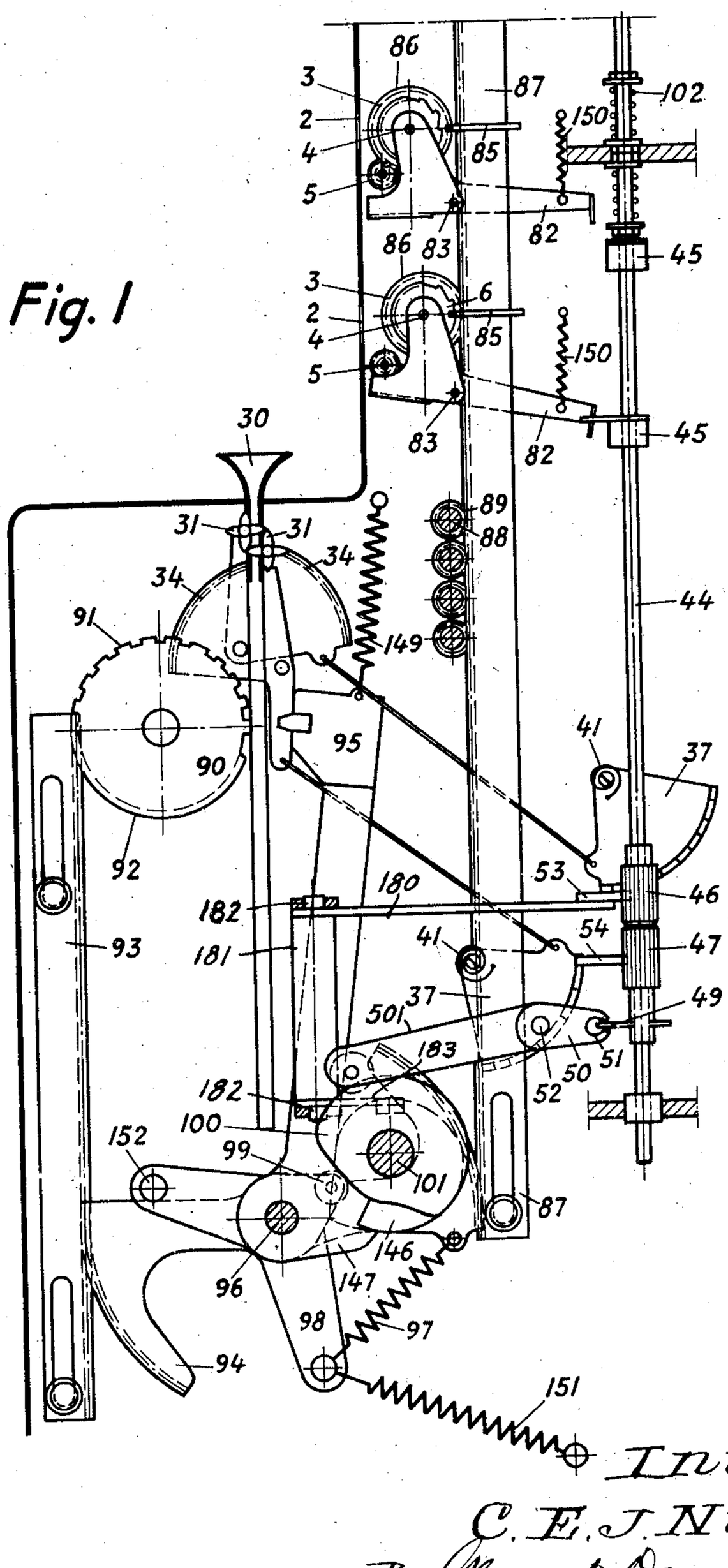
Oct. 4, 1949. C. E. J. NILSON 2,483,926

TIME RECORDING APPARATUS

Filed April 20, 1944

11 Sheets-Sheet 1

Fig. 1

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TIME RECORDING APPARATUS

Filed April 20, 1944

11 Sheets-Sheet 2

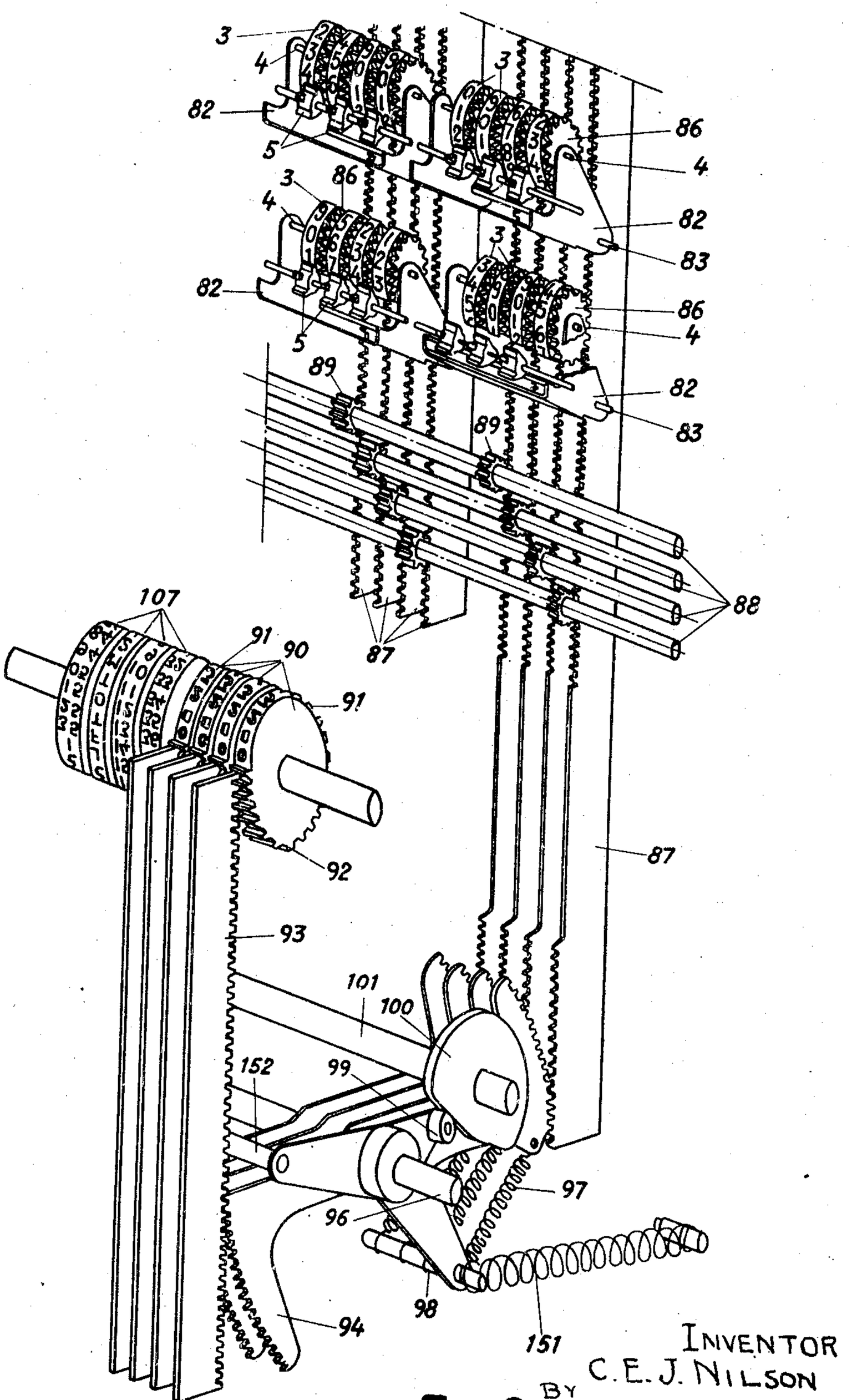


Fig. 2

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TIME RECORDING APPARATUS

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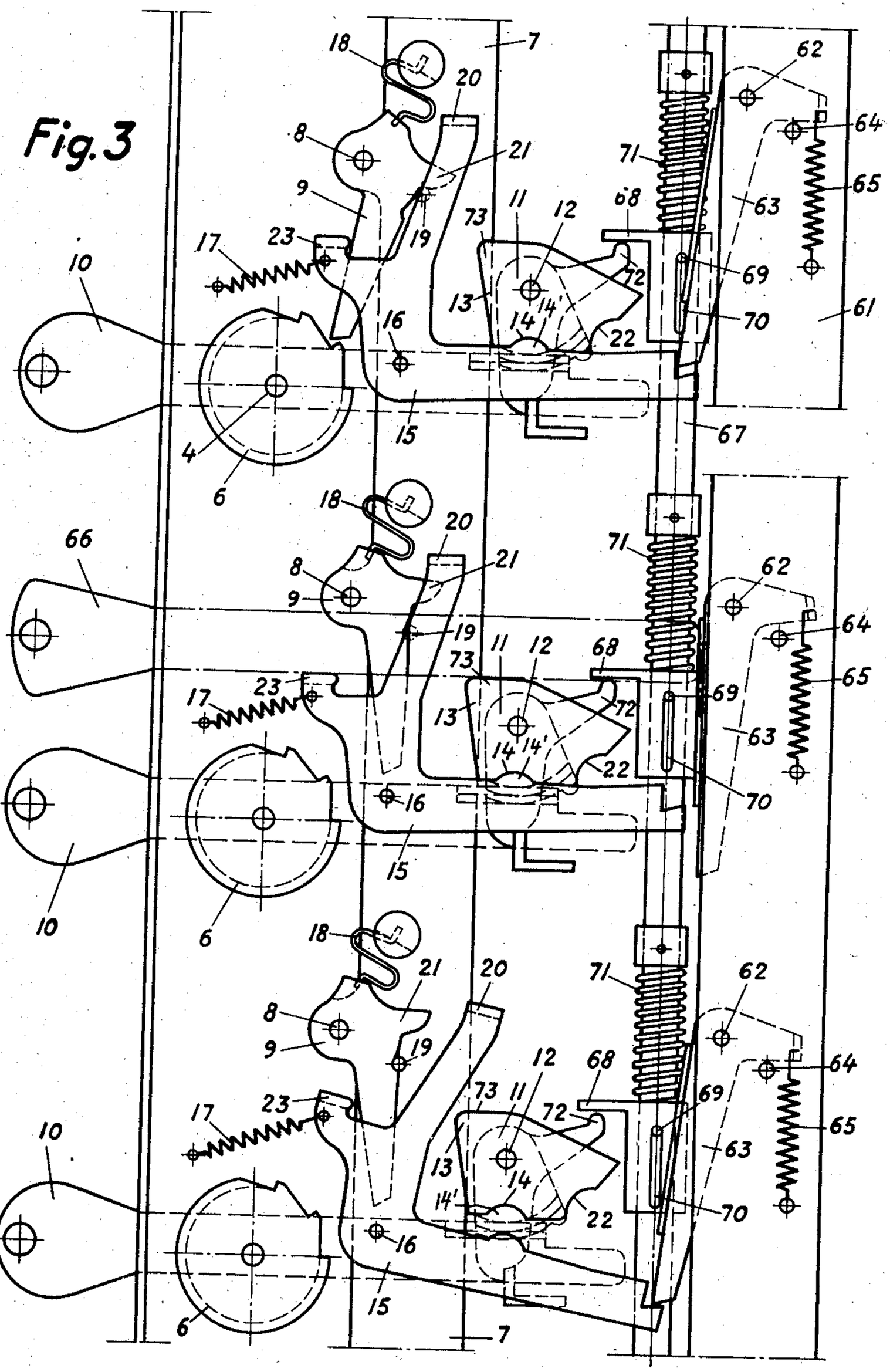
11 Sheets-Sheet 3

Fig. 3

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TIME RECORDING APPARATUS

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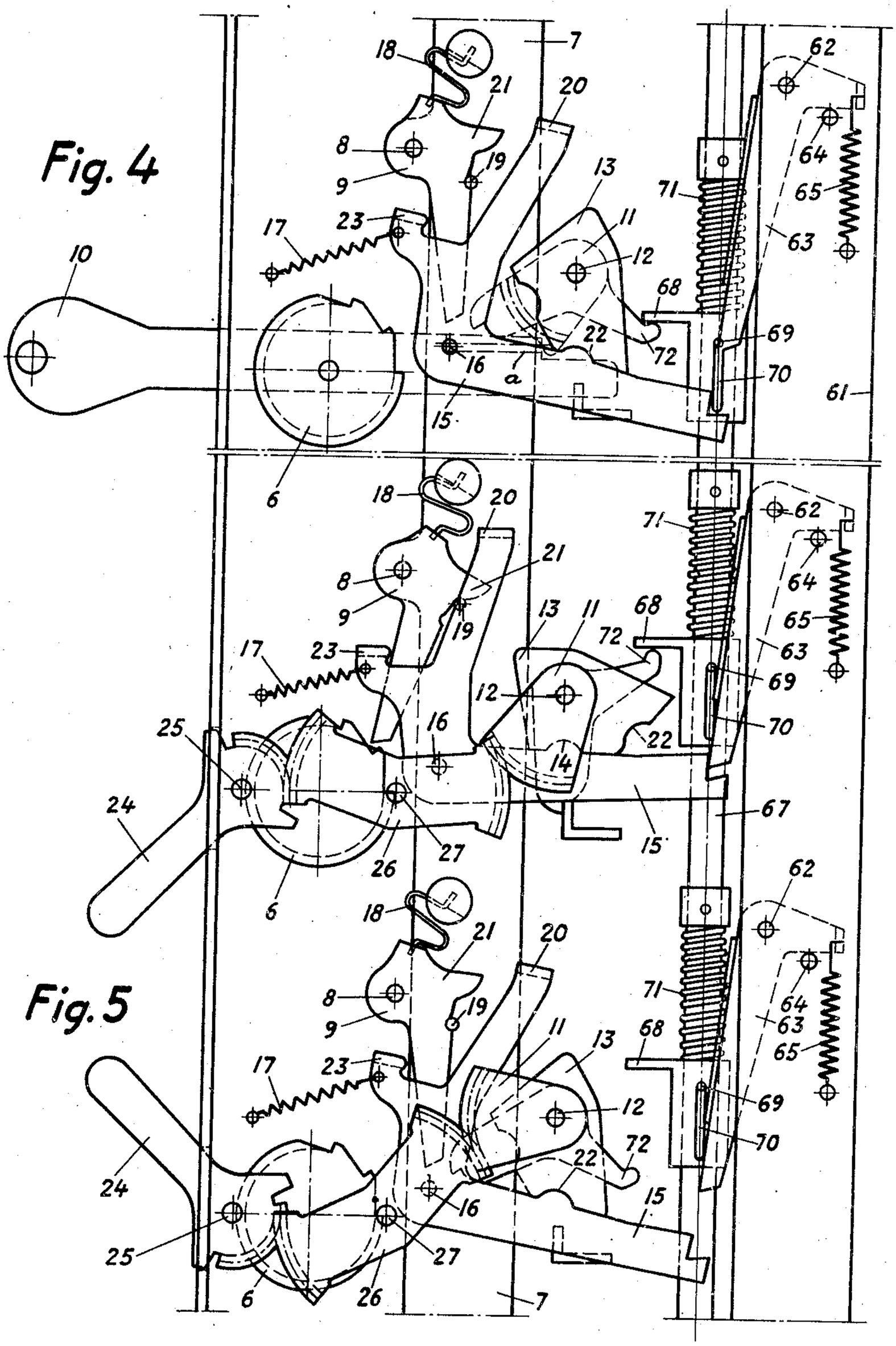
11 Sheets-Sheet 4

Fig. 4

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TIME RECORDING APPARATUS

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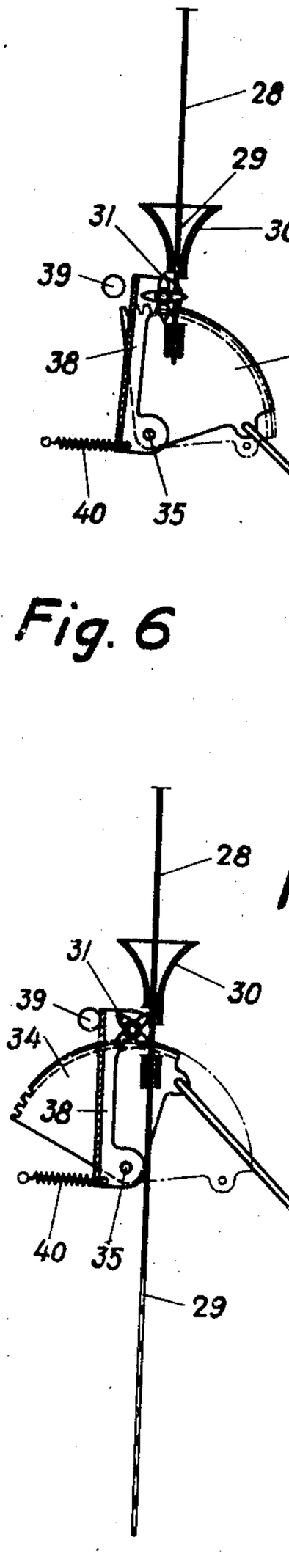


Fig. 6

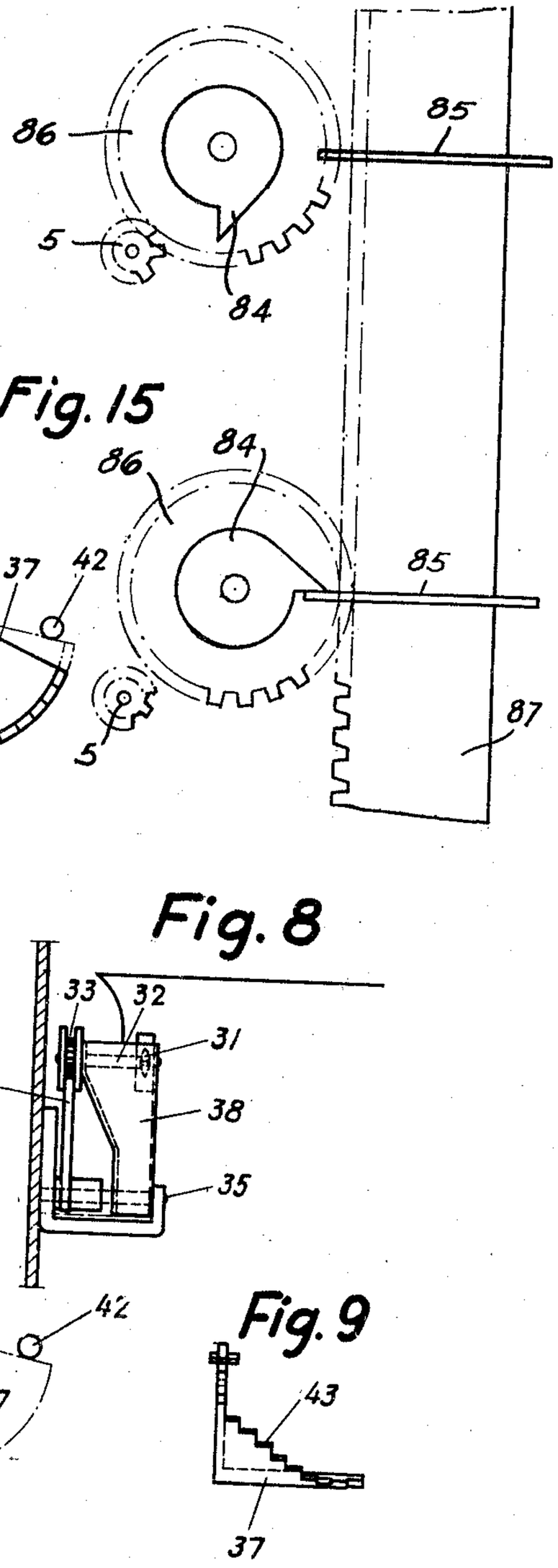


Fig. 15

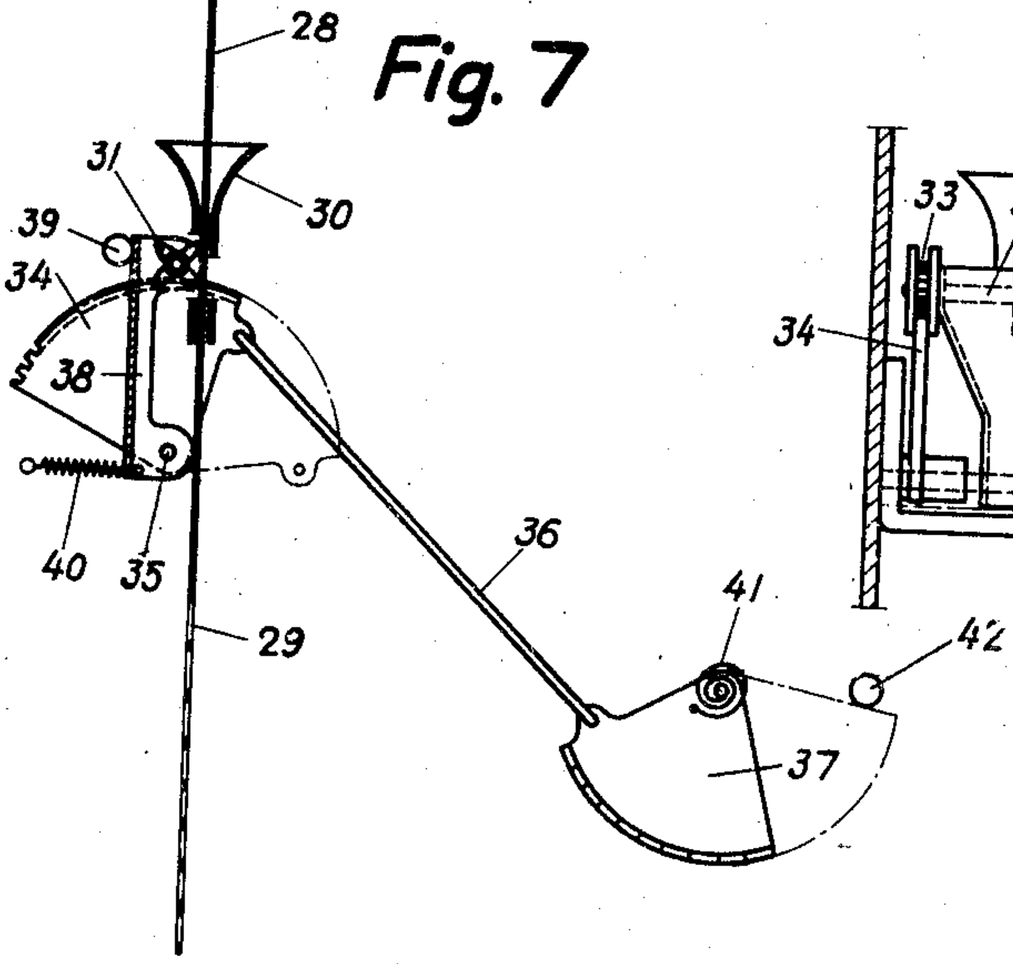


Fig. 7




Fig. 8




Fig. 9

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TIME RECORDING APPARATUS

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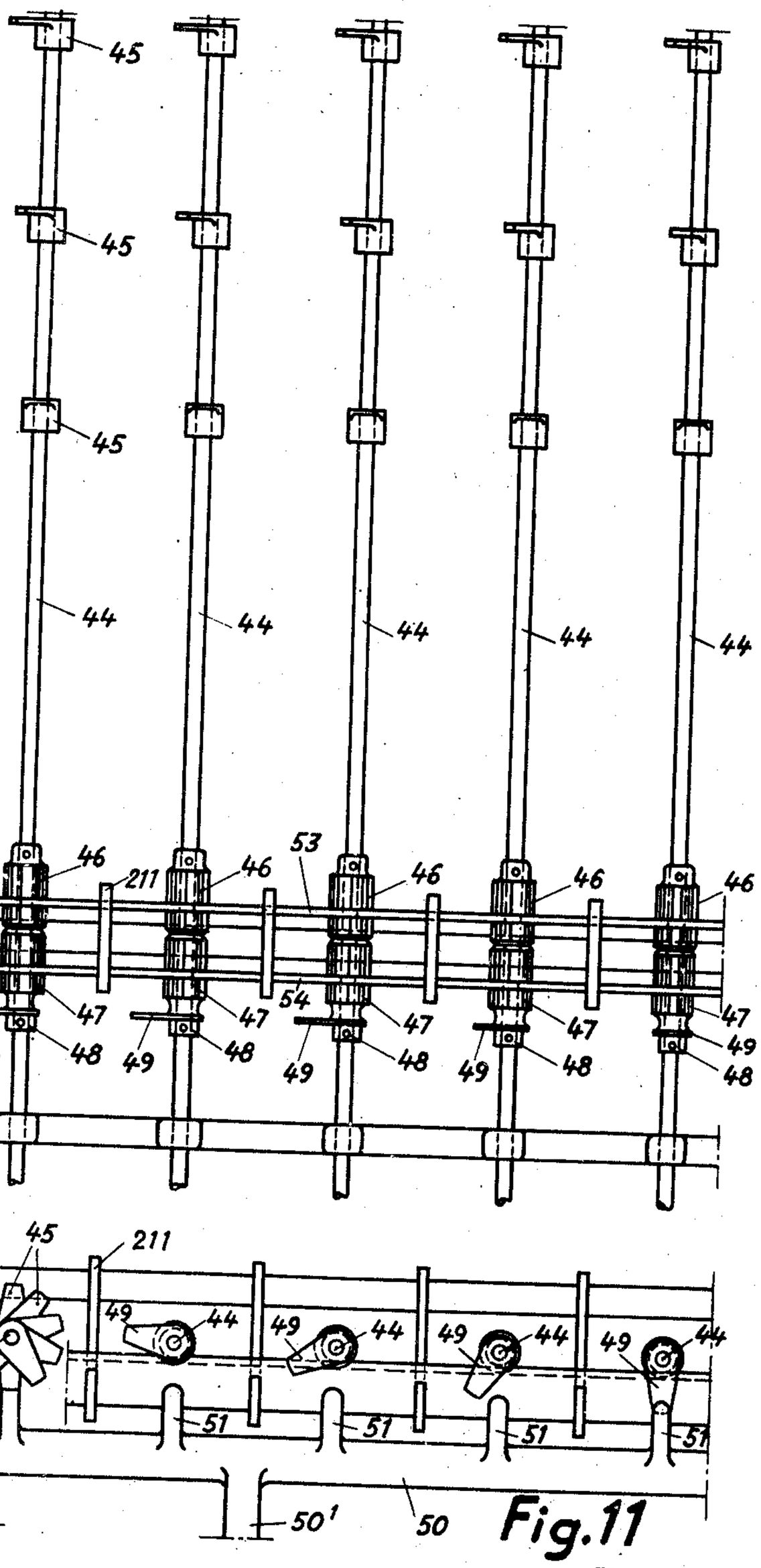


Fig. 10

Fig. 11

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TIME RECORDING APPARATUS

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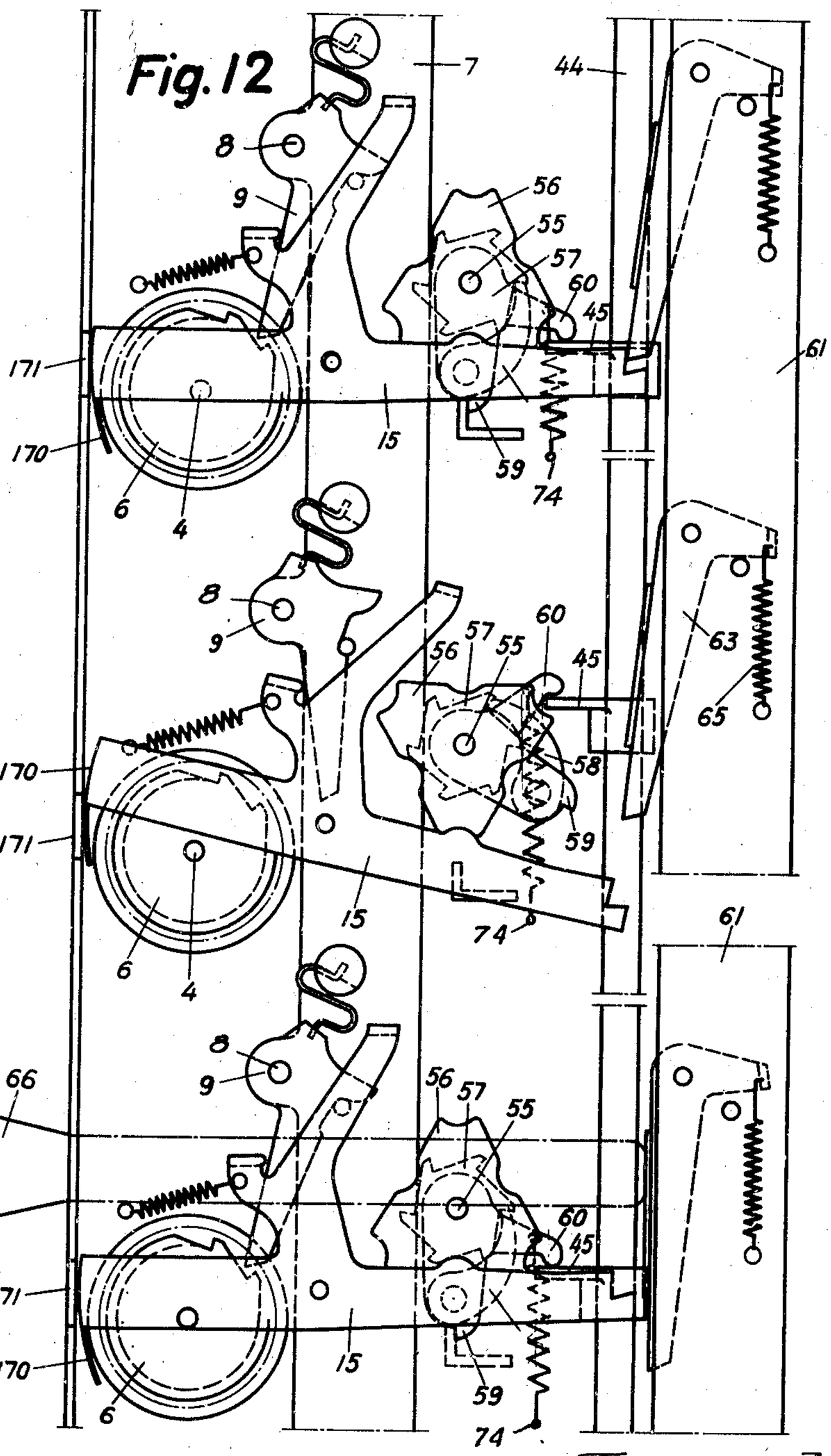
Fig. 12

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TIME RECORDING APPARATUS

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Fig. 13

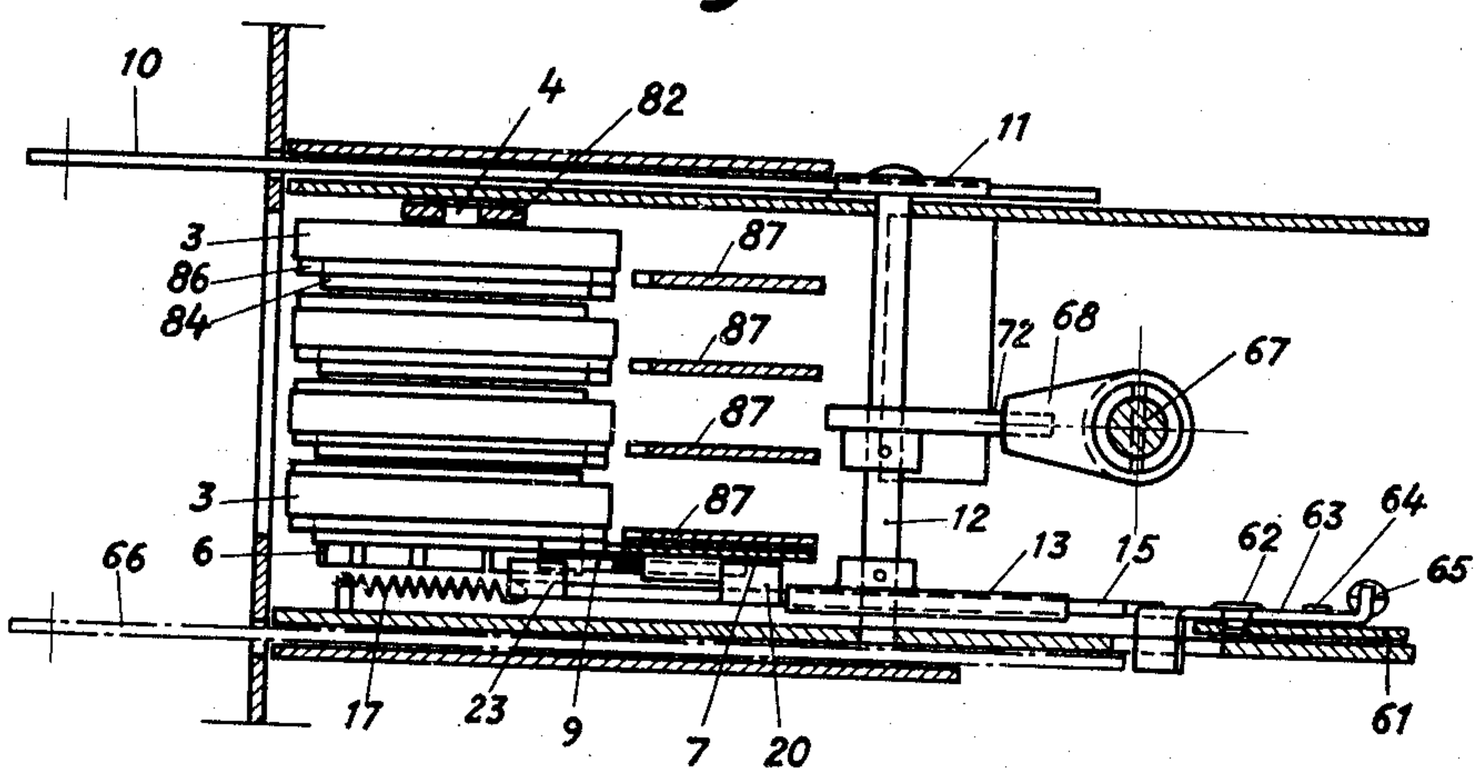
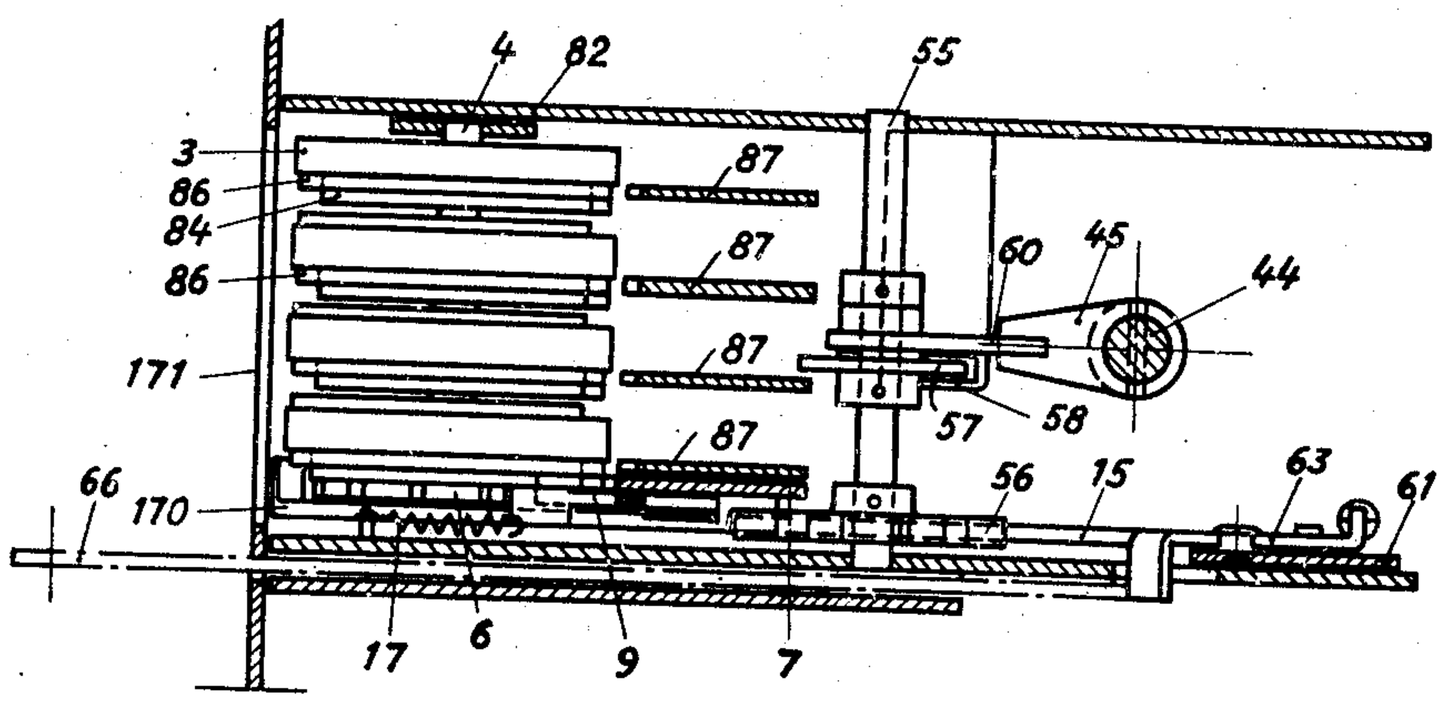



Fig. 14

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TIME RECORDING APPARATUS

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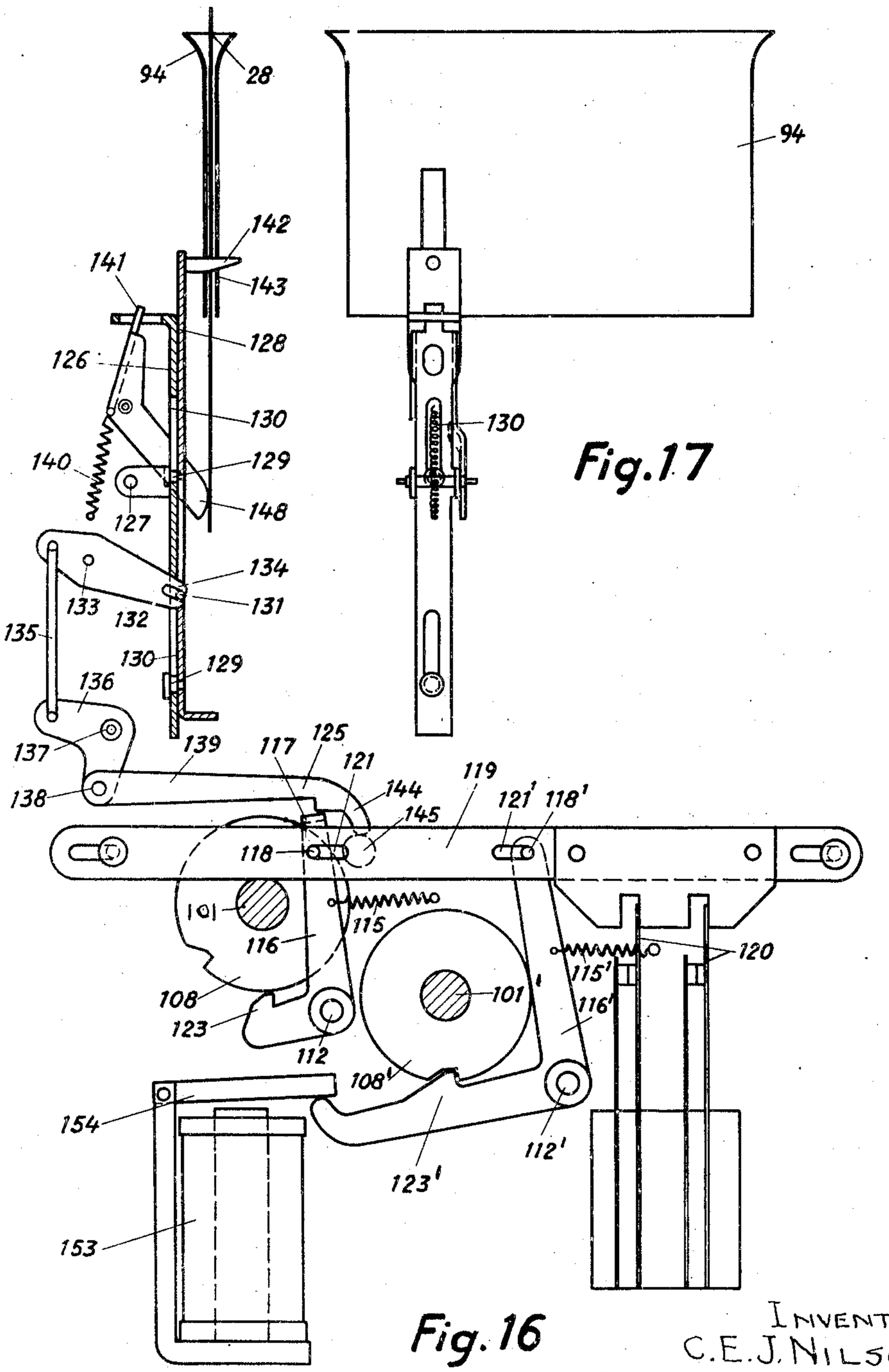


Fig. 17

Fig. 16

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TIME RECORDING APPARATUS

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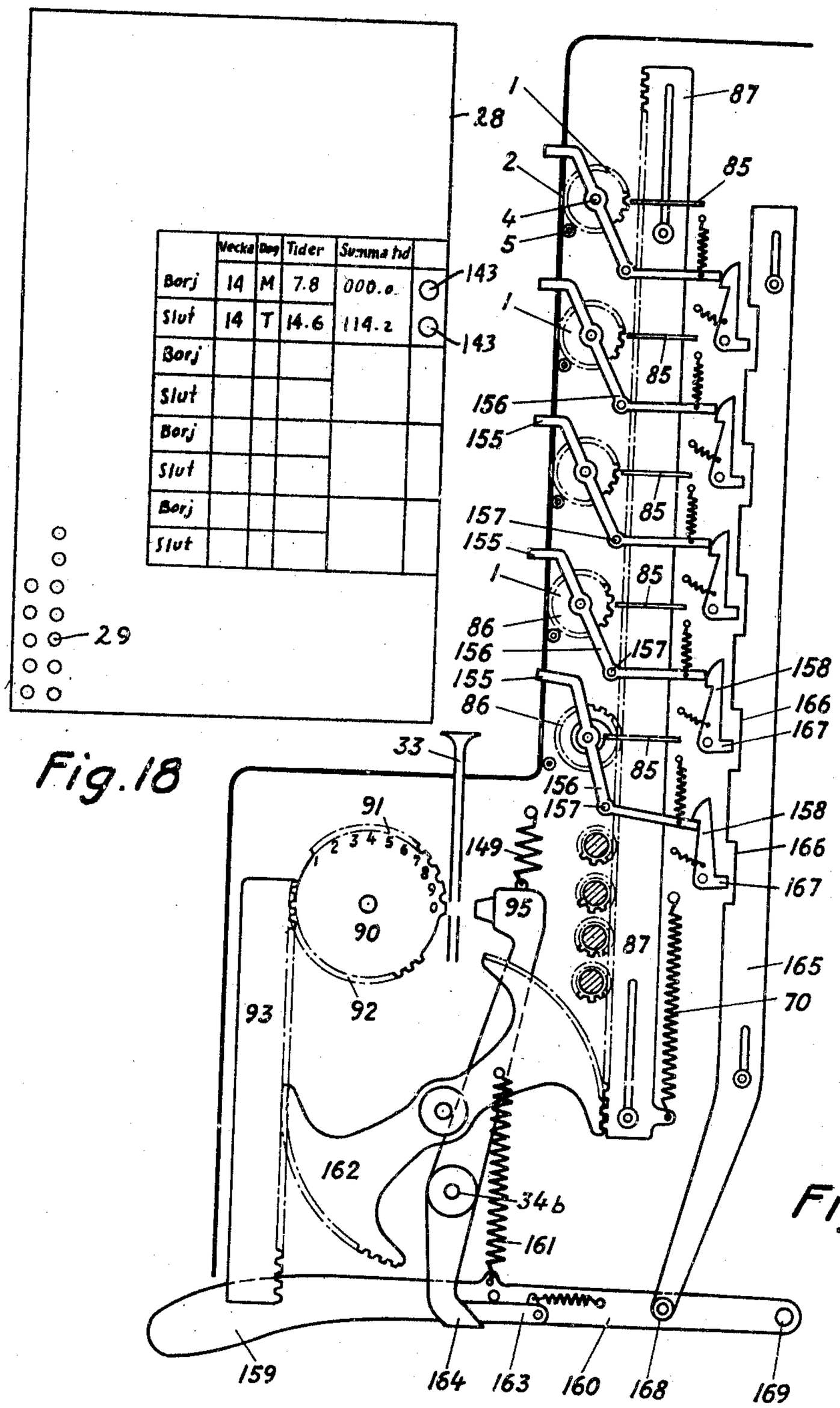


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Fig. 18

Fig. 19

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Fig. 20

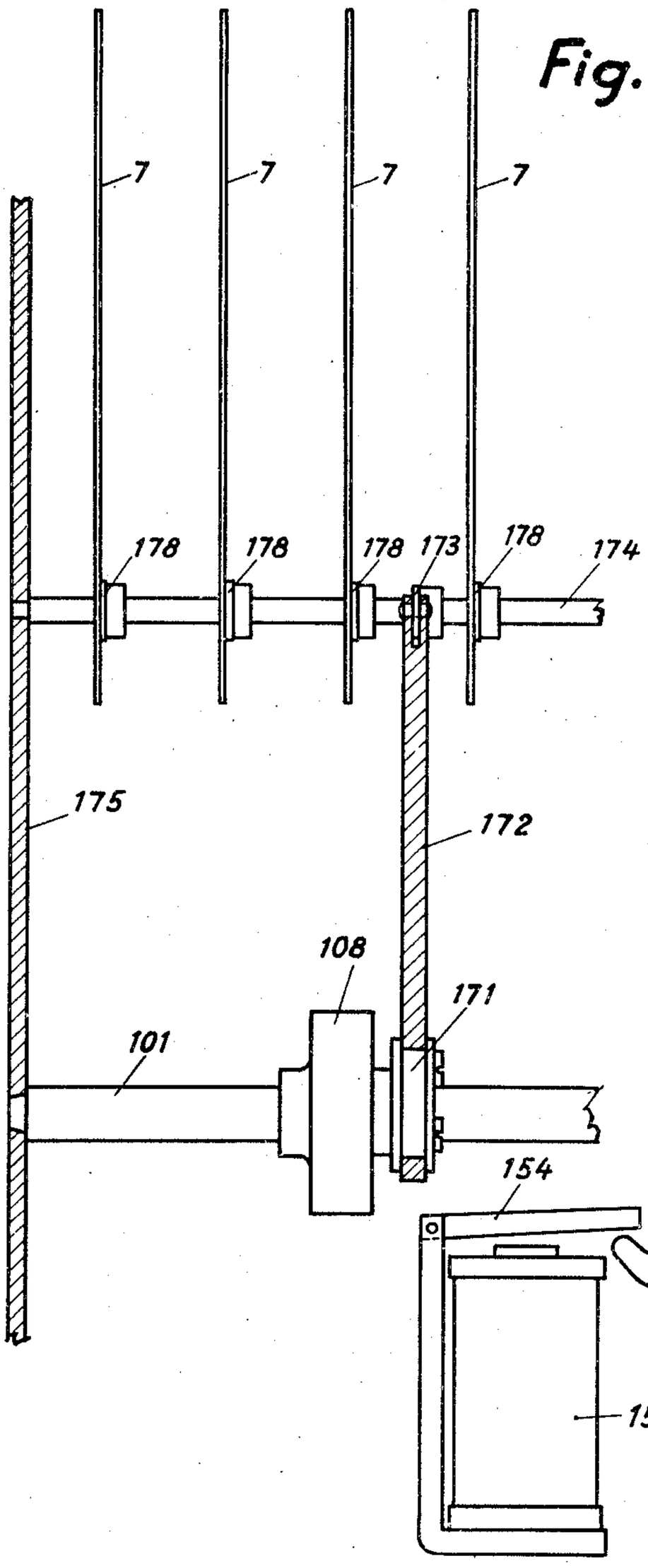
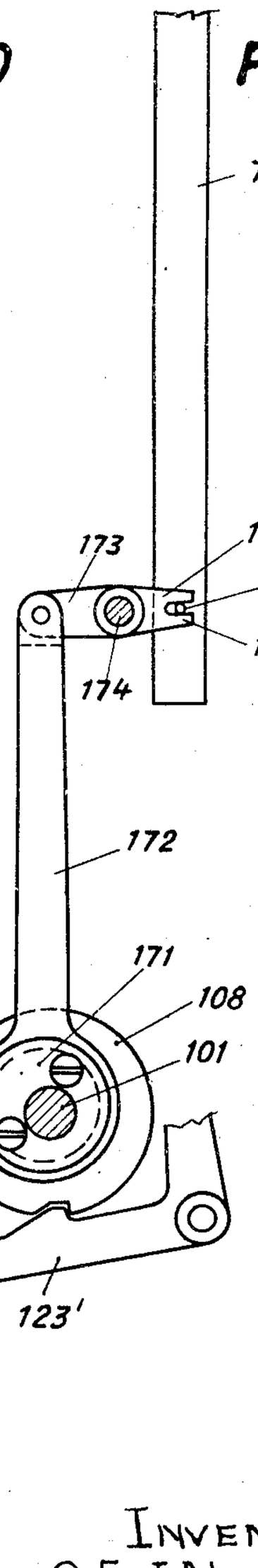



Fig. 21.

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Patented Oct. 4, 1949

2,483,926

# UNITED STATES PATENT OFFICE

2,483,926

## TIME RECORDING APPARATUS

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Application April 20, 1944, Serial No. 531,975
In Sweden May 15, 1942

2 Claims. (Cl. 346—14)

1

The present invention relates to an apparatus for time recording.

For recording time used for a certain purpose, such as time needed for the execution of work in a factory, a clock connected to a time recorder is generally used, whereby the time for the commencement and the conclusion of the work may be stamped on a card, etc. The working time accumulated is thereupon calculated on the basis of the commencing and concluding times recorded on the card. This time calculation requires close attention and occupies considerable time. It can only be performed by a trained staff, regard having to be paid to possible interruptions in work on account of rest periods, absence from work or other wasted time which must be deducted from the regular working hours in order to determine the effective working time for certain work.

The invention has for an object a time recording device in which the total effective time for a certain purpose can be stamped direct on a card or a suitable form. According to the invention this is achieved by employing a number of counters, connected with a stamping device, whereby the counters individually may be connected to and controlled by a time indicating device so that the time, for instance for different kinds of work, workmen or machinery, is counted in separate counters where for each job the used time in hours or parts thereof is registered. When the work is finished, the counter, wherein the time for the work in question is accumulated, can be connected to the recorder or stamping device to which the accumulated figure or sum will be transferred. This figure may thereupon be stamped on a card or other suitable form. At the same time the counter automatically is brought to zero position. A device of this kind gives exact and reliable figures and the above-mentioned inconvenient time calculation is dispensed with.

A device according to the invention is designed for simultaneous time recording of a number of various kinds of work, whereby it is arranged that the total of the effective time used for each work separately, in hours or parts thereof, can be recorded on a card.

In order that the invention may be clearly understood and readily carried into effect, the same will hereinafter be more fully described with reference to the accompanying drawings, in which:

Fig 1 is a diagrammatic side view of an embodiment of the time recording apparatus according to the invention;

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Fig. 2 is a view in perspective, showing the position of the counters and the transfer racks between counter and recorder;

Figs. 3 and 4 illustrate time impulse coupling by means of a key;

Fig. 5 shows time impulse switching with a segment;

Figs. 6 to 12 are details of an arrangement for time impulse switching by means of time recording cards;

Figs. 13 and 14 show details forming parts of the construction;

Fig. 15 shows a detail of the resetting device for the counters;

Figs. 16 and 17 represent the card funnel of the apparatus and related arrangements;

Fig. 18 illustrates an exemplary form of record card;

Fig. 19 shows an apparatus arranged for manual operation, and

Figs. 20 and 21 show details of the mechanism for controlling the operation of the counters of Fig. 3.

The counters designated by numerals **3**, **4** and **5** in Fig. 1 may be of any number. In a factory there may be one or several for each workman. They are provided with arrangements for receiving time impulses, for example, every minute, tenth part of an hour, half hour. The time may be transmitted direct from a built-in clock mechanism in the apparatus or electrically from a master clock. The counter proceeds one step for every such period. The apparatus is moreover equipped with a device so constructed that for each counter individually the time impulses—independent of the other counters—may be switched on and off at the commencement and conclusion of the time-controlled work. This makes it possible to count and in the counters accumulate the number of time impulses, i. e. the time units required for the execution of certain work. By the counters the time is indicated in hours and parts of an hour. The apparatus may be so constructed that the counters are visible so that the time a certain work has been going on may be read through a window at the front of the apparatus at any time.

The counters may be of arbitrary construction. In the embodiment described the counters consist as usual of a number of type-wheels **3**, Figs. 1 and 2, mounted on a common shaft **4**, and so-called tens transfer gears **5** placed between the wheels. The first wheel includes as is seen from

Figs. 3 and 12, a ratchet wheel 6, which can be operated by a driving pawl 9 connected to a strip 7 by means of a tap 8, which pawl, when the strip 7 is reciprocated in an up-and-down manner, actuates the ratchet wheel causing the counter to rotate one step for each such motion of the strip.

On each strip 7 a number of driving pawls are arranged so that they can at the same time actuate all the counters placed along this strip. The strip 7 is the means which, in this embodiment, transmits the time impulses to the counters. It can be driven mechanically (by clockwork) or electrically (by an electric magnet or an electric motor) and be controlled by a time releasing device. With reference to Figs. 20 and 21 the device for driving of strip 7 will be explained. A shaft 174, mounted in the body 175 of the apparatus is provided with arms 178 in a number equal to the number of strips 7 existing in the apparatus. A groove 176 in each arm 178 is caught by a pin 177 fastened in the strip 7. The shaft 174 is further provided with another arm 173 which can, through a link 172, be made to execute a swinging movement by means of an electromagnet or the like. In the apparatus, there is a shaft 101 which is arranged to be driven with a suitable speed. An eccentric 171 is freely arranged on the shaft 101 and can be coupled to and rotate one revolution with the shaft by means of a connecting device 108. The eccentric 171 is connected with the arm 173 by means of link 172. The connecting device 108 is operated by an electromagnet 153 which receives regular electric time impulses from a main-watch. The armature 154 of the magnet thereby actuates, by means of an arm 123, an electric contact closing the electric current for a motor, so that said motor starts and brings the shaft 101 to rotate. The arm further actuates the connecting device 108, which then connects the eccentric 171 to the shaft 101 and makes it rotate one revolution. The movement of the eccentric is thereby transmitted through the link 172, the arm 173 and the shaft 174, through the arms 178 and the pins 177 to the strip 7.

Every counter has an arrangement permitting the time impulse device to be connected or disconnected from the counter involved.

In a factory department, for instance, where the apparatus is provided with a counter for each workman, the latter, on arriving in his department, registers his presence by switching on the impulse device to his counter; on leaving the department, he registers his absence by switching off the impulse device.

Figs. 3 and 4 show an embodiment where the connection and disconnection of the time impulses take place by means of a key 10. Each counter has its proper key, which the respective workman, on entering his department, pushes into the counter carrying his number and which he takes out on leaving. When the key is in, the counter receives time impulses and counts them. Should the key be taken away, the time impulses are switched off from the counter. In this manner time indication takes place in the counter only when the workman is present in his department.

The counters may exclusively count full periods of time. When the key is inserted at the beginning of work, the time will thus only be counted from and including the next-following period and when, at the end of work the key is taken out, the time will be counted up to and including the foregoing period.



The key 10, Figs. 3 and 4, is at point *a* provided with teeth which, on the key being inserted, actuate the corresponding segment 11 and moves said segment around the shaft 12 mounted in the frame of the apparatus (not shown). Segment 11 and member 13 are rigidly connected to the shaft 12 so that, on segment 11 being moved around, member 13 is also given the same movement. During its motion member 13 actuates the arm 15, which is movable round a shaft 16 and is pressed against the member 13 by means of spring 17. Fig. 4 shows the position of the arm 15, key 10 being drawn out, i. e. the worker having marked that he is "out" and the counter having been cut from impulse giving, and Fig. 3 shows the position of the arm 15, the key being inserted, which indicates that the worker is "in" and that the counter is to receive time impulses and the time is to be recorded. The member 13 has a notch 14 and the arm 15 a protuberance 14' corresponding to said notch. Said protuberance and notch serve the purpose to lock the member 13 in the right position. The pawl 9, which is the driving member of the counter, is by means of spring 18 held against a pin 19 fixed to the strip 7 in the same position which it occupied before the arm 15 was readjusted by the key so that the pawl cannot mesh with the ratchet wheel 6. The spring 18 presses against the pawl 9 laterally of a line passing through the pivot 8 and the point of attachment of the spring and maintains the pawl against the pin 19. A hook 20 on the arm 15, in this inserted key Fig. 3 position of the arm lies above an arm 21 fitted to the pawl 9.

On the impulse emission, when strip 7 is set into movement, said strip is arranged first to move downwardly far enough to cause the counter to advance one step, then upwardly past its starting position to the top position and thereafter downwardly to its starting position.

When the strip 7 moves downwardly (middle arrangement of Fig. 3) the pawl 9 does not mesh with the ratchet wheel and the impulse is not counted. Thereupon the strip moves upwardly. The arm 21 of the pawl is moved against the hook 20 on the arm 15, whereby the pawl 9 during the last part of the upward movement of the strip 7 is pushed forwardly and set in gearing position (topmost arrangement in Fig. 3) in which position the arm 21 is maintained against the pin 19 by the spring 18. The next time impulse and all the following impulses are now counted into the counter as long as the key remains.

When the workman leaves his department, he marks his being "out." This is done by taking out the key 10, Fig. 4. The disc 13 is thereby actuated, turning the arm 15 downwardly until the notch 22 of disc 13 engages the protuberance 14' on the arm 15. A hook 23 on the arm 15 thereby actuates the pawl 9 so that said pawl disengages from the ratchet wheel 6, in which position it is maintained against the pin 19 by the spring 18, Consequently, upon movement of the strip 7, the counter will not advance until the key has been inserted anew.

Fig. 5 shows an embodiment where the connection and disconnection of the time impulses take place by means of a segment 24 fitted to each counter. This segment may be differently coloured on its upper and lower sides, for example, blue on top and red below. The workman marks his being "in" by turning this segment downwardly, causing blue to appear, and his being "out" by turning the segment up, showing red. The arrangement consists of a segment 24 ar-

ranged on a shaft **25**. By means of a gear segment **26** moveable about a shaft **27**, a segment **11** and a disc **13** are operated in the same way as described above in connection with the manipulation with a key.

Connection and disconnection of the time impulses may also be arranged by using the time recording cards of the worker in question so that on his stamping the time of arrival on the card, the time impulses are simultaneously connected to his counter and, on his stamping "out," the time impulses are switched off.

This embodiment of the time register is provided with a so-called time stamp for cards, so arranged that the type wheels **107** Fig. 2 for the time stamping are placed in the recorder on the same shaft as the type wheels **90** Figs. 1–2 for stamping the total. The time recording cards **28**, Fig. 18, are provided in their lower left-hand corners with holes **29** cut in one or several rows. These holes may correspond to the number of the workman, work, machine, etc. The first row corresponds to tens digits and the second row to unit digits. If, for instance, the worker has the number 57, the first row contains 5 holes and the second row 7 holes. If his number is 99, every row will contain 9 holes. In Fig. 6 the card **28** is partially inserted and the star-wheel engages the holes in the card whereas in Fig. 7 the card is inserted so far that the holes lie below the star-wheel and the latter slides on the card and is thus held against rotation.

On the card funnel **30** fitted on the time stamp arranged in the time recorder is mounted a star-wheel **31** which, through a shaft **32**, as is also shown in Fig. 8, being a side view of a detail of Fig. 7, is rigidly attached to a ratchet wheel **33** which operates against a gear segment **34**. By means of a link **36** the segment **34** is connected to a step segment **37**. The step segment **37** is fitted with steps **43**, as shown in Fig. 9, which is a side view of a detail of Fig. 7. These steps **43** correspond to the holes **29** in the recording cards **28** and amount to the same number as the highest number of holes **29** which can be contained in a row on the recording card. The star-wheel **31** and ratchet wheel **33** are inserted in a lever **38** movable around a shaft **35** fastened in a suitable manner to the frame of the apparatus. Moreover, on the frame is arranged a stop pin **39** for the lever **38**. The lever **38** is also provided with a spring **40** which presses said lever **38** against the card funnel so that the star-wheel **31** can mesh with the hole **29** of the recording card **28**. The step segment **37** is provided with a spring **41** which, after a certain working process, is intended to restore the star-wheel **31**, gear segment **34** and the step segment **37** to their normal positions and there to maintain them against a stop pin **42** fastened to the frame.

The arrangement as described above refers to a row of holes **29** in the card **28**. If two rows of holes exist on the card, the card funnel will be provided with two such arrangements for instance, two segments **34** and two segments **37**, and so on.

When the recording card **28** is pushed down into the card funnel **30**, the teeth of the star-wheel **31** mesh with the number-hole **29** of the card, causing the star-wheel **31** to revolve. By means of the ratchet-wheel **33** and the gear segment **34**, the step segment **37** is thereby turned by the number of holes **29** in the card **28**, Fig. 7, to a predetermined position. For each of the holes **29**, which the star-wheel **31** passes on the



card, the step segment makes one step, viz. one stage. Thus if five holes exist in the hole row corresponding to the step segment **37** in the card **28**, the step segment **37** advances five steps corresponding to five stages **43**. When the teeth of the star-wheel have passed all the holes intended for this wheel on the card, the lever **38**, on account of the teeth of the star-wheel **31** gliding up on to the card, is pushed back against a stop pin **39**, thus locking the star-wheel **31** and also the gear segment **34**. The step segment **37**, for every hole **29** in the card **28**, now takes up a predetermined position. On the recording card being drawn upwards for removal from the card funnel, the star-wheel **31** resumes mesh with the card hole and the star-wheels rotate in the opposite direction, whereby the gear segment **34** and step-segment **37** are restored to normal position where they are maintained by a spring **41**, as the step segment **37** is pressed against the fixed stop pin **42**. The starting position corresponds to the broken line in Figs. 6 and 7.

For transmitting the movement to the counters a shaft **44**, Fig. 1, is provided behind every vertical row of counters. Fig. 10 illustrates said transmitting mechanism. These shafts **44** are so arranged in front of every counter and equipped with an arm **45**, Figs. 10 and 11, that upon step-by-step movement of the shaft only one of these arms **45** for each position can be set in connection with a counter. If ten counters are placed one on top of the other ten arms are thus distributed spirally one above the other so that, for each step made by the shaft, the arms **45** will, in their proper turn, mesh with their respective counters.

Further, the shafts are equipped below with a rigidly mounted gear **46** and a freely running gear **47** held in its position by a stop ring **48** on the shaft **44**. The gear **47** is further provided with a rigidly attached arm **49**. In front of the arm **49** existing on each of the shafts **44** is a horizontal strip **50**, Figs. 1 and 11, with, for every shaft **44**, protruding prongs **51**. The strip **50**, which thus stretches past all the shafts, is fastened to a shaft **52**, Figs. 1–11, arranged in the frame of the apparatus. The strip **50** is further fitted with a lever **501** which can be set in up and down motion by a cam on the shaft **101** in Fig. 1. It is understood that this motion also will swing the prongs **51** up and down. The arms **49** are so arranged that, on a simultaneous turning of the gears **47**, Fig. 1, but a single arm **49** at a time can gear into its corresponding prong **51** on the lever **50**.

The interrelationship between the gear **46** and shafts **44** is determined by a gear rack **53** and the gears **47** through a gear rack **54**. The racks **53** and **54**, Figs. 10 and 11, are mounted in supports **211** carried by a bolt **212** fixed in the body **213** of the apparatus.

The step segments **37**, Fig. 9, and those designated **37** in Fig. 10, are identical, it being understood that for purposes of illustration only one step segment is shown in Fig. 9. These segments are adjusted as described above, when the recording card **28** is inserted in the card funnel **30**, whereby the number of holes **29** in each row individually, through the star-wheels **31** and the gear segment **34**, each actuate a step segment **37**, one for units and one for tens digits, and adjust these according to the workman's number—the counter's number—as indicated by the number of holes in the recording card.

The gear rack **53** is pushed against the step segment **37**, arranged in front of it by means

of an arm 180, Fig. 1, fastened to a shaft 182, which is geared in a link 181 fixed in the body of the apparatus. The arm 180 is through the shaft 182 fixed to another arm 183, which is provided with a roller 184, which runs on a curve, cylinder-shaped in a manner known per se, and which is fastened to the shaft 101. The movement of the gear rack 53 stops on engaging the stage 43, which, through the adjustment of the step segment made by the recording card, has arrived in front of the rack. The movement of the rack 53 is transferred by the gear 46 to all the shafts 44, which turn with a movement corresponding to the extent of movement of the rack. The steps 43 of the step segment 37 are in number equal to that of the arms 45 on each shaft, and the distances between the steps correspond to the movement of the rack in such a way that, for every step, the arms 45 in their proper turn will come into engagement with the counters arranged one on top of the other along the shaft involved. By movement of the rack 53 towards the step on the step segment 37, all the shafts 44 will thus be adjusted so that, of the arms 45 on these shafts, one will be in gearing position with the corresponding counter. Preferably, the arrangement should be such that all these arms are in line so that should, for example, the seventh arm be adjusted on a shaft, the seventh arm of all the other shafts will be adjusted to gear with the corresponding counters.

The gear rack 54 in the manner above described, drives the gear 47 existing on every shaft 44, so that these are set according to the position of the stop segment determined by the card. Thus the arm 49 on the gear 47 on a predetermined shaft 44 arrives in front of the corresponding prong 51 on the lever 50.

The strip 50, which is movable around its shaft 52, Fig. 1, is now moved upwardly, whereby the prong 51, Fig. 11, presses against the arm 49, which is adjusted for gearing with the prong, whereby its shaft 44 is pushed somewhat upwardly. The arm 45 on this shaft, which was formerly set in gearing position with a corresponding counter, now operates the impulse receiving mechanism of this counter while all the other counters remain unactuated. When the lever 50 returns to the starting position, the shaft 44 is restored to normal position by a spring 102, Fig. 1, fitted on the shaft.

The upper part of Fig. 12 shows how this movement effects the connection and disconnection of the time impulses to the counters.

The counter is provided with a member 56 mounted on the shaft 55 and which can be driven round step-by-step by a ratchet wheel 57. The ratchet wheel is actuated by a driving pawl 58 fitted on an arm 59 which can swing to and fro around the shaft 55. The arm 59 is provided with a finger 60 and a spring 74, which tend to move the arm 59 downwardly. Behind the counter is placed the aforesaid shaft 44 with the arms 45. When the shaft as previously described, has been so adjusted that it arrives beneath finger 60 and the shaft is moved upwardly, it causes movement of the finger 60 of the arm 59, thus causing the ratchet wheel 57 to advance one step, whereby the disc 56 is turned. The arm 15 is also reset (see the arrangement of Fig. 12), which actuates the driving pawl 9 so that the time impulse device is switched on or off as described above in connection with the manipulation with a key.

In order to indicate the adjustment of the counter to the time impulse device, the arm 15



is provided with a semaphore 170 which, through a window 171 on the front part of the apparatus opposite the counters in question, indicates by different colours the positions "in" and "out" of the time impulse device.

As a rule, every factory, etc., has a so-called regular working time, that is, the work begins at a certain hour in the mornings and ends at a certain hour in the evenings, possibly with interruptions for rest periods. The time counted in the counters may as a rule comprise only the regular working hours. The workman may however arrive somewhat earlier at the commencement of work and immediately marks his presence in the apparatus. He may also remain in his department after the work has finished and mark his departure later.

To prevent time impulses being fed into the counters beyond the regular working hours, there is in each vertical row of counters a strip 61, Fig. 3 (middle arrangement). This strip extends past all the counters arranged in a row one on top of the other and such a strip 61 is provided for each of the vertically arranged rows of counters contained in the apparatus. The strip 61 for each counter is provided with a catch 63 movable around a shaft 62 fitted in the strip 61, which catch can mesh with the arm 15. The catch 63 is held by a spring 65, in its correct place against a stop pin 64 arranged on the strip 61. At the end of the regular working time, the strip 61 is moved downwardly whereby the catches 63 engage the arms 15 and turn them down. Hereby the driving pawls 9 of the counters are disconnected, preventing further feeding of the time impulses (see lower part of Fig. 3). The strip 61 now remains in its lower position until work begins again at a regular hour when it is then restored to its top position, whereby the arm 15 is released and rises towards its stop pin on the disc 13, so that, if this is set in inner position by a key, segment or card, the catch 9 is released and the time impulses are counted in the counters.

The position of the strip 61 does not affect the possibility of the workman having any time to mark in the apparatus if he is "in" or "out," that is, to switch on or off the impulse emission for his counter. However, the impulses are counted only in case the strip 61 has its upper position, viz., during regular working hours.

Outside of regular working hours, when the time impulses are normally fed into the counters, the time impulse feeding into the counter of the workman doing overtime is possible. In such a case a key 66 is inserted (see middle arrangement of Fig. 3) in the counter of the workman called upon to do work after regular working time. This key 66 pushes back the catch 63 so that, when the strip 61 is pulled downwardly, it does not engage the arm 15. The arm 15 thus maintains the position it had before the strip 61 was set in movement. Should the disc 13 now have its "in" position, time impulses are fed into the counter.

If the arm 15 (lower arrangement of Fig. 3) in its lower position is obstructed by the pulled-down strip 61 and the catch 63, whereby the time impulses are disconnected on insertion of the key 66, the catch 63 is pushed back by the key 66. The arm 15 is thus released and, if the disc 13 (or 56 in Fig. 12) is in its "in" position, is pulled up by the spring 17 to touch this disc. This causes release of the catch 9, so that time impulses are fed into the counter (see middle arrangement Fig. 3).

When the work is interrupted and the worker leaves his place at the end of the regular working hours, he marks that he is out by removing the key **10**, Fig. 3, or by pushing his segment **24**, Fig. 5, so that the time impulse emission to his counter ceases. Should he neglect to do so, no time impulses enter the counter, because the strip **61** at the ending of the regular working hours, as above described, switches it off. If he neglects to remove his key or respectively to actuate his segment, the disc **13** remains in the "in" position so that when the disc, at the beginning of the next regular working period, returns to its upper position and arm **15** is released, said arm occupies a position enabling the catch **9** to move into operating position whereby time impulses are fed into the counter even should the workman not be in.

To prevent this an arm **72**, Figs. 3 and 4, has been provided which, through the shaft **12**, is rigidly connected to the disc **13**. Behind the arm **72** is a bar **67** running vertically past all the arms **72** pertaining to the counters which are placed vertically one over the other. The bar carries in front of each of the arms **72** an arm **68** moveable up and down the bar. This movement is limited by a pin **69** fastened to the bar **67**, which pin runs in a slot **70** arranged in the hub of the arm **68**, the slot also preventing the arm **68** from turning on the bar. The arm **68** is held down by a spring **71** towards the pin **69**.

At any time during rest periods or other non-regular working time when the staff is absent, as a rule the bar **67**, Fig. 5, is pressed down. The arm **68** then also presses the arm **72** downwardly which then sets the disc **13** in "out" position whereby also the gear segment **11** is turned so that the key **10**, Fig. 3, is pushed out or the segment **24**, Fig. 5, is reset in "out" position. The bar **67** now returns to its upper position. Time impulses cannot be fed into the counters until the key **10** has been re-inserted or the segment **24** has taken its inner position.

The counter for workman ordered to work overtime and thus have a so-called overtime key inserted may consequently not be switched off from the time impulse emission when the bar **67** moves downwardly. In order to prevent disconnection of these, the gear segment **11**, middle arrangement in Fig. 3, is provided with a projecting part **73** against which the overtime key **66** rests, preventing the gear segment **11** and thus the disc **13** and the arm **72** from turning around their shaft **12**. When the bar **67** is brought downwardly the arm **68** presses against the arm **72** and tends to turn it. The arm **72** together with gear segment **11** and the disc **13** is, however, locked by the overtime key **66** and may not be reset. The arm **68** resting against the spring **71** is instead displaced on the bar, preventing the resetting of the disc **13**. When the bar **67** returns to its upper position, the arm **68**, by the pressure of the spring **71**, is restored to its starting position on the bar **67**.

In an arrangement for connection and disconnection of the time impulses by means of the workman's time recording card, as described above, the apparatus may be arranged in the same manner so that, in the case of the recording being neglected, the disc **56**, Fig. 12, is automatically reset to "out" position.

The counters in Fig. 1 are fastened to a bridle **82** movable around a shaft **83** fixed in the frame of the apparatus. On each of the wheels in the counters is a catch **84**, Fig. 15, situated so that



the type wheel is in zero position if the counter is restored and the type wheel turned so that the catch **84** meets a stop **85**. The type wheels are also equipped with gears **86** which can be moved to mesh with a rack gear **87**. Normally, the gear **86** and the rack **87** do not mesh with one another. The rack gears **87** are intended to connect any of the counters with the recorder and extend from any of the recorders upwards above all the placed vertically counters, Figs. 1 and 2. If a counter is composed of several denominational type wheels, there is a rack gear for every type wheel contained in the counter. Thus if the counter consists of four type wheels it will have four racks. These four racks are common for all the counters placed one above the other so that if, for instance, ten counters are placed one above the other only these four racks are required.

If the apparatus is to be extended to contain more counters than can possibly be built together vertically, several such vertically extended groups may be placed side by side whereby every group has its own racks. The racks are then interconnected whereby all the racks pertaining to units wheels are interconnected separately, all the racks for tens number wheels separately, and so forth. The interconnection can easily be effected by means of shafts **88**, Fig. 2, which are equipped with gears **89** so arranged that one shaft connects all the units racks and units wheels of the apparatus, a second shaft connects all the tens racks and tens wheels, etc. This arrangement ensures that all the racks in, for instance, the units wheels will accompany one another, whereby their movement becomes identical. This applies also to the tens and hundreds digit racks, etc.

The recorder consists of a group of type wheels **90**, Figs. 1 and 2, corresponding to and as many in number as the type wheels of the individual counters. The type wheels are equipped on one half of their circumferences with type **91** corresponding to the digits of the type wheels **3** and on their other half circumferences provided with gear segments **92**. Each segment **92** is connected by means of the rack gear **93** to a gear segment **94**, the other side of which meshes with the rack **87**. The type wheels **90**, rack **93** and gear segment **94** as well as the rack **87** are as many in number as the type wheels in one counter. However, they are arranged so that when several rows of counters exist in the apparatus as many gear racks **87** are provided in every such row as there are type wheels in every counter. Since several counters are placed side by side, a single group of racks only need be connected to the gear segments, the racks **87** being interconnected in groups through the shafts **88** and the gears **89**. To obtain connection with the gear segments a group of the rack gears **87** from the counters are therefore extended, as shown in Fig. 2.

The recorder is equipped with the card funnel **30**, Fig. 1, intended to receive the form or card on which the time counted in the respective counter is to be recorded and with a recording hammer **95** moveable around a shaft **96** mounted in the frame and intended to press the card inserted in the funnel against the recording type wheels when the recording is to take place. The gear segments, each with its spring **97**, are elastically connected with a lever arm **98** which can move around the shaft **96**. The arm **98** is further equipped with a roll **99**, which can be actuated by a cam disc **100** fixed to a shaft **101**.

On transmission of the sum in the counters

to the recorder, that counter the sum on which is to be recorded, is geared with the rack gear **87** which, through the segment **94** and the rack **93**, is connected to the type wheel **90**.

This may partly be done by the counter in question having a push button **155**, Fig. 19, with which the counter can be moved by hand towards the rack **87**, or by the counter automatically gearing with the rack **87** on insertion of the recording card in the card funnel.

In the latter case the recording card **28**, Figs. 6 and 7, is provided with holes **29** corresponding to the workman's number and the apparatus is arranged with the device previously described in connection with the "in" and "out" switching of the time impulses by means of a recording card whereby, through the shafts **44**, Figs. 1, 10 and 11, the card adjusts the arm **45** so that when the shaft **44** is pushed downwardly the arm **45** also pulls the bridle **82** downwardly. The bridle **82** in which the counter is fastened moves round a shaft **83** and thus presses the counter backwardly so that the counters are released from the tens transfer gears **5** and, further, so that the gear segments **66** of the type wheels mesh with the racks **87**.

If the time register is motor driven it is fitted with one or more shafts supplied with one set of cam discs for each different operation in the register, e. g. one set of cam discs which will drive the strips **7**, Fig. 3, for the impulse device, one set of cam discs for the movements required for the recording and so on.

The electric motor of the time register is connected to the respective shafts by means of a coupling so arranged that only a single set of cams at a time can be set in motion, and, further, so that they can make only one revolution for each switching.

The electrically driven time register is so arranged that, when the recording is to take place and the recording card inserted in the funnel of the apparatus, the electric motor of the apparatus is started automatically at the same time as the register shaft, which is to be set in operation, is connected, the total amount in the counter involved is conveyed to the recorder, the counter is set in zero position and its sum total stamped on the card.

The card **28**, Fig. 18, on which the accumulated time is recorded, is arranged in known manner so that, on the card being inserted in the card funnel and the recording taking place, a hole **143** is stamped in the card which hole at the next recording serves to establish the position of the card in the recorder so that the stamps are made in their proper turn, one underneath the other, at equal distances. At every new stamping a new hole **143** is made.

Moreover, the recorder is so arranged that when the sum from the counters is stamped on the card **28**, the calender time is recorded simultaneously. Thus the exact time indication for the beginning of work as well as the time for its finish is obtained.

On card funnel **94**, Figs. 16 and 17, of the apparatus is a strip **126**, which below is angularly bent and mounted on a shaft **127** in the frame (not shown). On the strip **126**, a strip **128** is moveably connected to the strip **126** by means of two studs **129** which move in their respective slots **130** on the strip **126**. On the strip **128** is a further stud **131**. A lever arm **132** is arranged on a shaft **133** fastened to the frame. The arm **132** has in one end a slot **134** which actuates the pins **131** of the strip **128**. The other end of the lever arm is connected by means of a link **135** with an angle lever **136** arranged on a shaft **137** fastened to the frame. The angle lever **136** is furthermore equipped with a catch **139** moveable on a stud **138**. A strip **119**, Figs. 16, 17, is mounted to slide longitudinally. Two pairs of springs **120** are provided with electrical contacts for closing and breaking the electrical current for the motor of the register. The springs **120** tend to keep the strip **119** in its position to the right, in which position the electrical current for the motor is broken. An arm **116**, mounted on a shaft **112**, is provided with a stop pin **117**, which can be actuated by catch **139**. The arm **116** is moreover provided with a pin **118**, which meshes into a slot **121** in the strip **119** and further a finger **123** which meshes into a notch on disc **108**. The disc **108**, which is driven by means of a gear device from the motor of the register (not shown on the drawing), can connect the shaft **101** which supports the cam discs necessary for the function of the register, said cam discs thus being set in motion and driven around one turn. This is obtained, the arm **116** being brought to the left, whereupon the finger **123** is brought out of its notch in the disc **108**, connection of the shaft **101** thus being obtained and the disc beginning to revolve. The finger **123** is then brought upwards against the periphery of the disc against which it is kept pressed by means of spring **115** until the disc and with it the shaft **101** have been revolved one turn, after which the finger **123** again gears with its notch, disconnection thus taking place and the disc being locked into a position determined by the notch. Adjacent the strip **119** and the point **144** of the catch **139** there is a roll **145** fastened in the body of the register, not shown in the drawing, by means of which roll the catch, on being brought to the left, is disengaged from the pin **117** of the arm **116**.

For receiving electrical time impulses from a main clock and transmission of the impulses to the mechanism of the register in order to drive the type wheel for time-stamping, there is an electro-magnet **153**, Fig. 16, provided with an armature **154**, which can actuate an arm **116¹** mounted on a shaft **112¹**. The arm **116¹** is provided with a pin **118¹** which meshes into a slot **121¹** in the strip **119** and further with a finger **123¹** gearing with a notch in the disc **108¹**. The shaft **101¹** supports the cam discs necessary for the time feeding, said cam discs being revolved on turn by each connection, similarly to the above described device.

The operation of the apparatus at the recording of the time accumulated is as follows:

When the card **28**, Fig. 18, is inserted in the card funnel **30**, Figs. 1 and 6, the star wheels **31** are actuated by the number holes **29** existing in the cards corresponding to the workman's number whereby a counter is selected. Upon continued insertion of the card, the catch **148**, Fig. 16, is pushed aside and, through the spring **140** and the finger **141** keeps the strip **126** away from the card funnel **94**, so that the strip **126** turns around its shaft **127** and causes the strip **128** to approach the card funnel so that the pin **142** contacts the stamping card. If the card has not previously been stamped it goes down towards the stop formed below on the strip **128**. Should the card already be stamped, the pin **142** penetrates the hole **143**, Fig. 16, located by the immediately preceding stamp. Upon a continued insertion of the card it moves the strip **128** along with it, either due to its pressure against the stop below on the strip

128, or by means of the pins 142, as far as the studs 129 in the slots 130 allow. When the strip 128 is brought downwardly, the stud 131 actuates the lever arm 132, the movement of which is conveyed through the link 135 to the angle lever 136. Then the catch 139 is pulled to the left bringing with it the arm 116. The strip 119 is simultaneously by means of the pin 118 in the arm 116 working in the slot 121 brought to the left whereby through the motor contacts 120, the circuit for the electric motor is closed so that the motor starts operating. When the strip has reached its left hand position, the point 144 of the catch 139 engages a roll 145, whereby the catch 139 is disengaged from the arm 116. Since the pin 118 on the arm 116 runs in a slot on the strip 119, no other arms connected with the strip are affected by its movement.

On the arm 116 being brought to the left, the finger 123 is also brought out of its notch in the disc 108, the shaft 101 then being connected, and since the motor is now operating, the shaft 101 together with the disc 108 are now being revolved. The arm 116 is kept in its position, the finger 123 resting against the periphery of the disc 108 and being kept in said position for one revolution.

On the shaft 101, Fig. 1, cam discs are so arranged that they firstly actuate the gear racks 53 and 54 which set the gears 46 and 47 so that when the shaft is brought downwardly through arm 50, an arm 45 clutches the bridle 82 on the counter the number of which was set by means of the card and maintains the bridle in the downward position (lower counter, Fig. 1). Thus the counter wheels are released from the tens digit transmission and the gear segments 86, Fig. 5, of the type wheels are thrown into gear with the racks 87. Upon continued movement of the shaft 101 the lever 98 is actuated and made to turn around its shaft 96. This movement is transmitted through the springs 97 to the gear segments 94, which pull the gear racks 87 downwardly. The gear rims 86, Fig. 5, of the indicator wheels are also actuated and made to turn until the heel 84 has reached the stop 85, when the movement of the wheels and the gear racks 87 stops. This sets the indicator wheels of the counters involved into zero position. The rotary movement of the indicator wheels corresponds to the number of digits which the respective counter had in its starting position. The movement of the arm 98, Fig. 1, may continue further without the segments moving and the spring 97 will then extend. The movement of the corresponding rack gear dependent on the position of the indicator wheel involved is transferred by the segment 94 and rack 93 to the recording wheel 90, which turns through as many teeth as the corresponding indicator wheel in the counter. The type wheel 90 is thus set in such a manner that the same figure as shown by the indicator wheel in the counter before the re-setting on the type wheel, has now been set in recording position. During the movement of the shaft 101 the hammer 95, which can turn round the shaft 96, has also been removed under the influence of another cam disc 146 which operates towards a catch 147, from the type wheel 90, causing the spring 149 to be set. When the shaft 101 has nearly completed one revolution and the recording wheels 90 have been adjusted, release of the hammer follows which by the set spring 149 is moved towards the recording wheels making one impression on the card inserted into the funnel.



The counter which has zero position is restored to its starting position by the shaft 44 being brought upwardly so that the arm 45 releases its connection with the bridle 82 which by the spring 150 is pulled upwardly. The connection of the counters with the rack 87 is released and the counter takes up its operating position. A new counting of the time impulses may thereafter follow immediately.

Upon continued movement of the cam disc 100 the arm 98 is released and brought back by the spring 151 whereby a rod 152 fastened to the outer end of the arm is pressed against the gear segments 94, restoring these and thus also the gear rack 87 and the gear rack 93 as well as the type wheels 90 to their starting position.

The shaft 101, Fig. 1, makes only one revolution because the finger 123 on the arm 116 after one revolution of the disc 108 will catch in the notch in the disc 108 which thus will be disconnected from the motor drive and locked in this position. When the arm 116, Fig. 16, was released, and the finger 123 reentered the recess in the disc 108, the strip 119 was also released, which, through the pressure from the contact springs 120, is pushed to the right breaking the circuit and stopping the motor.

Hereinafter the recording card is removed from the card funnel, whereby the strip 128 and the catch 139 together with the devices connected hereto return to their starting position, as is also the case with the gear segments 34 and the step segment 37. The apparatus is now ready for the next recording.

Since the time impulse emission is controlled by electric impulses emitted from a master clock at predetermined hours, for instance every minute, tenth part of an hour or half-hour, these actuate an electromagnet 153, Fig. 21, in the time register; the armature 154 of this electro-magnet, on being attracted by the magnet, is pressed against the arm $116^1$ so that this latter turns around its shaft. Hereby the pin $118^1$ in the other end of the arm actuates the strip 119 closing the electric contacts 120 and starting the motor. Now follows, as was the case in the above description, connection of the shaft $101^1$, which in its turn actuates the strips 87, Fig. 2, for the impuse emission to the counters etc., whereupon, when the shaft 101, Fig. 23, has made one revolution, the shaft is locked and the strip 119 released enabling it to return to its starting position whereby the electric circuit over the contacts 120 breaks and the motor stops.

The electric motor for the drive of the time recording mechanism may naturally be replaced by electro-magnets, a mechanical clock movement or some other driving device.

Instead of the above described automatic device for the transmission of the total sum in the counters to the recorder a push-button 155, Fig. 19, may be arranged for every counter. Instead of a button, a loose key, different for every counter (workman), may be used. The button 155 is connected with a lever 156 moveable around an axis 157. When recording is to take place a recording card is introduced in the card funnel 33 and the button 155 pertaining to the counter the time indication of which is to be recorded, is depressed. Release of the counting wheels from the tens number transmission follows and the gear 86 of the indicator wheels engages the rack gears 87. At the same time the counter is locked in this position by the catch 158. A handle 159 on the lever 160 moveable around a centre 169

is depressed and the downward movement of the lever is transmitted through the springs 161 to the gear segments 162, which actuate the racks 87 and convey the values in the counter to the recorder 90. At the same time as the downward movement of the arm 160 over the handle 159 takes place the catch 163 acts against a cam 164 and the hammer 95 and makes it swing backwardly whereby the hammer spring 149 is set. When the catch 163 has passed the oblique cam 164 the hammer is released and recording follows. The arm 160, however, continues its downward movement until the strip 165, which is moveably connected at 168 to the arm 160, has reached a position where the groove 166 meets the arm 167 on the catch 158, which is now conducted backwardly and releases the arm 156, causing the counter to be restored to its former position. The counter now occupies zero position and a new counting of the time impulses can follow immediately.

On release of the handle 159 the rack 87 is restored by the spring 170 to its starting position, causing its movement to be conveyed through the segment 162, to the rack 93 and the recording wheel 90, which thus takes zero position. The apparatus is thereupon ready for the next recording.

The embodiments shown in Figs. 3, 5 and 12 illustrate how the time impulse emission to the counter is mechanically connected and disconnected by a key, segment or stamping card. Where coupling of the impulses is to be made from another place than that where the counters are placed, this may naturally be done by electric transmission in connection with the constructions shown.

I claim:

1. Time recording apparatus including a plurality of individual counters operable to register the time elapsed in the performance of different operations, time controlled means for imparting timing impulses to said counters, a common stamping device for recording elapsed times registered by said counters, a device for receiving



record cards bearing perforations arranged to control the selection of the individual counters corresponding to said record cards, star wheels arranged to sense the number of such perforations upon insertion of each record card, means controlled by the amount of rotation of the star wheels for selecting the corresponding counter, a ratchet wheel for each counter and means for advancing said ratchet wheel one step upon each insertion of the record card corresponding to said counter, means controlled by the position of said ratchet wheel for alternately connecting and disconnecting said counter from said time controlled means upon successive insertions of the corresponding record card, gearing arranged to transmit the registrations of said counters to said common stamping device, means for connecting said counters selectively with said gearing, and means for actuating said gearing to transmit the selected registration to said stamping device and simultaneously to restore the selected counter to zero registration.

2. The invention in accordance with claim 1, and means responsive to alternate insertions of a card in said receiving device for initiating the connection of the corresponding counter with said gearing, for initiating the actuation of said gearing, and for operating said stamping device to record the registration upon said card.

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