(No Model.) 4 Sheets—Sheet 1.

C. M. SAFFORD & W. M. ROSS.

REPEATING MECHANISM FOR CLOCKS.

No. 574,114. Patented Dec. 29, 1896.

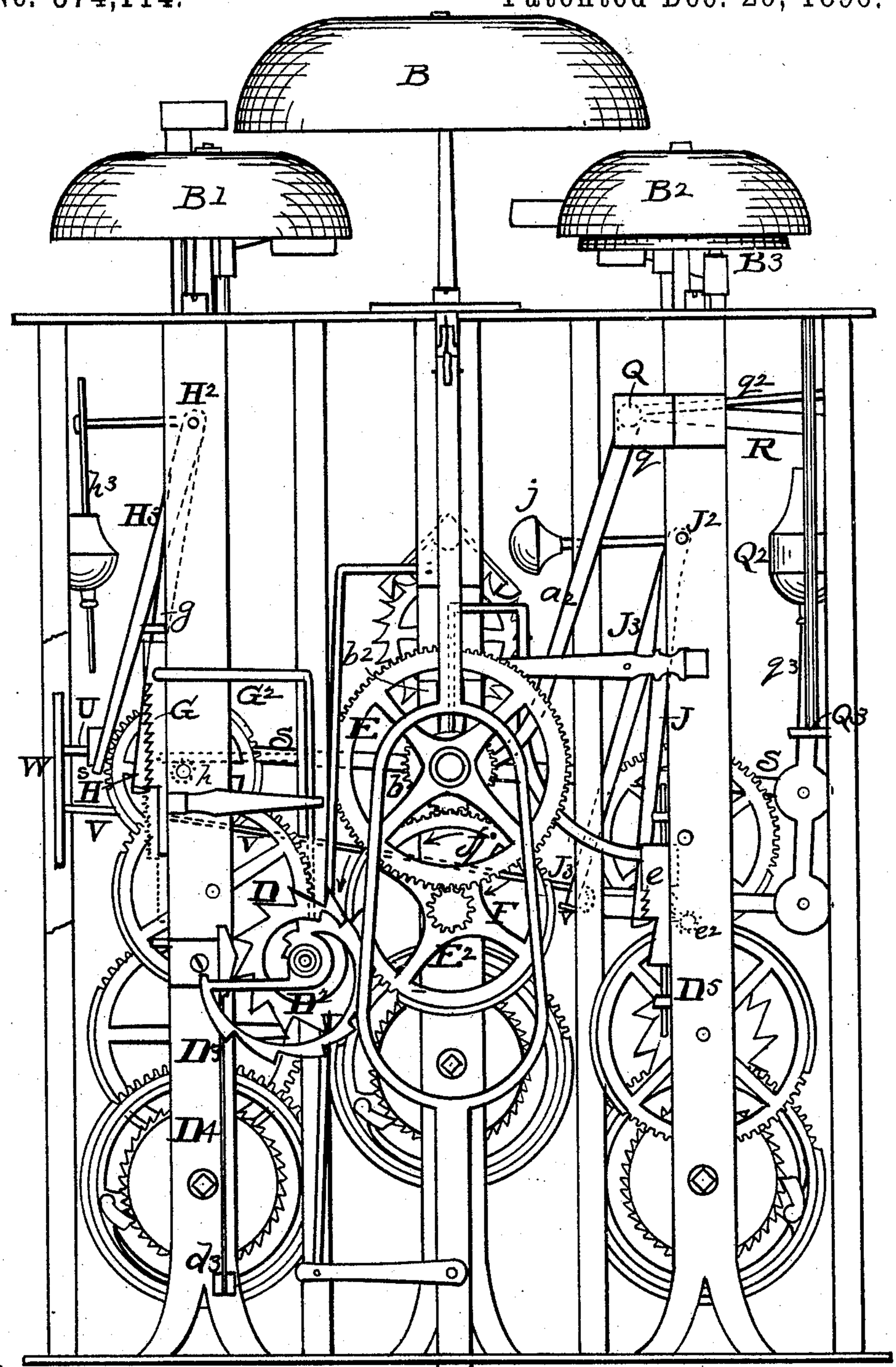

Fig. 1.

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REPEATING MECHANISM FOR CLOCKS.

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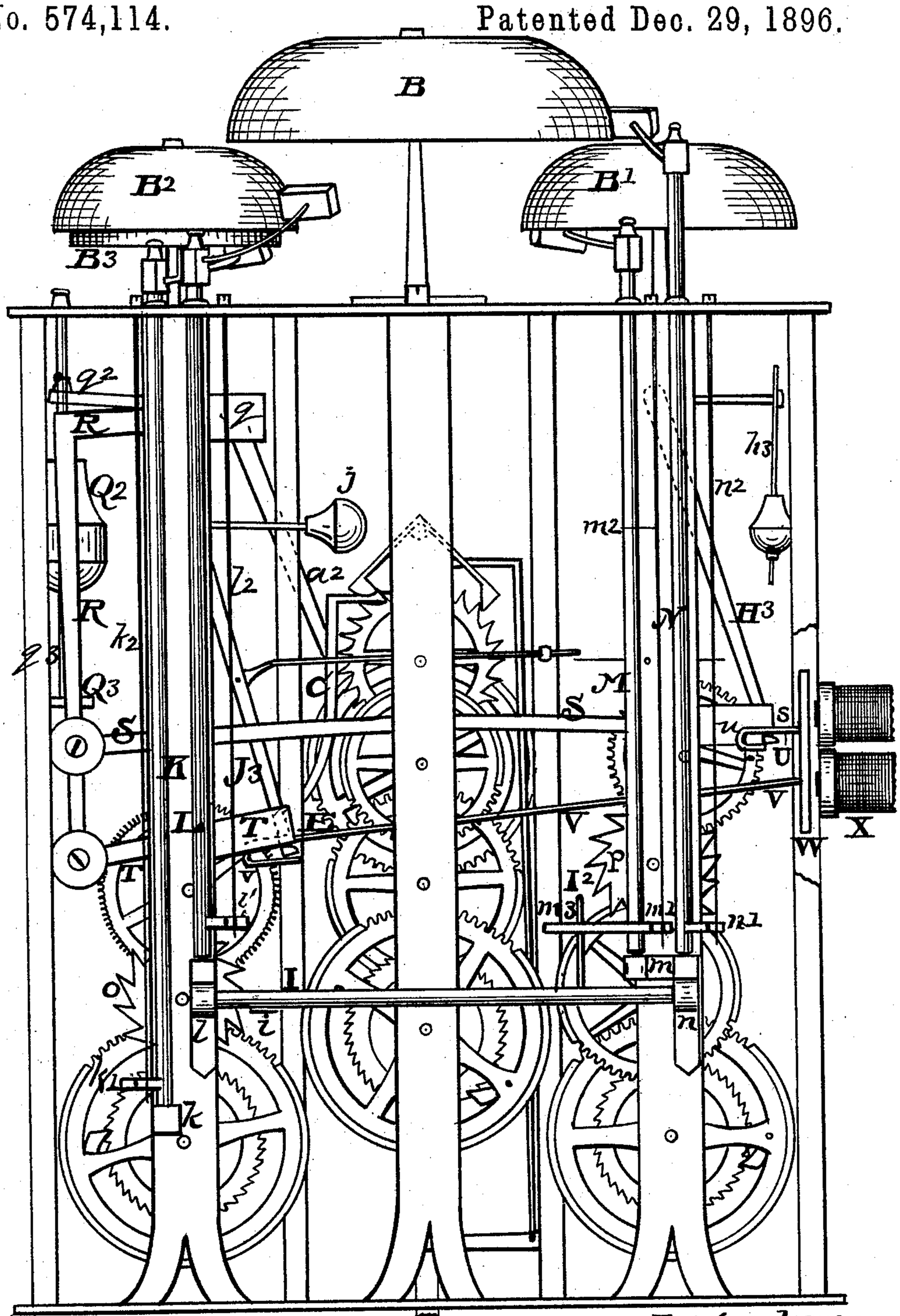

Fig. 2.

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REPEATING MECHANISM FOR CLOCKS.

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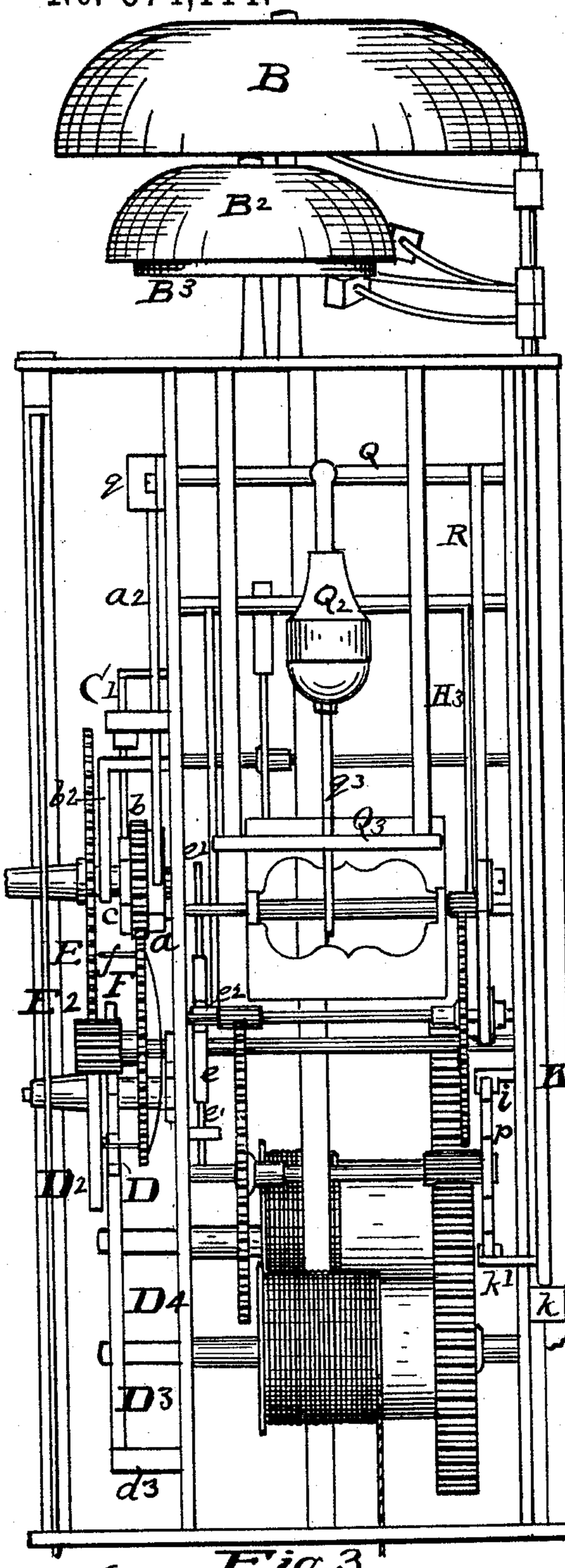

Fig. 3.

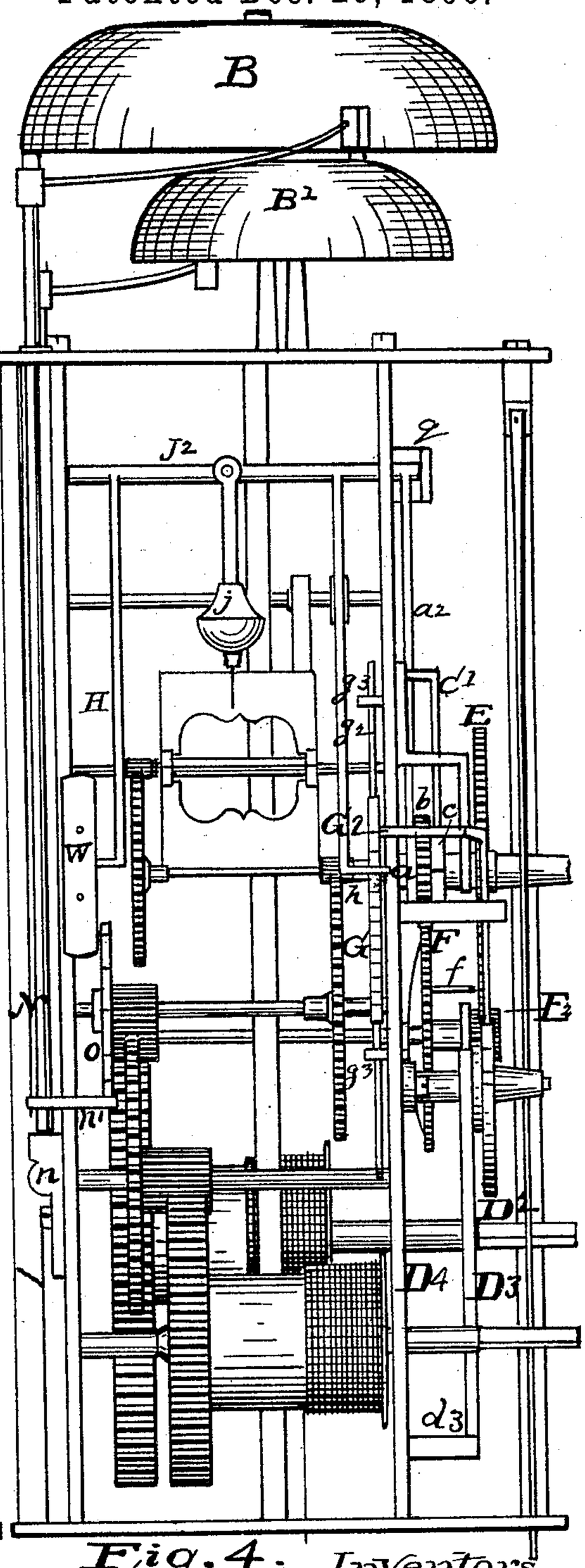

Fig. 4.

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(No Model.) 4 Sheets—Sheet 4.

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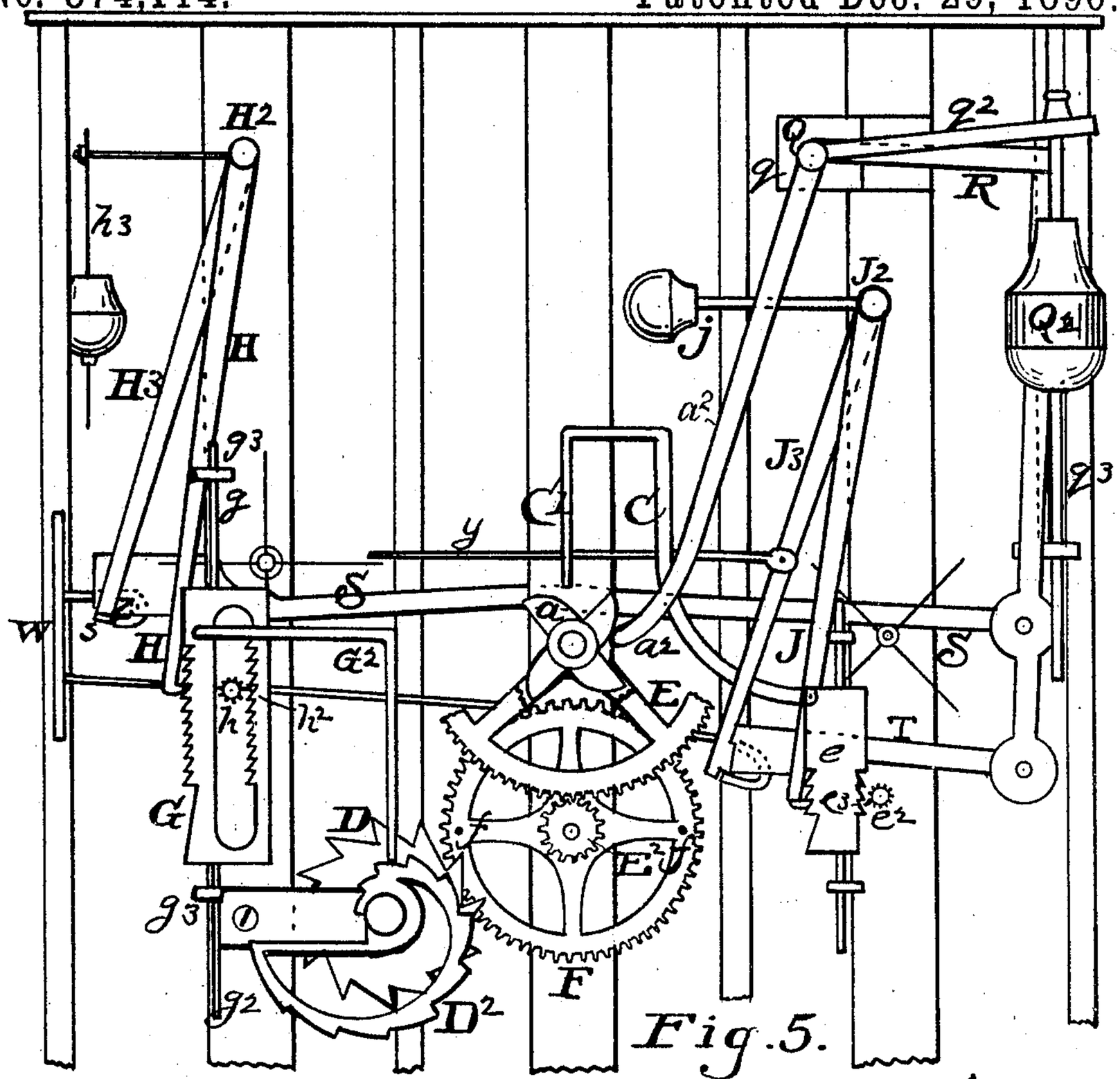

Fig. 5.

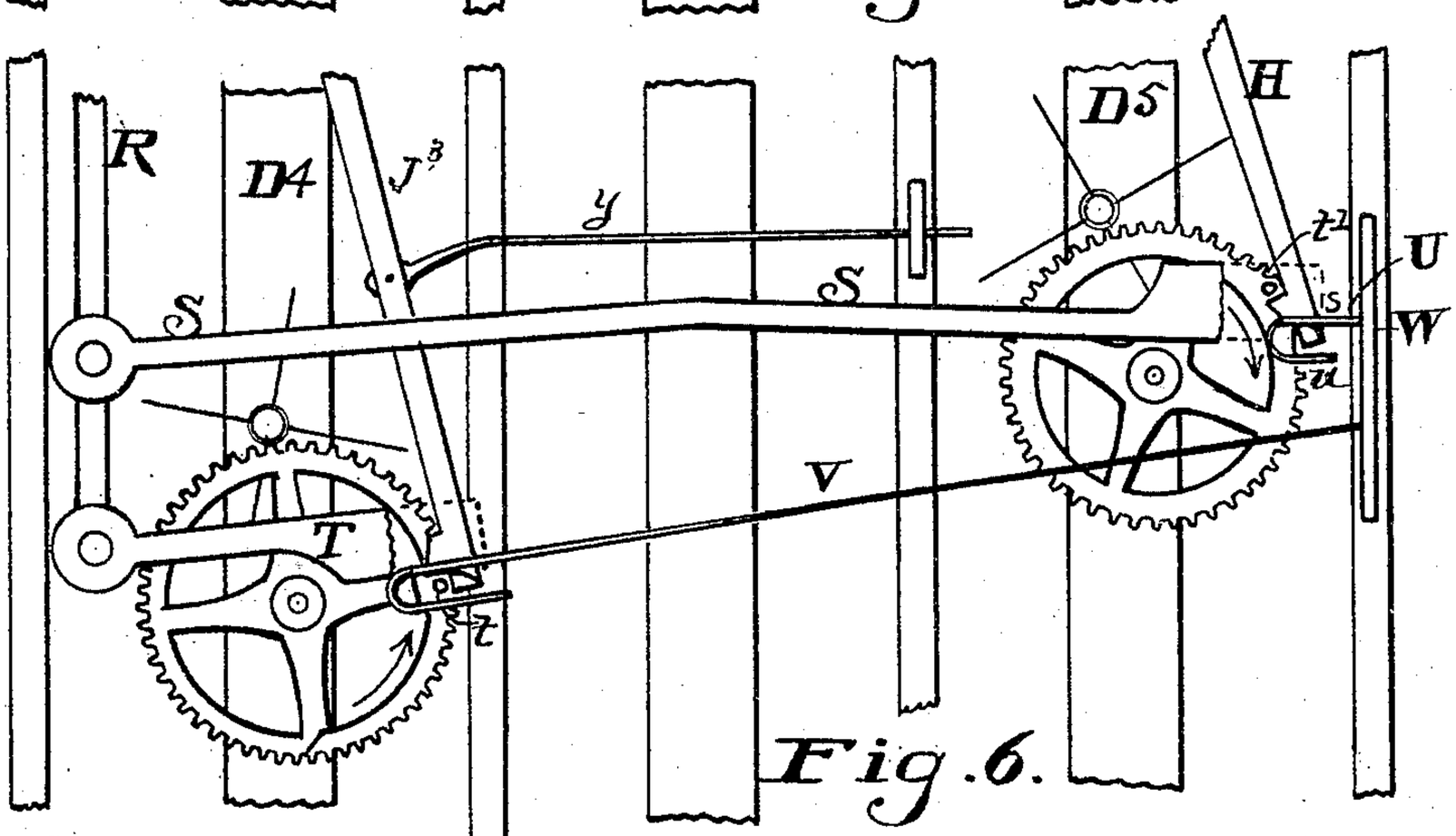

Fig. 6.

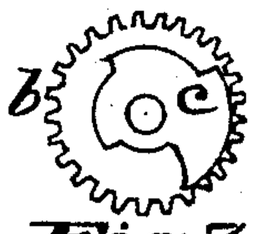

Fig. 7.

Witnesses,
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UNITED STATES PATENT OFFICE.

CHARLES M. SAFFORD AND WILLIAM M. ROSS, OF CLEVELAND, OHIO.

REPEATING MECHANISM FOR CLOCKS.

SPECIFICATION forming part of Letters Patent No. 574,114, dated December 29, 1896.

Application filed September 11, 1895. Serial No. 562,220. (No model.)

To all whom it may concern:

Be it known that we, CHARLES M. SAFFORD and WILLIAM M. ROSS, citizens of the United States, residing at Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Striking Attachments for Clocks, of which the following is a specification.

These improvements relate to the striking parts of clocks, consisting in the new striking mechanism in combination with the common time-keeping train, in which the hours and quarter-hours are struck automatically at regular and proper intervals, but which may also be repeatedly struck at irregular intervals between the regular intervals at pleasure by an electromagnet attachment.

The construction, combination, and operation of these improvements will fully appear from the subjoined description, when considered in connection with the accompanying drawings, in which—

Figure 1, Sheet 1, is a front elevation of a clock mechanism having our improvements embodied therein. Fig. 2, Sheet 2, is a rear elevation of the same. Fig. 3, Sheet 3, is a right-hand end elevation showing the new quarter-hour-striking train. Fig. 4, Sheet 3, is a left-hand end elevation showing the hour-striking train. Fig. 5, Sheet 4, is a front elevation showing some of the new parts which we apply to the front portion of the clock. Fig. 6, Sheet 4, is a rear elevation showing some of the new parts which we apply at the back of the clock. Fig. 7, Sheet 4, is a detached view of the gear *b* and snail *c*, which we place on the hour-hand arbor.

The first part of our invention is attached directly to the clock and is as follows:

On the arbor of the hour-hand is placed a cam-wheel *a*, having four projections, a pinion *b*, and a stop-snail *c*, having four increase projections. The cam-wheel is employed for actuating the quarter-hour-striking train, the gear *b* for actuating the hour-striking train.

D is a star or ratchet-tooth wheel journaled on a bracket to a post of the supporting-frame. D^2 is a snail permanently attached to the star-wheel to be turned by it. The star-wheel has twelve points, and the snail has twelve increase projections, corresponding in number with the number of revolutions of the minute-hand of the clock or the twelve divisions of time comprised in one revolution of the hour-hand.

D^3 is a spring-lever placed by the side of the star-wheel D. It is attached at its lower end to a stud d^3 on the post D^4, and it is provided on its upper end with a beveled projection which bears against the points of the star-wheel, the friction of which serves to prevent the star-wheel being turned by jarring or handling of the clock.

E is a gear-wheel on the arbor outside of the bracket b^2 (plainly seen in Fig. 3) and meshes with pinion D′ on the hub of the gear-wheel F. On said wheel F are provided pins *f*, which, as said wheel rotates, strike the teeth of the ratchet-wheel and turn it the space of one tooth each time the hour-hand points off the hour, and thereby also turning the snail D^2 for presenting its projections in succession for the purpose hereinafter described.

The next or second part of our invention, which relates to the hour-striking mechanism, is described as follows:

At the left-hand side of the clock, looking at Fig. 1, is attached the spring-actuated gears common in such clocks.

G is a frame having a rod *g* on its top end and a rod g^2 on its lower end, by which it is supported in lugs g^3 on the supporting-post D^4 and in which said frame has vertical movements. On the outer left side edge of said frame G are made twelve ratchet-teeth and on the inner edge are also made twelve teeth. These teeth correspond in number with the number of increase projections on the snail D^2.

G^2 is an arm attached to the frame G, having a downwardly-bent branch, which reaches down to rest on the projections of snail D^2. A pinion *h*, on the third wheel of the striking-train, has an extension h^2 of one of its teeth, which, as said pinion revolves, catches in a tooth of the inner rack and carries said rack upward, tooth by tooth, as it revolves. When the lowest tooth is reached, a hook on a lock-lever falls under it and holds the frame up until it is again released by the operations of the clock. The lock-lever, which holds the rack-frame up, is attached to and suspended from rock-shaft H^2, journaled be-

tween the front and rear posts of the hour-striking train. H^3 (seen in Fig. 2) is also a lever suspended from said rock-shaft H^2. Its purpose is to move the lock-lever for releasing the rack-frame G, which then falls, the number of teeth corresponding to the projection on snail D^2. h^3 is a weight suspended from an arm on the said rock-shaft H^2, which serves to hold the lock-lever hook in contact with the frame G and prevent its being jarred off. The method and means for moving said lever H^3 will appear in the description of the mechanism on the back of the clock.

The next and third part of our invention, which relates to the quarter-hour-striking mechanism, is described as follows:

At the right-hand side of the clock, looking at Fig. 1, is attached the spring-actuated gears common to such clocks.

e is a rack-plate, having rods on its upper and lower ends which support it in lugs on the supporting-posts of the train mechanism, in which said plate has vertical movements, in like manner to ratchet-frame G. In each side of plate *e* are made four ratchet-teeth, the same in number as the increase projections on the snail *c* on the arbor.

C is a curved arm, attached to the rack-plate *e*, which stands upright and has a downwardly-extending branch C′, which rests on the projections of the snail *c*, said projections representing the four quarters of the hour, and they govern the drop of the plate to regulate its movements to the quarter to be struck.

J is a lever suspended from a rock-shaft J^2, journaled between the supporting-posts of the quarter-hour-striking train. On the lower end of said lever J is a hook which engages with the rack-teeth on the plate *e* and serves to hold said plate up in like manner to lever H of the hour-striking mechanism.

j is a weight on an arm j^2, designed for holding the hook on lever J in contact with the rack-plate *e*.

J^3 is also a lever suspended from rock-shaft J^2, as seen in Fig. 2, whose purpose is to move the lever J for releasing the rack-plate *e*, which then falls, the number of teeth corresponding to the projection on the snail *c*. The method and means for moving said lever J^3, which is similar to that for lever H^3 in the hour-striking mechanism, will also appear in the description of the mechanism on the back of the clock.

A pinion e^2 on the shaft of the third wheel of the quarter-striking train has an extension e^3 of one of its teeth, which, as said pinion revolves, catches in a tooth of the rack and lifts said plate tooth by tooth as it revolves. When the lowest tooth is reached, the hook on lever J falls under it and retains the plate in place until it is again released by the operations of the clock.

The automatic releasing of these striking-trains is performed by the cam *a* (seen in Fig. 5) for the regular striking of the hours and quarters of the hour by the means described as follows: a^2 is a lever suspended from a rock-shaft Q, journaled between brackets *q*, attached to the posts of the quarter-striking train. The lower end of said lever a^2 bears against the cam *a* and is moved by it as it rotates. To the rock-shaft Q is also attached a lever q^2, carrying a weight Q^2, said weight having a tail-rod q^3, which has vertical movements in a hole in a cross-bar Q^3. This is provided for preventing the weight swinging by jarring or handling of the clock, and the purpose of the weight is to hold the moving end of the lever a^2 against the cam *a*. To the rock-shaft Q is also attached an angle-lever R. To the depending arm of said lever R is pivotally attached a push-rod S, which extends across at the back of the clock and striking-trains. It has a broadened end with a notch *s*, which rests on the hook on the end of the lever H^3 of the hour-striking train. T is also a short push-rod pivotally attached to the end of lever R below said lever S. Rod T also has a broadened end which rests on the hook on the end of lever J^3 of the quarter-hour-striking train. This mechanism is plainly seen in Figs. 5 and 6. A stop-pin *t*′ on the upper wheel of the hour-striking train seen in Fig. 6 serves to arrest the running of said train by contacting with a projection on the lever H when the hook on said lever falls under the last tooth of rack-frame G. A like stop-pin *t* on the upper wheel of the quarter-hour-striking train operates in like manner on lever J^3. Now when the cam *a* pushes the lever a^2 it moves lever R, and this pushes rods S and T. These rods move lock-levers H and J, releasing their hold on the rack-frame G and the rack-plate *e*, which now fall to the limit of the projections on the snails D^3 and *c*, respectively. This also moves levers H^3 and J^3, freeing them from the stop-pins *t* and *t*′ on the wheels of both striking-trains, thus giving freedom for each striking-train to run, but the hour-train will not run until the quarter has ceased, as a rod *y*, attached to the lever J^3. (seen in Figs. 2, 5, and 6,) holds the fly-pinion of said hour-train until withdrawn by falling back of said lever J^3. Then the hour-train runs and strikes the hour. Then the lever H falls back and both trains are again locked and in the normal position ready for a repetition of this operation.

For a repetition of said operation at irregular intervals a means is provided for withdrawing the lock-levers from the outside of the clock-case, as follows: U is a short pull-rod having a hook *u*, which engages with the hook on the end of lever H^3. V is a long pull-rod having a hook *v*, which engages with the hook on the end of lever J^3. These two pull-rods are fixed to a bar or head W, and pull simultaneously. The bar W constitutes an armature for an electromagnet X, by means of which the said pull-rods U and V are actuated, the wires connecting said magnet reaching to other or distant rooms. Now whenever this means is employed the striking-trains are

freed to run entirely independent of the automatic lever a^2, and which is not deprived of its functions at its proper intervals.

Accompanying these striking-trains is a striking mechanism consisting of bells and hammers operated in conjunction with said trains, as follows: On the back posts of the striking-trains are placed vertical shafts K L M N, their lower ends stepped in brackets $k\ l\ m\ n$, fixed on said posts. The upper ends of said shafts extend up through the top plate of the clock-frame, and to the top ends of each shaft are attached hammers for striking, respectively, bells or gongs B B′ B² B³. In the gearing of the quarter-hour-striking train is provided a spur-wheel o for actuating said hammer-shafts. To the shaft K is attached an arm k', (seen in Figs. 2 and 3,) which is bent so as to reach around the side of the post within reach of the spur-wheel and be actuated thereby. To the shaft L is attached an arm l', which is also bent to be actuated by the said spur-wheel o. The shaft M is supported on the back of the post of the hour-striking train, but is actuated by the quarter-hour train. I is a horizontal shaft journaled in the brackets l and m. i is an arm on the shaft I, which is acted upon by the spur-wheel o in the same manner as the arms $k'\ l'$. On the shaft M is attached a bifurcated arm m^3, and on the shaft I is attached an upright arm I², which passes through the bifurcated arm m^3, so that the movements of shaft M are derived from said shaft I from the aforesaid spur-wheel o. These arms k', l', and i are so disposed that the shafts K L M are actuated in continuous order, so as to strike the bells in succession, as 1, 2, 3, or "ding, dong, bell." These bells are thus struck once for the quarter, twice for half, and thrice for three-quarters. The hour is struck by the hour-striking train by means of a spur-wheel p in the gearing of said striking-train. N is a shaft by the side of shaft M. n' is an arm on shaft N, (seen in Fig. 2,) and like arms $k'\ m'\ l'$ are bent to reach around to be actuated by said spur-wheel p; but as before explained this does not take place until after the quarters have been struck. Rods of spring metal $k^2\ l^2\ m^2\ n^2$ are attached to the top plate of the clock-frame, which hang down by the sides of the respective shafts K L M N with their lower ends bearing against the arms $k'\ l'\ m'\ n'$. They are provided to give force to the hammers for striking the bells.

Having thus described our invention, we claim—

1. In a clock mechanism, the combination with the pull-rods U and V, joined to the bar W, and the locking-levers H³ J³; of the electromagnet X, adapted to pull said rods U and V, for unlocking and releasing the striking-trains from a distance and at irregular intervals, substantially as described.

2. The combination with the arbor of the hour-hand, of the cam a, gear b and snail c, the gear-wheel E, pinion E², gear-wheel F, pins f on said wheel F, star-wheel D and snail D², adapted to operate as and for the purpose set forth.

3. The combination with the arbor of the hour-hand and the snail thereon, lever a^2, lever q^2, carrying the weight Q², angle-lever R, said levers supported by rock-shaft Q, push-rods S and T, attached to lever R, adapted for unlocking the striking-trains, substantially as described.

4. The combination of the lock-levers H and J, having hooks engaging with the teeth of the rack-frame and the rack-plate respectively, and supported by the rock-shafts H² and J², respectively, levers H³ and J³, also supported by said rock-shafts respectively, the push-rods S and T, pivotally attached to the angle-lever R, pull-rods U and V, having hooks engaging with the hooks on the levers H³ and J³, and attached to the armature-bar W, and adapted to pull the levers H³ and J³ by the application of an electric current, substantially as described and for the purpose set forth.

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