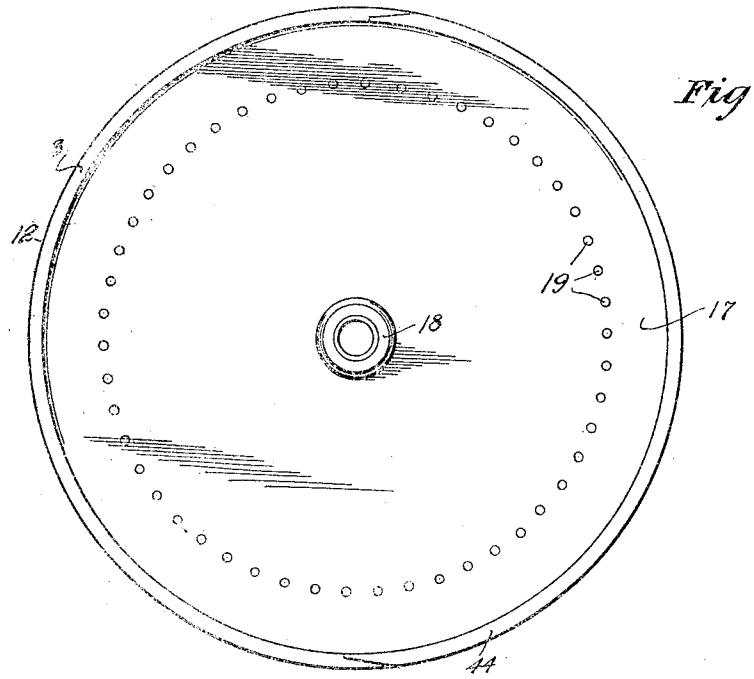


Fig 7.

John Doe 32'
Machinist

A M				P M			
IN	OUT	IN	OUT	IN	OUT	IN	OUT
8.00	12.00			1.00	5.00		

Fig 8.

Inventor

Frederick A. Kaiser

By C. C. Shepherd

Attorney

Patented Jan. 6, 1925. 1,521,631

UNITED STATES PATENT OFFICE.

FREDERICK A. KAISER, OF COLUMBUS, OHIO.

TIME-COMPUTING MACHINE.

Application filed January 26, 1922. Serial No. 532,002.

To all whom it may concern:

Be it known that FREDERICK A. KAISER, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, has invented certain new and useful Improvements in Time-Computing Machines, of which the following is a specification.

This invention relates to improvements in calculating machines, and has for its primary object the provision of an easily controlled and operated machine constructed by predetermined manual operations to compute mechanically differences in time.

Another object of the invention resides in the provision of a machine by means of which time cards, employed in keeping an account of the number of hours which employees give certain tasks, or the number of hours and minutes which employees give to their respective occupations, bearing time indications or numerals disclosing certain specific hours, may be rapidly computed in a mechanical manner and without mistake for the purpose of determining time differentials, in order to relieve clerks of the necessity of mentally performing such mathematical calculations and to admit of rapid mechanical calculation of the problems from the data presented.

With these and other objects in view that will appear as the description proceeds, the invention consists in the novel features of construction, combinations of elements and arrangements of parts, hereinafter fully described and pointed out in the appended claims.

In the accompanying drawings:

Figure 1 is a top plan view of a time calculating machine constructed in accordance with the features of the invention.

Figure 2 is a vertical longitudinal sectional view taken through the machine on the plane indicated by the line 2—2 of Figure 1.

Figure 3 is a horizontal sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a similar view on the line 4—4 of Figure 2.

Figure 5 is a transverse sectional view taken on the line 5—5 of Figure 2.

Figure 6 is a detail horizontal sectional view taken on the plane indicated by the line 6—6 of Figure 5.

Figure 7 is a detail view of one of the minute wheels.

Figure 8 is a detail view of the time card.

In many large industrial establishments or other commercial places of business employing a relatively large number of employees, time clocks are provided for the purpose of maintaining a record of the exact number of hours which each individual employed applies to his occupation, or again such time clocks are also employed, for example, in machine shops or other factories for the purpose of keeping an accurate record of the time taken by an employee for performing a given task, in order that the employer may ascertain the labor costs of each particular task and render charges proportionate thereto. These time clocks when operated print a record on the time card or sheet corresponding to the existing time at which the clocks are operated. In establishments employing a large number of employees, it has been a laborious task for a clerk to compute the timed differentials on each card and therefore the present invention provides a method whereby this work may be accomplished in a purely mechanical manner and with utmost accuracy and convenience.

To this end my improved time calculating machine has been formed to include a rectangular box like casing 1 consisting of a base 2, upstanding walls 3 and a substantially rectangular top 4. Mounted within the casing is an upstanding bracket 5 which includes bearing hubs 6 and 7. Arranged within the hub 6 is a stationary axle 8, which is provided with an enlarged headed end 9 and with an opposite relatively reduced threaded end 10, projecting beyond the bearing hub 6. Mounted upon the axle 8 is a sleeve 11 and arranged for rotation with or about the sleeve 11 is a first minute dial 12 of the machine.

The dial 12 may be of metallic construction and includes an annular flange 13, disposed to extend parallel with the axle 8, the said flange being provided with numerals beginning, as shown in Figure 4 with 0 and including two sets of numerals disposed in reverse order and extending to the numerals 9, including successively all numbers between 0 and 9. Disposed adjacent to the first minute dial 12 and mounted for rotation contiguous to the enlarged headed end 9 of the axle 8 is a second minute dial 14, which is a duplicate of the construction of the dial 12. However, the periphery of

the dial 14 includes two complete sets of reversely arranged numerals, extending from 0 to 5. By this arrangement, it will be apparent that the minute dials may register any fraction of an hour up to fifty-nine minutes, and when a remainder is greater than fifty-nine minutes or more than one hour, mechanism is provided for automatically operating an hour indicating dial 15. This latter dial is also of similar construction to the minute dials 12 and 14, and is loosely mounted for rotation upon a stud axle 16 carried by the bearing hub 7. The periphery of the hour dial bears two complete sets of reversely arranged numerals indicating from 0 to 12 hours. It will be apparent that by this construction, the machine herein specifically described and illustrated may be employed for the purpose of indicating time differentials up to twelve hours and fifty-nine minutes. However, it will be obvious that this range may be increased by changes in the dials.

Each of the dials is preferably formed to include a pressed or stamped metallic body of light weight material, formed to include the annular peripheral flange 13 and a vertically disposed circular body 17 terminating axially in enlarged hubs 18 for the reception of the axial supports about which the dials revolve. Disposed concentrically of the axial supports and extending horizontally at spaced circular intervals from the body 17 of each dial, is a plurality of pins 19, which connect with each dial a pair of spaced guide rings 20, which serve in the capacity of guides for the purpose of receiving horizontally extending actuating bars 21 and 22 of the initial and final dial setting mechanism of the machine. The bars 21 constitute a part of the initial "in" setting mechanism, and each of said bars 21 includes a plurality of ratchet teeth 23, which latter being appropriately spaced to engage with the pins 19, and upon horizontal movement on the part of said bars to effect the rotation of the dials associated therewith. The opposite ends of the bars 21, as regards the teeth 23 are pivotally connected as at 24 with a plurality of seating levers 25. These levers are pivotally mounted at their lower ends, as at 26, upon the base 2, the upper ends of said levers projecting through elongated slots 27 provided in the top 4. These slots are formed to provide contiguous numeral bearing surfaces 28, upon which numerals are placed corresponding to the numerals on the "in" side of the dials 12, 14 and 15. To support the bars 21 in their horizontal positions, there is provided stationary upstanding brackets 29 within the casing, which include a horizontally extending cross bar 30, upon which the bars 21 rest, the said bars, contiguous to the teeth 23 thereof being formed with inclined surfaces 31, which are adapted to permit the bars 21 upon being retracted, to automatically elevate themselves, lifting the teeth 23 thereof out of engagement with the pins 19 of the dials. It will be observed that each lever 25 has connected therewith a spring 32, which tends to retain the levers at the inner ends of the slots 27. By this construction, it will be apparent that in the event a time card 32′, as shown in Figure 8, which has been printed in the ordinary time clock and from which time calculations on the machine are made, shows that an operator started work at, for example, 7.25, the lever 25 at the top of the "in" setting mechanism, Fig. 1, is oscillated until the same registers with the numeral 5 on the graduated surface 28 adjacent thereto. This results in causing the inclined surface 31 of the bar 21 connected with the lever actuated, to be lowered by riding off of the bar 30, permitting the teeth 23 of said bar to be engaged with the pins 19 of the dial 12, rotating the latter 5 places or until the numeral 5 on the "in" side of the dial is registered with the sight openings 33 provided in the top 4. It will be observed, by reference to Figure 2, that each dial is provided with a spring 34, including a beveled nose portion 35, disposed for engagement between the pins 19 so as to lock each particular dial in any position in which they may be set. Owing to the ratchet construction of the teeth 23, the bar 21 thus moved may be forced back to its initial starting position without interfering with the seat adjustment of the dial 12. Following this operation, the intermediate lever 25 of the "in" mechanism is operated and is moved forwardly until said lever registers with the number 20 on the graduated surface 28 contiguous to its slot 27. This moves the second minute dial 14 forwardly two places, or until the numeral 4 on the "in" side of the dial 14 is in registration with the sight opening 33. Following this operation, the setting lever 25 at the bottom of the machine is oscillated until the same registers with the numeral 7 on the graduated surface contiguous to its slot 27, or until the numeral 6 on the "in" side of the hour dial 15 is brought into registration with the sight opening 33 provided therefor in the top of the casing. By these cumulative operations, it will be seen that the dials 12, 14 and 15, by the operation of the "in" mechanism in carrying out the example set forth, will be rotated so that the said dials will be positioned beneath the sight openings 33 to read six hours and forty-five minutes, but are not visible due to the shutter 55 hereinafter explained covering the registering dials 12, 14 and 15 at this stage of the operation.

Now, in the event that the workman has completed the specified task at, we will say,

11.15, the "out" mechanism is operated. This mechanism is substantially a duplicate of that employed in the "in" mechanism, and includes a plurality of levers 36 corresponding to the levers 25, the levers 36 being pivotally mounted as at 37 within the casing 1 and so disposed that their upper ends will project through slots 38 formed in the top 4 and corresponding to the slots 27. The slots 38 are graduated as at 39 to constitute a guide for controlling the oscillatory movement of the lever 36, the numerals on the graduated surfaces 39 corresponding to the numerals on the "out" side of the dials 12, 14 and 15. Pivotally connected with the levers 36 are the horizontally extending bars 22, corresponding in construction and function to the bars 21, in that the bars 33 are formed to includes the ratchet teeth designed for engagement with the pins 19 and so located to rotate the registering dials in opposition to the direction of rotation thereof as effected by the "in" setting mechanism. The levers 36 have connected therewith return springs 40 which normally serve to retract the bars 22 from engagement with the pins 19, this being done by providing the bars 22 with inclined surfaces 41, which when the bars are retracted, engage with a fixed cross bar 42 carried by rigid upstanding brackets 43. However, upon forward movement of the bars 22, the surfaces 41 are disengaged from the cross bar 42, permitting the bars to drop into engagement with the pins 19, thereby rotating the registering dials.

In the particular example given, a task was completed at 11.15 which was started at 7.25. By operating the "in" setting mechanism, as previously described, the registering dials were positioned so that the numbers six forty-five were aligned with the sight openings in the top but not visible. The next step is to operate the "out" mechanism. The time when the task was completed is given as 11.15. Therefore, the lever 36 of the "out" mechanism, controlling the movement of the first minute dial 12 is operated until the same registers with the numeral 5 on the surface 39 contiguous to its slot 38. By this operation, the first minute dial will be rotated backwardly a distance equivalent to five points or until 0 is registered by the first minute dial at the sight opening 33. The next operation is to operate the middle lever 36 of the "out" mechanism until the same registers with the numeral 10 adjacent its slot 38. This results in moving the second minute dial backwardly with respect to the movement imparted thereto by the "in" setting mechanism, a distance equal to one point, thus bringing the numeral 5 of the second minute dial into registration with the sight opening. Following this, the operating lever 36 controlling the movement, by the "out" mechanism, of the hour dial is operated until the said lever registers with the numeral 11 adjacent to its slot 38, rotating the hour dial backwardly a distance equivalent to eleven points, which will bring the numeral 4 of the hour dial into registration with the sight opening 33. It will be observed that a reading will thus be effected at the sight openings indicating a time differential of four hours and fifty minutes, which in fact is one hour in excess of the actual time difference between the hours given.

To correct, therefore, this reading and to indicate the true difference in time, the minute dials 12 and 14 are formed to include cams 44 which extend substantially half way around the periphery of said dials, said cams being located in registration with the "out" numerals of the dials. The positions of these cams are such that whenever the "in" numerals of the dials are in registration with the sight-openings, the said cams will engage and depress bars 45 pivotally mounted as at 46 within the casing, causing the elevation of the forward up-turned ends 47 of said bars so that the latter will be disposed in the path of reciprocatory links 48. These links have their outer ends pivotally connected to crank arms 49, fixed to a rotatable shaft 50, located at one end of the casing. The said shaft 50 is provided with an upstanding operating arm 51 disposed to extend through a slot 52 provided in the casing top 4. Therefore, after the operating levers 25 and 36 of the "in" and "out" mechanism respectively have been operated, the operator moves the arm 51, to the rear end of the slot 52, causing the rotation of the shaft 50 and the crank arms 49 thereof, which results in forcing the links 48 forwardly so that the nose ends 53 thereof will ride over the elevated ends 47 of the base 45 elevated by the cams 44. By thus elevating the nose ends 53 of the links, the shoulders 54 provided thereon will engage with the pins 19 of the dials, finally rotating the latter a distance equal to one point. It will be seen therefore that in the example given, the hour dial will be set back so that the numeral 3 thereof will be brought into registration with the sight opening 33, thereby giving the correct time difference between the hours set forth. It will be observed that the cams 44 are automatically engaged to elevate the base 45 when the "in" numerals of the dials are in registration with the sight openings; the said cams, conversely, are not engaged when the "out" numerals of the registering dials register with the sight openings.

To prevent a reading from being made prior to the actuation of the arm 51, which is required in every case to avoid error, the bearing hub 7 is provided with a pivotally

mounted shutter 55, which extends normally immediately under the sight openings to conceal the registering dials, a spring 56 being connected with said shutter to normally maintain the same in registration with the sight openings. However, upon movement of the outer link 48, the depending crank arm 57 of the shutter is engaged by said link, so that the shutter will be oscillated to assume a position uncovering the sight openings, thereby enabling the dials to be conveniently read, but not until after the machine has been fully and completely operated.

To return the dials to 0, following the completion of a given example, I provide the interior of the casing with slidably mounted re-setting bars 58, which are slidably positioned within openings provided in the brackets 29 and 43 and include openings 59 therein of substantially semi-circular construction, said openings including circular walls 60, which terminate in angular sides 61 converging toward a slot or recess 62. These recesses in the bars 58 normally receive rollers 63, mounted eccentrically upon the disks or dials 12, 14 and 15. Springs 64 are situated between the outer ends of the bars 58 and the brackets 29, and the normal tendency is to project said bars 58 so that the rollers 63 will engage with the circular walls of the openings 59, stop pins 65 being provided upon the bars 58 for engagement with the brackets 29 after the latter have been projected a sufficient distance under the influence of the springs 64 to bring the rollers 63 into contact or adjustment to the walls 60. While the bars 58 are thus normally positioned, it will be seen that the registering dials may rotate freely in response to the setting mechanisms and under control of the brake springs 34. Now, after a given example has been completed and it is desired to return the dials to 0 positions, irrespective of their final registering positions, I provide the shaft 50 with crank arms 66, to the outer ends of which are pivotally connected operating links 67. These links project forwardly from the arms 66 and are supported in openings formed in the bracket 43, the said links including shoulders 68 disposed for engagement with the ends of the bars 58. It has been previously described that the arm 51 is manually moved to the rear end of the slot 52 to operate the connecting mechanism and the shutter structure 55. Now, as the arm 51 is returned to its normal position, which is the forward end of the slot 52, the shoulders 68 of the link 67 engage with the rear ends of the base 58 and force the latter longitudinally against the resistance exercised by their springs 64, causing the rollers 63 of the dials or registers to engage with the inclined walls 61 and finally with the recesses 62, thus locking each dial in a position in which the same will register 0 at the sight openings. The links 67 are formed with inclined surfaces 69 which are so disposed that after the dials have been re-set, the said inclined surfaces 69 will engage with the openings in the brackets 43 in which the links are supported. These inclined surfaces cause the links 67 to be elevated, freeing the shoulders 68 thereof from engagement with the ends of the bars 58, allowing the latter to return to their normal positions by the action of their springs 64, without influencing the positions of the registering dials.

Further by returning arm 51 to its normal position causing the outer link 48 to release pressure from the depending crank arm 57 which is connected with the shutter 55 and by means of the spring 56 depending crank arm 57 is rotated until shutter 55 registers with the sight opening 33 which obstructs the view of the dials 12, 14 and 15. After this has been done the device is ready for the next problem.

In view of the foregoing description, taken in conjunction with the accompanying drawings, it will be obvious that the present invention provides mechanism for mechanically computing time differentials, to admit of positive and accurate operation with less liability of mistake, increased accuracy, greater speed and the like to greater advantage than these operations can be accomplished by manual computation. With the use of the machine, unskilled labor may be employed for quickly accomplishing calculations dealing in time differences, and moreover, clerks and other users of the machine are not apt to be mentally fatigued in computing a large number of calculations of the character set forth.

The right is reserved to vary the structural details of the apparatus herein disclosed by way of example only, within certain limits, and the invention is not confined to the exact construction and arrangement shown, other than the same is limited by the terms of the following claims. In this connection it will be understood that although, in the example given, which contemplates the completion of a task at 11.15 which was started at 7.25 the operation of producing the proper registration has been described herein as beginning with the numeral 5 at the right, it is obvious that such operation could begin with the numeral 7 thus working from left to right instead of from right to left.

What is claimed is:

1. In a machine for computing time differentials, movable hour and minute indicating registers, said registers each bearing two complete sets of numerals corresponding to the hours and minutes capable of being represented thereby, means for initially

setting said registers in accordance with a given time, means operating upon said registers in opposition to said first named means to set the registers in accordance with a second given time, and a transferring means operated by the minute register when one set of the numerals thereof assumes predetermined positions to move said hour register in the direction at a distance equal to one unit of its movement as actuated by the first named means.

2. In a machine for computing time differentials, selectively operated hour and minute registers, means for initially setting said registers in accordance with a given time, and means operating upon said registers in opposition to said first named means, and to an extent determined by a second given time, for setting said registers in positions indicating the difference between said times.

3. In a machine for computing time differences, a plurality of rotatable dials bearing hour and minute indicating numerals, means cooperative with said dials and tending to maintain the latter at rest, initial setting mechanism including a plurality of movable bars, having teeth formed thereon, means on said dials for engagement with said teeth to rotate the dials to an extent governed by the movement of said bars, and a final setting mechanism including tooth bars disposed for engagement with the means on said dials, said final setting mechanism serving to rotate said dials in directions opposite to the rotary movement imparted thereto by the initial setting mechanism.

4. In a machine for computing time differences, a casing including a sight opening, hour and minute dials independently mounted for rotation in said casing and arranged in registration with said opening, and initially operated mechanism for setting said dials in accordance with a given time, said mechanism including movable bars arranged to be longitudinally shifted varying distances, teeth provided upon said bars, means on said dials disposed for engagement with said teeth whereby said dials may be rotated to various positions in accordance with the extent of movement of said bars, and a final setting mechanism including longitudinally movable tooth bars manually operated for engagement with said dial means for rotating the latter in directions opposite to the rotary movement imparted to said dials by the initial setting mechanism.

5. In a machine for computing time differences, a casing including an opening, a dial mounted in said casing in registration with said opening, gear means formed upon said dial, an axial support about which said dial rotates, and initial setting mechanism including a longitudinally movable bar adapted to be manually shifted, teeth provided upon said bar and disposed for engagement with said gear means, whereby said dial may be rotated a distance proportionate to the extent of movement of said bar, and a final setting mechanism including a manually operated longitudinally movable toothed bar disposed for engagement with said gear means subsequent to the operation of the initial setting mechanism, and serving to rotate said dial in a direction opposite to that of the initial setting mechanism.

6. In a time computing machine, a casing, hour and minute dials rotatably mounted within said casing, said dials including in and out sets of numerals disposed for registration with sight openings provided in the casing, an initially operated setting mechanism for rotating said dials in accordance with a given time, a finally operated mechanism for setting said dials in accordance with a second given time, said final operating mechanism serving to rotate said dials in a direction opposite to that imparted thereto by the initial setting mechanism, and means for rotating said hour dial to a further extent when the out set of numerals of said minute dial are in registration with said sight opening.

7. In a time computing machine, hour and minute dials rotatably mounted within a casing, initially operated setting mechanism for rotating said dials from a normal position in accordance with a given time, a final setting mechanism for rotating said dials in accordance with a second given time and in a direction opposite to that imparted to the dials by the initial setting mechanism, and automatically operated means for rendering the numerals on said dials visible following the final setting operation thereof.

8. In a machine for computing time differentials, including hour and minute registers, manually operated means for initially setting said registers in accordance with a given time, and a second manually operated means for re-setting said registers in accordance with a given hour of time, whereby said registers will be positioned to indicate in hours and minutes the length of the period of time existing between said given hours of time.

In testimony whereof I affix my signature.

FREDERICK A. KAISER.