N° 5045 A.D. 1896

*Date of Application, 6th Mar., 1896*

*Complete Specification Left, 2nd Dec., 1896—Accepted, 13th Feb., 1897*

PROVISIONAL SPECIFICATION.

# Improvements in Time Checking or Registering Apparatus.

We, THE BROOK TIME CHECKING CLOCK COMPANY LIMITED of Kings Head Buildings, Cloth Hall Street, Huddersfield, Yorkshire Time Checking Clock Manufacturers, and FRANK BROOK of the same place, Managing Director, do hereby declare the nature of this invention to be as follows :—

Our invention has reference to apparatus for automatically registering or checking the times of arrival, and departure also, if desired, of clerks, assistants, warehousemen and others in all cases where the signatures or initials have to be written, stamped or otherwise affixed on a sheet of paper or in a time book on entering and leaving the premises.

In carrying out our invention we employ a suitable case or box with an inclined or desk top and either with or without provision for the reception of a clock.

Within the said case or box and under the desk top or sloping lid is a barrel or drum around the axis of which is wound a cord, chain or wire having a weight suspended from the end thereof.

On one or both ends of the said drum are a number of projections, teeth or lugs with which in successive order is adapted to engage a suitable form of lever or pallet which normally holds the drum in position against the gravity action of the weight. The pallet or lever is adapted to be moved on its pivot clear of the teeth or projections on the drum by an electro magnet or magnets on the completion of an electric circuit which is effected by the clockwork mechanism forming a part of our improved apparatus for checking or registering the times at which signatures or initials are written or affixed on the time sheet. This said clockwork is somewhat similar to that shewn and described in the Specification of Letters Patent granted to the aforesaid Frank Brook on the 5th September 1893, No. 16,662 ; and comprises an eight days clock having combined therewith the striking mechanism of a thirty hours' clock which is actuated as and when required by and from a discharge wheel or plate receiving rotary motion from the hour wheel to the extent of one revolution to every twenty four revolutions of the said hour wheel. On the said discharge wheel or plate are arranged any number of detachable studs or pins according to the times at which the checking or registering is to take place, such pins being brought successively into abutment with the connection or connections for releasing the escapement or striking mechanism, which, being then put in motion by the action of the coiled spring, gives movement to a wiper, cam or equivalent piece of mechanism adapted during a part of its rotation to engage with a spring or contact maker in circuit with the electro magnet or magnets and insulated from the clock or striking mechanism, whereby the circuit is completed and the pallet or lever withdrawn by the magnet or magnets out of the path of the studs or teeth on the drum. The latter on being thus released is rotated to the extent of one tooth or stud by the action of the suspended weight, the pallet or lever being returned by spring or otherwise to its normal position in time to engage with the next succeeding stud and lock the drum. A detent or catch engaging with the same teeth or studs or with others on the opposite end of the drum prevents any backward movement of the drum.

On or around the drum or barrel we secure a sheet of paper with lines marked

[*Price 8d.*]

thereon for receiving the signatures or initials and dividing the sheet in accordance with the times each portion thereof will be presented opposite a slot or opening in the sloping lid or desk top through which the pencil or marker has to be inserted to make or stamp the initials or signatures, such divided portions being marked printed or otherwise stamped with the times at which it is determined the checking or registering shall take place. The paper may be supplied from a roll and wound onto the drum by the action of the latter.

Instead of a weight, a coiled spring may be employed to rotate the drum each time it is released, and, in both cases, the weight or spring is wound up by rotating the drum or barrel in a backward direction.

On the discharge wheel or plate we may secure a second set of pins or studs which will engage in turn with a contact piece in a bell circuit and completing the circuit will cause the bell to be rung shortly in advance of the actuation of the checking apparatus thereby giving warning to late comers to hasten and affix their signatures or initials.

If desired we can dispense with the electrical connections for releasing the drum at pre-determined times, and in lieu thereof rotate the drum in corresponding manner by a pinion or bevil, gearing with a toothed wheel or bevil wheel on the drum or drum shaft, said pinion being rotated to the required extent at each release of the escapement or striking mechanism by a shaft and bevils deriving motion from the striking mechanism.

Dated this 3rd day of March 1896.

TASKER & CROSSLEY,
Huddersfield, Agents for the Applicants.

## COMPLETE SPECIFICATION.

### Improvements in Time Checking or Registering Apparatus.

We, THE BROOK TIME CHECKING CLOCK COMPANY, LIMITED, of Kings Head Buildings, Cloth Hall Street, Huddersfield, Yorkshire, Time Checking Clock Manufacturers, and FRANK BROOK, of the same place, Managing Director, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

Our invention has reference to apparatus for automatically registering or checking the times of arrival, and departure also, if desired, of clerks, assistants, warehousemen and others in all cases where the signatures or initials have to be written, stamped or otherwise affixed on a sheet of paper or in a time book on entering and leaving the premises.

In carrying out our invention we employ a suitable case or box with an inclined or desk top and either with or without provision for the reception of a clock. Within the said case or box and under the desk top or sloping lid is a barrel or drum around the axis of which is wound a cord, chain or wire having a weight suspended from the end thereof. On one or both ends of the said drum are a number of projections, teeth or lugs with which in successive order is adapted to engage a suitable form of lever or pallet which normally holds the drum in position against the gravity action of the weight.

The pallet or lever is adapted to be moved on its pivot clear of the teeth or projections on the drum by an electro magnet or magnets on the completion of an electric circuit which is effected by the clockwork mechanism forming a part of our improved apparatus for checking or registering the times at which signatures or initials are written or affixed on the time sheet. This said clockwork is

somewhat similar to that shewn and described in the Specification of Letters Patent granted to the aforesaid Frank Brook on the 5th September 1893, No. 16,662, and comprises an eight days' clock having combined therewith the striking mechanism of a thirty hours' clock which is actuated as and when required by and from a discharge wheel or plate receiving rotary motion from the hour wheel to the extent of one revolution to every twenty four revolutions of the said hour wheel. On the said discharge wheel or plate are arranged any number of detachable studs or pins according to the times at which the checking or registering is to take place, such pins being brought successively into abutment with the connection or connections for releasing the escapement or striking mechanism, which, being then put in motion by the action of the coiled spring, gives movement to a wiper, cam or equivalent piece of mechanism adapted during a part of its rotation to engage with a spring or contact maker in circuit with the electro magnet or magnets and insulated from the clock or striking mechanism whereby the circuit is completed and the pallet or lever withdrawn by the magnet or magnets out of the path of the studs or teeth on the drum. The latter on being thus released is rotated to the extent of one tooth or stud by the action of the suspended weight, the pallet or lever being returned by spring or otherwise to its normal position in time to engage with the next succeeding stud and lock the drum. A detent or catch engaging with the same teeth or studs or with others on the opposite end of the drum prevents any backward movement of the drum.

On or around the drum or barrel we secure a sheet of paper with lines marked thereon for receiving the signatures or initials and dividing the sheet in accordance with the times each portion thereof will be presented opposite a slot or opening in the sloping lid or desk top through which the pencil or marker has to be inserted to make or stamp the initials or signatures, such divided portions being marked pointed or otherwise stamped with the times at which it is determined the checking or registering shall take place. The paper may be supplied from a roll and wound on to the drum by the action of the latter.

Instead of a weight, a coiled spring may be employed to rotate the drum each time it is released, and, in both cases, the weight or spring is wound up by rotating the drum or barrel in a backward direction.

On the discharge wheel or plate we may secure a second set of pins or studs which will engage in turn with a contact piece in a bell circuit and completing the circuit will cause the bell to be rung shortly in advance of the actuation of the checking apparatus thereby giving warning to late comers to hasten and affix their signatures or initials.

Referring to the drawings illustrating our invention.

Fig. 1 is elevation of an eight days' clock having the striking mechanism of a thirty hours' clock combined therewith for determining and controlling the action of the signature or initial time registering or checking mechanism; the clock face or dial and part of the clockwork being omitted and the minute and hour hands and gearing for actuating the hour hand being shewn in dotted lines for the sake of clearness.

Fig. 2 is longitudinal section of the signature or initial time registering or checking mechanism taken on line 1, 1, of Fig. 4.

Fig. 3 is end elevation of Fig. 1 looking in the direction of arrow 2.

Fig. 4 is transverse section of Fig. 2 taken on line 3, 3.

Fig. 5 is longitudinal elevation of the drum or cylinder which carries the time roll register or sheet.

Fig. 6 is transverse section of Fig. 5 taken on line 4, 4.

Fig. 7 is elevation of the double pallet or releasing and holding lever for releasing and allowing partial rotation of the registering drum or cylinder.

Fig. 8 is transverse section of Fig. 7 taken on line 5, 5.

Fig. 9 is enlarged detail of the means for completing and checking the electric circuit which are situated on the rear frame of the clock and seen in dotted lines in Fig. 1.

Fig. 10 is view illustrating two signature or initial time registering or indicating machines in circuit with a clock.

Fig. 11 shews a modification of the registering or checking apparatus in which the time sheet is unwound off a roll by the drum or cylinder and the time printed on said sheet by a type disc previous to being carried around by the drum and exposed.

Like letters of reference indicate corresponding parts in all the figures.

In the drawings, letter *a* represents the framework of the clock, *b* the arbor or shaft on which the hour wheel *c* is mounted, said hour wheel gearing with wheel *d* and receiving motion from the ordinary mechanism of an eight days' clock, which, being well known, is not shewn on the drawings.

On the hour wheel arbor *b* is mounted a pinion *e* which gears into and drives a disc or discharge wheel or toothed plate *f* mounted on a stud secured to the framework *a*, said discharge plate being rotated to the extent of one revolution to every twenty four revolutions of the hour wheel.

The face of the discharge plate *f* has an index line $f^1$ thereon, which is, by preference, marked off radially into divisions $f^2$, representing hours, these divisions being subdivided again into halves and quarters or other fractional parts or units in the form of a scale, and holes are punched or drilled at any of these divisions or intermediate thereof for the reception of studs or pins $f^3$ whose number and disposition around the discharge wheel are determined by the periods of time at which the checking or indicating is required to take place.

In conjunction with the above mechanism we employ the striking mechanism of a thirty hours' clock, consisting of levers *g* and *h* for releasing said mechanism, spring barrel *i*, fusee *j*, the train of wheels *k*, $k^1$ $k^1$, $k^2$, $k^3$, $k^3$, $k^3$, $k^3$, "fly" $k^4$, and snail $k^5$ mounted on the shaft $k^6$.

Connected with the lever *g* is a short lever arm $g^1$ which is adapted to be engaged by the pins $f^3$ on the discharge wheel as the latter rotates and to elevate the said lever *g* which lifts the leg of the lever *h* clear of the shoulder on snail $k^5$, whilst the short lever arm $h^1$ secured on the same stud as the lever *h*, is at the same time placed clear of the pin *l* on the toothed wheel $k^2$, whereby the mechanism is temporarily released and is put in motion by the uncoiling of the spring in the barrel *i*.

The motion of the parts, however, is only temporary, so as to bring the larger diameter of the snail $k^5$ under the depending leg of lever *h*, and is arrested by the pin *m* on wheel $k^3$ engaging a projection *n* on the end of lever *g*, but immediately the pin $f^3$ in engagement with the lever arm $g^1$ rides clear of said lever arm the lever *g* assumes its normal position and releases the wheel $k^3$ and therefore the striking mechanism, whereupon the action of the coiled spring causes the parts to be rotated until the cam or snail $k^5$ has completed a revolution and is again locked by the depending foot of lever *h* as shewn on the drawings.

The parts remain in the positions shewn in Fig. 1 and inoperative until a second pin on the discharge wheel actuates the lever arm $g^1$, when they are operated as previously described, and this is repeated each time a pin $f^3$ on the rotating discharge wheel *f* engages the lever arm $g^1$.

The intermittent motion of the striking mechanism obtained in the manner set forth by the successive engagement of pins or studs $f^3$ with the lever arm $g^1$, is utilised for the purpose of completing and breaking an electric circuit whereby to determine and bring about the periodical partial rotation of the signature or initial time registering or indicating drum or cylinder as hereafter described.

On the rear end of the snail shaft $k^6$, (shewn more clearly in Fig. 10) is mounted a switch or cam *o* adapted to rotate therewith and to make a complete revolution each time the striking mechanism is released and actuated. The end of said switch or nose of the cam *o* is tipped with silver and engages at one part of each revolution with the silvered under surface of a spring or contact piece *p* carried by an insulating bracket $p^1$ secured to the frame *a* and insulating the contact piece from the clock. To said contact piece is secured a terminal $p^2$ connected by wire

to one end of a coil or armature on bobbins forming the electro magnet $p^3$ the opposite end of such coil being connected to one pole of a battery $p^4$ whose other pole is connected by wire to a terminal $p^5$ secured to the clock frame $a$ the whole forming an electric circuit which is completed by engagement of the switch or cam $o$ with the contact piece $p$ and broken when moved out of engagement therewith.

The electro magnet $p^3$ is supported by and secured to a platform or shelf $q$ in the upper portion of a box or case $q^1$ wherein is journalled in bearings $r$ secured to the sides of said casing a shaft $r^1$ on which is mounted the drum $r^2$ having secured around its periphery a sheet of paper $r^3$ comprising the time sheet or register on which the initials or signatures have to be affixed. The battery $p^4$ is placed in the bottom cupboard of the case or box which is provided with and closed in at the top by a sloping desk lid $q^2$ adapted to be locked so that admission cannot be had to the upper interior portion of the box except by a responsible official having charge of the key, a longitudinal slot $q^3$ of a given width being cut in the said lid to admit of the upper surface of the cylinder $r^2$ being level or nearly level with the face of the lid when closed.

The sheet of paper or time sheet $r^3$ is ruled with lines on which to affix the signatures or initials and is divided by horizontal lines $r^4$ into equal sections the number of which is determined by the number of times the apparatus is intended to register in a day or other given period of time, and vertical division lines may be marked thereon so that on each section of paper there are the same number of spaces provided for names or initials as there are employees engaged on the business premises. The time sheet is of such a length that when placed tightly around the cylinder $r^2$ its opposing edges overlap each other and such sheet is secured on the cylinder in the following manner:—An opening $s$ is made in the periphery of the cylinder $r^2$ (see Figs. 5 and 6) into which project pins or spikes $s^1$ attached to or driven into a thin piece of wood $s^2$ secured within the cylinder against the inner wall thereof, the said spikes or pins piercing through the overlapping edges of the paper, which are pressed into the opening and then firmly secured by a hinged plate or slide $s^3$ adapted to fit nicely into the opening $s$ and provided at one end with a lug or turned down end $s^4$ adapted to engage and lock with a spring stud or snap catch $s^5$ secured to the side of the cylinder.

Slots or openings $s^6$ are cut in the plate $s^3$ at equal distances apart corresponding to the position of the spikes $s^1$ so that the latter may project into same.

On the left hand side of the time sheet and in each section thereof is printed or marked the times of day each such section will be presented opposite the slot $q^3$ in the lid $q^2$, so as to be in view of the employees when affixing their initials or signatures on the exposed section of the time sheet, and forming the register or indicator by which the times of arrival or departure of the employees may subsequently be read off.

On each end of the cylinder $r^2$ are a series of teeth or projections $t$, $t^1$, one tooth at each end for each section into which the time sheet is divided, the series of teeth $t$ being adapted to be engaged by a double pallet $u$ and the series of teeth $t^1$ by a detent $v$ centred on a stud $v^1$ carried by a bracket $v^2$ secured to the inside of the case or box $q^1$ at the back thereof.

The double pallet $u$ is curved to the radius of the cylinder $r^2$ and is engaged about midway at each side thereof by, and pivots upon, the conical or pointed ends of two adjustable screws or bolts $u^1$ screwed through lugs or ears on a bracket $u^2$ secured by screws to the platform or shelf $q$, in a position close to and within the influence of the electro magnet $p^3$.

On the upper end of the pallet $u$ is formed at right angles a tooth $u^3$ adapted, when said pallet is moved into an abnormal position, to engage with a tooth $t$ on the cylinder $r^2$.

At the lower end of the said pallet is a loose toe piece or locking dog $u^4$ having a leg $u^5$ thereon which passes through and is adapted to slide in ways in lugs $u^6$ on the face of the pallet, its movement in one direction being limited by the toe piece

abutting against the end of the pallet and in the other direction by the engagement with the lower of the two lugs $u^6$ of a pin or stud $u^7$ secured on the leg $u^5$ intermediate of said lugs.

The drum or cylinder $r^2$, when released, is rotated in the direction of the arrow by the gravity action of a weight $w$ suspended from a cord $w^1$ attached at one end to an eyelet $w^2$ secured to the underside of the dividing partition $q^4$ of box or case $q^1$, and attached at its opposite end to a barrel $r^5$ on the cylinder, around which a portion of the cord is coiled.

The release of the registering cylinder $r^2$ at the times determined upon and its intermittent rotation to the extent of one section marked off on the time sheet, is effected in the manner following :—

Assuming, for illustration, that the section of the time sheet exposed opposite the slot $q^3$ in the lid $q^2$ is marked at 7.45 a.m., and that the period of time it is arranged to remain in an accessible position is expiring and the next section marked at 8 o'clock a.m. is required to take its place opposite the said slot, a stud or pin $f^3$ on the discharge plate $f$ at 8 of the clock or intermediate of 7.45 and 8 of the clock, rides under the lever arm $g^1$ and raises it to place the leg of lever $h$ clear of the shoulder on snail $k^5$ and release the striking mechanism which, on the stud $f^3$ passing clear of the lever arm $g^1$ and allowing it and levers $g$, $h$ and $h^1$ to assume their normal positions, is actuated, and by means of switch $o$, completes and breaks the electric circuit, as fully set forth above.

On the completion of the circuit, the current from the battery $p^4$ flows through the armature of the electro magnet $p^3$ and magnetises the core of same, which thereupon attracts the keeper $u^8$ and draws said pallet into the position shewn in dotted line in Fig. 8, thereby removing the toe piece $u^4$ clear of the tooth $t$ it has been engaged with, and placing the tooth $u^3$ at its upper end, into the path of the teeth $t$ and slightly ahead of one of said teeth, which, on the cylinder $r^2$ being turned slightly on its axis in the direction of the arrow by the action of the suspended weight $w$, will abut against said tooth $u^3$ and temporarily hold the cylinder until the electric circuit is broken. On this taking place the pallet rights itself by reason of its greater weight being below the fulcrum, and again releases the cylinder and allows its partial rotation in the direction of the arrow to the extent of one section of the time sheet to be completed, so as to present the section marked at 8 o'clock a.m., opposite the slot $q^3$, by which time a succeeding tooth $t$ on the cylinder has engaged and raised the toe piece $u^4$ into abutment with the end of the pallet as shewn in full line in the figures, which prevents further movement of the cylinder until the electric circuit is again completed to place section marked at, say, 8.15 a.m. opposite slot $q^3$.

When the pallet is attracted and drawn into its abnormal position as described, the weight of the unsupported toe piece $u^4$ causes it to fall downwards, away from the end of the pallet, to the position indicated by dotted lines in Figs. 7 and 8, in which position it is held by the engagement of pin $u^7$ with the lower lug $u^6$, the result being that when the pallet rights itself on the breaking of the circuit, the said toe piece will abut against the under surface of, or fall under, the tooth it was last engaged with and thereby prevent the cylinder being rotated either intentionally or accidentally, in the wrong direction ; the detent $v$ engaged successively with the teeth $t^1$ on the left hand end of the cylinder $r^2$ when said cylinder has been moved to the extent of one complete section of the time sheet, likewise preventing any backward movement of the cylinder when the parts are in their normal positions and at rest. The teeth $t^1$ on the cylinder are made angular or curved on the rear faces thereof in order to raise the detent $v$ as they pass thereunder in a forward direction, but immediately they are clear of the end of the detent, it falls by its own weight to the horizontal, as shewn (Fig. 4) and successively engages with same.

A stop piece $v^3$ secured to the bracket $v^2$ limits the fall of the detent.

By raising and holding the detent clear of the cylinder, the latter can be rotated freely in the reverse direction to re-wind the cord $w$ on the barrel $r^5$. Any desired

number of registers or indicators, of the description set forth, may be in circuit with one and the same clock mechanism, and, in Fig. 10 we have shewn two signature or initial time registers or indicators in circuit with one clock, the clock being connected to one pole of a battery placed in the bottom cupboard of one of the boxes or cases $q^1$ as before explained, and the terminal $p^2$ on the contact piece $p$ connected to the armature of the electro magnet in one indicator which is connected to the armature of the electro magnet in the other indicator, and the latter connected to the opposite pole of the battery.

In Fig. 11 we shew a modification of the signature or initial time register or indicator consisting in the addition to the mechanism already described of a printing disc $x$ mounted on an axis journalled in bearings in the upper interior portion of the case or box $q^1$ and having raised type fixed thereon to print the times at which the sections of the time sheet $r^3$ are to be exposed, on the margin of said sheet. The said disc is of the same diameter as the cylinder $r^2$ and has a gear wheel thereon (not shewn) meshing with a corresponding gear on the said cylinder. The time sheet instead of being secured around the cylinder, may be in a long length and wound on a roll $x^1$ journalled in bearings in the box or case $q^1$ off which it is unwound by the motion of the cylinder. The end of the paper is passed between the type disc and cylinder, then carried partly around the latter and nipped against it by a roller $x^2$ driven by frictional contact with the cylinder. The type is fixed to the disc at intervals apart corresponding to the width of the section of paper which must be brought opposite the slot $q^3$ in the lid $q^2$ at each partial rotation of the cylinder and it impresses or prints the time on the margin of each section of paper at the point of contact of the disc with the cylinder, the type being inked over just prior to printing, by an inking roller $x^3$. The type on the disc $x$ may comprise the periods of time the indicator is to be actuated in one working day or part of a working day, or two or more days, and at each revolution will print the same matter on the time sheet in the same order of progression, repeated again and again until the length of paper on the roll is exhausted. The length of paper may be equivalent to what would be used in a full working week, or longer time, so that at the end of the week it could be taken out of the box or case, into the bottom of which it falls as it leaves the cylinder, and the times of arrival or departure of each employee on each day of the week thus recorded on one sheet of paper.

If desired, we can dispense with the electrical connections for releasing the drum at pre-determined times, and in lieu thereof rotate the drum in corresponding manner by a pinion or bevil wheel gearing with a toothed wheel or bevil wheel on one end of the drum, or on the drum shaft, said pinion being rotated to the required extent at each release of the escapement or striking mechanism by a shaft and bevils deriving motion from the striking mechanism in manner precisely similar to the arrangement shewn and described in the before mentioned Specification of Letters Patent No. 16,662[95]. On the discharge wheel or plate $f$ we may secure a second set of pins or studs $f^4$, on a separate index line $f^5$ (shewn in dotted line in Fig. 1) which said studs will engage in turn with a switch or lever $f^6$, and moving it into abutment with a contact piece $f^7$, complete a circuit and cause a bell in said circuit to be rung shortly in advance of the actuation of the checking apparatus whereby warning is given to those coming rather late to hasten and affix their signatures before the next section of time register is presented.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is :—

Firstly. The signature or initial time checking or registering apparatus constructed and operating in the manner and for purposes substantially as herein shewn and described.

Secondly. The combination, with a clock having striking mechanism combined therewith and a discharge plate or wheel driven from said clock and having

provision for receiving pins or studs for releasing the striking mechanism as and when required, of apparatus or apparatuses for receiving the signatures or initials of employees on entering or leaving business premises and for checking or registering the time or times at which they are affixed, and electrical or mechanical connections between the recording apparatus or apparatuses and the striking mechanism or clockwork for actuating the said apparatus at the predetermined times substantially as herein shewn and described.

Thirdly. The general arrangement, construction and combination of clockwork and parts comprising the herein described signature or initial time registering or checking apparatus substantially as shewn and herein set forth.

Dated this 1st day of December 1896.

TASKER & CROSSLEY,
Huddersfield, Patent Agents.

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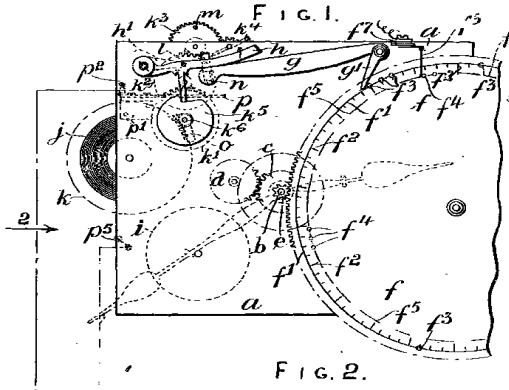
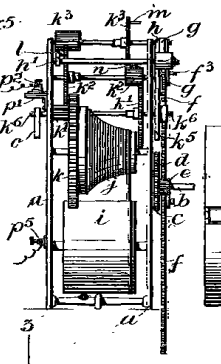
A.D. 1896. March 6. № 5045.
THE BROOK TIME CHECKING CLOCK CO. [LD.] & *another's* Complete Specification.

(2 SHEETS)
SHEET 1

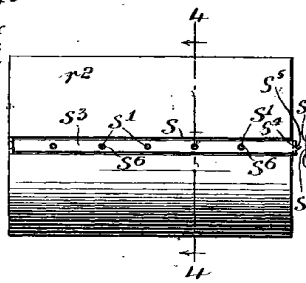
F I G. 1.



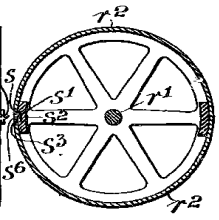
F I G. 3.



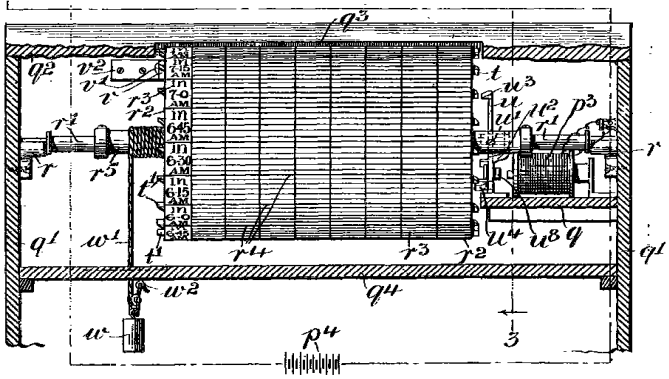
F I G. 5.



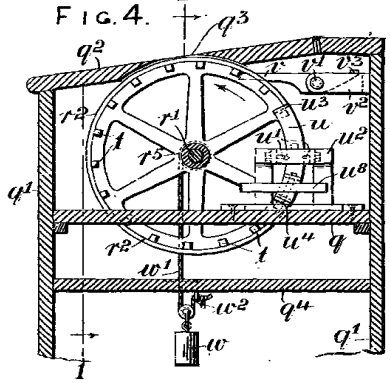
F I G. 6.



F I G. 2.



F I G. 4.



[This Drawing is a reproduction of the Original on a reduced scale.]



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for Her Majesty's Stationery Office. 1897.

FIG. 1.

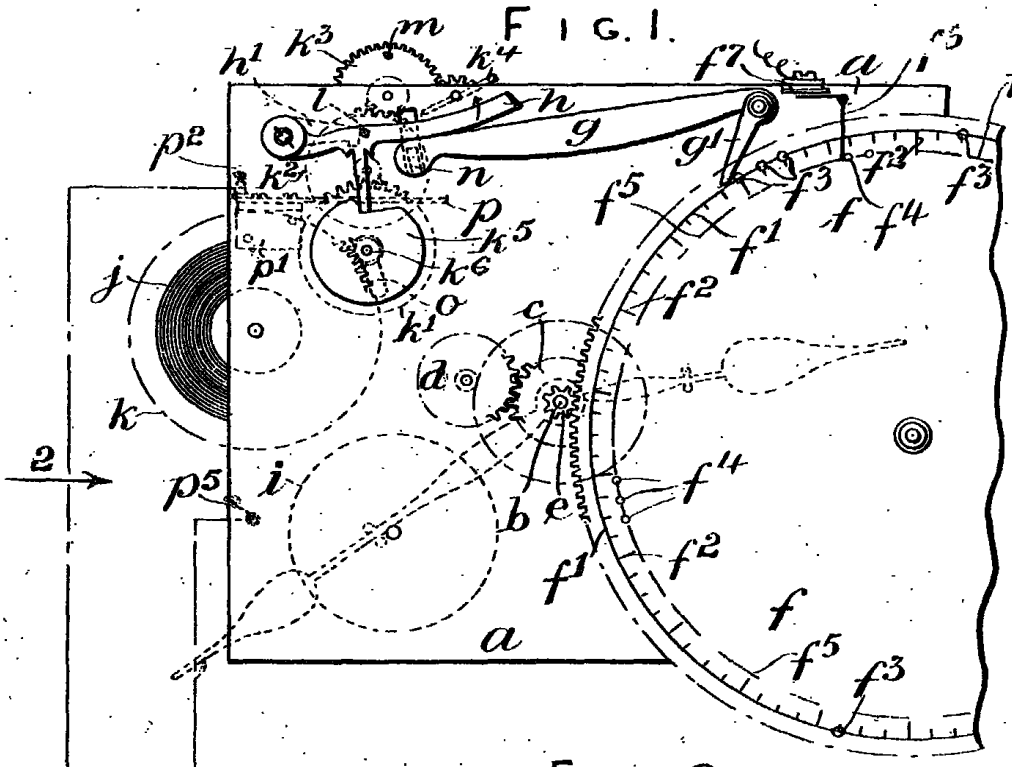
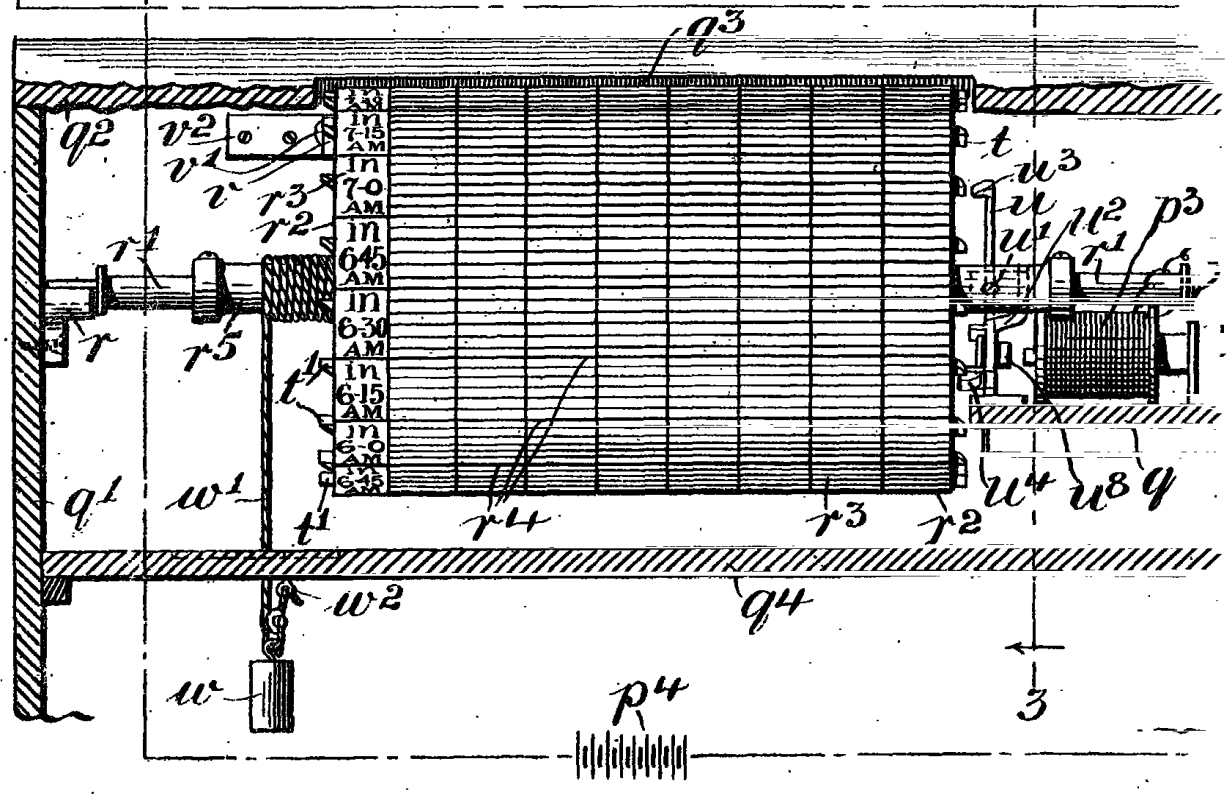



FIG. 2.

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3.

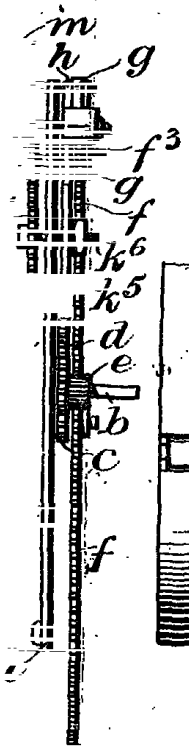



FIG. 5.

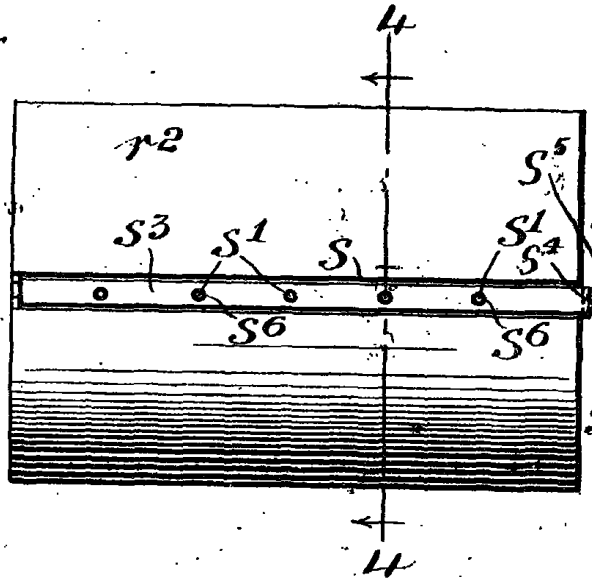



FIG. 6.

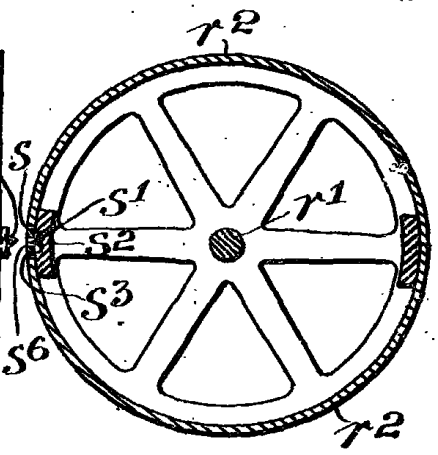
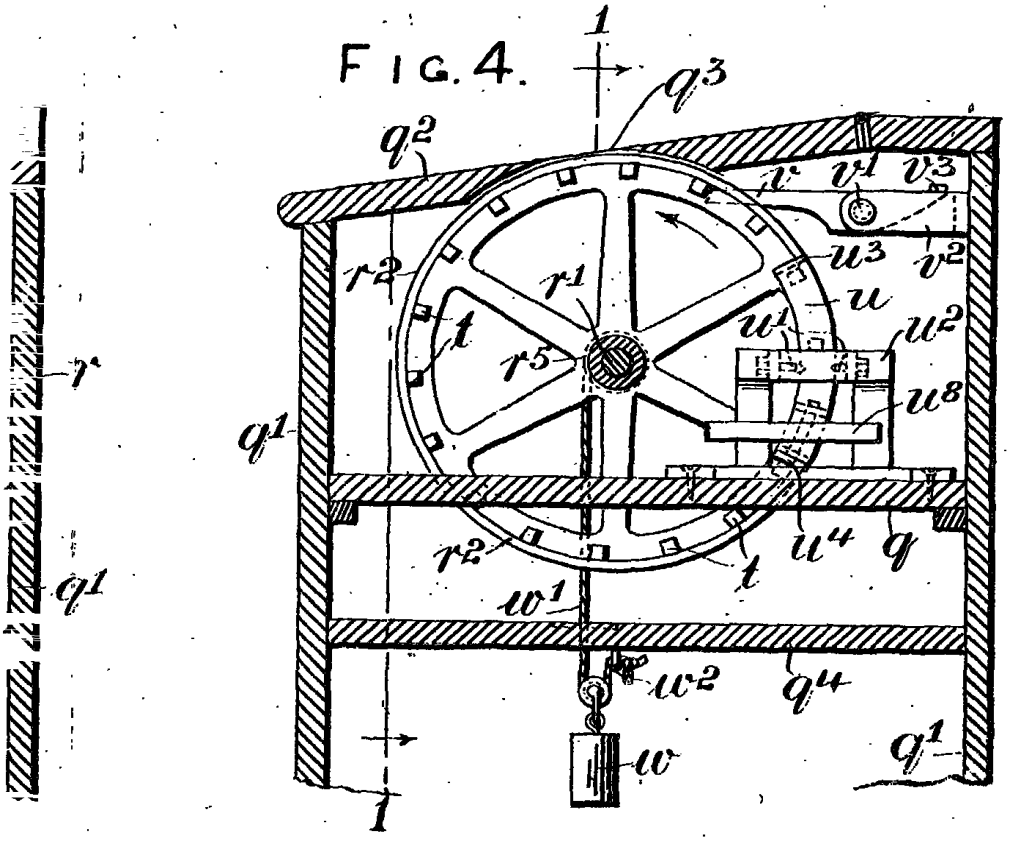



FIG. 4.

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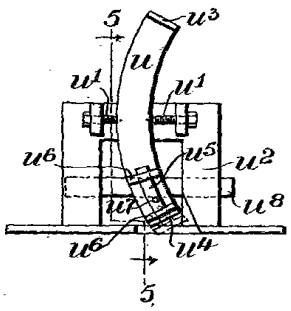
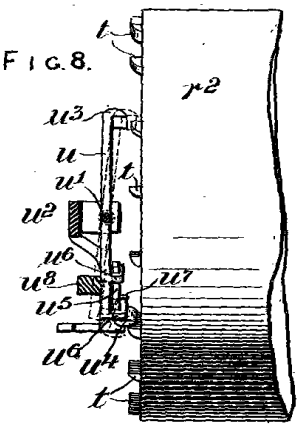
(2 Sheets), Sheet 2

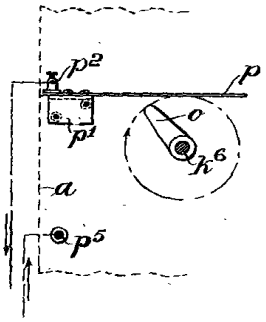
F I G. 7.

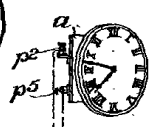



F I G. 8.

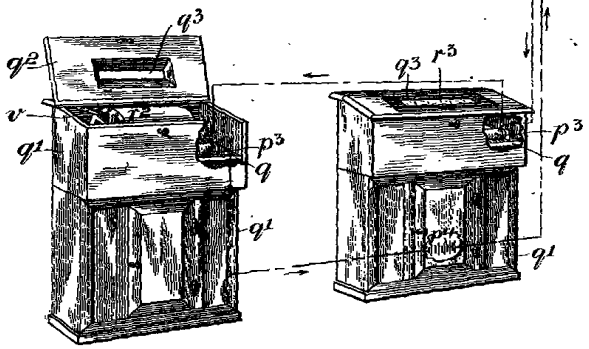



F I G. 9.




F I G. 10.




F I G. 11.

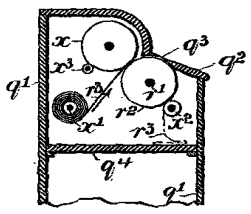



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FIG. 7.

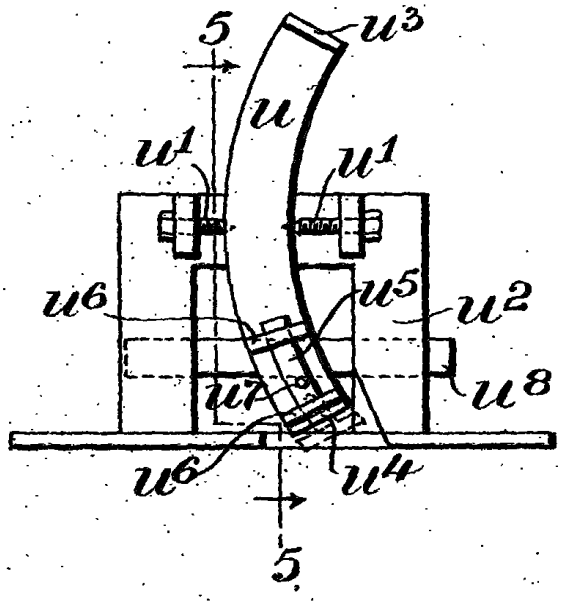


FIG. 8.

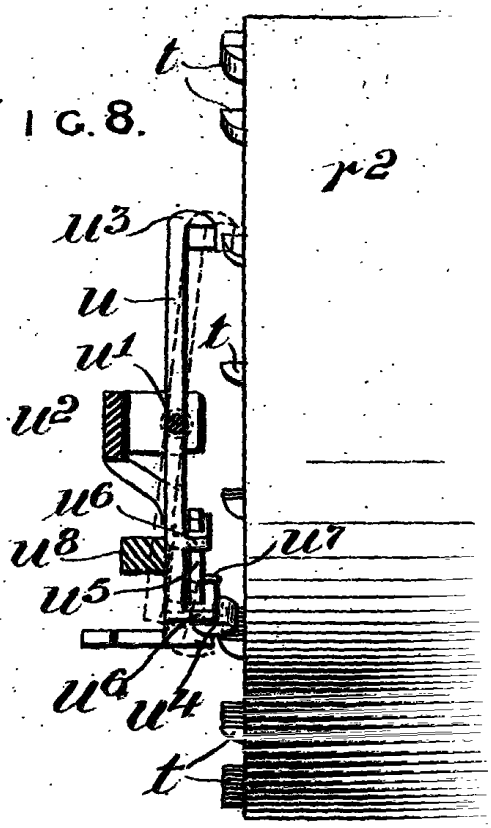


FIG. 10.

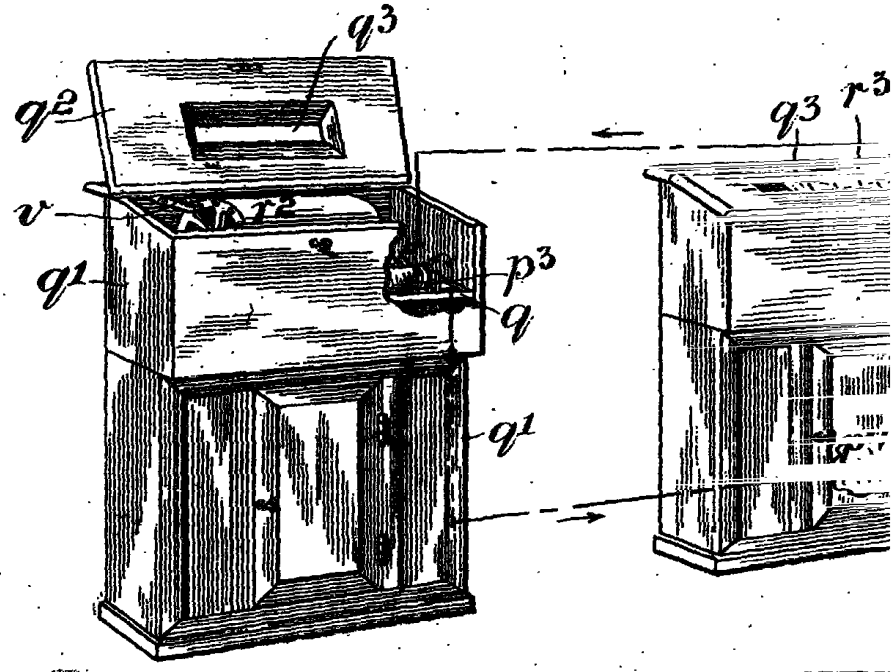


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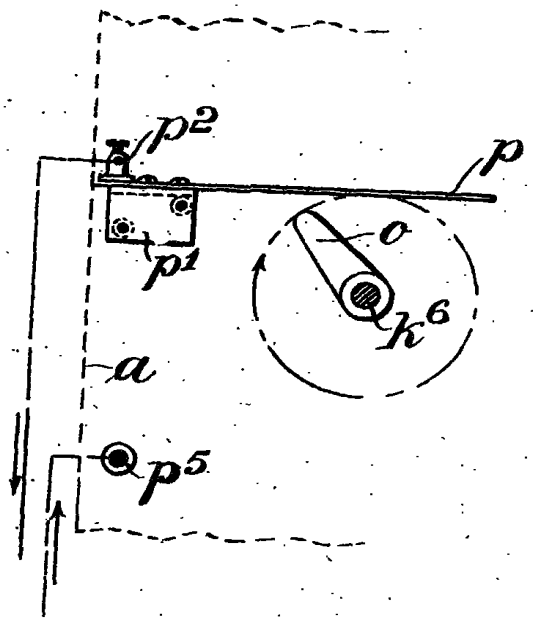
FIG. 9.



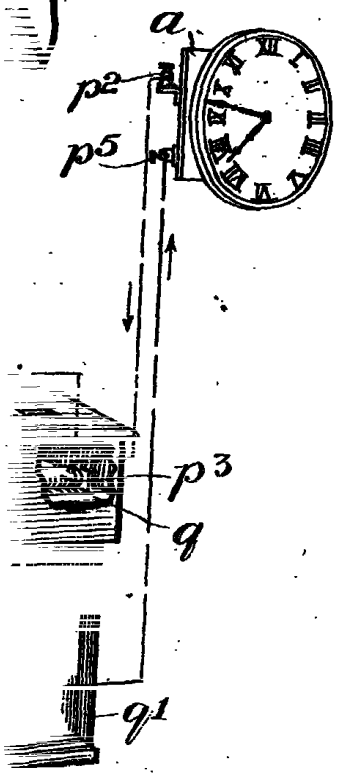
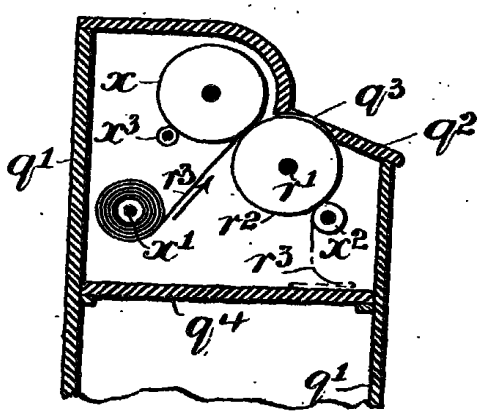




FIG. 11.



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