(Model.) 3 Sheets—Sheet 1.

W. D. SMITH.

ALARM APPARATUS FOR CLOCKS.

No. 294,338. Patented Feb. 26, 1884.

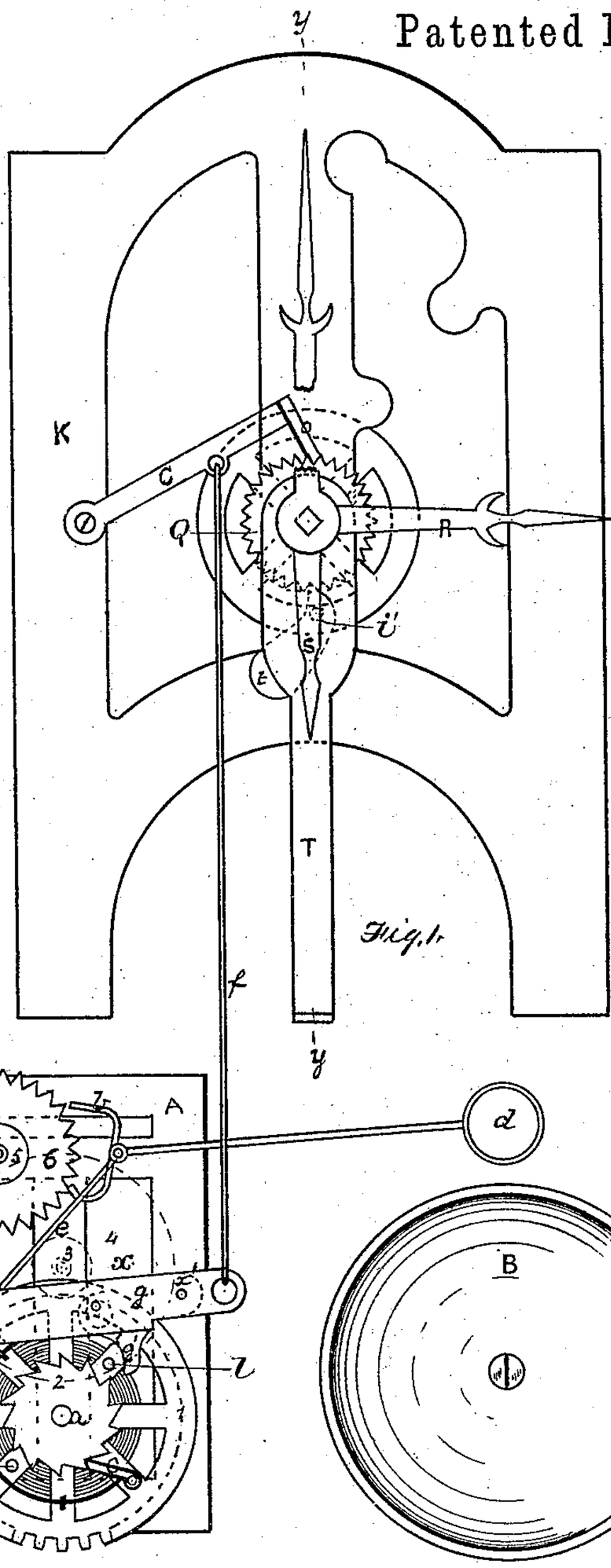


Fig. 1.

Fig. 4.

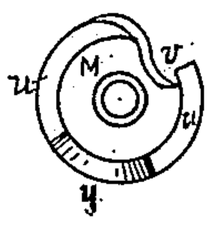


Fig. 3.

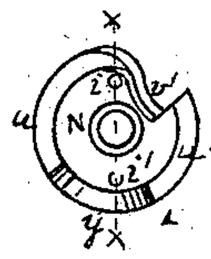


Fig. 2.

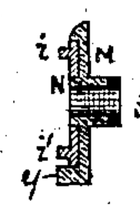


Fig 5

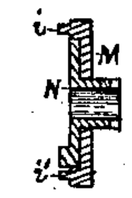


Fig. 15.

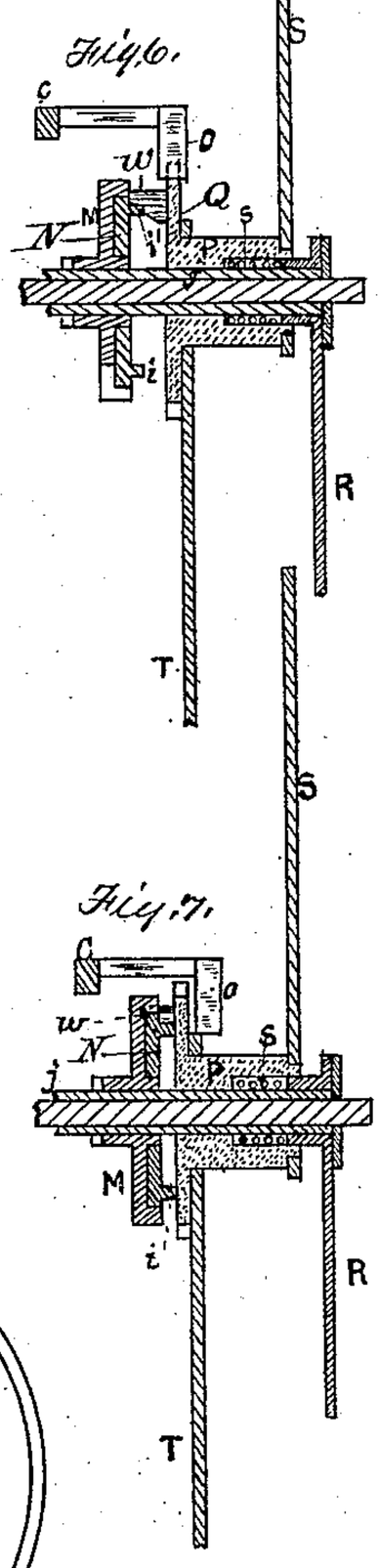


Fig. 6.

Fig. 7.

Witnesses.

R. C. Wormhall

J. E. Scully.

Inventor.

William D Smith

by his attorneys

Bakewell & Kerr.

(Model.)

3 Sheets—Sheet 2.

W. D. SMITH.

ALARM APPARATUS FOR CLOCKS.

No. 294,338. Patented Feb. 26, 1884.

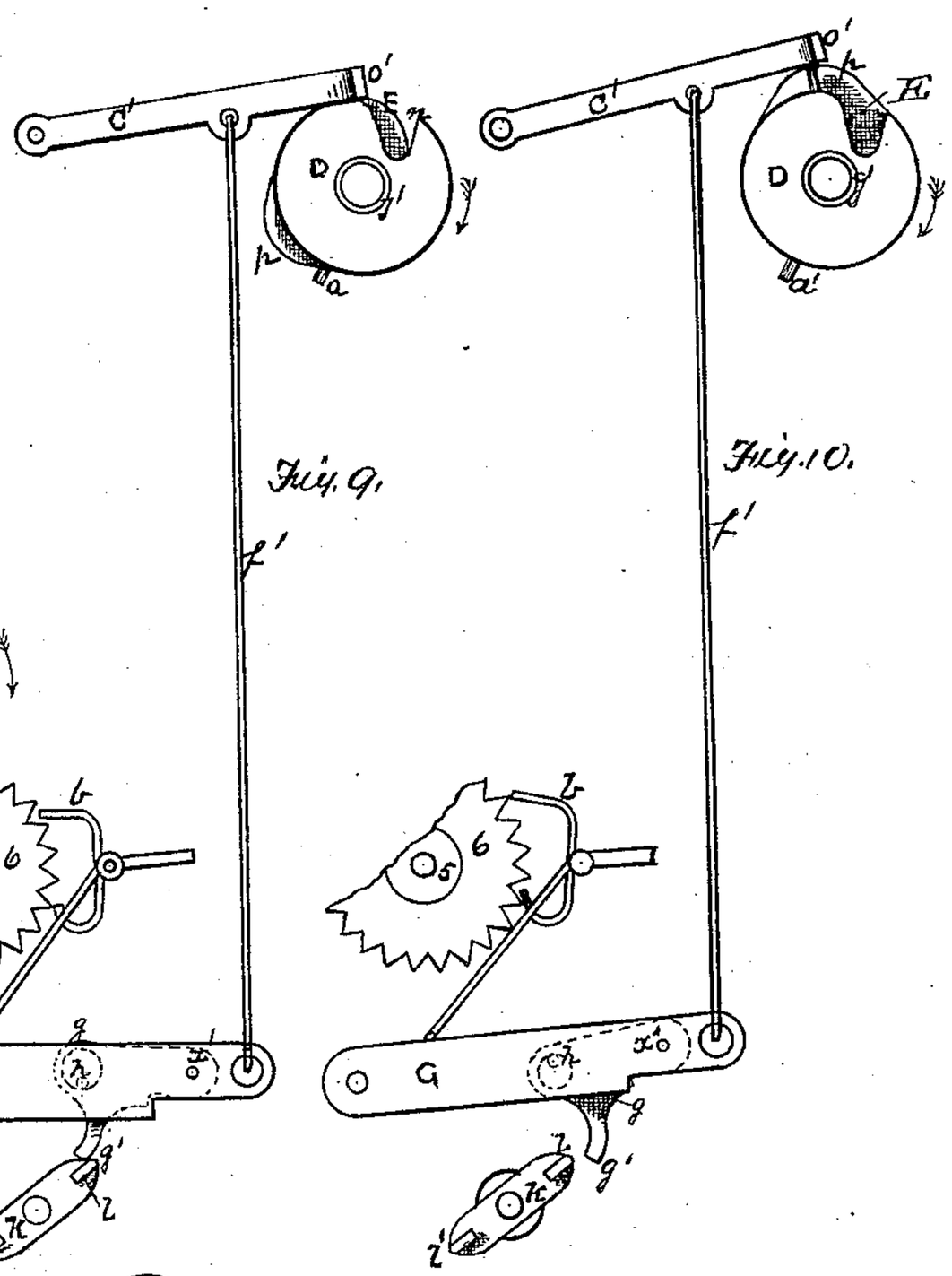
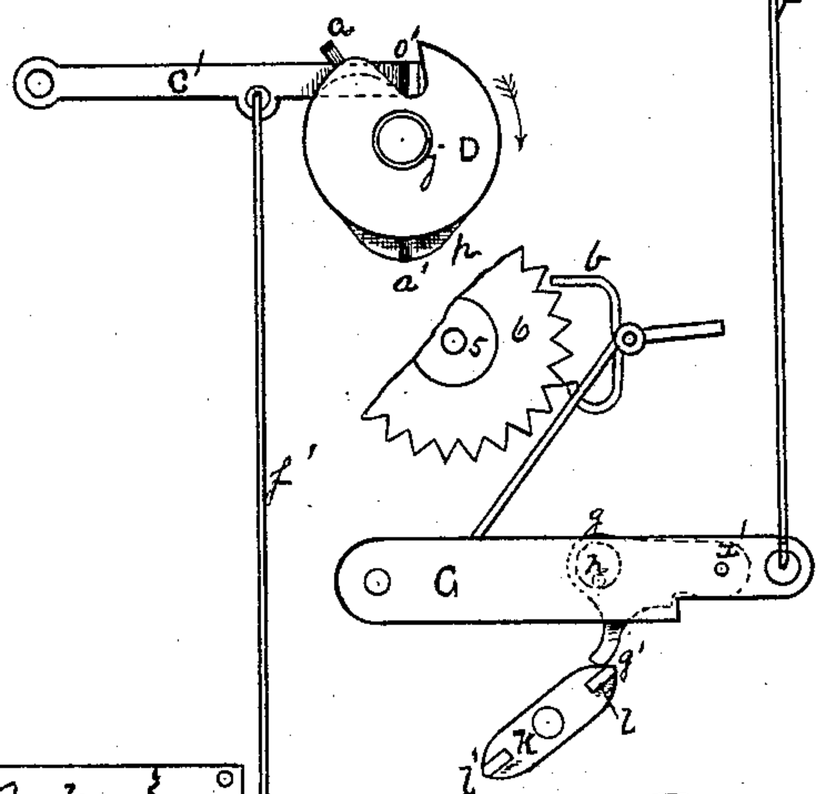


Fig. 9.

Fig. 10.



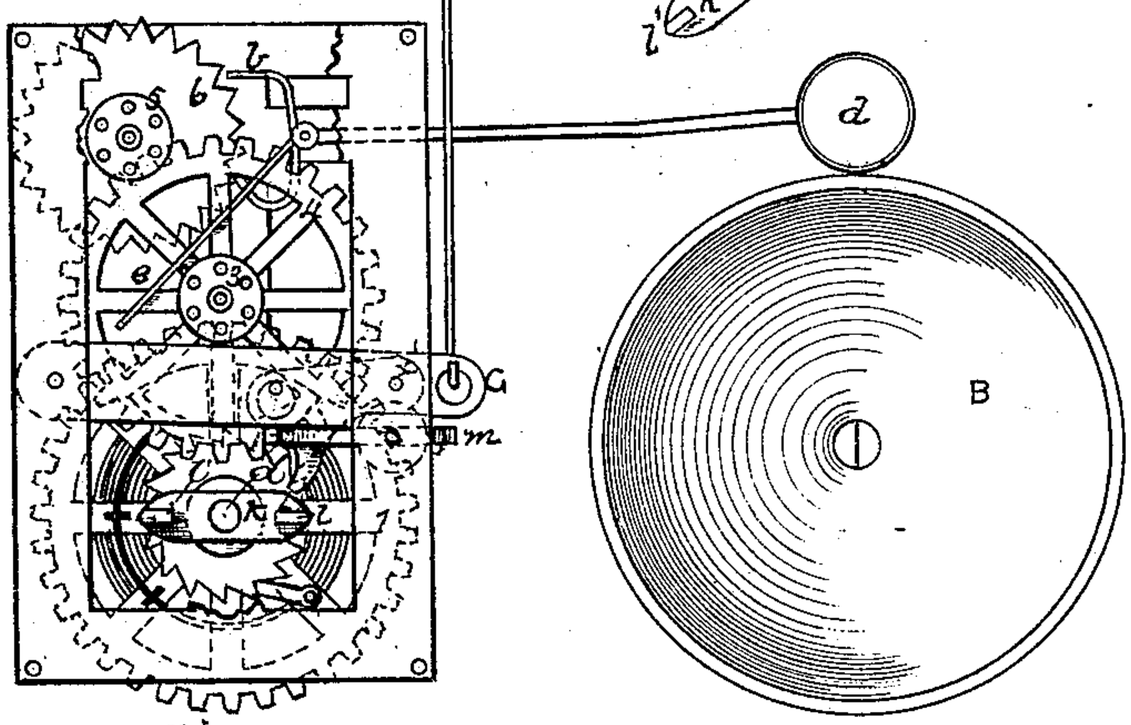


Fig. 8.

Witnesses—

L. J. Campbell.

I. H. Bakewell

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William D. Smith

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Bakewell & Kerr

(Model.)

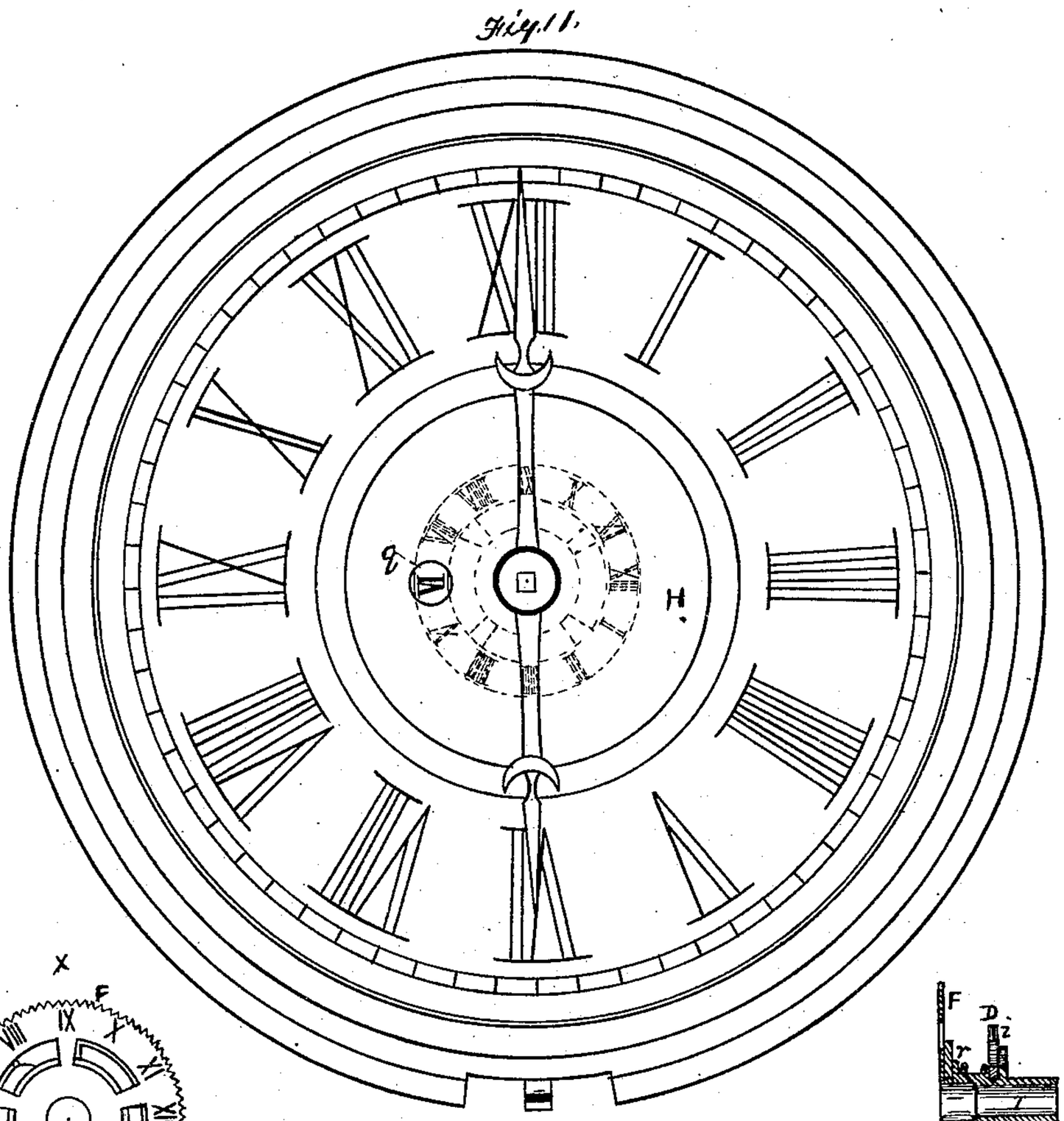
3 Sheets—Sheet 3.

W. D. SMITH.

ALARM APPARATUS FOR CLOCKS.

No. 294,338. Patented Feb. 26, 1884.

Fig. 11.



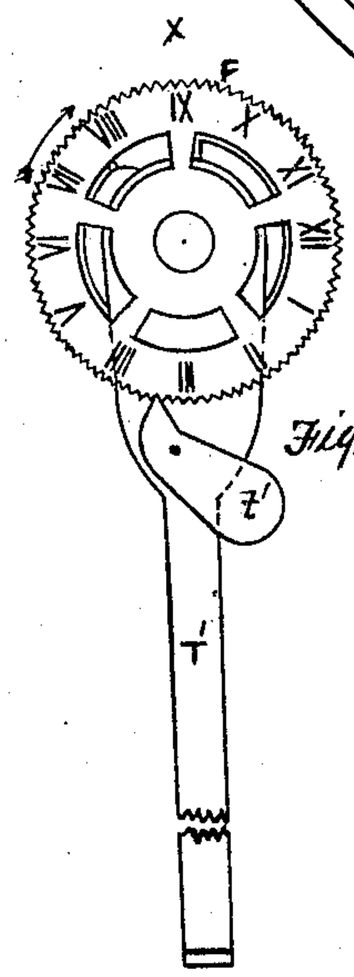


Fig. 12.

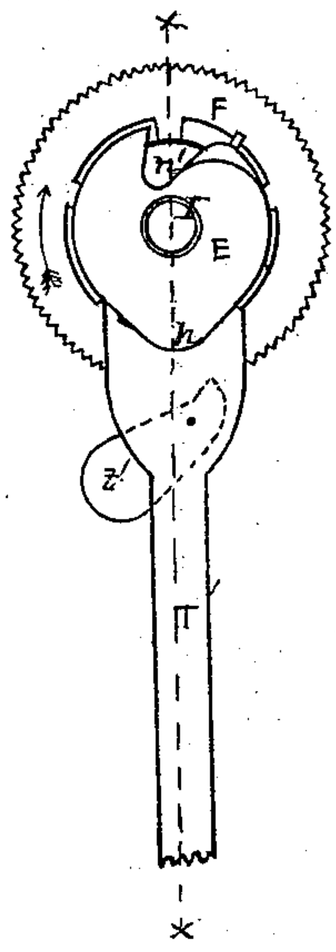


Fig. 13.

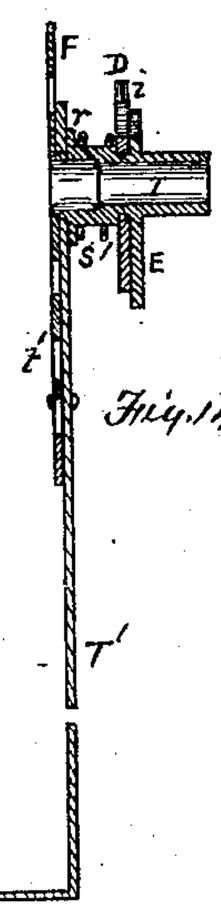


Fig. 14.

Witnesses—

L. J. Campbell.

I. H. Bakewell

Inventor—

William D. Smith

by his attorneys

Bakewell & Kerr

UNITED STATES PATENT OFFICE.

WILLIAM D. SMITH, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO HIMSELF, AND EMIL G. STUCKEY AND ROBERT FREW, BOTH OF SAME PLACE.

ALARM APPARATUS FOR CLOCKS.

SPECIFICATION forming part of Letters Patent No. 294,338, dated February 26, 1884.

Application filed February 19, 1883. (Model.)

To all whom it may concern:

Be it known that I, WILLIAM D. SMITH, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Alarm Apparatus for Clocks; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents a time-movement with alarm-movement attached. Figs. 2, 3, and 4 are representations of the disks by which the alarm-movement is operated at intervals of twelve or twenty-four hours. Fig. 5 is a section of Fig. 2 through the line *x x*. Figs. 6 and 7 are sections through the time-movement at *y y* of Fig. 1, showing the positions of the parts before and after the alarm is set in operation. Fig. 8 is a representation of the alarm-movement and disks for operating it. Figs. 9 and 10 are detailed representations of devices shown in Fig. 8 for operating the alarm. Fig. 11 is a representation of the clock-face, showing the position of the alarm-dial in dotted lines. Fig. 12 is a face view of the alarm-dial, showing the lever and pawl for operating the same. Fig. 13 is a rear view of the alarm-dial, showing the position of the disks. Fig. 14 is a section through the line *x x* of Fig. 13. Fig. 15 is a section of a modified form of the disks by which the alarm-movement is operated at intervals of twelve or twenty-four hours.

In the several figures like letters of reference indicate similar parts of the apparatus.

My present invention is an improvement in an alarm apparatus for which Letters Patent of the United States No. 269,475 were granted to me on the 19th day of December, 1882. In many respects the invention hereinafter described is similar to that described in my former patent, and some portions of my invention are directly applicable thereto. It will be necessary, therefore, in the specification, to describe some parts of the apparatus which are common to both.

My improved alarm apparatus, like that described in my former patent, is principally designed to be applied to time-pieces of otherwise ordinary construction, and is susceptible of being applied to almost all descriptions of clocks, but is especially adapted to use in time-pieces running for more than one day with a single winding, as it is so constructed as to sound the alarm at intervals of twenty-four hours, and to run as long as the clock itself, without repeated windings.

My improvements have relation to the alarm apparatus itself, to the devices for operating the alarm apparatus at stated intervals of time by connection with the time-movement, and to devices for setting the alarm so as to sound at any required time.

Most of the improvements which I am about to describe may be used as substitutes for the corresponding parts of the apparatus described in my former patent. I shall therefore not only describe my present improvements as a whole, but also show how they may severally be used in connection with some portions of my former apparatus, and as substitutes for others. I will therefore first describe my improved alarm device. This movement (shown in Fig. 1) is contained in a frame consisting of a front plate, A, and a similar back plate, connected in the usual way by posts at the four corners. The mainspring of the alarm apparatus is coiled on the winding-shaft *a*, which is furnished in the ordinary manner with a ratchet-wheel, 2, and a pawl, *c*, attached to the prime cog-wheel 1. This wheel gears into a pinion, 3, on the shaft of the cog-wheel 4, which gears with the pinion 5 of the escapement-wheel 6, the teeth of which engage the pallets of an escapement, *b*, to which is attached the rod of the clapper *d*, so that as the escapement-wheel 6 revolves, the clapper *d* strikes rapid blows on the bell B. This alarm-movement may have a separate bell, or may be so placed inside the clock-case as to strike the bell of the clock.

In order to prevent the alarm-movement from running down and striking the bell continuously, a locking-rod, *e*, is rigidly attached to the escapement *b*, or to the shaft on which the escapement vibrates, and extends downward so that its extremity nearly touches and rests upon the upper edge of a horizontal lever, G, which is pivoted at one end, at *x*, to one side of the frame A, while the other end of the lever projects slightly outside of the

frame on the opposite side, and so that when the lever G is raised the extremity of the locking-rod *e* touches it and arrests and prevents the vibration of the escapement. The free end of the lever G is connected by a rod or wire or chain, *f*, with the alarm devices in the time-movement, so that the alarm apparatus is set by raising the lever G, and caused to sound by allowing it to drop, as hereinafter described.

Near to the free end of the starting-lever G is pivoted, at *x'*, a stop-latch, *g*, (shown more clearly in Figs. 9 and 10,) the extent of the motion of which is limited by a pin, *h*, projecting horizontally from the lever G and entering a slot or hole in the stop-latch *g*. The stop-latch *g* has a leg, *g'*, extending downward, as shown in Figs. 9 and 10. The free end of the stop-latch *g* is made heavy enough to drop by its own weight. Fixed to the winding-shaft *a* is an arm, *k*, at each side of which is a stud, *l l'*. The length of the arm *k* and of the leg *g'* of the stop-latch is such that as the arm *k* revolves, when the alarm is in operation, one of the studs, *l*, will encounter the extremity of the leg *g'* when the lever G is lowered. When this occurs, the stud *l* raises the stop-latch *g* until its motion is arrested by the pin *h*, when the further motion of the alarm-movement is arrested and the alarm-bell ceases to ring. As the arm *k* is attached midway from either end to the shaft *a* and has a stud *l* at each end, the motion of the alarm apparatus is arrested when the prime wheel 1 has made only one half of a revolution. If it is desired that the alarm-bell should ring for a longer time, one of the studs, *l* or *l'*, may be dispensed with, and then the wheel 1 will make a whole revolution before the vibrations of the locking-rod *e*, and consequently of the escapement and its clapper, are arrested. An equivalent construction would be to place the studs *l l'* on the spokes of the wheel 1, or one of the other wheels, provided there were more wheels in the alarm-train.

In order to silence the alarm when desired, or to prevent its operation, a small lever, *m*, Fig. 8, is pivoted to the frame A, by depressing one end of which the other end raises the lever G until it presses up against the locking-rod *e* and prevents any further motion of the escapement *b*. After the alarm has ceased to ring, having been stopped by the engagement of the stud *l* with the leg *g'* of the stop-latch *g*, it is necessary to release the stud *l*, so that the alarm may be in a condition to operate again at the proper time. This is effected by raising the starting-lever G (in the manner hereinafter described) from the position shown in Fig. 9 to that shown in Fig. 10, until the upper edge of the starting-lever G comes in contact with the lower end of the locking-rod *e*, thus preventing the sounding of the alarm, while the leg *g'* of the stop-latch *g* is raised just high enough to allow the stud *l* to pass. As soon as this occurs, the stop-latch *g* drops down again as far as the pin *h* will permit, and the arm *k* remains in its position with the stud *l* just past the leg *g'*, ready for repeated action. When the parts are in that position, the only thing which then prevents the alarm from ringing is the contact of the starting-lever G with the extremity of the locking-rod *e*. All that is necessary to set the alarm in operation is to allow the starting-lever G to drop (to the position shown in Fig. 1) far enough to give sufficient room for the vibration of the locking-rod *e*, which thereby also permits of the vibration of the clapper *d*. This dropping of the starting-lever G is effected by the second division of my apparatus, which is connected with the clock or time-movement, and which I will now proceed to describe.

To the frame of the time-movement or clock is pivoted a lever, C, placed in a nearly-horizontal position above the alarm-movement, already described. About midway from either end of the lever C a rod or chain, *f*, is attached, which extends downward to and is connected with the free ends of the starting-lever G, so that when the lever C is depressed it allows the starting-lever G also to descend, thus starting the alarm; and when the lever C is raised it raises the starting-lever G, so as to hold the locking-rod *e* in a non-vibrating position, while the stud *l* is released from the leg of the stop-latch *g*, and thus the apparatus is set for repeated operation. This operation of the lever C may be effected by means of disks D and E, constructed and arranged in the manner described in my former patent, and shown in Figs. 8, 9, and 10 of the drawings to this specification, or in the following manner, as shown in Fig. 1:

K is the front plate or time-movement of the clock, the train of wheels and other devices of which, constituting the time-movement, not being represented, as they may be of the ordinary kind.

j is the hour-hand shaft, which is tubular, so as to receive the shaft of the minute-hand, as usual.

On the hour-hand shaft *j* is a circular disk, M, which is attached to the shaft *j*, so as to revolve therewith. The disk M has a circular recess or depression on the front side, forming a rim, *u*, which extends around it, excepting at the notch *v*, where the rim and disk are cut away, as shown in Fig. 3. The forward side of the notch *v* is a straight line extending radially toward the center of the disk, while the opposite face of the notch is curved, as shown in Fig. 3, and is also beveled from the inner to the outer face on the curved line. A smaller disk, N, fits into the recess of the disk M, being nearly of the same diameter as the inner edge of the rim *u*, and not quite the same thickness as the depth of the recess in the disk M. It has also a notch, *v'*, corresponding with the notch *v* in the disk M, having one side straight and the other curved and beveled, the shape and size of the disk N being such that when placed in the recess of disk M it

just fills its recess, and the notch *v'* forms a continuation of the notch *v*. The disk N is not attached to the hour-hand shaft *j*, but turns freely thereon. Two pins, *i i'*, project from the outer face of the disk N—one, *i*, at the termination of the curved side of the recess *v'*, near to the circumference of the disk, and the other, *i'*, nearly diametrically opposite.

On the outer face of the rim *u* of the disk M, diametrically opposite to the notch *v*, is a cam-like projection, *y*, the height of which above the face of the disk M is equal to or slightly in excess of the height of the pins *i i'* above the surface of the disk N.

In front of the disks M and N, on the hour-hand shaft *j*, is a sleeve, P, which has attached to it a ratchet-wheel, Q, which does not, however, revolve with though supported by the hour-hand shaft. Lever C has at its free extremity a finger, *o*, the lower edge of which is beveled, so as to serve as a pawl, fitting into the ratchet-teeth of the wheel Q, permitting that wheel to be turned from right to left only, or in the reverse direction of travel of the hands of the clock. On the inner face of the ratchet-wheel Q is a pin, *w*, the extremity of which is broad enough to rest against the rim of the disk M and to extend over its inner edge into the path of the pins *i i'* of the inner disk, N. The extremity of the pin *w* is beveled, so that when the pin enters the notches *v v'* in the disks M and N it may be raised out of the notches as the disks revolve by their beveled edges. The pin *w* of the ratchet-wheel Q is kept pressed inward against the face of the disks M and N by means of a spiral spring, *s*, which enters a recess in the sleeve P around the hour-hand shaft *j*. This spiral spring presses against a shoulder in the sleeve P in one direction, and in the other direction against the hub of the hour-hand R of the clock, which fits onto the sleeve *j* and enters the sleeve P. This arrangement is shown in detail in Figs. 6 and 7. The effect of this construction and arrangement is that, as the fixed disk M revolves with the hour-hand once in twelve hours, with the pin *w* pressing against its rim, the pin would drop into the notch *v* once during each revolution—that is, once in every period of twelve hours; but as the rim of the disk M projects slightly beyond the surface of the disk N, the pin *w* does not interfere with the motion of the disk N (which travels around with the disk M) until the pin *w* comes in contact with one of the small pins, *i*, on the disk N. The motion of the disk N is then arrested, while the disk M continues to revolve alone until the cam-shaped projection *y* on disk M passes under the pin *w*, raising it sufficiently to allow the pin *i* to pass it. The disk N then commences to revolve again with disk M until again arrested by contact of the pin *w*, the other small pin, *i'*, on the disk N stopping the motion of the disk N until the cam *y* again raises the pin *w* and frees the pin *i'*. The result of this is that when the pin *w* reaches the notch *v* in the rim of the disk M, at the completion of one revolution of the disk, the pin cannot fall into the notch, because the disk N, having been stopped during half the time, has made only half of a revolution, and the notch *v'* on disk N is on the opposite side of the circle from the notch *v* on disk M; but when the disk M has made another complete revolution, the disk N will have finished its revolution, and the two notches *v* and *v'* coinciding at the end of two revolutions of disk M—that is, once in every twenty-four hours—the pin *w* falls into the coinciding notches *v* and *v'*, and the ratchet-wheel Q approaches the disks M and N, being pressed inwardly by the spiral spring *s*. When this occurs, the ratchet-wheel leaves the finger *o* at the end of the lever C, the end of the finger *o* not being wide enough to remain in gear with the ratchet-wheel Q when the latter is pressed inward. The end of the lever C then drops downward, being no longer supported by the ratchet-wheel Q, and consequently the starting-lever G is also depressed or allowed to drop. As soon, however, as the pin *w* on the ratchet-wheel Q rises out of the notches *v v'* in the disks M and N, as they continue to revolve, the ratchet-wheel is pressed outward again, and the edge of the wheel pressing on the beveled face of the finger *o* at the end of the lever C raises it up into gear with the teeth of the ratchet-wheel Q, when the same operation is repeated.

Inasmuch as the alarm is set off whenever the lever C is depressed and the starting-lever G falls with it, it follows that by the device described the alarm will be sounded at regular intervals of twenty-four hours. If it is desired that the alarm should go off every twelve hours, it will only be necessary to remove the loose disk N, which can readily be taken out and replaced at pleasure. As a modification of this arrangement of disks M and N, the smaller disk, N, may be fixed to the shaft, and the larger disk, M, made to work loose on its shaft, in which case the notches *v v'* will be the same; but the pins *i i'* will be placed on the disk M, and the cam projection on the disk N. This construction is shown in Fig. 15, and its operation will be the same as that just described.

I will now explain the third portion of my invention, which relates to the means for setting the alarm to operate at any hour which may be desired.

Near the end of the ratchet-wheel sleeve P is a shoulder, against which, on the end of the sleeve, is placed a hand, S, like a clock-hand, but which may be made of a different shape or color, to distinguish it from the hour and minute hands of the clock. This hand S is fixed to the sleeve P, so that by turning the hand S the ratchet-wheel Q may be turned backward until the alarm-hand S points to any desired time on the hour-circle of the dial-plate at which it is desired that the alarm should sound.

In order that this apparatus may operate correctly, it is necessary to adjust the parts,

when the clock is put together, as follows: The disk M is placed on the hour-hand shaft *j*, and the disk N placed within the recess of the disk M. The alarm-hand S is securely fixed to the outer end of the sleeve P, so that it extends radially with the pin *w*—that is to say, in the same radial plane as that in which the pin *w* of the ratchet-wheel Q is placed. The sleeve P of the ratchet-wheel Q is then placed on the shaft *j* of the hour-hand, the spiral spring *s* inserted in the recess at the end of the sleeve P, and the hour-hand is then put on, which keeps the spring *s* in place. The alarm-hand is then turned backward until the alarm begins to ring, and the hour-hand is then set immediately over the alarm-hand, and finally the minute-hand is added, as usual. The alarm apparatus is then adjusted and ready to be set. Of course the adjustment does not need to be repeated unless the alarm apparatus or clock gets out of order. In order to set the alarm, all that is necessary to do is to turn the alarm-hand backward, so as to indicate on the hour-circle of the clock-face the time at which it is desired to sound the alarm. If the time at which the alarm is to operate is more than twelve hours from the time at which it is being set, you turn the alarm-hand (always backward) until the alarm sounds, then keep on turning the alarm-hand until it points to the desired time; but if it is desired that the alarm should sound in less than twelve hours from the time when it is being set, you turn the alarm a second time round the clock-face until it again points to the required time. It will then go off on the first occurrence of the hour for which it is set.

In Fig. 1 I have shown a device for setting the alarm without touching the alarm-hand. This device consists of a pendulous arm, T, which has a circular hole at the upper end, which fits in a groove in the sleeve P near to the ratchet-wheel Q. This arm T has a pawl, *t*, pivoted to it at *z'*, the lower end of the pawl being heavy enough and its pivot loose enough to dispense with a spring to keep it in place. The nose of the pawl *t* engages the ratchet-teeth of the wheel Q, so that by moving the arm T back and forth the ratchet-wheel, and with it the alarm-hand S, may be turned backward to any desired point on the hour-circle. This device is desirable because the ratchet-wheel having only a motion in one direction, and that the reverse of the motion of the clock-hand, a person setting the alarm would be very apt to attempt to turn the alarm-hand in the wrong direction, and thus it might readily become detached from the sleeve P, to which it should be rigidly fastened.

I will now proceed to explain the way in which the several improvements which I have described may be applied to alarm-clocks otherwise constructed, as described in my former Letters Patent, No. 269,475, as it will appear that the alarm-movement which I have described in this specification may be used with the devices for operating the alarm from the time-movement described in my former patent, and also the mode of setting the alarm by means of the arm T may be adapted to my former apparatus by means of certain modifications, which I will describe.

The alarm-movement shown in Figs. 1 and 8 may be substituted, without alteration, for the alarm-movement described in my former patent, the arrangement being as follows: To the front plate of the clock is pivoted a lever, C', the other or free end of which rests on the peripheries of a pair of disks, D E, which are carried by the horizontal tubular shaft *j'* of the hour-hand of the clock. A rod or chain, *f'*, connects the lever C' of the time-movement with the free extremity of the starting-lever G of the alarm-movement. The disks D and E are placed close together side by side, and rotate with the hour-hand of the clock. The rear disk, E, being fixed to the shaft *j'* of the hour-hand, rotates with it continuously, making a complete rotation once in every twelve hours; but the front disk, D, is loose on the shaft, and, by means which I am about to describe, revolves intermittently, so as to accomplish one complete revolution in every twenty-four hours. The free extremity of the lever C' has a finger, *o'*, projecting forward at right angles to the lever C'. This finger rests on the upper edge of both disks, as shown in Fig. 9. Each disk has a notch—*n* in disk D, and *n'* in disk E. These notches are of the same depth, which is such that when the finger *o'* drops into the notches (which can only occur when they coincide) the lever C' drops down so far as to allow the starting-lever G of the alarm apparatus also to drop down sufficiently to release the locking-rod *e* of the alarm-escapement and set it in operation. As the disk E revolves every twelve hours, its notch comes just so frequently under the finger *o'* of lever C', and the alarm would then go off; but as the disk D revolves only once in twenty-four hours, the notches do not coincide on every period of twelve hours, and do coincide on the recurrence of every period of twenty-four hours. This is effected by means of two pins, *a a'*, projecting from the periphery of the loose disk D. One pin, *a*, is placed just in rear of the notch, and the other pin, *a'*, diametrically opposite to the forward edge of the notch. (See Fig. 8.) On the other disk, E, is a cam-shaped projection, *p*, diametrically opposite to its notch *n'*, the height of which is that or a little in excess of that of the pins *a a'* from the periphery of the disk. Otherwise the disks D and E are circular in shape and of the same diameter. The notches in the disks have one side (the forward side) straight, while the opposite or rear side is curved, so that as the disks revolve in the direction of the arrows in Figs. 8, 9, and 10 the finger *o'* of the lever C' will drop down suddenly into the notch; but the opposite face of the notches is inclined and curved, so that as the disks continue to revolve the finger *o'* may slide up the curved incline and rise out

of the notch. The cam-shaped projection *p* on the disk E is designed to raise the finger *o'* of the lever C' over the pin *a* or *a'* on the disk D when it is desired that the finger *o'* should pass the pin without engaging it. The operation of these disks is as follows: When the finger *o'* of lever C' is down in the notches of the disks, as in Fig. 8, lever C' and starting-lever G are dropped. Then as the disks continue to revolve in the direction of the arrows (which is always the direction of travel of the hour-hand of the clock) they travel together until the finger *o'* rises out of the notch. It then engages the pin *a'* on disk D and arrests the motion of that disk; but disk E continues to travel on for a half-revolution of the hour-hand, or six hours, when the cam *p* on disk E reaches the finger *o'* and raises it slightly above the level of the top of the pin *a*. The disk D, being no longer arrested by the finger, commences to travel with the disk E, and they continue to revolve together for another half-revolution of the hour-hand, or six hours more. The notch in disk E is then under the finger *o'* of lever C', which, however, cannot enter the notch, because the notch of disk D is now on the opposite side of the circumference, while the other pin, *a'*, of the disk D now comes in contact with the finger *o'* of the lever, and the motion of the disk D is again arrested for a half-revolution or period of six hours, at the expiration of which time the notch in disk E coincides again with the notch in disk D, and the cam *p* on disk E has reached the finger *o'*, which it raises and sets the disk D free to resume its rotation with the disk E. During the next half-revolution or period of six hours the two disks travel together, with their notches coincident, so that at the completion of the period of twenty-four hours, the two notches come together under the finger *o'*, which drops down and starts the alarm. It will thus be seen that when the alarm is set to go off at any hour, it will go off again at the same hour after an interval of twenty-four hours, and not on the next recurrence of the fixed time. This arrangement of disks D and E and lever C' is similar to that shown in my former patent for accomplishing the same purpose. If it is desired that the alarm should sound every twelve hours, it is only necessary to remove the disk D, or, what will accomplish the same purpose, to remove the pins *a* *a'* from the disk D. For this purpose the pins *a* *a'* may be movable, being set in a slot in the periphery of the disk D, fitting tightly enough to prevent their working out of place. By this means the clock can be adjusted at pleasure as a twelve-hour alarm or a twenty-four-hour alarm.

I will now proceed to explain my improved devices for setting the alarm when an alarm dial-plate is used.

The alarm-dial is usually placed on the hour-hand shaft, outside of the clock-face, and is set by turning the dial-plate until the required hour comes directly under the hour-hand. This arrangement is unsightly, and as the alarm-dial is necessarily small, it is difficult to turn it with one's fingers, and it cannot readily be adjusted with precision. To remedy these defects, and to dispense with the plates and wires attached to one of the disks in my former patented device, in order to set the alarm so as to ring at an hour occurring less or more than twelve hours from the time when it is set, I have made the improvement represented in Figs. 11 and 12 of the drawings. The alarm-dial F, which is a circular metallic disk, with the hour-circle printed or impressed on it, is located back of the clock-face, and is rigidly attached to the sleeve I, to which the fixed disk E is also rigidly attached. This sleeve I fits into the tubular shaft of the hour-hand, and is capable of being adjusted without turning the hour-hand or hour-hand shaft, but revolves with the hour-hand and its shaft. If the alarm were designed to be set by turning the alarm-dial until the required hour comes under the hour-hand of the clock, the alarm-dial would be so fixed on the sleeve I that the straight side of the notch *n'* in the fixed disk E would be in line with the figures XII on the alarm-dial F, and my device might be so constructed and arranged; but as this is inconvenient, for the reason before stated, I place the figures IX opposite the straight side of the notch *n'*, and then I set the dial-plate a quarter of a circle (or three hours) to the left of the hour-hand. This difference of quarter of a circle or three hours is arbitrary, and any distance may be used which will place the point for setting the dial away from the hour-hand. I then make a circular opening in the face or dial plate of the clock, concentric with the hour-circle, in which I place a circular plate, H, of metal, (or other suitable material, similar to the clock-face, or otherwise, as may be desired,) close to but behind the clock-face, and to this plate I attach the hour-hand of the clock, rigidly connecting them, so that they may move together. I make a small opening, *q*, in the plate H, large enough to expose the figures of the alarm-dial, indicating any of the hours. This hole is located quarter of a circle to the left of the hour-hand, provided the notch in the disk E is placed three hours to the left of figures XII on the alarm-dial, as before stated. The alarm is then set by bringing the exact hour on the alarm-dial to the opening *q* in the plate H, and as the circular plate H and alarm-dial revolve with the hour-hand, these parts will preserve the same relative position, and the hour at which the dial is set to go off can be readily observed by looking at the aperture *q*.

In setting the alarm-dial, when the alarm is constructed to go off at intervals of twenty-four hours, it is necessary to be able to set it so that it will operate either at the first or second recurrence of the required hour in any period of twenty-four hours. In order to do this, it is only necessary to know when the alarm operated before; or, if this is not known,

then turn the alarm-dial until the alarm sounds. Then turn the dial-plate until the required hour appears at the aperture *q*, and if left so the alarm will go off, not on the next recurrence of the required hour, but at the recurrence which is more than twelve hours after the time when it is set. If it is desired that the alarm should go off twelve hours or less from the time it is set, turn the dial-plate one complete revolution more, until the required hour appears a second time at the aperture, and the alarm will then operate at the next recurrence of the hour.

In order to adjust the dial-plate with precision, a pointer may be fixed on the circular plate at the aperture *q;* or a mark may be made on the plate, so as to set the alarm to any desired fraction of an hour.

In order to set the alarm-dial F without revolving it by seizing its edges between one's fingers, I use a pendulous arm, T′, the upper end of which has a circular hole, through which the tubular shaft I of the hour-hand passes. This arm T′ lies close to the rear face of the alarm-dial F, against a flange, *r*, on the sleeve I, which keeps it in position. The periphery of the alarm-dial is serrated with fine teeth, as shown in Fig. 12, which are engaged by the nose of a pawl, *t′*, pivoted to the arm T′. A spring to keep the pawl up to its work is unnecessary if the portion below the pivot is made heavy and the pivot is loose. This construction of arm and pawl is similar to that before described as used for turning the ratchet-wheel Q. (See Fig. 1.) It is obvious that by moving the arm T′ back and forth the alarm-dial F will be moved only in one direction, (indicated by arrows in Figs. 12 and 13,) and that the dial may be set in that manner to any desired position indicated by the appearance of the figure of the desired hour at the aperture *q* in the circular plate H. As the rotation back and forth of the arm T′ might interfere with the loose disk D, which turns on the same sleeve, I, and alter its position relatively to the fixed disk E, I put a flange, *r*, on the sleeve I, between the arm T′ and the loose disk D, and interpose a small spiral spring, *s′*, between the flange *r* and the disk D, which serves to keep the disk D in place, pressed up closely to the fixed disk E, so that while the disk D is free to move on the sleeve I, or, rather, to remain stationary while the sleeve revolves, it will also, when not arrested in its revolution by the finger *o′* of the lever C′, move with the sleeve I and disk E.

In the description of my invention I have described a mainspring as the motive power to operate the train of wheels constituting the alarm apparatus; but it is obvious that other motive power might be employed to actuate the alarm—as a weight and pulley or an electric motor—which would be the equivalent of a mainspring, for the purpose described. It is further obvious that the alarm apparatus might be operated by some motor which was also employed at the same time for other purposes, in which case, instead of arresting the operation of the prime motor when the alarm is to be stopped, the lever G might be used to operate a clutch device to throw the alarm apparatus in or out of gear with the prime motor. This would be desirable in case the alarm apparatus were used detached from the time-movement otherwise than by the necessary connection for starting and stopping the alarm at the desired hour.

Having thus described my improvement, what I claim as my invention, and desire to secure by Letters Patent, is—

1. In an alarm apparatus consisting of a train of wheels operating a bell-ringing device, and connected mediately or immediately with an independent time-movement, the combination of the starting-lever G, actuated at regular intervals by the time-movement, a stop-latch, *g*, pivoted to said lever, the locking-rod of the alarm device, and one or more locking-studs connected and revolving with the shaft of one of the wheels of the alarm-train, and engaging the stop-latch, so as to raise it into contact with the locking-rod of the alarm device, for the purpose of starting and stopping the alarm at regular intervals, substantially as described.

2. In an alarm apparatus, the combination of the notched disks D and E, actuated by a clock or time-movement, one revolving in twelve hours and the other in twenty-four hours, the lever C, and connecting-rod *f*, an alarm-train and bell-ringing device operated thereby, and having a locking-rod, the starting-lever G, and stop-latch *g*, and one or more locking-studs, *l*, connected and revolving with the shaft of one of the wheels of the alarm-train, to raise the starting-lever in contact with the locking-rod of the alarm, substantially as and for the purposes described.

3. In an alarm apparatus, a time-movement or clock having a disk fixed to the hour-hand shaft and revolving therewith, with a notch at one point in its periphery, a ratchet-wheel fixed to a sleeve on the hour-hand shaft, with a pin on said wheel to engage said notch in the disk when the alarm is to be sounded, and a hand for setting the alarm by the figures on the hour-circle of the clock, fastened to the sleeve and moving with the ratchet-wheel, in combination with a lever connected with and operating the starting and stopping device of an alarm-movement, said lever engaging and operated by the said ratchet-wheel of the time-movement, substantially as and for the purposes described.

4. In an alarm apparatus, the combination of a notched disk fixed to and revolving with the hour-hand shaft of the time-movement, having a cam, *y*, near its periphery, a loose disk having pins *i i′* projecting from its side, a ratchet-wheel, Q, fixed to a sleeve on the hour-hand shaft, and having a pin, *w*, which is in contact with the faces of the disks as they revolve, a hand, S, attached to the sleeve or hub of the ratchet-wheel and indicating time on

the hour-circle of the clock-face, and a lever, C, engaging and operated by the ratchet-wheel, said lever being connected with and operating the starting and stopping device of an alarm-movement, substantially as and for the purposes described.

5. A device for setting an alarm-clock by means of a hand pointing to the required time for the sounding of the alarm on the hour-circle of the time-piece, consisting of a ratchet-wheel or equivalent device fixed to a sleeve on the hour-hand shaft of the clock, a clock-hand fixed to the same sleeve, a notched disk or equivalent device fixed to the hour-hand shaft, a pin on the face of the ratchet-wheel which enters the notch in the disk when the alarm is to ring, and a lever connected with and operating the starting and stopping device of the alarm-movement, and also engaging the teeth of the ratchet-wheel and operated thereby, constructed and operating substantially as and for the purposes hereinbefore set forth.

6. In an alarm apparatus operated by a clock or time-movement, the alarm-dial movably attached to hour-hand shaft of the clock, and having ratchet-teeth on its periphery, or a ratchet-wheel fastened thereto, in combination with an arm and a pawl pivoted thereto and engaging said ratchet-teeth, substantially as and for the purposes described.

7. In an alarm apparatus operated by a clock, the combination of the clock-face, the alarm-dial having the hour-circle marked thereon movably attached to the shaft of the hour-hand, and a central face-plate rigidly attached to the shaft of the hour-hand, so as to move therewith, and having an aperture for exposing to view the figures denoting the time for which the alarm is set, substantially as described.

8. The arrangement of the alarm-dial relatively to the notch in the disk by which the alarm is set off, and of the alarm-dial and movable face-plate, such that the figures XII of the alarm-dial are situate at any point from one to eleven twelfths of the circle distant from the notch in said disk, and that the aperture in the central face-plate for exhibiting the hour at which the alarm is set is fixed on the hour-hand shaft in the same relative position (in twelfths of a circle) from the hour-hand, for the purpose of enabling the alarm to be set without covering with the hour-hand the figures on the alarm-dial indicating the time for which the alarm is set, substantially as described.

In testimony whereof I have hereunto set my hand this 12th day of February, A. D. 1883.

WILLIAM D. SMITH.

Witnesses:
W. B. CORWIN,
T. B. KERR.