July 7, 1942. E. AGER-WICK 2,288,933

AUDIBLE-SIGNAL CLOCK

Filed June 12, 1936 3 Sheets-Sheet 1

Fig. 1.

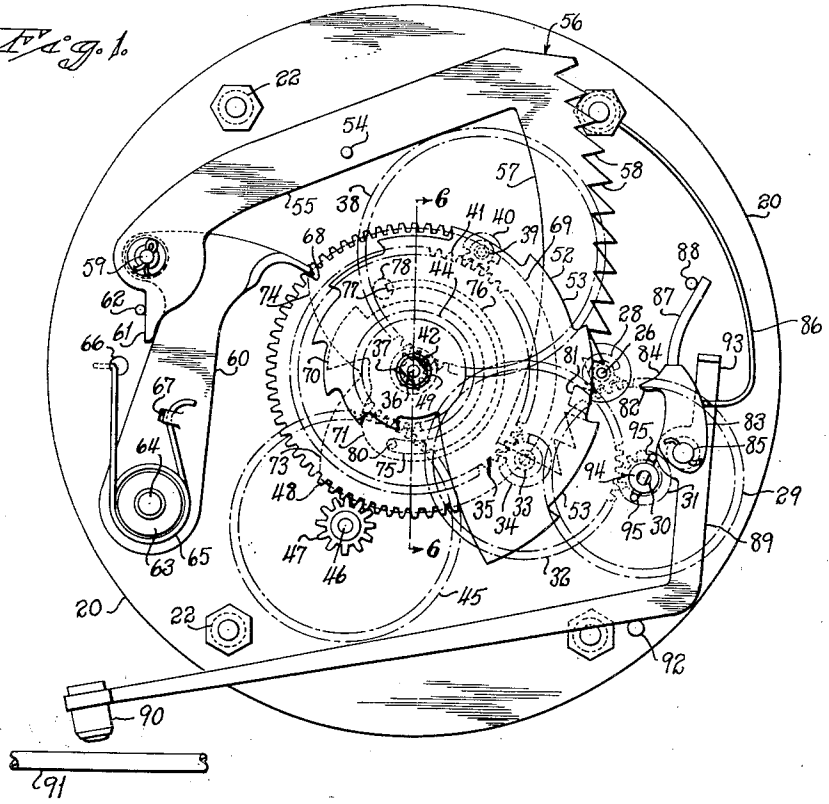
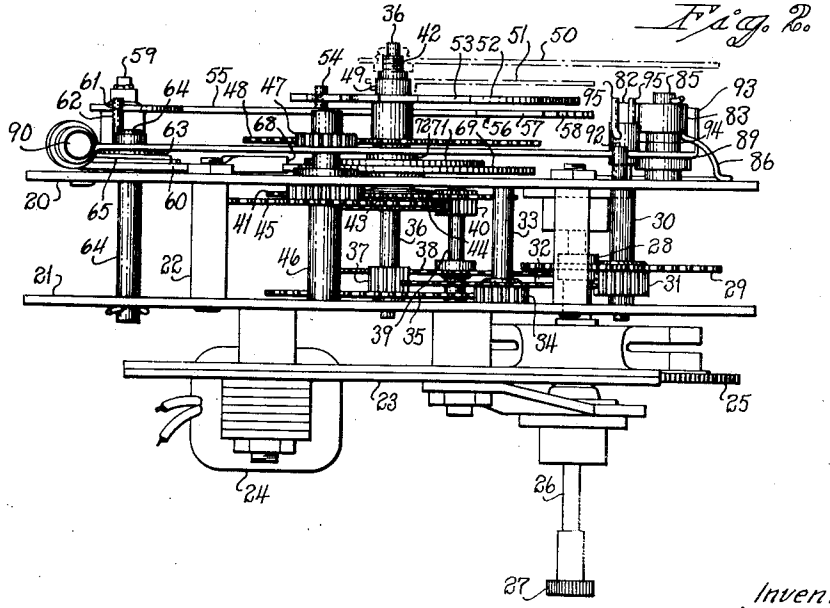


Fig. 2.



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Fig. 3.

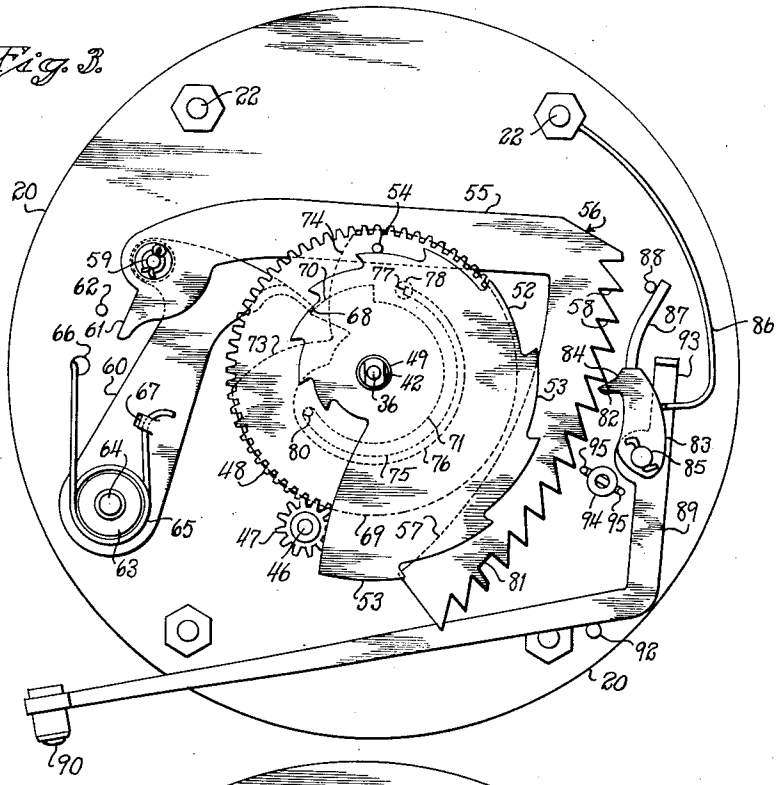
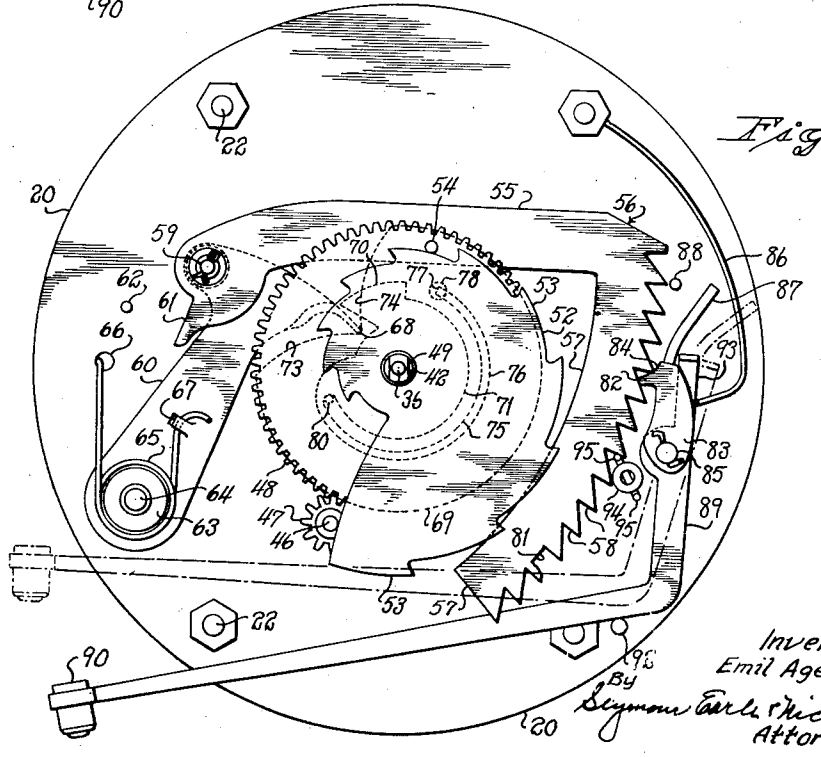


Fig. 4.



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Fig. 5.

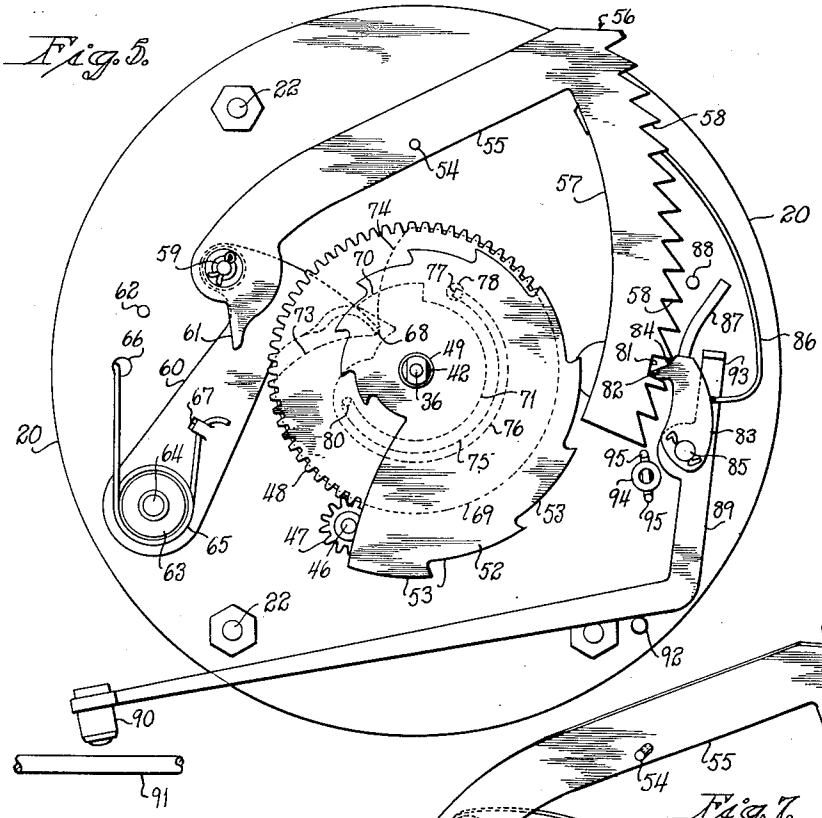


Fig. 6.

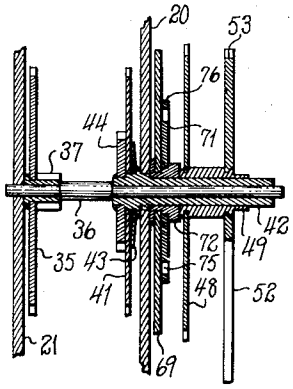


Fig. 7.

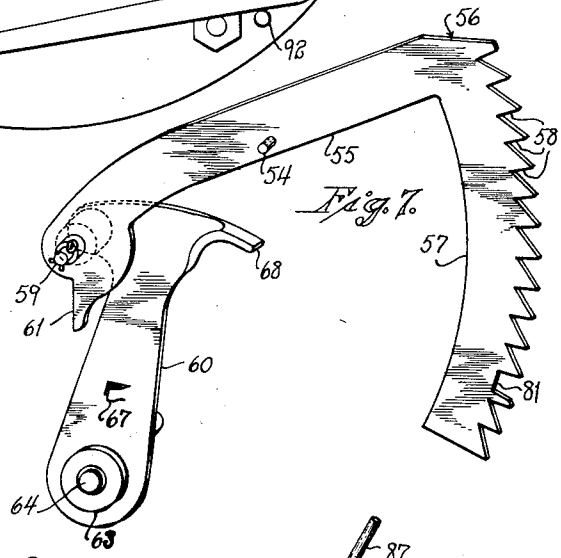


Fig. 8.

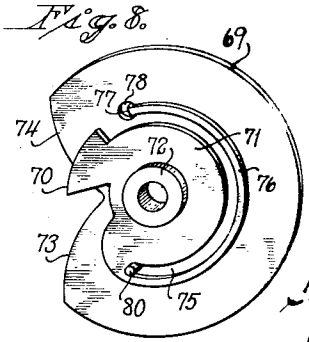
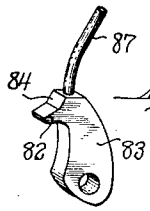


Fig. 9.



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Patented July 7, 1942

2,288,933

UNITED STATES PATENT OFFICE

2,288,933

AUDIBLE-SIGNAL CLOCK

Emil Ager-Wick, Arendal, Norway, assignor, by direct and mesne assignments, to The E. Ingraham Company, Bristol, Conn., a corporation of Connecticut

Application June 12, 1936, Serial No. 84,793

8 Claims. (Cl. 58—38)

This invention relates to an improvement in audible-signal clocks such, for instance, as strike clocks, chime clocks, ship's bells clocks, combinations of the same, etc. More particularly, the present invention relates to audible-signal clocks of the so-called "rack-and-snail" type.

One of the objects of the present invention is to provide a superior rack-and-snail audible-signal clock characterized by its capacity for being manually set in either direction without deranging the mechanism or throwing the same out of proper timing.

A further object is to provide a superior audible-signal clock of the rack-and-snail type, in which the signal-mechanism may be driven from the same source of power as is the time-mechanism.

Another object of the present invention is to provide an audible-signal clock of the class referred to which will be free from objectionable noises during the interval between the sounding of the audible signals.

A still further object is to provide a superior audible-signal clock of the rack-and-snail type characterized by compactness.

With the above and other objects in view, as will appear to those skilled in the art from the following, considered in conjunction with the accompanying drawings and appended claims, the present invention includes all features disclosed therein which are novel over the prior art.

In the accompanying drawings:

Fig. 1 is a view in front elevation of a rack-and-snail strike clock embodying the present invention, the parts being shown in the positions which they normally occupy in the intervals between the sounding of an audible signal;

Fig. 2 is an under-edge view thereof;

Fig. 3 is a front elevational view corresponding to Fig. 1, but showing the rack in its lowered position preparatory to final bodily movement toward the gathering-pins;

Fig. 4 is a similar view showing the rack shifted to the right into the path of the gathering-pins for being actuated thereby;

Fig. 5 is a similar view, but showing the rack and associated parts in the positions which they assume directly after the completion of the striking cycle of the clock;

Fig. 6 is a broken detail sectional view taken on the line 6—6 of Fig. 1;

Fig. 7 is a perspective view of the unit comprising the rack-carrier and the rack;

Fig. 8 is a perspective view of the unit comprising the rack-control disk and the supplemental rack-control disk; and

Fig. 9 is a perspective view of the rack-pawl.

The particular audible-signal clock herein chosen for the illustration of the present invention is of the strike type, designed to strike each hour, and is driven by a synchronous electric motor, though other motive power such, for instance, as a spring-motor, may be employed.

The synchronous electric strike clock shown includes a front movement-plate 20 and a rear movement-plate 21 arranged parallel and spaced from each other by a suitable number of pillars 22. Secured to the rear of the rear movement-plate 21 is a synchronous electric motor which requires no detail description other than to say that, as shown in Fig. 2, it includes a field-structure 23 having an energizing-coil 24 and a rotor 25 mounted upon a motor-shaft 26 carrying at its rear end a starting-button 27. Adjacent its forward end and intermediate the movement-plates 20 and 21, the said shaft is provided with a driving-pinion 28.

The clock herein illustrated includes both a time-train and a strike-train, and for purpose of clarity of description, the time-train will be first described.

The driving-pinion 28 of the motor-shaft 26 meshes into and drives a gear-wheel 29 located intermediate the front and rear movement-plates 20 and 21 and is rigidly mounted upon an arbor 30 bearing in the said plates. The gear-wheel 29 carries a pinion 31 which meshes into and drives a gear-wheel 32 mounted upon a shaft 33 journaled at its respective opposite ends in the movement-plates 20 and 21.

The gear-wheel 32, above referred to, carries a pinion 34 which in turn meshes into and drives a gear-wheel 35 secured to the center-arbor 36 of the clock, which arbor is journaled in the movement-plates 20 and 21 and extends through and forwardly of the front movement-plate 20 for the purpose as will hereinafter appear. The gear-wheel 35 carries a pinion 37 which meshes into and drives a gear-wheel 38 mounted upon an arbor 39 journaled in the movement-plates 20 and 21 and carrying a pinion 40.

The pinion 40, just above referred to, meshes into and drives a minute-wheel 41 which is mounted with freedom for relative movement upon a minute-sleeve 42, which is, in turn, mounted upon the center-arbor 36 with freedom for rotation with respect thereto. The said minute-wheel 41 is frictionally coupled to the minute-sleeve 42 in a manner usual in clocks to permit manual setting, by means of a spring-washer 43 (Fig. 6), and bears at its rear face against a

pinion 44 which is rigidly staked to the rear end of the minute-sleeve 42, before referred to.

The pinion 44 meshes into and drives a gear-wheel 45 located just to the rear of the front movement-plate 20 and rigidly attached to an arbor 46 which is journaled in the said front movement-plate 21. The forward end of the arbor 46 extends through the front movement-plate and has there secured to it a pinion 47 which meshes into and drives an hour-wheel 48 which is rigidly secured to the rear end of an hour-sleeve 49. The hour-sleeve 49, just referred to, is mounted with freedom for rotation upon the minute-sleeve 42, before described.

The minute-sleeve 42, in the usual manner of clocks, is adapted to mount a minute-hand, indicated by broken lines 50 in Fig. 2, and similarly the hour-sleeve 49 is adapted to mount an hour-hand, which is also indicated in the said figure by broken lines 51.

From the foregoing, it will be seen that the minute-hand 50 and the hour-hand 51 are continuously driven at the correct rate of speed by the rotor 25 of the synchronous motor mounted upon the rear movement-plate 21.

The strike-train of the clock is driven by the same synchronous motor which drives the time-train, before referred to, as will presently appear.

The hour-sleeve 49 is, as before described, rotated by the hour-wheel 48 and in addition to carrying the hour-hand 51, the said sleeve also rigidly carries adjacent its forward end a snail 52 having on its periphery a series of twelve concentric steps 53, each of which is located a different distance from the axis of the snail, in the usual manner of rack-and-snail clocks.

Coacting on occasion with the vartious steps 53 of the snail 52 is a count-pin 54 rigidly mounted in the radial arm 55 of a rack, which is generally designated by the numeral 56. The said rack also has a usual curved arm 57 in the outer edge of which is formed a series of ratchet-teeth 58. The rack 56 is mounted for pivotal movement upon a stud 59 carried at the outer end of an oscillatable rack-carrier 60. The said rack 56 is also formed with a depending lifting-finger 61 which is adapted on occasion, as will hereinafter appear, to engage a pin-like abutment 62 rigidly mounted in and forwardly extending from the front movement-plate 20.

The rack-carrier 60, before referred to, is rigidly provided at its lower end with a bushing 63, which fits over and oscillates upon a stud 64 projecting forwardly from the front movement-plate 20. For the purpose of urging the rack-carrier 60 from left to right, a spring 65 is provided, which has one of its ends hooked through an opening 66 in the front movement-plate 20 and which has its opposite end hooked beneath a finger 67 struck up from the rack-carrier 60, as clearly shown in the drawings.

The upper end of the rack-carrier is bent rearwardly at right angles to provide a relatively-broad-faced control-finger 68 which is adapted to ride upon the perimeter of a rack-control disk 69 and also upon the periphery of the drop-off nose 70 of a supplemental rack-control disk 71 (Fig. 8). The rack-control disk 69 is rigidly mounted upon a bushing 72 which in turn is rigidly mounted upon the minute-sleeve 42 so as to in effect form a part thereof. The supplemental rack-control disk 71 is mounted upon the bushing 72 with freedom for limited turning movement with respect thereto and with respect to the rack-control disk 69 and lies immediately adjacent the forward face of the said disk 69.

The rack-control disk 69 is deeply notched, as is clearly shown in Fig. 8, to provide a rack-retiring cam 73 and a rack-advancing cam 74 diverging from each other. Normally the drop-off nose 70 of the supplemental rack-control disk 71 overlaps the cam 74 of the rack-control disk 69 and is yieldingly held in such position by providing it with an arcuate slot 75 which results in the formation of a spring-finger 76. The said spring-finger has its free end rearwardly bent as at 77 for entry into an anchoring-aperture 78 formed in the rack-control disk 69. The spring-finger 76 exerts a constant effort to turn the supplemental rack-control disk 71 in a counterclockwise direction with respect to the disk 69 so as to cause its drop-off nose 70 to overlap the rack-advancing cam 74. The urge of the spring-finger 76, just described, is limited, however, by the engagement of the end of the slot 75 in the disk 71 with a stop-pin 80 rigidly offsetting from the rack-control disk 69.

Adjacent its lower end, the arm 57 of the rack 56 has one of its teeth 58 cut away to provide a relatively-deep notch 81 for the reception of the nose 82 of a rack-pawl 83, which nose is so shaped as to provide a cam-surface 84 which coacts with the one of the ratchet-teeth 58 next above the notch 81, in a manner as will hereinafter appear.

The rack-pawl 83 is pivotally mounted upon a stud 85 forwardly offsetting from the front movement-plate 20 and is yieldingly urged in a counterclockwise direction for engaging its nose 82 with the teeth 58 of the rack 56, by the free end of a spring 86 having its opposite end anchored to the forward end of one of the pillars 22. The swinging movement of the rack-pawl 83 under the urge of the spring 86, when the said pawl is not engaged with the rack 56, is limited by providing the said pawl with an upwardly-extending stop-finger 87 which is engageable with a stop-pin 88 forwardly offsetting from the front movement-plate 20.

Also pivotally mounted upon the stud 85 intermediate the rack-pawl 83 and the forward face of the front movement-plate 20 is a hammer-arm 89 carrying a usual hammer-head 90 for engagement with a gong-rod or other suitable sounder 91. The descent of the hammer-arm 89, after the same has been lifted in the manner as will hereinafter appear, is limited by a stop-pin 92 forwardly offsetting from the front movement-plate 20. The upper end of the hammer-arm 89 is forwardly bent to provide an actuating-finger 93 which is engaged for the purpose of lifting the hammer-head 90 by the stop-finger 87 of the rack-pawl 83 in a manner as will more fully hereinafter appear.

For the purpose of effecting the step-by-step lifting of the rack 56 after the same has descended just prior to the initiation of the striking in a manner usual in strike clocks, the arbor 30 before described has its forward end extended through the front movement-plate 20, where it rigidly carries a head 94, which latter is equipped with two diametrically-opposite forwardly-extending so-called "gathering-pins" 95—95, which function as rack-return means and which continuously swing around the arbor 30 inasmuch as the said arbor also forms a feature of the time-train previously described.

In the intervals between the striking of the clock on each hour, the various parts will oc-

cupy the positions in which they are shown particularly well in Fig. 1, in which it will be noted that the rack 56 is retired laterally away from the path of movement of the gathering-pins 95 so as to be unaffected thereby. The rack is held in the position referred to by the bearing of the control-finger 68 of the rack-carrier 60 upon the periphery of the rack-control disk 69 and by the engagement of the lifting-finger 61 of the said rack with the abutment 62.

When in the continuous rotation of the rack-control disk (one revolution per hour), the rack-advancing cam 74 thereof comes into registration with the finger 68, the rack-shifting spring 65 will be permitted to swing the rack-carrier 60 from left to right, with the effect of moving the said rack partway from left to right to disengage the lifting-finger 61 from the abutment 62 and thus permit the said rack to swing about the stud 59 and drop by gravity until its count-pin 54 rests upon the periphery of the particular one of the steps 53 of the snail 52 which happens to be in position beneath it.

In riding down the rack-advancing cam 74 of the disk 69, the control-finger 68 of the rack-carrier 60 will ultimately be temporarily checked by its engagement with the periphery of the drop-off nose 70 of the supplemental rack-control disk 71. The parts will now have assumed the positions in which they are shown in Fig. 3.

When, now, in the continued rotation of the two rack-control disks 69 and 71, the drop-off nose 70 of the latter disk passes from under the control-finger 68 of the rack-carrier 60, said carrier will very abruptly swing to a further extent from left to right under the urge of the spring 65, with the effect of bringing the ratchet-teeth 58 of the rack 56 into the path of travel of the gathering-pins 95. The parts will now have assumed the position in which they are shown in Fig. 4.

With the ratchet-teeth now in the position shown in Fig. 4, the gathering-pins 95 will alternately effect the step-by-step lifting of the rack 56, with the result that for each step, the rack-pawl 83 will be cammed back and thus cause the stop-finger 87 thereof to engage the actuating-finger 93 of the hammer-arm 89 and raise the latter into the position in which it is indicated by broken lines in Fig. 4. After a given tooth has cammed back the rack-pawl 83, as described, and as soon as the tooth in question has passed the nose of the said pawl, the said pawl will swing from right to left to permit the hammer-head 90 to descend by gravity and strike the gong-rod 91.

When the gathering-pins 95 have raised the rack 56 to its uppermost position as shown in Fig. 5, the nose 82 of the rack-pawl 83 will be swung into the notch 81 in the said rack by the spring 86, with the effect of causing the cam-surface 84 to engage with the particular tooth 58 immediately above the said notch and effect the further though slight lifting of the rack to a degree sufficient to bring its lowermost tooth 58 slightly above the path of travel of the gathering-pins 95. This final slight lift of the rack 56 by the nose 82 of the rack-pawl 83 serves to shift the lowermost tooth 58 of the said rack above the path of movement of the gathering-pins 95 as described, and thus prevents undesirable noise which would otherwise be occasioned by the engagement of the continuously-moving gathering-pins with the lower end of said rack.

It will be appreciated that the hammer-arm is lifted and dropped once for each lifting action of either one of the gathering-pins 95. As is usual in rack-and-snail strike clocks, the degree of descent of the rack 56, and hence the number of strokes imparted to the hammer-arm 89, is determined by which of the various steps 53 of the snail 52 is in position to be engaged by the count-pin 54. Inasmuch as the said snail 52 is coupled to the hour-sleeve, it is shifted so as to present a new one of the said steps 53 for each hour of a twelve-hour period.

After the clock has struck, as before described, and the parts have assumed the positions in which they are shown in Fig. 5, the continued rotation of the rack-control disk 69 will bring the rack-retiring cam 73 thereof into engagement with the rack-control finger 68 of the rack-carrier 60 and in a short period of time will retire the said rack-carried and the rack 56 from right to left into the positions in which they are shown in Fig. 1. This retiring movement of the rack, as just described, will engage the lifting-finger 61 of the rack 56 with the abutment 62, and thus serve to raise the said rack to a degree sufficient to retire its count-pin 54 out of the path of the highest one of the steps 53. The parts will now have resumed the positions in which they are shown in Fig. 1, preparatory to the striking of the clock on the next succeeding hour.

The clock may be set by moving its hands either forwardly or backwardly, in which event the rack-control disk 69 will turn with the minute-hand. In the event that the clock should be turned backwardly, the rack-control finger 68 of the rack-carrier 60 will be brought into engagement with the substantially-radial edge of the drop-off nose 70 of the supplemental rack-control disk 71 and will effect the retirement thereof against the urge of its spring-finger 76, and will ride up the cam 74 of the disk 69 without undue hindrance. Thus, simple, reliable and effective provision is made for permitting the clock to be turned either forwardly or backwardly without deranging the mechanism or altering the relationship between the hands of the clock and the snail 52, which serves to control the number of strokes of the hammer-arm 89.

The clock hereinbefore described is an hour-strike, but it will be obvious to those familiar with the art that the mechanism may be embodied in hour and half-hour strike clocks, chime clocks, ship's bells clocks, etc.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are therefore to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. An audible-signal clock of the rack-and-snail type including in combination: a snail; a rack cooperating with the said snail and movable with respect thereto; continuously-moving rack-operating means engageable with the said rack to effect the step-by-step retirement thereof; and a spring-pressed pawl engageable with said rack and serving to prevent the return movement of the said rack after the same is moved by the said rack-operating means, the said spring-pressed pawl being constructed and arranged to impart to

the said rack a supplemental retiring movement after the same has been retired by the said rack-operating means to the limit of the action of the latter.

2. An audible-signal clock of the rack-and-snail type including in combination: a snail; a rack carrying lever pivoted at one end and spring loaded for motion in one direction, said lever having a projecting lip at its free end; a rack pivoted to the free end of said rack carrying lever and bodily movable by same; said rack being in operable engagement with said snail; a rack retiring cam mounted on the center post of the clock, said cam being in operable engagement with said lip of the rack carrying lever; automatic continuously moving rack operating means engageable with said rack when said lip of the rack carrying lever is in a given position, and hammer means operable by said rack whereby the clock strikes as many strokes as predetermined by the position of the said snail.

3. An audible-signal clock of the rack-and-snail type claimed in claim 2 where said rack retiring cam comprises a disc cam having a circular shape along part of its periphery and being deeply notched at one point, said notching forming a rack retiring cam on one side and a rack advancing cam on the other side of the deepest point of the said notch, said rack retiring cam being rigidly mounted to the center post of said clock; a second control cam rotatably mounted on the center post of said cam coaxially with and on one side of said retiring cam, said second control cam having a nose-like extension projecting in front of the notched-out portion of said rack retiring cam and being tied to said rack-retiring cam by a spring member, said rack retiring cam and said second control cam being capable of co-acting when in operable engagement with said projecting lip of the said rack carrying lever, whereby said rack may be bodily moved in and out of engagement with the rack operating means at timed intervals.

4. An audible-signal clock of the rack-and-snail type including in combination a snail; a bodily-shiftable rack cooperating with the said snail and movable with respect thereto; continuously-moving rack operating means engageable with the said rack to effect the step-by-step movement thereof; automatic control means effecting the bodily shifting of the said rack from a position removed from the path of movement of the continuously-moving rack operating means into the path of said means at the start of a signal-sounding period and also serving to return the said rack to said removed position after the termination of such signal-sounding period; and an abutment engageable by the said rack when the same is shifted to said removed position as described and serving to fully retire the said rack.

5. An audible-signal clock of the rack-and-snail type including in combination a snail; a rack-carrier; a rack carried for bodily movement by the said rack-carrier and cooperating with the said snail; continuously-moving rack operating means engageable with the said rack to effect the step-by-step movement thereof; automatic control-means acting upon the said rack-carrier and serving to move the same to effect the bodily shifting of the said rack from a position removed from the path of movement of the continuously moving rack operating means into the path of movement of same at the start of a signal-sounding period and also serving to return the said rack to said removed position after the termination of such signal-sounding period; and an abutment engageable by the said rack when the same is shifted to said removed position as described and serving to fully retire the said rack.

6. An audible-signal clock of the rack-and-snail type including in combination a snail; a rack-carrier; a rack pivoted to the said rack-carrier and bodily movable therewith and cooperating with the said snail; continuously-moving rack-operating means engageable with the said rack to effect the step-by-step pivotal movement thereof; automatic control-means acting upon the said rack-carrier and serving to move same to effect the bodily shifting of the said rack from a position removed from the path of movement of the continuously-moving rack operating means into the path of movement of same at the start of a signal-sounding period and also serving to shift the said rack to said removed position after the termination of such signal-sounding period; and an abutment engageable by the said rack when the same is shifted to said removed position as described and serving to swing the said rack into its fully-retired position.

7. An audible-signal clock of the rack-and-snail type including in combination a snail; a pivoted rack-carrier; a rack carried by the said pivotal rack-carrier for bodily movement therewith and cooperating with the said snail; continuously-moving rack-operating means engageable with the said rack to effect the step-by-step movement thereof; automatic control-means acting upon the said pivotal rack-carrier and serving to swing the same to effect the bodily shifting of the said rack from a position removed from the path of movement of the continuously-moving rack operating means into the path of movement of same at the start of a signal-sounding period and also serving to return the said rack to said removed position after the termination of such signal-sounding period; and an abutment engageable by the said rack when the same is shifted to said removed position as described and serving to fully retire the said rack.

8. An audible-signal clock of the rack-and-snail type including in combination a snail; a pivotal rack-carrier; a rack pivoted to the said pivotal rack-carrier for bodily movement therewith and cooperating with the said snail; continuously-moving rack operating means engageable with the said rack to effect the step-by-step pivotal retirement thereof; automatic control-means acting upon the said pivotal rack-carrier and serving to swing the same to effect the bodily shifting of the said rack from a position removed from the path of movement of the continuously moving rack operating means into the path of movement of same at the start of a signal-sounding period and also serving to return the said rack to said removed position after the termination of such signal-sounding period; and an abutment engageable by the said rack when the same is shifted to said removed position as described and serving to swing the said rack into its fully retired position.

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