No. 705,909. Patented July 29, 1902.

N. COLLINS.

TIME STAMP.

(Application filed July 10, 1901.)

(No Model.) 4 Sheets—Sheet 1.

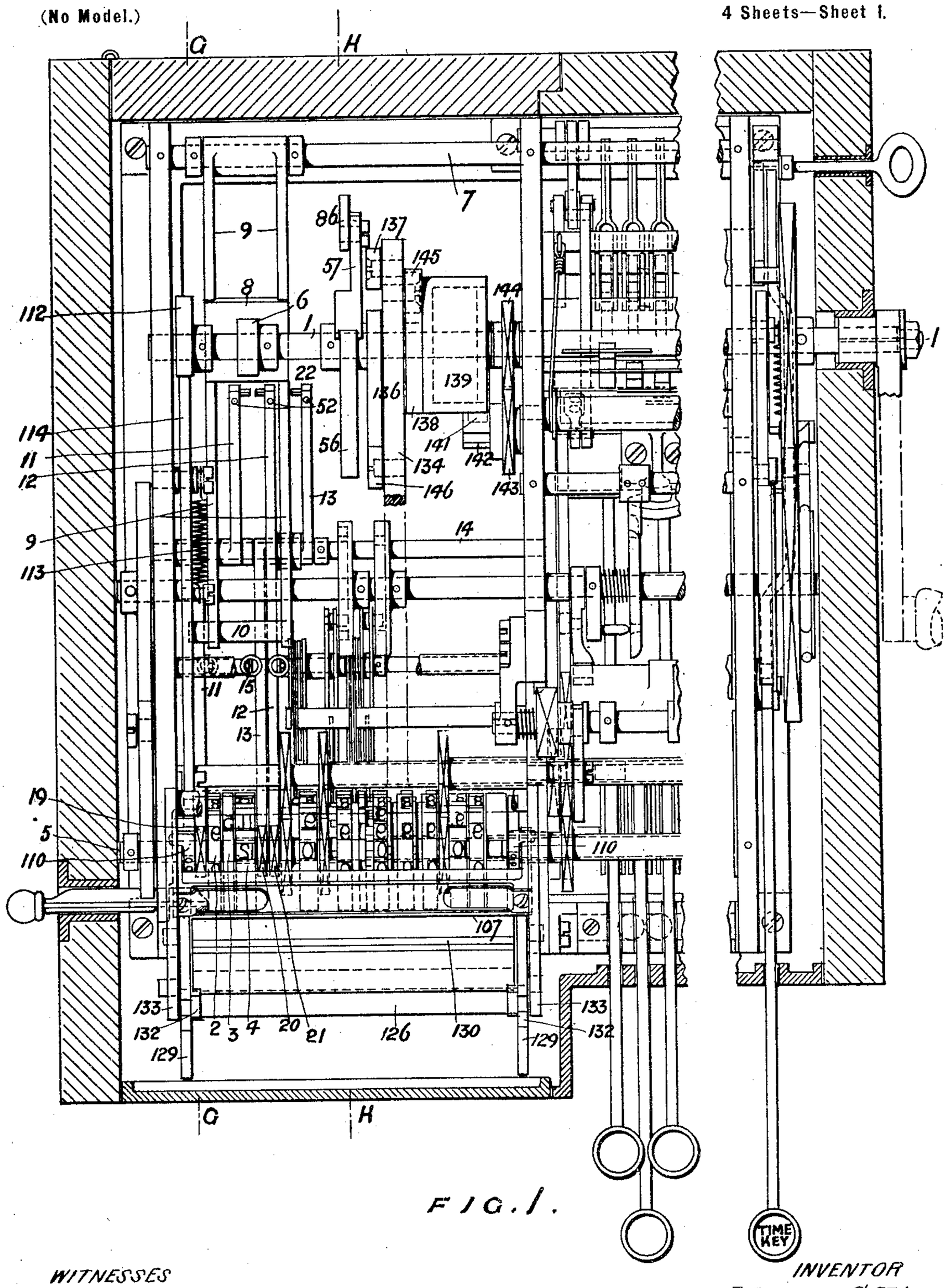

FIG. 1.

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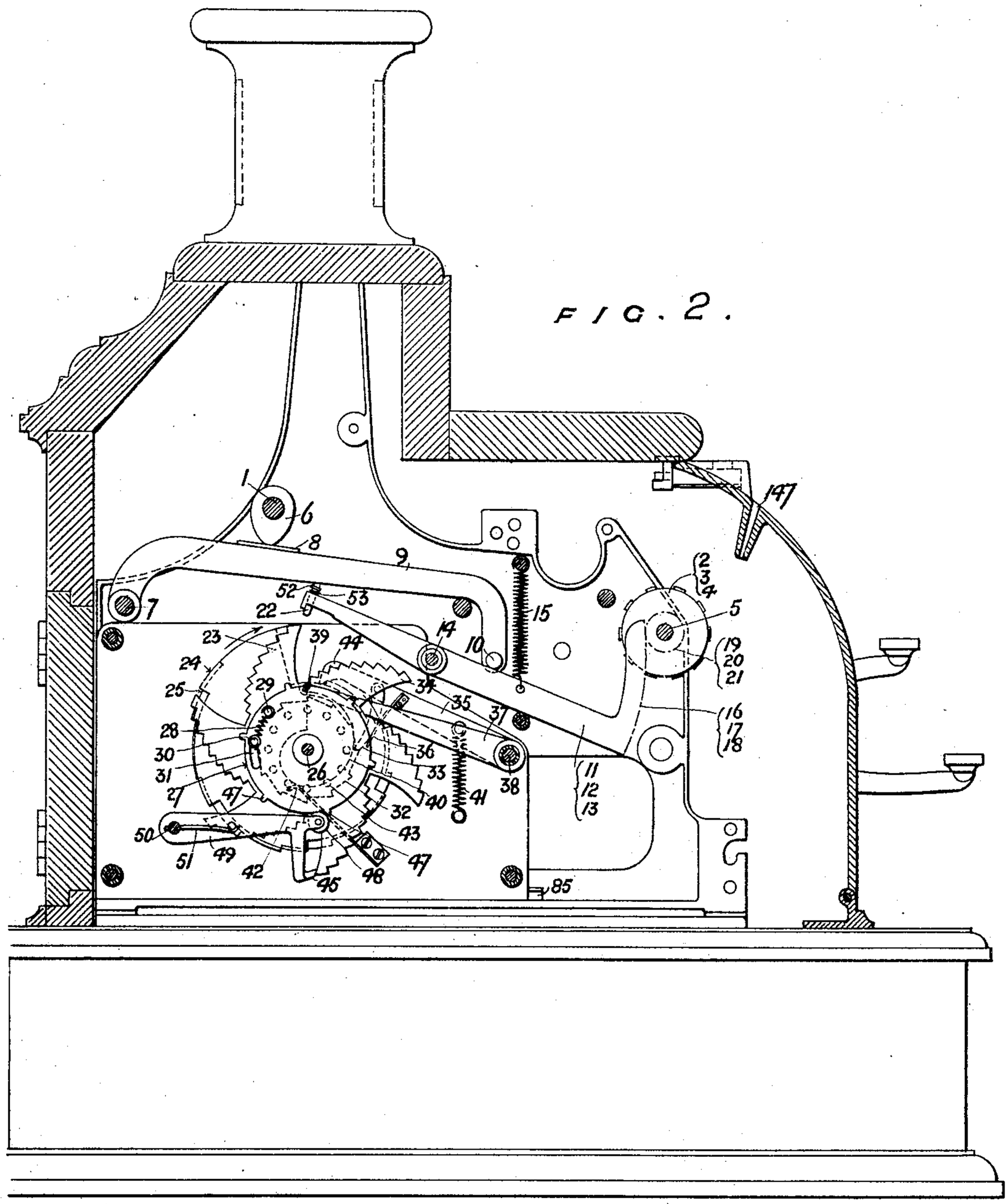
(No Model.) 4 Sheets—Sheet 2.

FIG. 2.



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(No Model.) 4 Sheets—Sheet 3.

FIG. 3.

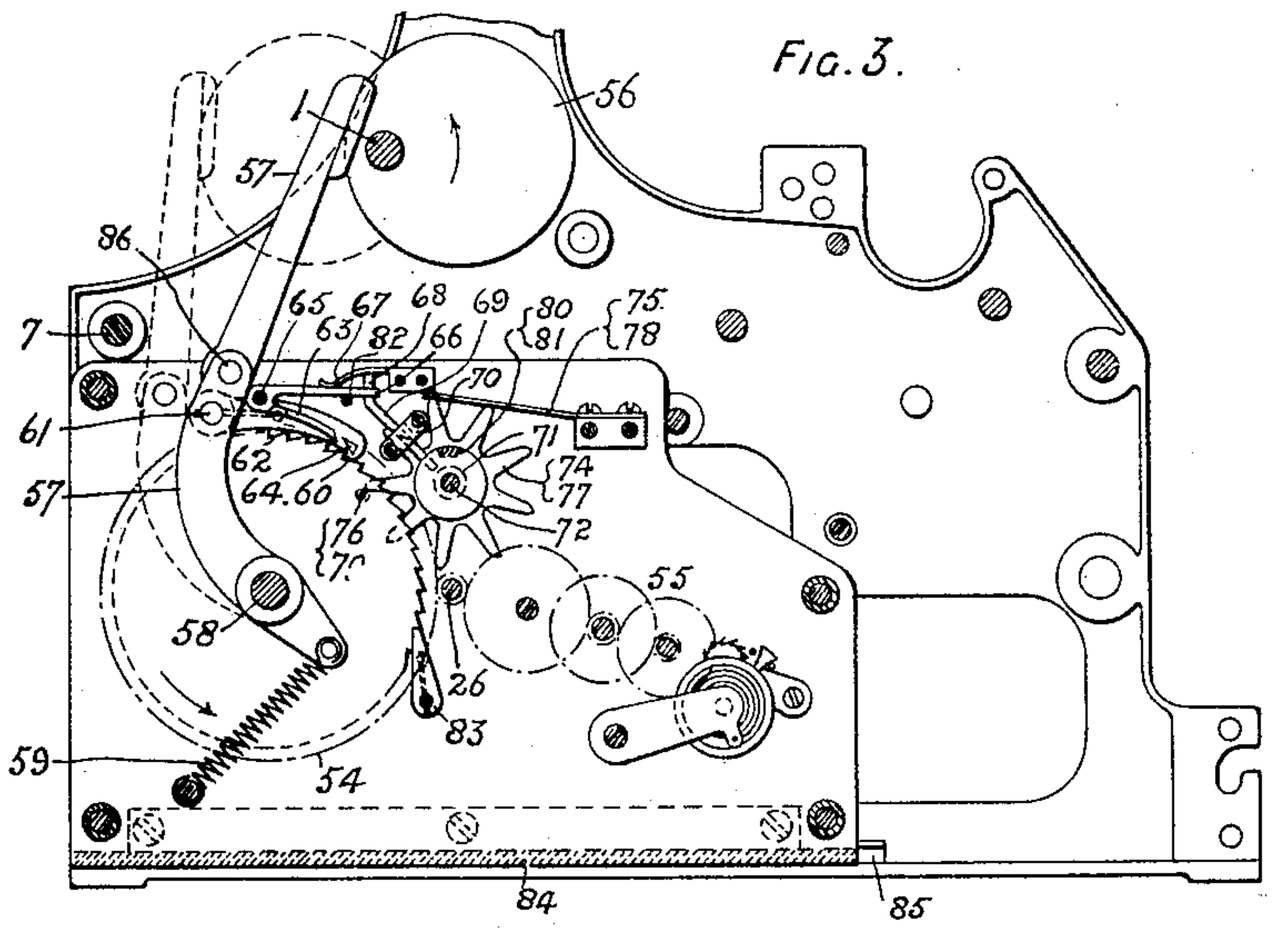
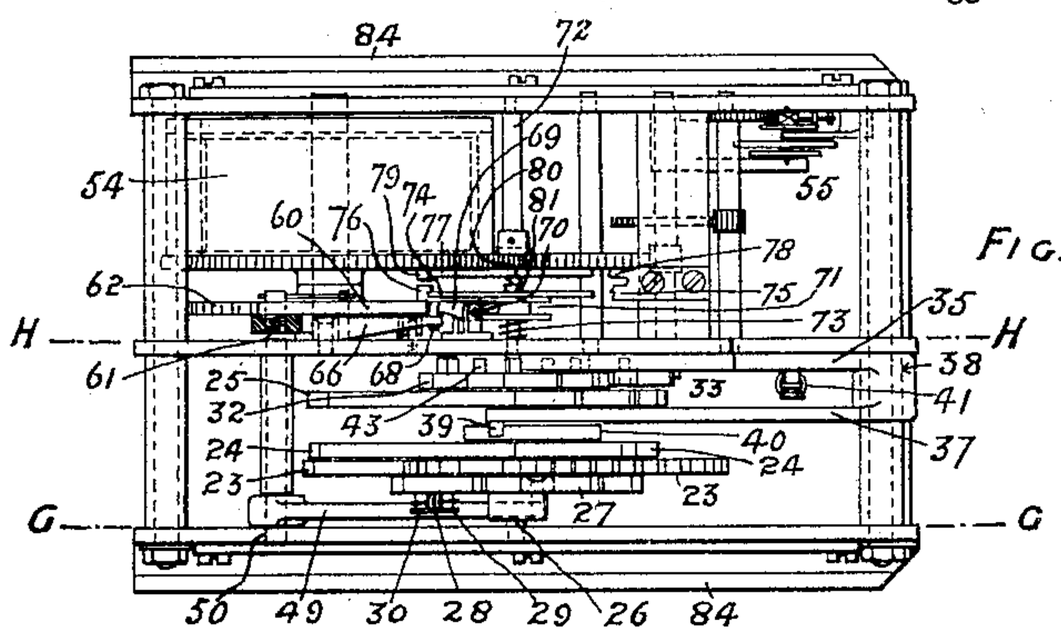


FIG. 4.



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(No Model.) 4 Sheets—Sheet 4.

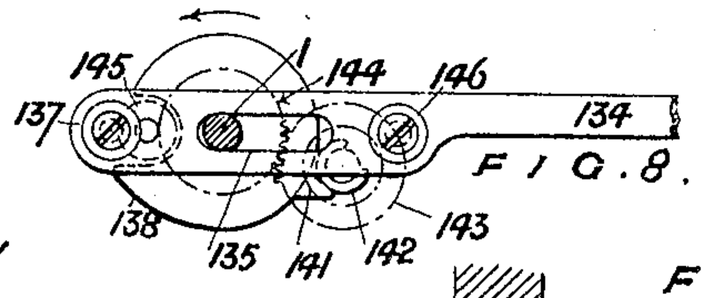

FIG. 8.

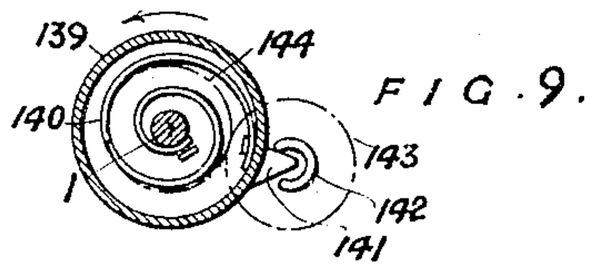

FIG. 9.

FIG. 5.

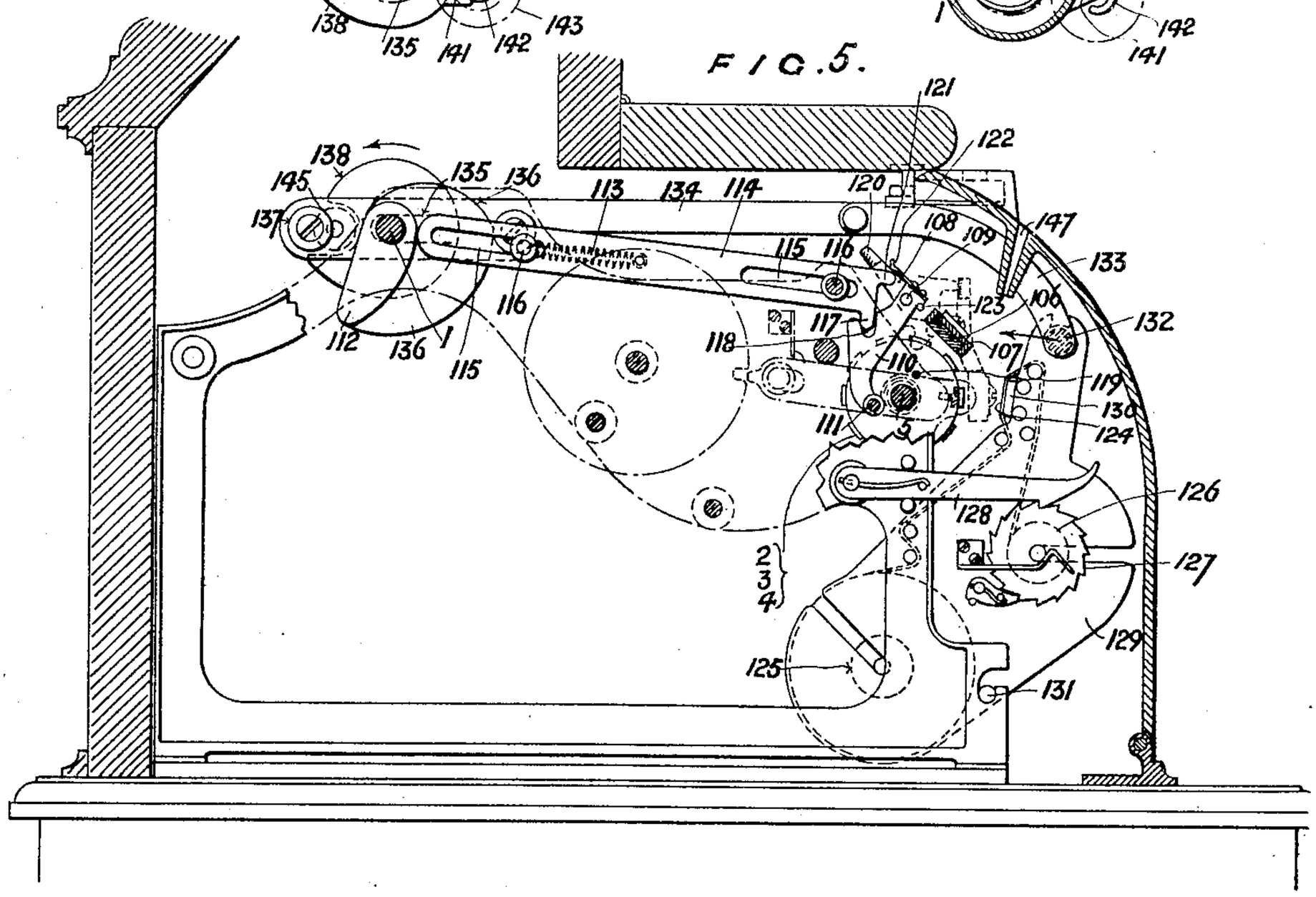

FIG. 6.

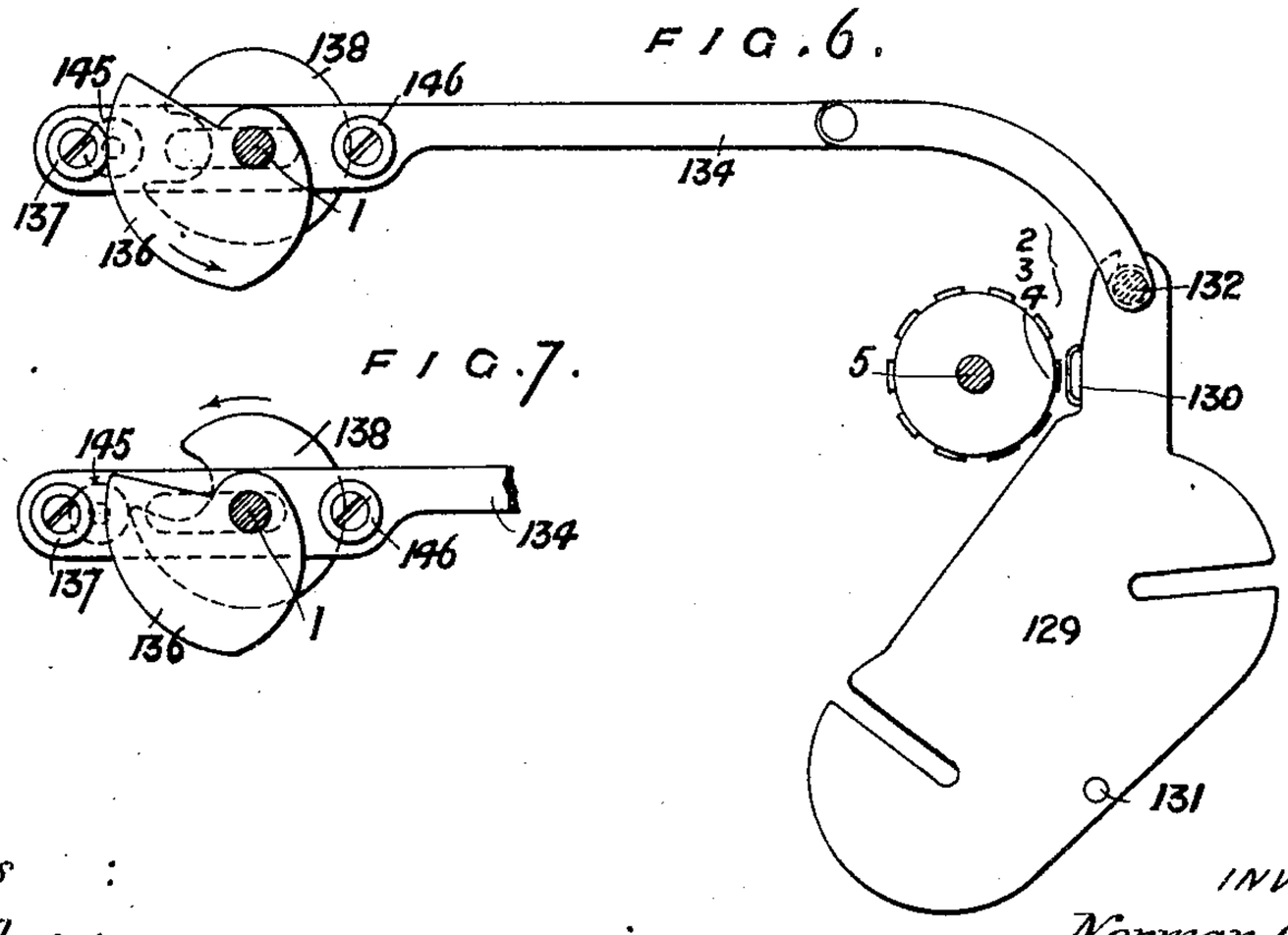

FIG. 7.

WITNESSES:

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UNITED STATES PATENT OFFICE.

NORMAN COLLINS, OF LONDON, ENGLAND, ASSIGNOR TO THE EMPIRE CASH REGISTER, LIMITED, OF LONDON, ENGLAND.

TIME-STAMP.

SPECIFICATION forming part of Letters Patent No. 705,909, dated July 29, 1902.

Application filed July 10, 1901. Serial No. 67,727. (No model.)

To all whom it may concern:

Be it known that I, NORMAN COLLINS, engineer, a subject of the King of Great Britain, residing at Monument Square Chambers, in the city of London, England, have invented new and useful Improvements in Time-Stamps, of which the following is a specification.

This invention relates to an improved time-stamp or apparatus for printing a record of the hour and minute at which the time-stamp is operated, the apparatus being primarily intended for use in connection with a cash-register for denoting the time at which each cash transaction is recorded, although capable of being used apart from a cash-register for printing a time-record of any other occurrence.

The invention will be described as operated in connection with a cash-register.

Reference is to be had to the accompanying drawings, wherein Figure 1 shows a plan of the time-stamp mechanism and of so much of a cash-register as is necessary to explain its operation. Fig. 2 is a section on line G G, Figs. 1 and 4. Fig. 3 is a section on line H H, Figs. 1 and 4. Fig. 4 is a plan of the clock and time-cam mechanism. Fig. 5 is a side elevation of the inking and printing mechanism. Figs. 6 and 7 illustrate the action of the platen-operating cams, and Figs. 8 and 9 show details of the escapement controlling the action of the spring-operated cam.

The same reference-numerals indicate the same parts in all the figures.

1 is a hand-operated main shaft, rotated by hand in the direction of the arrow once at each operation of the machine and prevented by a suitable detent from retrograde motion.

2, 3, and 4 are the type-wheels for printing the time-record, and when the time-stamp is combined with a cash-register they are mounted in axial alinement with other type-wheels for printing a cash record. The wheels 2, 3, and 4 turn loose on an axis 5 and are set each time that the time-stamp is to be operated through the agency of the shaft 1 and of clock-actuated cam mechanism hereinafter described. The setting in position of the time-record type-wheels 2 3 4, so as to print a record of the time on each occasion that the main shaft 1 is rotated, is permitted by the operation of a cam 6, fast on the main shaft 1, acting on a lever-frame fulcrumed on a cross-bar 7 of the frame and formed of a bridge-piece 8, on which the cam 6 acts, and a pair of arms 9, carrying at their free end a cross-bar 10, adapted to bear upon three levers 11 12 13, fulcrumed on a spindle 14 and each raised by a separate spring 15, these levers 11 12 13 terminating in segmental racks 16 17 18, respectively, in gear with pinions 19 20 21, respectively, corresponding to and turning as one with the units-of-minutes type-wheel 2, the tens-of-minutes type-wheel 3, and the hours type-wheel 4, the pinion 20 being connected to the type-wheel 3 through the medium of a sleeve upon which the pinion 21 and type-wheel 4 turn. The downward movement of the rack-carrying levers 11 12 13 is determined by the cam 6, whereby the type-wheels are brought to and maintained at their normal or inoperative position, as indicated in Fig. 2, until by the revolution of the main shaft 1 and cam 6 the springs 15 are permitted to act for the purpose of simultaneously setting the three type-wheels 2 3 4. For this purpose the amplitudes of the strokes of the respective segmental rack-carrying levers 11 12 13 are determined by pallets 22, carried by and projecting laterally from the tail ends of those levers respectively coming into contact with time-cams 23 24 25, mounted side by side upon the hours-arbor 26 of a clock, the units-of-minutes cam 23 and the tens-of-minutes cam 24 turning together as one and being connected to the arbor 26 through the medium of a disk 27, fast on the arbor 26, the driving connection between said disk and the units-of-minutes cam 23 being through the medium of a spring 28, attached to a stud 29 on the disk 27 and to a stud 30 on the cam 23. The stud 30 passes through a slot 31 in the disk 27 and is normally held against the forward end of said slot by the spring 28, the purpose of this spring connection being to enable the rotation of the arbor 26 and disk 27 to continue, and thus avoid stoppage of the clock, when, as hereinafter explained, the rotation of the cams 23 24 is temporarily checked, as hereinafter described, the forward end of the slot 31 acting as a stop to determine the nor-

mal angular position of the cams 23 24 relatively to the disk 27. The units-of-minutes cam 23 has six arms, each formed with ten steps situated at progressively and equally diminishing radii. The six arms of this cam correspond, respectively, to intervals of ten minutes, and each of the ten steps of each arm therefore corresponds to an interval of one minute. The tens-of-minutes cam 24 is an ordinary small cam, whose periphery is divided into six steps situated at progressively and equally diminishing radii, each of the six steps of the cam 24 corresponding to the ten steps of one of the arms of the units-of-minutes cam 23, so that each step of the cam 24 corresponds to the movement of the cam during an interval of ten minutes. Theoretically the lengths of the steps of cams 23 24 are determined by the combined angular movements of those cams and of the respectively corresponding levers 11 12, and the beginning of each step of cam 24 should coincide in angular position with the beginning of the corresponding arm of cam 23, (assuming the pallets 22 to have no thickness and to be carried by lever-arms of equal length.) In order, however, to compensate for the necessary thickness of the pallets, and so render the angular amplitudes of the minute steps of cam 23 equal, *inter se*, in effect, it is necessary to diminish the angular amplitude of the step of greatest radius of each arm of cam 23, so as to diminish the length of the step to an extent equal to not less than the thickness of the pallet 22, and to correspondingly increase the lengths of the steps of least radius. Similarly as regards the steps of greatest and least radius, respectively, of cam 24; but in this case the variation of length of those steps is determined by the fact that whereas while the beginning of the step of maximum radius of cam 24 must coincide in angular position with the beginning of the step of maximum radius of one of the arms of cam 23 the cam 24 must as regards its other changes of radius be set angularly in advance of the cam 23 to such an extent as to prevent the possibility of the pallet of lever 11 striking upon a step of greatest radius of that cam at the same time that the pallet of lever 12 strikes upon the step of that cam which corresponds to the preceding limb of the cam 23. The hours-cam 25 is formed with twelve steps, the highest steps of all the cams being preferably of the same radius, and similarly as regards the lowest steps. The hours-cam 25 is not fast on the hour-arbor 26 of the clock and is caused to suddenly rotate to the extent of one-twelfth of a revolution at the completion of every hour through the agency of a ratchet-wheel 32, fast with the hours-cam 26 and engaged by a driving-pawl 33, pivoted at 34 to a lever 35, the pawl being pressed into engagement with the ratchet-wheel by a spring 36. The lever 35 is in one with a lever 37, the two levers being pivoted at 38 to the clock-frame and the lever 37 terminating in a stud 39, which is acted upon by a snail-cam 40. This cam 40 is fast on the hours-arbor 26 and has but a single step, whose angular position is such that during every hour the levers 35 37 are lifted and the driving-pawl 33 is retracted until it comes into engagement with another tooth of the ratchet-wheel 32 and on the completion of the hour the edge of the step passes under and clear of the stud 39, and so permits the levers 35 37 to fall suddenly and move the pawl 33 forward under the impulse of a spring 41, attached to the combined levers 35 37 and to a fixed point, so as to cause the instantaneous advance of the hours-cam 25 to the extent of one tooth of the ratchet-wheel 32. During the retraction of the driving-pawl 33 the hours-cam 25 is held stationary by a jumper-spring 42, engaging with a circle of twelve stop-pins 43, fixed to the ratchet-wheel 32, excessive motion of said wheel during the driving stroke of the pawl being prevented by a check-detent 44, carried by the lever 35, coming into the path of one of the stop-pins 43 at the termination of the driving stroke of the pawl 33.

In order to accurately coördinate the movement of the combined minutes-cams 23 24 with that of the hours-cam 25 at the instant when the change from one hour to the next is made and also in order to cause every change of position of cam 23 (at which a step of maximum radius of that cam is presented to the pallet 22) to be made suddenly, a detent 45 is presented in the path of each of the limbs successively of the cam 23 just before each such change of position, so as to temporarily check the rotation of the combined cams 23 24, this detent 45 being disengaged, as hereinafter described, so as to permit the combined cams to be moved forward suddenly by the action of the spring 28. The disengagement of the detent 45 is effected by one of a series of studs 47 on the disk 27 acting upon an antifriction-roller 48, bearing against the edge of the disk and mounted on an arm 49, which carries the detent 45 and which is pivoted to the clock-frame at 50 and is normally pressed by a spring 51 into position for engagement. At the change of the hour the disengagement of the detent 45 from the arm of cam 23 is coincident with the driving stroke of the pawl 33, so as to cause the sudden movement of all three cams 23, 24, and 25 to take place at the same instant. The effect of the delay in the rotation of the combined cams 23 24 is to cause a possible error in time of a minute if a record be printed during any one of these short delays; but if a record be printed during the delay which occurs just before the completion of an hour this delay has the advantage of preventing a possible error of fifty-nine minutes, which would otherwise be caused if the sudden change of the hour-cam were to occur before the relatively slow change of the minutes-cams could take effect and if a record happened to be printed in the interim.

In order to prevent stoppage of the clock by the advancing back edges of the cams 23, 24, and 25 coming against the pallets 22 in the event of the rack-carrying levers being brought and left in operative position, the pallets 22 project laterally each from a stud 52, mounted to turn about its own longitudinal axis in the end of the rack-carrying lever 11, 12, or 13, so that should the pallet be fouled by the radial back edge the pallet will yield and swing aside out of the way, being normally held in operative position against a stop by the torsion of a spring 53.

The hours-arbor 26 is driven by an ordinary spring-barrel 54 under the control of a suitable clock-train and escapement 55. The barrel-spring is automatically rewound each time the apparatus is used by an eccentric cam 56, fast on the main shaft, acting upon a lever 57, fulcrumed upon the barrel-arbor 58 and held up to the cam by a spring 59. To this lever 57 a pawl 60 is jointed at 61 and is pressed by a spring into engagement with a ratchet-wheel 62, fast on the arbor 58, to which the inner end of the barrel-spring is attached, so that at each revolution of the main shaft 1 the lever 57 will be oscillated and the spring will be rewound to a corresponding extent, the extent of rewinding being so much in excess of the average extent to which the barrel runs down in the intervals between successive operations of the machine as to compensate for the prolonged period of inaction of the machine out of business hours and so keep the clock always going. To enable this to be done, it is necessary to make provision against overwinding, and for this purpose a deflecting-cam 63 is provided, which when the barrel is fully wound is brought into the path of a stud 64 on the pawl 60, so that during the driving stroke of the pawl the stud 64 will ride up on the cam, and thus cause the pawl to be lifted out of engagement with the teeth of the ratchet-wheel 62. The cam 63 is pivoted at 65 and is provided with an arm 66, pressed upon by a spring 67, whereby the cam constantly tends to assume the operative position shown in Fig. 3. Normally, however, the cam 63 is swung back on its pivot, so that the stud 64 will pass freely beneath it, the cam being moved to and retained in this inoperative position against the pressure of the spring 67 by an inclined cam 68 taking under the arm 66, said cam 68 being formed on the end of a lever 69, pivoted at 70 and having its other end engaged in a grooved collar 71, capable of turning and sliding upon a spindle 72, the cam 68 being normally held in operative position by a spring 73 acting to press the collar 71 along the spindle 72. This collar 71 is in one with a star-wheel 74, which is intermittently rotated under the control of a jumper-spring 75 by the successive engagement with its arms of a stud 76 on the ratchet-wheel 62. A precisely similar star-wheel 77 is mounted to turn loose but not to slide upon the same spindle 72 and is intermittently rotated under the control of a jumper-spring 78 by a stud 79 on the barrel 54. The two star-wheels have upon their adjacent faces inclined cam-studs 80 81, which when the spring of barrel 54 is fully wound ride up the one upon the other, and so cause the star-wheel 74 to be forced away from the star-wheel 77, thereby moving the collar 71 lengthwise of the spindle 72 against the pressure of the spring 73, and so retracting the cam 68 from the tail end 66 of the pawl-releasing cam 63, which is thus allowed to come into the operative position shown. As soon as (by the revolution of the spring-barrel 54) the star-wheel 77 is revolved the cam-stud 81 is moved out of angular alinement with the cam-stud 80, the star-wheel 74 is moved toward the other star-wheel by the spring 73, and the cam 68 is caused to act upon the tail end 66 of the pawl-disengaging cam 63, which is thus moved to the position in which rewinding of the barrel by the pawl 60 is permitted. As soon, however, as by the rotation of the ratchet-wheel 62 its stud 76 rotates the star-wheel 74 sufficiently to cause the cam-stud 80 to overtake and come into angular alinement with the cam-stud 81 the pawl-disengaging cam 63 will again be brought into operative position, as before described. It will thus be seen that this mechanism constitutes what may be termed a "hunting-gear," wherein the one part is continually moving away from and repeatedly being overtaken by the other part, with the result above described. The operative position of the cam 63 is determined by a stop 82, and the meeting faces of the stud 64 and cam 63 are so beveled and meet so early in the driving stroke of the pawl 60 as to cause the latter to be disengaged from the ratchet-wheel before it can move said wheel to the extent of a tooth, and consequently before the retaining-detent 83 can engage with a fresh tooth of the ratchet-wheel. By the use of star-wheels and jumper-springs, as described, the action of the cam-studs 80 81, and consequently the movement of the cam 63 into and out of operative position, is effected suddenly, and the inclined faces of cam 63 and stud 64 are knife-edged, so that there is no liability of these two parts butting so as to cause breakage of the parts.

The clock and time-cam mechanisms, as shown in Figs. 2, 3, are mounted together in a frame removable as a whole from the machine for the purpose of cleaning or repair, the frame being provided with flanges 84, which slide into guides 85 on the main frame of the machine, and the clock-winding lever 57 being for the sake of convenience knee-jointed at 86 to admit of being folded down to pass beneath the cross-bar 7 of the main frame of the machine.

The type-wheels having been set by the operation of the springs 15, permitted to act under the control of the above-described mechanism by the revolution of main shaft 1 and cam 6, the types which have thus been

brought to printing position are inked by means of an inking-pad 106, carried in a frame 107, having arms 108, by which it is pivoted at 109 to the side limbs 110 of a rocking yoke-frame pivoted at 111 on fixed studs carried by the frame of the machine, so as to enable the pad 106 to be first swung into position for inking the line of types which are to be printed from and to be then pressed against those types. These two movements are produced by the action of a cam 112, fast on the main shaft 1, said cam acting (in opposition to a spring 113) against the end of a thrust-rod 114, longitudinally guided by slots 115, working on fixed studs 116, a dog 117 at the front end of this thrust-rod engaging a notch 118 in one of the arms 110 of the yoke-frame, so as by the forward movement of the thrust-rod 114 to cause the pad 106 to be swung into inking position, (shown by dotted lines in Fig. 5,) in which position it comes against a stop 119. In this position the dog 117 escapes from the notch 118, but rides upon a surface on the arm 110 of the yoke-frame, so as to maintain said frame in the position to which it has been brought. Meanwhile a lug 120 on the tail end of one of the arms 108 of the pad-carrying frame has been brought (in consequence of the angular movement of the yoke-frame about the axis 111) into the path of a second dog 121, forwardly projecting from the end of the thrust-rod 114, so that by the further movement of said thrust-rod produced by the cam 112 the pad-carrying frame 107 will be swung on its axis 109, so as to cause the pad 106 to be pressed against and to ink the line of type. When the thrust-rod then escapes from the cam 112, it is retracted by its spring 113, and the pad-carrying frame is swung back on its axis by springs 122 to an extent limited by studs 123 on said frame coming against shoulders on the arms of the yoke-frame 110, after which the dog 117 becomes reëngaged in the notch 118, and the yoke and pad carrying frames are swung back about the axis 111 to their original position. The impressions of the inked types are made upon a continuous strip of paper 124, drawn from a spool 125 and wound on another spool 126 by a step-by-step motion derived (through a ratchet-and-pawl feed mechanism 127 128) from the vibrating movement of the frame 129, in which the spools are mounted, said frame 129 carrying a rubber-faced platen 130, over which the paper strip is drawn in its passage from one spool to the other and by which the paper is pressed against the inked line of type. The vibrating frame 129 is pivoted at 131 and is pivotally coupled to a pair of gudgeons 132, carried by a yoke 133, attached to the front end of a rod 135, whose other end is provided with a slot 135, whereby it is longitudinally guided on the shaft 1. In order to permit of ready connection and disconnection, the parts 129 133 are coupled by the cylindrical gudgeons 132, having formed upon them flats, which when the parts are in a certain angular relation to one another can pass through slots leading to the circular bearings in the cheeks of the frame 129, while when the parts 129 133 are in working position secure connection will be insured. Vibratory motion is imparted to the platen-frame in the direction for making an impression in two stages and at different speeds, the first stage being performed under the action of a cam 136, fast on the main shaft 1, acting on a stud and roller 137, carried by the pull and push rod 134, and the second stage is performed by the sudden action of another cam 138, carried by a spring-barrel 139, loose on main shaft 1. The spring 140 of barrel 139 is attached by one end to the barrel and by the other end to the main shaft 1, so that at each revolution of the shaft the spring will first be wound up while the barrel is prevented from turning, and thereafter at a given point in the revolution of the shaft the barrel will be released and, with the cam 138, will be caused by the spring to make a rapid revolution. The barrel 139 is held (while the spring is being wound) and is released at the proper moment by a sort of cylinder-escapement (shown in Fig. 9) formed by a tooth 141 on the barrel engaging with an escapement-cylinder 142, carried by a gear-wheel 143, pivoted on a fixed stud and in gear with an equal-wheel 144, fast on the main shaft 1, the relation of the parts being such that during the first part of the revolution of the shaft 1 the tooth 141 abuts against the outside of the escapement-cylinder 142, thereby causing the spring to be wound by the revolution of the shaft 1, the escapement-cylinder being meanwhile revolved until the gap 145 in the cylinder 142 first comes opposite to and receives the tooth 141, as shown in Fig. 9, and by its further revolution permits the tooth to escape, whereupon the barrel 139 and cam 138 are allowed to perform a sudden revolution under the impulse of the spring 140, whose action has thus been delayed. The slow movement produced by the cam 136, acting on the stud-roller 137 of rod 134, vibrates the platen through the greater part of its stroke and brings the platen to and retains it in such position that the paper is nearly but not quite in contact with the inked type, as shown separately in Fig. 6, at the same time that another stud and roller 145 on the rod 134 is brought by the movement of said rod, produced by cam 136, into position to be acted upon by the spring-actuated cam 138. Upon the release of the tooth 141 from the escapement-cylinder 139 this cam is caused by the spring 140 to make a rapid revolution and to act upon the stud-roller 145, as shown in Fig. 7, and in so doing to cause the stroke of the platen to be completed by an almost instantaneous movement, whereby the impression is produced without the possibility of such prolonged fractional contact of the paper with the type as would interfere with the going of the clock by which the time-record type-wheels are

set. The return movement of the platen is produced in one stage (after the cam 138 has completed its revolution and been arrested by the reëngagement of tooth 141 with escapement-cylinder 142) by the action of cam 136 on another stud and roller 146 on rod 134.

147 is a slot in the casing of the machine through which a loose slip of paper may be introduced, together with a slip of carbon paper, in order to take the impression thereon as well as on the continuous strip 124.

I claim—

1. In a time-stamp the combination of type-wheels respectively adapted to denote hours and tens and units of minutes; racks respectively in gear with said type-wheels for imparting rotary movement thereto; rock-levers for operating the respective racks; clock-driven snail-cams stepped to correspond respectively to hours and to tens and units of minutes of angular movement for determining the amplitudes of the oscillations of said levers; springs for moving said levers up to the respective cams; a hand-operated main shaft and mechanism actuated thereby adapted to normally hold the said levers out of contact with the said snail-cams and to permit by the revolution of said shaft the levers to be brought, by the respective springs, into operative contact with the said cams, for revolving the respective type-wheels to extents determined by the respective cams.

2. In a time-stamp the combination of a clock-driven stepped snail-cam; a rock-lever for coöperation with said cam; a pallet pivoted to said lever about an axis substantially in the plane of oscillation of the lever and coincident with the direction of motion thereof, for making unyielding contact with the periphery of said cam for the purpose of determining the amplitude of oscillation of the lever; and a spring adapted to normally hold the pallet in position to make such unyielding contact with the cam, and to permit the pallet to yield and be swung aside when caught by the cam in its rotary movement.

3. In a time-stamp, the combination of clock-driven snail-cams stepped to correspond respectively to units and tens of minutes of angular movement and rotated together as one; a spring connection between said cams and the hours-arbor of the clock, a detent for periodically engaging and detaining said cams in order to put the spring in tension, and means actuated by said arbor whereby to cause the detent to be withdrawn after a short interval of detention so as to permit the said cams to make under the stress of the spring a sudden angular advance, at the completion of every tenth of a revolution of the units-of-minutes cam.

4. In a time-stamp the combination of clock-driven snail-cams stepped to correspond respectively to units and tens of minutes of angular movement and rotated together as one; a spring connection between said cams and the hours-arbor of the clock, a detent for periodically engaging and detaining said cams in order to put the spring in tension, means actuated by said arbor for withdrawing the detent so as to permit the cams to make a sudden angular advance under the stress of the spring, a snail-cam stepped to correspond to hours of angular movement, a ratchet on said cam, a spring-actuated driving-pawl to engage said ratchet for actuating the hours-cam intermittently and suddenly and a snail-cam rotated by the hours-arbor of the clock for straining the driving-pawl spring and controlling its action, the operation of the hours-cam-propelment mechanism being coördinated with one of the sudden movements of the units and tens of minutes cams.

5. In a time-stamp, the combination with type-wheels, a printing-platen for taking impressions from said wheels and a hand-operated main shaft, of cam mechanism actuated at each revolution of said shaft and adapted to act on the platen so as to move the same toward the type by a sudden movement and consisting of a cam loose on an axis revolved at each revolution of the hand-shaft, a spring connected to said cam and axis so as to be wound up by the revolution of the hand-shaft when the cam is held stationary, a dog in connection with the cam, a cylinder-escapement geared with and rotated by said shaft and adapted to be engaged by the dog so as to cause the arrest of the cam and the winding of the spring during the first part of the revolution of said shaft, and adapted to permit the escape of the dog and the sudden revolution of the cam under the stress of the spring at a given point in the revolution of the shaft as described.

6. In a time-stamp the combination with type-wheels, a printing-platen for taking impressions from said wheels and a hand-operated main shaft, of cam mechanism actuated at each revolution of said shaft and adapted to act on the platen so as to move the same toward the type in two successive stages of relatively slow and sudden movement, said cam mechanism consisting of two rotary cams adapted to act successively on the platen, the cam for producing the slow movement being operated directly by the revolution of said shaft, and the other cam being connected to the said shaft through the medium of a spring adapted to be wound by the revolution of said shaft while the cam is held stationary, and being combined with a cylinder-escapement adapted to engage and retain the said cam and operated by said shaft so as to release the cam and permit it to act suddenly on the platen under the stress of the spring as described.

7. In a time-stamp, the combination with a cam-shaft and with clock-actuated type-wheel-setting mechanism adapted to be brought into operation by the rotation of said shaft, of cam-operated lever, pawl, and ratchet mechanism intermediate of said shaft and the spring-arbor of the clock-barrel and

adapted to cause the clock-barrel spring to be rewound by the rotation of the said shaft at each rotation thereof.

8. In a time-stamp the combination with a cam-shaft, and with clock-actuated type-wheel-setting mechanism adapted to be brought into operation by the rotation of said shaft, of cam-operated lever, pawl, and ratchet mechanism adapted to rotate the spring-arbor of the clock-barrel and rewind the spring at each revolution of the shaft, and of safety mechanism for rendering the rewinding mechanism inoperative when the spring is fully wound, said safety mechanism comprising a cam adapted when in operative position to throw the driving-pawl out of engagement with the ratchet, and mechanism controlling the said cam, whereby the position of the said cam is determined by the mutually relative angular displacement of the spring-barrel and the spring-arbor.

9. In a time-stamp, the combination with a cam-shaft and with a clock-movement of lever, pawl, and ratchet mechanism operated by a cam on the said shaft, for rewinding the mainspring of the clock at each revolution of said shaft, of mechanism for rendering the rewinding mechanism inoperative when the spring is fully wound, said mechanism consisting of a cam adapted when in operative position to throw the driving-pawl out of engagement with the ratchet of the spring-arbor, a "hunting-gear" formed by a pair of star-wheels controlled by jumper-springs and adapted to be intermittently revolved by the barrel and by the spring-arbor respectively, cam-studs rotating with the star-wheels and adapted, when said cam-studs coincide in angular position, to cause displacement of one of the star-wheels in the direction of its axis, and means intermediate of the said star-wheel and the driving-pawl-disengaging cam, whereby the position of said cam will be determined by the mutually relative angular displacements of the said star-wheels.

NORMAN COLLINS.

Witnesses:
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