(Model.)

2 Sheets—Sheet 1.

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STRIKING MECHANISM FOR CLOCKS.

No. 348,915. Patented Sept. 7, 1886.

Fig. 1.

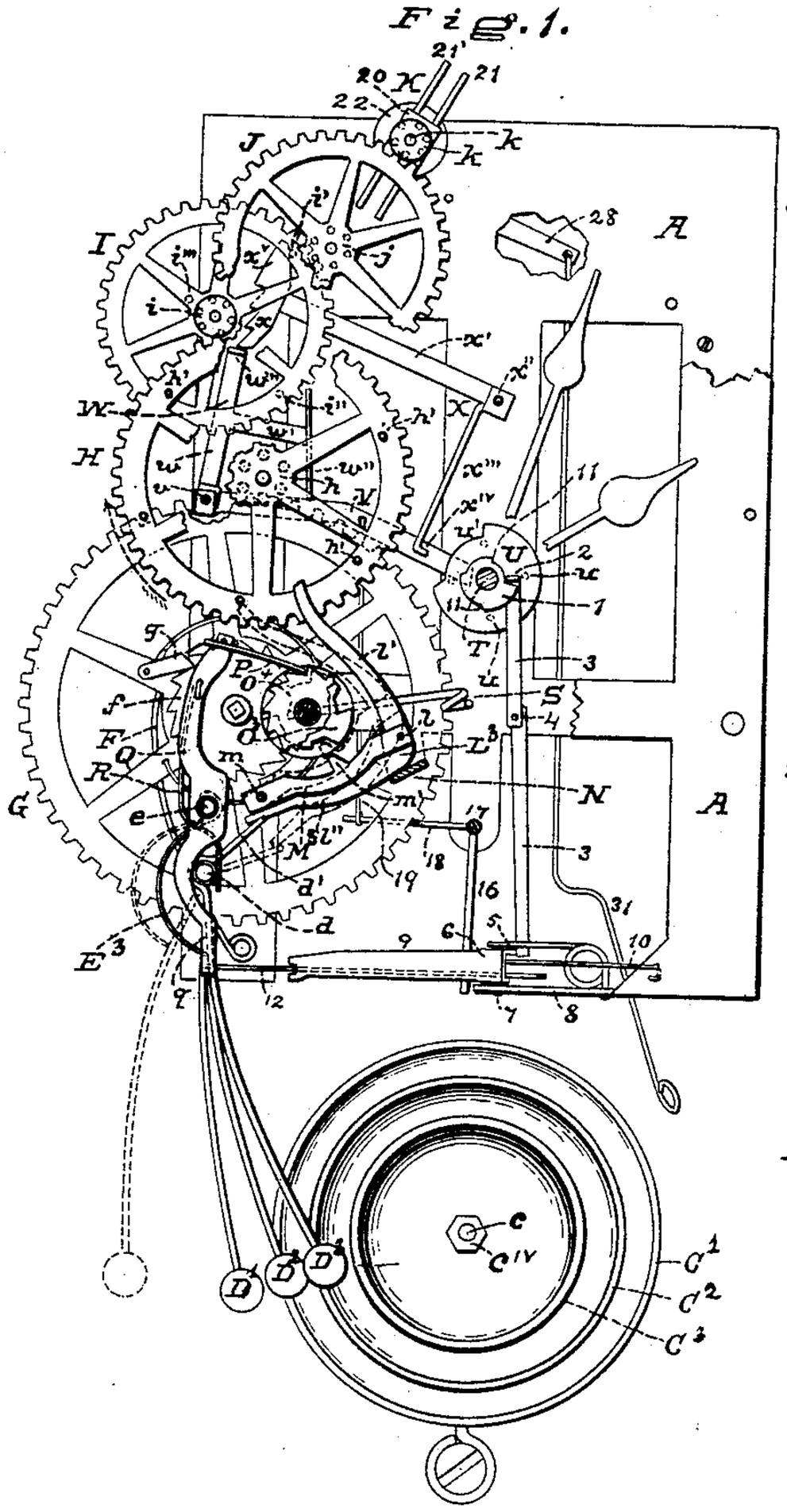

Fig. 2.

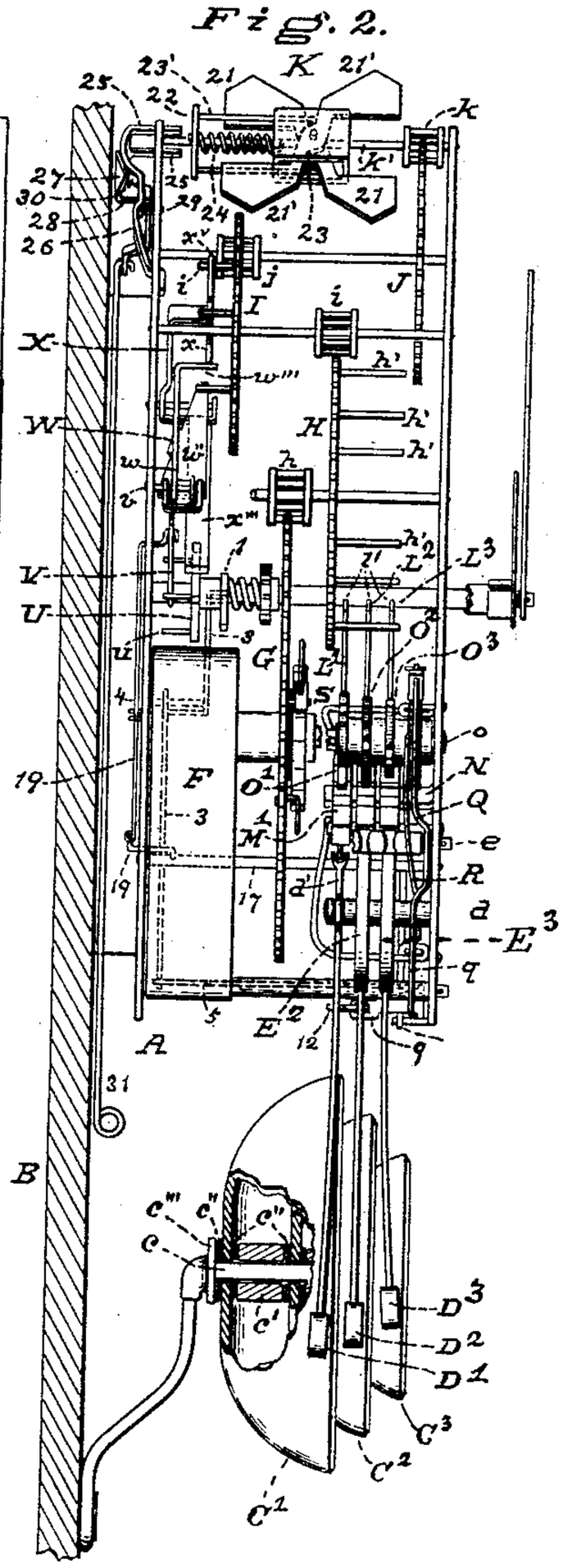

Fig. 3.

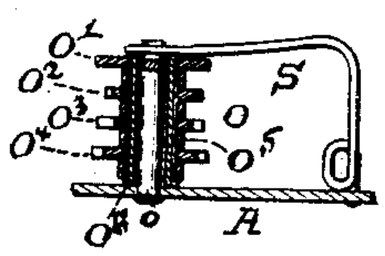

Fig. 4.

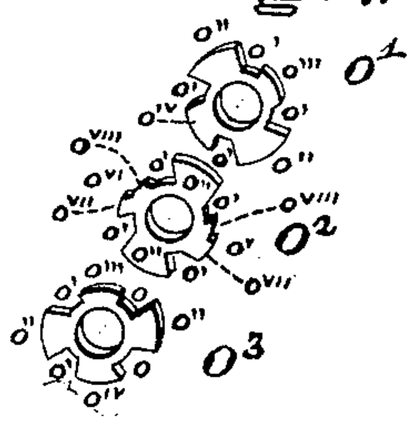

Fig. 5.

Fig. 6.

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Fig. 7.

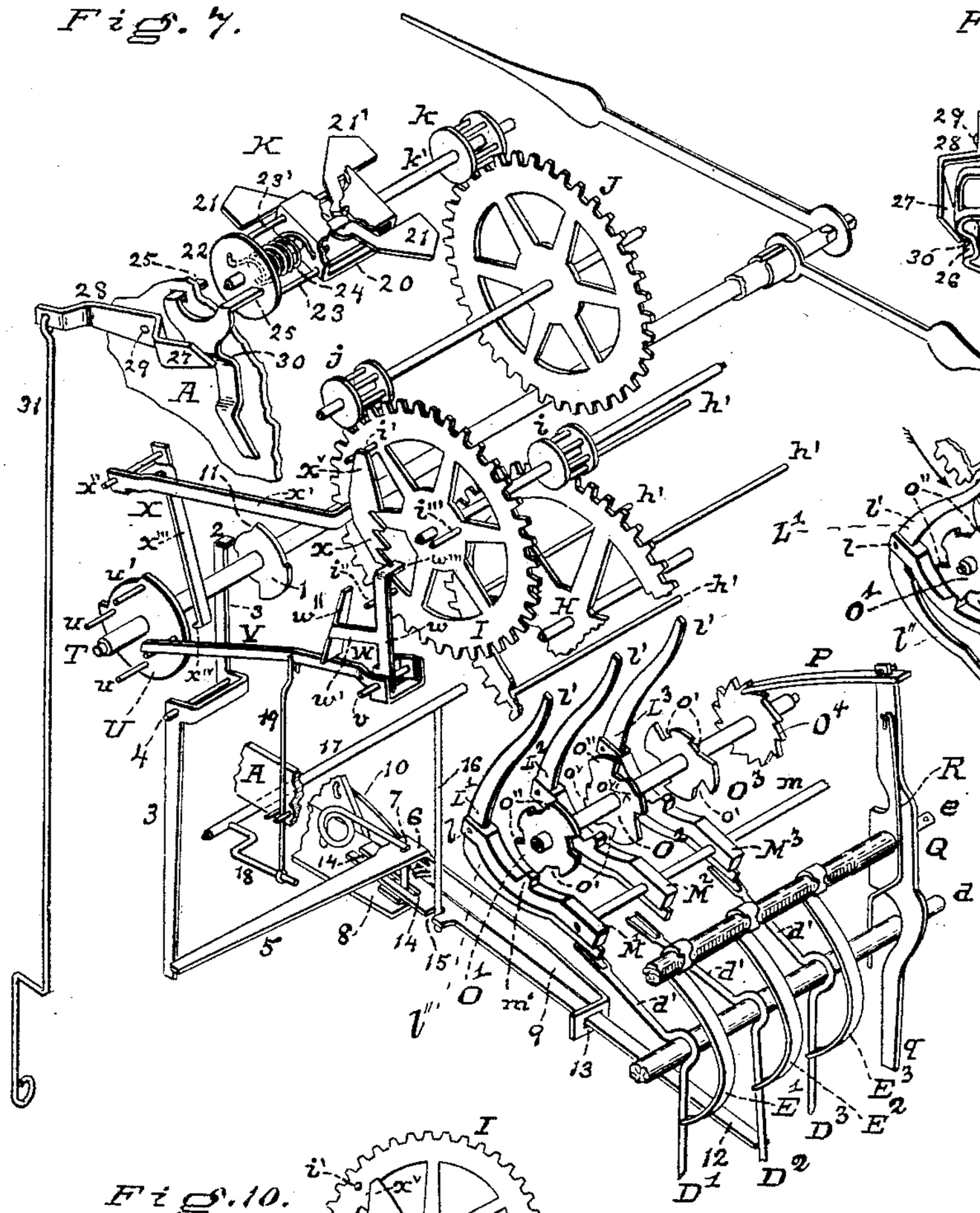

Fig. 9.

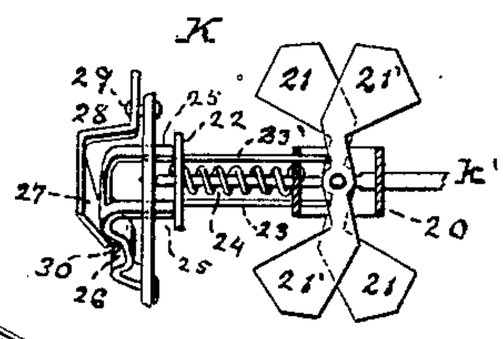

Fig. 8.

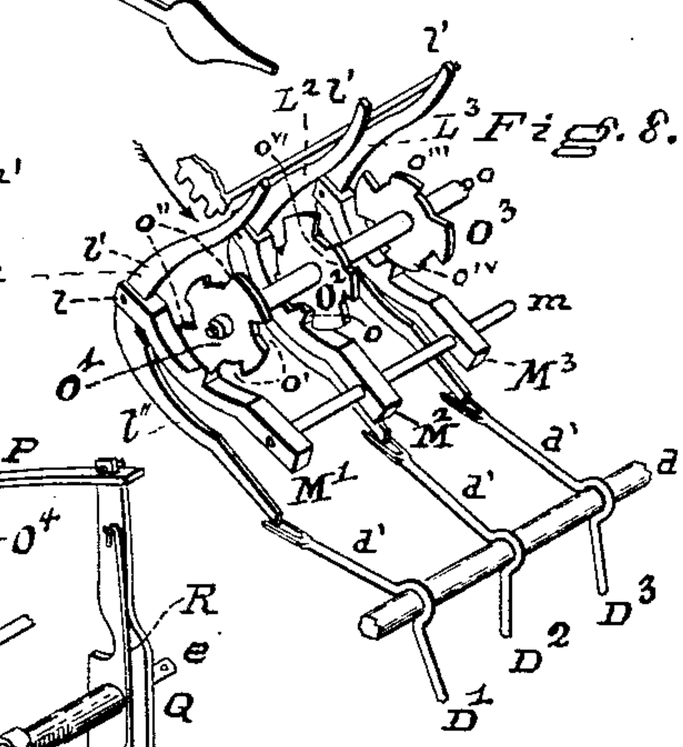

Fig. 11.

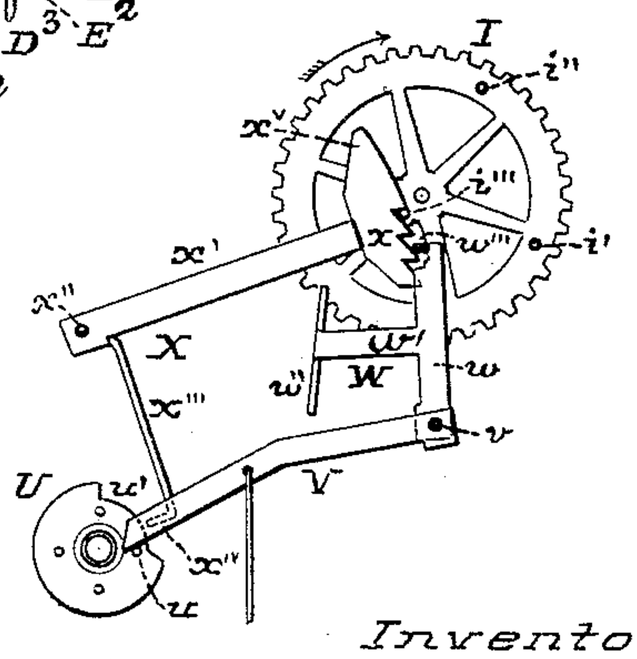

Fig. 10.

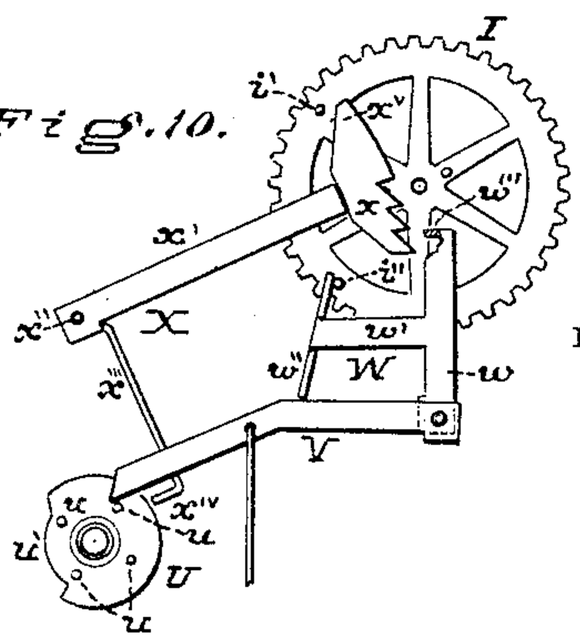

Fig. 12.

hour	chime
XII	E - CG
I	E - GC
II	C - GE
III	C - EG
IV	G - EC
V	G - CE
VI	EC - G
VII	EG - C
VII	CG - E
IX	CE - G
X	GE - C
XI	GC - E

Attest:
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F. A. Hopkins

Inventor:
Friederick Klinkermann
By Knight Bros Attys

UNITED STATES PATENT OFFICE.

FRIEDERICH KLINKERMANN, OF DILLSBOROUGH, INDIANA.

STRIKING MECHANISM FOR CLOCKS.

SPECIFICATION forming part of Letters Patent No. 348,915, dated September 7, 1886.

Application filed January 13, 1886. Serial No. 188,425. (Model.)

To all whom it may concern:

Be it known that I, FRIEDERICH KLINKERMANN, of Dillsborough, Dearborn county, Indiana, have invented new and useful Improvements in the Striking Mechanism of Clocks, of which the following is a specification.

My invention comprises, in the first place, mechanism whereby each hour of the day is announced by the sounding of one or other of twelve different chimes, of which each corresponds to a certain hour, and of which all consist of the various combinations of three different notes with an interposed rest.

In association with my aforesaid mechanism for distinctively announcing the hours by chimes, my invention also includes mechanism for announcing each quarter-hour by the sounding of one or other of the three aforesaid notes, of which each corresponds to a certain one of the three quarters.

My invention further comprises a governor or fly for regulating the rapidity of striking.

In the accompanying drawings, Figures 1 and 2 are respectively front and end views of my striking mechanism with portions thereof broken away, the timer mechanism proper (with the exception of the minute-shaft and pinion and the hands) being completely removed. Fig. 3 is an axial section of the quadruplex-wheel that controls the motion of the hammer-lifting bell-cranks of my chime-striking mechanism. Fig. 4 shows the notched plates of the said quadruplex wheel detached. Fig. 5 is a side view of the hammer-pivot. Fig. 6 is a top view of the supporting-pin of the hammer-springs. Fig. 7 is a somewhat diagrammatic perspective view of my striking mechanism. Fig. 8 is a similar view of my chime-striking mechanism proper, showing it in its active condition. Fig. 9 is a top view of the governor in its active condition. Figs. 10 and 11 are rear views of my device for releasing the chime-striking mechanism for action, showing said device in two of its conditions. Fig. 12 is a time-table.

A represents the clock-frame, secured to a back or support, B. Also attached to the same support is a group of three bells, C' C^2 C^3, which are of different diameters, and are adapted to emit different notes of the musical scale. Said notes should be such as will harmonize or accord with one another. The bells C' C^2 C^3 are arranged in a nest on a supporting-bolt, *c*, and are clamped together, with interposed metal washers c' and cloth or leather washers c'' between a shoulder, c''', and a nut, c^{iv}, on said bolt. The smallest bell, C^3, is placed so that at its edge it projects a little beyond the edge of the intermediate bell, C^2, which projects in a similar manner beyond the edge of the largest bell, C'. The object of the soft washers c'' is to prevent jarring. Three hammers, D' D^2 D^3, are supported side by side upon a fixed horizontal pivot, *d*, so that each is capable of striking the edge of one of the bells C', C^2, and C^3. These hammers are forced toward their respective bells by means of springs E' E^2 E^3, which are all secured to a pin, *e*, projecting from the clock-frame. Each of the hammers D' D^2 D^3 has a tail, d'.

I shall now describe the mechanism which I employ for actuating the hammers D' D^2 D^3 so as to produce chimes. Said mechanism comprises a train of wheels and pinions actuated by a customary driving-spring, F, which has the usual ratchet-wheel and pawl connection, *f g*, with the first or great wheel, G, of said train. From this great wheel the force of said driving-spring is transmitted to a second wheel, H, third wheel, I, fourth wheel, J, and fly or governor K, through their respectively-attached pinions *h i j k*, in the manner customary in clock-trains. The second wheel, H, carries pins h', arranged equidistantly in a circle concentric with its shaft. When the second wheel turns, one or other of these pins engages with the end portion of one arm, l', of each of three bell-cranks, L' L^2 L^3, of which each is attached by a pivot, *l*, to one end of one of three bars, M' M^2 M^3, which are placed side by side, and are supported at their other ends upon a pivot, *m*, which projects from the clock-frame, and is near and parallel to the hammer-pivot *d*. The other arms, l'', of the three bell-cranks L' L^2 L^3 extend along beneath the corresponding bars, M' M^2 M^3, and at their extremities engage with the tails d' of the respective hammers D', D^2, and D^3. The pressure of the hammer-springs E' E^2 E^3 causes the hammer-tails to press upwardly against the arms l'', thereby holding each of the latter firmly against the corresponding bar. In their normal positions the bell-cranks L' L^2 L^3 rest upon a projection, N, from the clock-frame.

This projection thus at the same time supports the free ends of the bars M′ M² M³. The three bars M′ M² M³ come, respectively, directly underneath three notched plates or cam-wheels, O′ O² O³, and each bar has on its upper edge a tooth or lug, *m′*, which is capable of engaging with the periphery of the plate that is directly over it. The said notched plates, together with a ratchet-wheel plate, O⁴, of twelve teeth, are fastened rigidly side by side, so as to form a quadruplex wheel, O, which is supported and is capable of turning on a pivot, *o*, projecting from the clock-frame and placed parallel with the other pivots, *d* and *m*. Different portions of the notched plates O′ O² O³ may thus be presented to the corresponding teeth, and the parts are so arranged that even the most projecting portions of said plates, when thus presented, will fall somewhat short of touching said teeth, if the latter are in their lowest or normal positions. Now, suppose the striking, train to have been liberated for action. The wheel H will move in the direction indicated by the dotted arrow in Fig. 1, or the strong arrow in Fig. 8, and some one of the tappets *h′* will engage with the bell-crank arms *l′*, striking them all simultaneously. The pressure of this tappet tends to cause the bell-cranks L′ L² L³ to turn about their pivots *l*, and also tends to produce a motion of each bell-crank, together with its corresponding bar, M′, M², or M³ as a whole, about the pivot *m*. The motion of the bell-cranks around their pivots *l* would cause depression of the hammer-tails, and is hence resisted by the hammer-springs. The points of contact of the hammer-tails with corresponding bell-crank arms *l″* are made to come near the pivot *m*, so that the motion about this pivot of the bars, together with their corresponding bell-cranks, does not depress the hammer-tails, and is not resisted by the hammer-springs. This latter motion will therefore at once begin; but the motion of each bar will be sooner or later arrested by the contact of the tooth *m′* of said bar with a more or less projecting portion of the corresponding notched plate, O′, O², or O³, and the attached bell-crank will then turn about its pivot *l* until it swings clear of the tappet *h′*. While the bell-crank L turns about its pivot *l*, its arm *l″* depresses the tail of the hammer D′ and retracts said hammer, and when its arm *l′* is released from the tappet *h′* the spring E′ will force the hammer D′ forward, so as to strike the bell C′. The bell-cranks L² and L³ operate in a similar manner upon their corresponding hammers. The parts are so arranged that the points at which the tappet *h′* releases the bell-crank arms *l′* are about in the plane of the second wheel-shaft and the pivot *m*, so that the motion of any one of the bars M′ M² M³, with its attached bell-crank, will not sensibly affect the amount which said bell-crank must subsequently turn about its pivot *l* before it is released from said tappet. The plates O′ O² O³ are so notched that on no two are portions of equal radial distance presented to the opposing teeth *m′* at the same time, and hence the three bells C′ C² C³ will be struck consecutively in the order of the radial distances of the presented portions of the corresponding notched plates, thus sounding a chime. A pawl, P, engages with the ratchet-wheel O⁴, and is attached to the upper end of a lever, Q, which at its middle portion is pivoted on a fixed pin—such as the spring-supporting pin *e*. The lower arm, *q*, of this lever extends down alongside of the hammer-rods. Once every hour the lever-arm *q* is retracted by mechanism, hereinafter described, so as to cause the pawl P to advance, thereby bringing new portions of the notched plates O′ O² O³ opposite the respective teeth *m′*, so as to change the order of radial distance of the opposing portions of said plates, and to thus change the chime. The said lever-arm is then released, so as to allow it to be returned to its former position by means of a spring, R.

With the three notes of the three bells C C² C³ six combinations of three notes each can be formed. By causing two of the notes in any one of these combinations to be struck in quick succession, and to be separated from the remaining note by a rest or elongated pause, there may be obtained twelve combinations, for the rest or elongated pause may be interposed either between the first and second or between the second and third notes. These twelve combinations constitute chimes, which I employ to distinctively announce the twelve hours, preferably arranging them as exhibited by the time-table, Fig. 12, in which the rest is indicated by a dash, and the three notes are supposed to be the notes G, C, and E of the musical scale. To produce chimes in accordance with this time-table, the plates O′ O² O³ are notched in the manner now to be described. The bottoms of all the notches and the tops of all the raised portions of each plate lie on four concentric circles whose common center is in the axis of the pivot *o*, and of which the corresponding circles are of equal diameter in all three plates. Each plate has four equidistant notches, *o′*, penetrating to the innermost circle, and each occupying one-twelfth of a circumference. Of the four raised portions between these notches there are two diametrically-opposed ones, *o″*, on each plate, that extend from the innermost to the outermost circle, each occupying one-sixth of a circumference. On the plates O′ and O³ the two remaining diametrically-opposed raised portions *o‴* *o*ᴵⱽ extend from the innermost circle, one, *o‴*, to the inner and the other, *o*ᴵⱽ, to the outer intermediate circle, each occupying one-sixth of a circumference. The plates O² and O³ are thus identically similar, but the plate O′ is turned relatively to the plate O³, one-sixth of a circumference in the direction of rotation of the wheel O. Of the remaining diametrically-opposed raised portions *o*ⱽ *o*ⱽᴵ of the middle plate, O², each occupies one-sixth of a circumference and consists, half of a higher part, *o*ⱽᴵᴵ, extending to the outer intermediate cir-

cle and half of a lower part, o^{VIII}, extending to the inner intermediate circle. These stepped raised portions o^{VII} o^{VIII} ascend in opposite directions. The highest portions of the plate O^2 are made to come one-sixth of a circumference in advance of those of the plate O'. The plates O' O^2 O^3 are placed side by side, together with the ratchet-wheel plate O^4 and interposed washers O^5, on a sleeve, O^6, whose ends are turned over upon the end plates so as to clamp the parts firmly together. The sleeve o^6 is occupied by the pivot *o*, which is notched at its end to receive the end of a retaining-spring, S, which bears against the end of the quadruplex wheel O, and holds it to any position to which it may be moved by the pawl P, which, once every hour, shifts it one-twelfth of a circumference. It will be seen that whatever be the position of the quadruplex wheel O, there will be in opposition with the teeth *m'* a highest portion of one tooth, an intermediate portion of another, and a deepest portion of another. For example, in the position shown in Figs. 7 and 8, the plates O' O^2 O^3 present to the respective teeth *m'* a highest, a deepest, and an upper intermediate portion. If, now, the pin or tappet *h'* comes into engagement with the bell-crank arms *l'*, the motion of the bar M' will be arrested first, that of the bar M^3 second, and that of the bar M^2 third, and their corresponding bells will be struck in the same order; but there is double the interval between the times of arrestation of the bars M^3 and M^2 that there is between those of the bars M' and M^3, and this gives rise to a rest between the striking of the bells C^3 and C^2. The bell C corresponding to G in the time-table, the chime struck will be G E—C, the signal of ten o'clock. The first succeeding shift of the wheel O will bring opposite the teeth *m'* a highest portion, *o''*, of the plate O', the upper half, o^{VII}, of the descendingly-stepped tooth o^V on the plate O^2, and a notch, *o'*, of the plate O^3, making the chime G C—E for eleven o'clock. By the next shift the presented portions of the plates O' and O^3 will be changed from a highest to a deepest part, and vice versa, while the deeper half o^{VIII} of the stepped tooth o^V, will replace the upper half, so as to transfer the rest from between the second and third to between the first and second notes, and to make the chime E—C G for twelve o'clock. In this latter position the rest remains throughout the succeeding shifts with the varying chimes up to six o'clock, when, by means of the ascendingly-stepped tooth o^{VI}, it is returned to its former position, where it remains through the various succeeding chimes until twelve o'clock comes round again.

To release this chime-striking mechanism for action at the proper times, I employ a device which may be described as follows: Rigidly attached to the shaft T of the minute-hand is a plate V, which carries four pins or tappets, *u*, arranged equidistantly in a circle concentric with the said shaft T. As the minute-shaft rotates, each of these tappets in turn engages with one end of a bar, V, so as to first lift and then drop the same. This bar is hinged at its other end to the clock-frame by means of a pintle, *v*. Also pivoted at its foot on the pintle *v* is a bar, *w*, which, extending upwardly, is integrally connected by a cross-piece, *w'*, to a piece, *w''*, so as to form a single piece, W, shaped somewhat like the letter **H**, the bar *w* and the piece *w''* corresponding to the uprights of the **H**. The foot of the side piece, *w''*, rests upon the bar V. The top of the bar *w* is formed into a lip or tooth, *w'''*, that engages beneath one or other tooth of a ratchet-wheel segment or rack *x*, that is carried by and at the end of the arm *x'* of a bent lever, X, pivoted to the clock-frame at *x''*. The other arm, *x'''*, of this lever has at its end a tooth, x^{IV}, that is capable of engaging with the periphery of the pin-plate U. In the normal condition of the parts the lowest tooth of the rack *x* rests on the lip *w'''*, and an upward prolongation, x^v, of the rack-plate comes in front of a tappet, *i'*, on the third wheel, I, thus acting as a stop for the chime-striking mechanism, and the tooth *x'''* is separated from the pin-plate U. As the minute-shaft T revolves, the free end of the bar V is lifted by the pin *u* in engagement therewith, and the piece *w''* being lifted with said bar, the upper end of said piece is brought in front of a tappet, *i''*, on the third wheel, while the **H**-formed piece W is turned, as a whole, about the pintle *v*, so as to withdraw the lip *w'''* from engagement with the rack *x*. The latter then falls until the tooth x^{iv} on the other arm *x'''*, of the lever X strikes the periphery of the plate U. Said periphery is circular and concentric with the minute-hand shaft T, with the exception of a notch, *u'*, and the rack *x* will fall one or two teeth, according to whether the tooth x^{iv} strikes the unnotched or the notched portion of plate U. The falling of the rack *x* withdraws the stop x^v from in front of the tappet *i'*, but the third wheel, I, is still prevented from moving by the engagement of its tappet *i''* behind the piece *w''*, as shown in Fig. 10. When, however, the bar V is dropped by the engaging-pin *u*, so as to fall onto the next pin, the catch-piece *w''*, being no longer sustained by said bar, drops away from in front of the tappet *i''* and allows the wheel I to move, as indicated by the arrow in Fig. 11. As the wheel I turns, a pin, *i'''*, which it carries engages with the rack *x*, lifting it one tooth at each rotation. The rack is held from falling back by means of the pawl W *w'''*, which is held to engagement therewith by its own weight. If the rack *x* has only fallen one tooth's distance, it will be raised to its normal position by a single rotation of the wheel I, which, having completed this rotation, is stopped by its tappet *i'* coming against the rack-plate, as before. If, however, the rack has fallen the distance of two teeth, the wheel I will have to make two rotations before it is thus arrested. The lifting of the rack *x* by

the pin i''' causes a momentary elevation of the catch-piece w'' by the turning of the pawl W on the pivot v; but the said pin is so placed with reference to the pins i' i'' that this elevation of said piece does not occur when either of the latter pins are passing it, and hence does not interfere with the motion of the wheel I. The four pins u drop the bar V at every quarter-hour, and at the first, second, and third quarters the tooth x^{iv} of the lever x strikes the unnotched portion of the plate U, while at the full hour it falls into the notch w'. A single rotation of the third wheel, I, causes the second wheel, H, to turn through the distance between any two of the tappets h'. At each quarter, therefore, a chime is rung once, and at each full hour a chime is rung twice.

I shall now explain the mechanism whereby the hammers D′ D^2 D^3 are actuated, so as to strike the single quarter-hour notes, and the lever Q is caused to shift the quadruplex wheel O. The minute-shaft T carries a graduated snail or cam, 1, of four steps, which engages with a lip or tooth, 2, on the end of one arm of a lever, 3, which is pivoted to the clock-frame at 4, and whose other arm extends downward and bears against one arm, 5, of a bell-crank, 6, pivoted at 7 to a projection, 8, from the clock-frame. The other arm, 9, of this bell-crank extends to within the vicinity of the carrying-rods of the hammers D′ D^2 D^3 and the lower arm, q, of the pawl-lever Q. A spring, 10, presses against the bell-crank 6, so as to hold the arm 5 of the latter against the lower arm of the lever 3, the tooth 2 on whose upper arm is thereby retained in contact with the stepped snail 1. As the minute-shaft revolves, the tooth 2 is pushed out from one step of the snail 1 to another, by means of the interposed inclined planes 11, till it reaches the top step, from which it falls inward to the bottom step. A slide, 12, is supported near one end, and so as to be capable of sliding endwise, in a correspondingly-formed orifice, 13, in the outer end of the bell-crank arm 9, and has at its other end a slit, 14, to enable it to straddle the pivot 7, which thus serves to guide it. A notch, 15, in the side of this slide receives the lower end of an arm, 16, of a rock-shaft, 17, journaled in the clock-frame. Another arm, 18, of this rock-shaft is connected by a rod, 19, to the lifting-bar V. During the first quarter-hour the tooth 2 bears against the bottom step of the snail 1, and this causes the slide 12, to be directed toward the rod of the hammer D′. At the beginning of the quarter, the lifting-bar V being depressed, the slide 12 is thereby drawn away from said hammer-rod, but as said bar is raised the slide is thrown out, so as to retract the hammer-rod. When the bar 12 is released, the spring E′ compels the hammer D′ to fly toward and strike the bell C, and in thus flying, by pushing in the slide 12 to aid the weight of the bar V in restoring the parts to their former positions. At the beginning of the second quarter the tooth 2 passes from the bottom step of the snail 1 to the one next higher, thereby angularly shifting the bell-crank 6, so as to cause the slide 12 to point toward the rod of the hammer D^2. This hammer will now be retracted, and at the half-hour will strike the bell C^2, and the tooth 2 will then pass on to the next higher snail-step, so that the bell C^3 will be struck at the third quarter. Finally, at the beginning of the fourth quarter, said tooth passes onto the top step, thereby bringing the end of the slide 12 opposite the lever-arm q, which is then retracted by said slide, so as to cause the wheel O to advance through one-twelfth of a circumference. Each quarter is thus distinctively announced by a single strike of one or other of the three bells C′ C^2 C^3 and each of these single strokes takes place at the instant of release of the bar V. The chime-striking mechanism is released, as above explained, at the same time; but the pins h' are so arranged that before any one of the bell-cranks is released from the engaging-pin the latter has to move from its position of rest a sufficient distance to interpose a distinctly separating pause between the quarter-strike and the chime. This chime is struck but once, as before mentioned, and as the wheel O is not shifted until the fourth quarter, this chime will be the same as for the last full-hour strike; but when the next full hour arrives the wheel O, having been shifted, the chime, which is now allowed to strike twice, will be changed in accordance with the time-table in Fig. 12. The repetition of the hour-chime at each quarter not only announces the hour last past, but aids the ear of the listener in determining which one of the three bells, and hence which quarter, has been struck.

In addition to its value as a source of pleasure, my described method of announcing the hours and quarters possesses an educational value, for it tends to develop the power of the ear for correct perception and remembrance of musical sounds. It also does away with the tedious repeated striking which takes place in the old method when the later hours of the twelve are announced, and avoids the necessity of counting the strikes, the sound of a chime being involuntarily impressed upon the memory and associated with the corresponding hour.

To regulate the speed of the chime-striking train, any customary fly or fan may be used, but I prefer to employ a governor, K, of the following description: Rigidly attached to the shaft k' of the pinion k is a frame, 20, to which are pivoted at their centers, and on opposite sides of the shaft k', two similar pieces, 21 21′. The shaft k' passes loosely through a disk, 22, from which project, parallel with said shaft, two rods, 23 23′, which pass through corresponding orifices in the frame 20, and rest at their ends against the respective hinged pieces 21 21′, being pressed against the same by means of a spiral spring, 24, attached at one

end to the disk 22, and at its other end to the frame 20, so as to pull said disk and frame together. This pressure on the pieces 21 21′ causes them to assume positions in which their directions are oblique to the axis of the shaft *k*′, the pieces crossing one another, as shown in Figs. 2 and 7. When however, said shaft rotates, the pieces 21 are caused to fly together by centrifugal force, so as to bring their longest directions more nearly perpendicular to the axis of the shaft. As the pieces 21 21′ fly together, they push the rods 23 23′, and throw the disk 22 farther away, and this brings the farther side of said disk into contact with prongs 25 on one end of a spring-plate, 26, whose other end is secured to the clock-frame. The friction of these prongs against the disk operates to brake or retard the motion of the latter, and consequently of the whole striking-train. The plate 26 tends to spring away from the disk 22, but an abutting plate, 27, which is carried at the end of one arm of a lever, 28, (attached by a pivot, 29, to the the clock-frame,) and is inclined at an angle with the plane of vibration of said lever, engages with a correspondingly-inclined portion, 30, of the spring-plate 26, so as to hold the latter toward the disk 22. To the other arm of the lever 28 is attached the upper end of a wire, 31, which extends down so that its lower end, which is formed into a handle, comes below and out of the way of the clock-frame. By moving this wire the inclined abutting plate 27 may be made to slide on the corresponding surface 30 of the spring-plate 26, so as to force the latter toward or allow it to spring away from the disk 22. The pressure and consequent friction of the prongs 25 against said disk may thus be increased or diminished, so as to cause the clock to strike slowly or rapidly, as desired.

I claim as new and of my invention—

1. The striking attachment to a clock or time-piece, for distinctively announcing the hours by chimes, consisting of the combination of the following elements, to wit: a spring or weight actuated wheel-train, a detaining and releasing device for the same under the control of the time-piece, three rigidly-attached and diversely-indented rotatable plates, to which motion is imparted from the time-piece, three hinged bars which have teeth capable of engaging, respectively, with said plates, and which carry, pivoted to their free ends, levers which engage with and are actuated by a tappet or tappets on a wheel of the aforesaid train, and three hammers which are successively retracted by said levers, and on being released are caused by their protracting springs to successively strike three bells of different pitch.

2. In a chime-striking clock, the combination, with the three hinged bars M′ M² M³ and their attached bell-cranks L′ L² L³, whose arms *l* engage with tappets *h*′ on the train-wheel H, and whose other arms, *l*′, actuate the hammers D′ D² D³, of the three bells C′ C² C³, of different pitch, of the quadruplex wheel O, consisting of a ratchet-wheel plate, O⁴, engaging with a pawl actuated from the timer mechanism, and of the three diversely-indented plates O′ O² O³, capable of engaging, respectively, with the teeth *m*′ of the bars M′, M², and M³, the three latter plates being indented, substantially as described, and being rigidly secured, together with the ratchet-wheel plate O⁴, on a sleeve, O⁶, which fits on a pivot, *o*, and is held in place by frictional spring-detent S.

3. The detaining and releasing device for a chime-striking clock-train, consisting of notched disk U, secured to the minute-hand shaft and carrying tappets *u*, lifting-bar V, hinged and gravitating combined stop and pawl W, lever X, carrying rack *x*, stop *x*ᵛ, and heel-tooth *x*ᴵᵛ, and the train-wheel I, carrying stop-pins *i*′ and *i*″, and gathering or lifting pin *i*‴, all in the described combination.

4. In combination with a time-piece hour-striking attachment in which three differently-pitched bells, C′ C² C³, are successively struck by corresponding hammers, D′ D² D³, which are protracted by springs E′ E² E³, and are retracted by mechanism whose action is controlled by a quadruplex wheel, O, so that a rotary shift of the latter changes the succession of striking of the three bells, the device for striking one or other of said bells at each quarter, and for shifting the wheel O, consisting of the following parts in the described combination: the snail 1, which is fastened on the minute-hand shaft, and whose cam action on the tooth 2 of a lever, 3, is transmitted by said lever to one arm of a bell-crank, 6, whose other arm carries a slide, 12, which by such cam action is caused to be directed to the rod of one or other of the hammers D′ D² D³, or to the arm *q* of the lever Q, which carries a pawl, P, that engages with a ratchet-wheel plate of the wheel O, and a rock-shaft, 17, having an arm, 16, which engages in said slide, and another arm, 18, which is connected to a lifting-bar, V, hinged at one end and engaging at its free end with four equidistant tappets, *u*, on a plate, U, attached rigidly to the minute-hand shaft.

5. In combination with the striking-train of a time-piece, the governor K for the same, in which a frame, 20, rigidly attached to a shaft of said train, carries pivoted pieces 21 21′, which, when said shaft rotates, by their centrifugal motion push rods 23 23′ projecting from a spring-retracted disk, 22, and occupying orifices in the frame 20, and thereby press said disk against a friction-plate, 26.

6. The combination, in a governor for the striking-train of a time-piece, of the frame 20, fastened to a train-shaft, the pieces 21 21′, pivoted to said frame, the slidable disk 22, having projecting rods 23 23′, which pass through corresponding orifices in the frame 20, and bear against the pieces 21 21′, which, when the frame is rotated, by their centrifugal motion push said rods so as to protract the

disk 22, the spring 24, which tends to retract said disk, the friction-plate spring 26, against which said disk presses when protracted, the lever 28, carrying abutting plate 27, inclined to the plane of vibration of said lever and engaging with a similarly-inclined portion of the spring-plate 26, and the manipulating-wire 31, attached to said lever.

In testimony of which invention I hereunto set my hand.

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Attest:
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