

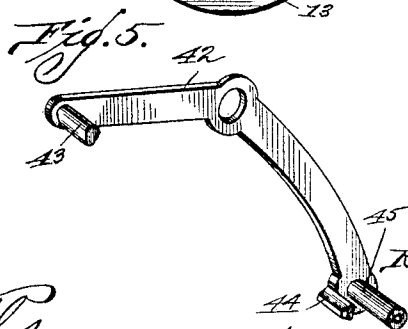
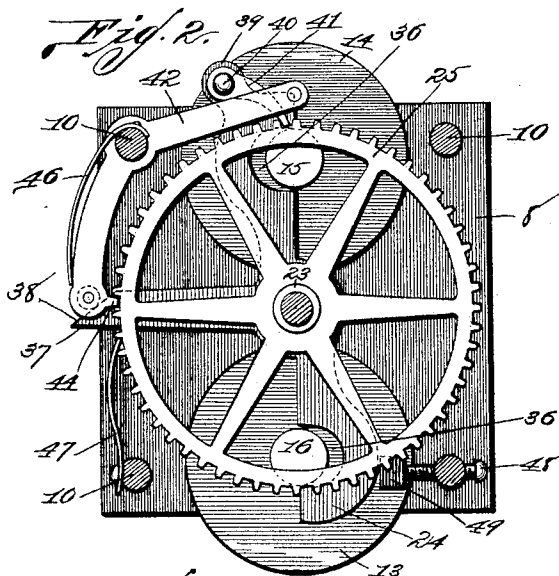
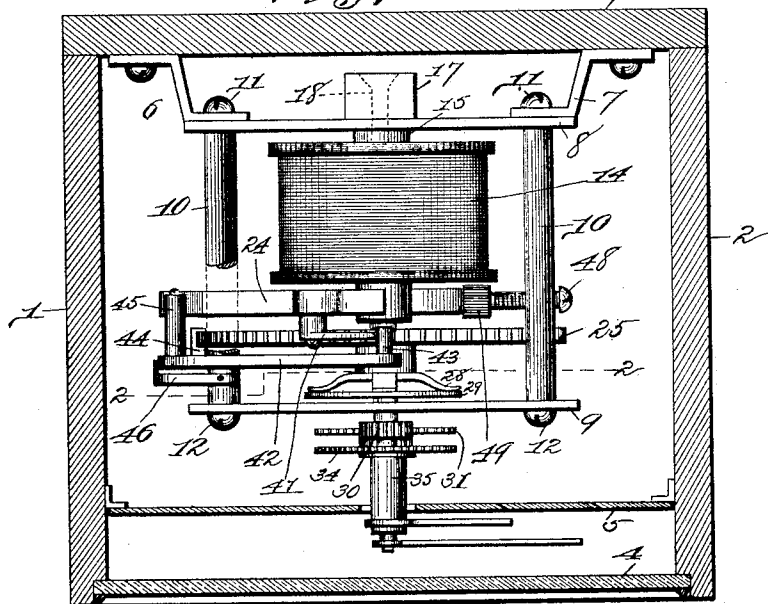
(No Model.)

2 Sheets—Sheet 1.

R. BAUMANN & T. H. WURMB.
ELECTRIC CLOCK.

No. 585,249.

Fig. 1. Patented June 29, 1897.



Attest
M. Smith
S. S. Wells

Inventors:
Robert Baumann, and
Theodore H. Wurmb.
By Higdon & Higdon Solicitors.

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Fig. 6.

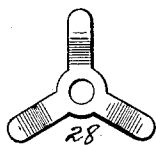


Fig. 3.

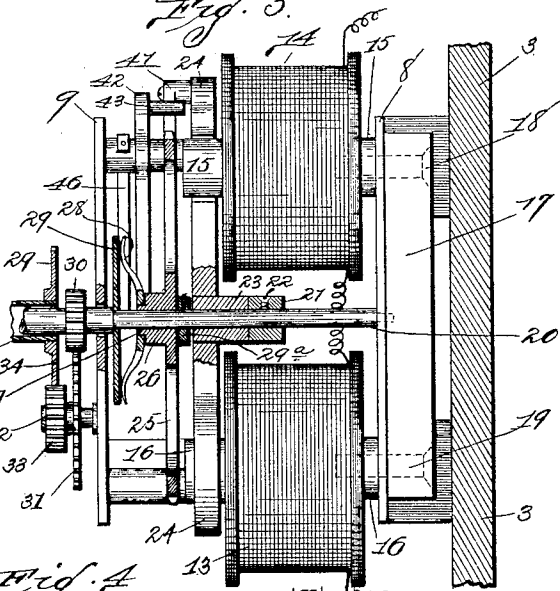


Fig. 7.

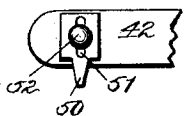
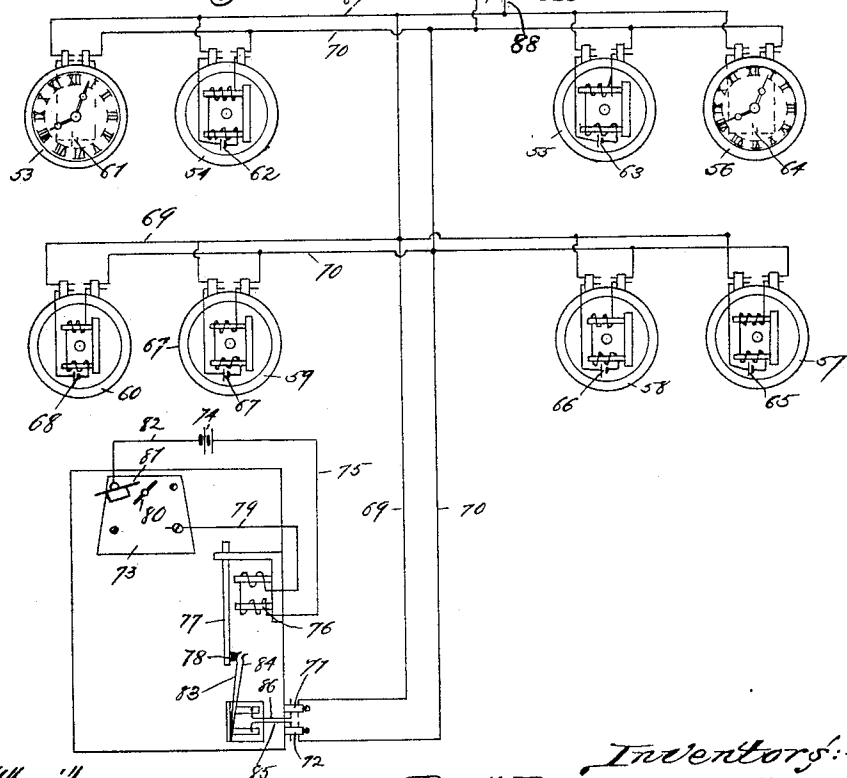


Fig. 4.



Attest—
J. G. Wells

Inventors:—
Robert Baumann— and
Theodore H. Wurmb.
By Higdon Higdon Longan
Attys.

UNITED STATES PATENT OFFICE.

ROBERT BAUMANN AND THEODORE H. WURMB, OF ST. LOUIS, MISSOURI.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 585,249, dated June 29, 1897.

Application filed May 18, 1896. Serial No. 591,932. (No model.)

To all whom it may concern:

Be it known that we, ROBERT BAUMANN and THEODORE H. WURMB, of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Electric Clocks and System of Operating the Same, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

Our invention relates to the construction of electric clocks and to the system of operating the same from a master-clock.

In large public buildings, schools, office buildings, railroad depots, &c., it is a matter of considerable importance that there should be uniformity in the time indicated by the different clocks. The clocks heretofore in use have been found to be very unreliable and require much attention.

To equip a large building with high-priced regulators that will not vary half a minute in a month or so is a very expensive accommodation, and the mechanical sign-clocks which have heretofore been in use have been found to vary so much in time that they are absolutely unreliable.

Spring-actuated clocks wound periodically by an electric motor or by an electromagnet actuating a spring-lever armature require excessive battery-power in order to overcome the necessary tension of the spring which drives the train of gears and operates the clock. These considerations have led us to our present invention, the object of which is to provide an electric clock which shall be at the same time simple in construction, economical in the consumption of electric power, and adapted for in and out door service under all conditions, which shall indicate uniform and correct time, and which shall be free of the difficulties heretofore existing, some of which are named above.

Our invention consists primarily of an electromagnet provided with a rocking armature, which armature has a side pull and which operates through its connections the hands of clocks of the class hereinafter described.

Our invention further consists of a master-clock provided with a circuit-closer capable of carrying a current of considerable strength,

and, further, of the system for connecting several clocks together and operating the same synchronously by the operation of the master-clock.

Our invention consists, further, of the details of construction hereinafter described and claimed.

In the drawings, Figure 1 is a top plan view of our improved electric clock. Fig. 2 is a vertical sectional view on the line 2 2 of Fig. 1. Fig. 3 is a side elevation of the mechanism shown in Fig. 1 with a part of the casing removed and part of the mechanism broken away. Fig. 4 is a diagrammatic view illustrating our improved system of operating electric clocks. Fig. 5 is a detail perspective of a bell-crank lever of which we make use. Fig. 6 is a side elevation of a spring-washer of which we make use. Fig. 7 is a view of a modified form of the bell-crank shown in Fig. 5, showing how the pawls used on the ends of said bell-crank may be made adjustable.

Our clock may be placed in a casing consisting of the side walls 1 and 2, the back wall 3, the glass front 4, and the dial-plate 5. The frame of the clock mechanism may be attached to the back wall 3 of the casing by means of the brackets 6 and 7.

The clock-frame consists of the back plate 8 and the front plate 9, connected together by the posts 10, and the screws 11 pass through the ends of the brackets 6 and 7, then through the back plate 8 of the clock-frame, and then into the posts 10. The screws 12 pass through the front plate 9 and into the posts 10.

The coils 13 and 14 are placed one above the other in horizontal position with the rear end of their cores 15 and 16 against the back plate 8 of the clock-frame, and the bar 17 is placed on the back side of said plate 8 in a vertical position and in alinement with the rear ends of said cores 15 and 16, and screws 18 and 19 are inserted through said bar, then through said plate 8, and into the ends of said cores 15 and 16, the bar 17 thus forming the yoke of the electromagnet.

The plate 8 should be of non-magnetic material, or, if preferred, the bar 17 may be omitted and the plate 8 may be so constructed as to form the yoke of the electromagnet.

Mounted in a horizontal position in the cen-

ter of magnetic force, or, in other words, half-way between the cores 15 and 16 and in a position parallel therewith, is a shaft 20. The rear end of said shaft is journaled in the plate 8 and the front end passes out through the plate 9 and is journaled therein. Fixed upon the shaft 20 at some distance in front of the plate 8 is a collar 21, the position of which may be adjusted and regulated by the set-screw 22. Rotatably mounted upon said shaft 20 in front of said collar 21 and abutting against said collar is a brass or non-magnetic collar 23, which forms the hub of the S-shaped armature 24, which armature is so constructed that the attraction of the cores 15 and 16 gives it a rotary motion upon the shaft 20. The front ends or free ends of the cores 15 and 16 project through the coils 13 and 14 far enough so that the ends of the armature 24 are attracted to the side of said cores instead of to the faces of the ends of the cores, as in the magnets heretofore in use.

Rotatably mounted upon the shaft 20 directly in front of the armature 24 is a toothed wheel 25. The hub 26 of said toothed wheel projects forwardly and the extreme front end 27 of said hub is reduced in size, and a spring-washer 28 (shown in plan in Fig. 6) is rotatably mounted upon said end 27 of said hub. The outer edges of the spring-washer 28 engage against the disk 29, which is rigidly fixed upon the shaft 20 in front of said washer. A collar 29^a is adjustably fixed to the shaft 20 directly behind the hub of the wheel 25 to sustain the pressure of the spring-washer 28.

Mounted upon the shaft 20 in front of the plate 9 is the usual gearing for operating the hands of the clock, which gearing consists of the spur-pinion 30, fixed to the said shaft 20, the spur-gear 31, rotatably mounted upon the stub-shaft 32, which is fixed to said plate 9, and the spur-pinion 33, fixed to the hub of said gear 31 and meshing into the gear 34, which is rotatably mounted upon the shaft 20 and connected to the collar 35, which collar carries the hour-hand of the clock.

The armature 24 is constructed of suitable magnetic material and is S-shaped in front elevation. With reference to a line drawn vertically through the centers of the cores 15 and 16 the upper half of the armature 24 is on one side of said line, preferably the left side, and the lower half of said armature is on the opposite side of said line. The faces 36 of the ends of the armature which are to contact with the side faces of the ends of the cores are constructed to fit said cores when in contact therewith. The cores are preferably circular, and the faces 36 are in the form of semicircular recesses designed to fit half-way around said cores, as shown in Fig. 2.

The upper end of the armature 24 contacts with the opposite side of its core from the side of the core with which the lower end of said armature contacts, thus giving said armature a rocking motion upon the shaft 20. In this form of rocking armature both ends

of the armature are attracted simultaneously, as distinguished from the rocking armature shown in our concurrent application, Serial No. 591,993, in which the ends of the armatures are attracted alternately.

Projecting from the hub of the armature 24 and at right angles to a line drawn through the center of the cores 15 and 16 is an arm 37, having the bevel-face 38 upon the upper side of its free end. Upon the upper end of said armature 24 is a lug 39, to which is fixed a stud 40, and a pawl 41 is journaled upon said stud, said pawl 41 being designed to engage with its free end the teeth upon the wheel 25, as required to rotate said wheel by the rocking of said armature 24.

A bell-crank lever 42, a perspective of which is shown in Fig. 5, is journaled upon the post 10 at the upper left-hand corner of the clock-frame and in such a position relative to the wheel 25 that the lugs 43 and 44 alternately engage the teeth of said wheel. A pin 45 passes through the lower end of said lever 42 in a position parallel with the lug 44, said pin 45 being designed to ride upon the bevel-face 38 of the arm 37. A leaf-spring 46 is attached to the post 10, upon which said bell-crank lever 42 operates and passes downwardly to a position against the outer face of the lower end of said bell-crank 42, as shown in Fig. 2. The tension of the spring 46 will normally hold the lug 44 in engagement with the teeth of the wheel 25 and prevent said wheel from rotating. A leaf-spring 47 is attached to the post 10 at the lower left-hand corner of the clock-frame and extends upwardly and engages the teeth of the wheel 25, said leaf-spring being designed to prevent said wheel from rotating backwardly at all times.

A set-screw 48 is horizontally positioned through the post 10 at the lower right-hand corner of the clock-frame, and a piece of rubber 49 is mounted upon the point of said set-screw and designed to engage the rear side of the lower end of the armature 24 and act as a cushion to regulate and limit the length of stroke of the armature.

A pawl-faced block 50, having the oblong aperture 51, through which operates the screw 52, as shown in Fig. 7, may be substituted at one or both ends of the bell-crank lever 42 in place of the lugs 43 and 44, and thus said lever may be made adjustable.

We prefer to make the wheel 25 with one hundred and twenty teeth, and the length of the stroke between the face of the armature and the core should be equal to about the space occupied by a tooth and a half upon the wheel 25. Then by means of the pawl 41, carried by the armature 24, engaging the teeth of the wheel 25 each vibration of the armature toward its core will advance the wheel 25 one tooth. As the armature 24 is attracted the free end of the arm 37 is raised, thus raising the pin 45, resting upon the pawl-face 38, and rocking the bell-crank 42 and causing the lug 43 to swing downwardly and engage the

teeth of the wheel 25. The object of this motion is to prevent the wheel 25 from being carried forward by its momentum.

The operation of the armature is very quick and positive, and if the wheel 25 moves easily it might be carried a tooth or two more than is desired but for the fact that the lug 43 drops between a pair of teeth at the same time that the wheel is moved to the desired position and thus prevents momentum from carrying the wheel farther than is desired. At the same time that the operation just described takes place the leaf-spring 47 engages behind one of the teeth on the wheel 25 and thus prevents the possibility of said wheel being rotated backwardly by the friction with the armature as the armature recedes from the core when the circuit is opened. The weight of the arm 37 and the bell-crank 42, resting upon the end of said arm, together with the tension of the spring 46, acting upon said lever, slightly overbalances the armature 24, causing it to recede from the cores as soon as the circuit is opened. If the face of the armature is inclined to stick to the core after the circuit is opened, a short brass pin may be inserted in the core upon the side facing the armature, so that the contact between the face of the armature and the core will not be close enough to cause them to stick after the circuit is opened. The minute-hand is attached directly to the shaft 20, and if there are one hundred and twenty teeth upon the wheel 25, which operates said shaft 20, it will require an action of the armature 24 each half-minute to indicate the correct time on the dial of the clock.

By means of the frictional connection between the wheel 25 and the shaft 20 the hands of the clock may be set and reset without moving the wheel 25. In other words, the operation of the wheel 25 will rotate the shaft 20, but the shaft 20 may be rotated by moving the hands of the clock without rotating the wheel 25. The pin 45 rides continually upon the bevel-face 38 of the arm 37, and said arm being operated by the motion of the armature operates the bell-crank lever 42. The object of the lug 44 is to hold the wheel 25 from rotating when it is desired to move the hands of the clock manually in either direction, but especially in a forward direction.

Assuming that the range of motion between the armature and the core is equal to a tooth and a half, then when the armature is attracted the pawl 41 will travel one-half a tooth forward one-third of its entire range of motion before it comes in contact with the tooth to be pushed. By this time the arm 37 will have raised the lug 44 out of contact with the teeth of the wheel 25 and the pawl 41 will then push said wheel a distance of one tooth without hindrance. By the time said pawl has advanced the distance of one tooth, the armature 24 is in contact with its core, the lug 43 has descended into a notch immedi-

ately in front of the tooth behind which the end of the pawl is operating, and thus stops said wheel from going any farther.

Any desired number of clocks of the class just described may be placed in a building or series of buildings or upon the streets and the entire series of clocks may be operated simultaneously in the following manner:

Referring to the diagrammatic view in Fig. 4, let 53, 54, 55, 56, 57, 58, 59, and 60 represent a series of clocks such as we have just described. Each clock is provided with a battery 61, 62, 63, 64, 65, 66, 67, and 68, and the wire 69 next to the positive poles of said batteries and the wire 70 next to the negative poles of said batteries. The wire 69 is attached to the binding-post 71 and the wire 70 is attached to the binding-post 72. 73 is a diagram of the front plate of the frame of the master-clock and shows the connections therewith. This matter in regard to getting electrical impulses from the operation of the seconds-hand of the master-clock is shown and described in detail in our pending application, serially numbered 591,993, which description should be read in connection herewith. The electric circuit which is opened and closed by the platinum point on the seconds-hand of the master-clock is furnished by the battery 74. The wire 75 leads from the battery 74 to the electromagnet 76, the coils of which are arranged one above the other in a horizontal position. The yoke of the electromagnet 76 extends upwardly and forwardly to a point above and in front of the front faces of the cores of said magnet, and the armature 77 is pivotally attached to said yoke and depends downwardly therefrom in front of the front ends of the cores of said magnets. Upon the lower end of said armature, which is of more than the usual length, is a brass bar 78, the rear face of which is covered with platinum. From the electromagnet 76 the current from the battery 74 passes through the wire 79 to the plate 73 of the master-clock and through said plate to the platinum pin 80, then to the spring 81, and from said spring through the wire 82 back to the opposite pole of the battery 74, from which it started. The operation of the seconds-hand shaft carrying the pin 80 alternately opens and closes this circuit. The closing of the circuit vibrates the armature 77, carrying the bar 78. A spring 83 is positioned in such a manner that its free end rests against the platinum face of the bar 78. A similar spring 84 is so positioned that it strikes against the platinum face of the bar 78 when the armature 77 is against the face of the cores of the magnet. The fixed end of the spring 83 is connected by a conductor 85 to the binding-post 72, and thus to the conductor 70. The fixed end of the spring 84 is connected by a conductor 86 to the binding-post 71, and thus to the wire 69. When the armature 77 is attracted, both of the springs 83 and 84 rest against the platinum face of the bar 78, and this operation

closes the clock-circuit, or, in other words, connects the wires 69 and 70, and the breaking of the circuit controlled by the battery 74 by the action of the master-clock releases
 5 the armature 77, and said armature is pushed away from the cores by the action of the spring 83, and the spring 84, being so set that it does not follow the bar 78 as it retreats, thus breaks the clock-circuit. One or two
 10 cells of the battery are sufficient in place of the battery 74 to operate the electromagnet 76 by the operation of the master-clock, as heretofore described. Each of the clocks to be operated being provided with batteries
 15 sufficient to operate its mechanism and each of these batteries being connected together and connected to the springs 83 and 84, it is obvious that every half-minute as the master-clock opens and closes the circuit through
 20 the battery 74 the clock-circuit will be opened and closed by the vibration of the armature 77, carrying the bar 78.

A tower-clock such as is described in our concurrent application hereinbefore referred
 25 to may be attached to wires 87 and 88 or several tower-clocks may be attached to these wires.

It will be obvious to those familiar with the art that our reducing the number of the teeth
 30 upon the wheel 25 to sixty instead of one hundred and twenty or by using one end of the platinum point upon the seconds-hand of the master-clock instead of using both ends the clocks may be made to operate once a
 35 minute instead of every half-minute, or that by doubling the number of teeth upon the wheel 25 or by making four platinum points upon the seconds-hand of the master-clock instead of two the clocks may be operated
 40 four times a minute.

We claim—

1. A side-pull rocking armature mounted upon the shaft of the clock, the arm 37 projecting at right angles from the center of said
 45 armature, the bell-crank lever 42 pivotally mounted upon one of the posts of said clock, the pin 45 attached to one end of said bell-crank lever and engaging the bevel-face 38 upon the free end of said arm 37, the lug 44 in
 50 position parallel with said pin 45, the toothed

wheel 25 mounted upon the shaft of said clock and in position to be engaged by said lug 44, the lug 43 upon the opposite end of said bell-crank lever 42 from the lug 44 and in position to engage the teeth of said wheel 25, substantially as specified. 55

2. A side-pull rocking armature mounted upon the shaft of the clock, the arm 37 projecting at right angles from the center of said armature, the bell-crank lever 42 pivotally
 60 mounted upon one of the posts of said clock, the pin 45 attached to one end of said bell-crank lever and engaging the bevel-face 38 upon the free end of said arm 37, the lug 44 in position parallel with said pin 45, the toothed
 65 wheel 25 mounted upon the shaft of said clock and in position to be engaged by said lug 44, the lug 43 upon the opposite end of said bell-crank lever 42 from the lug 44 and in position to engage the teeth of said wheel 25, and a
 70 set-screw 48 carrying the rubber cushion 49 upon its point adjustably positioned in one of the posts of said clock to limit and regulate the length of stroke of said armature, substantially as specified. 75

3. A side-pull rocking armature mounted upon the shaft of the clock, the arm 37 projecting at right angles from the center of said armature, the bell-crank lever 42 pivotally
 80 mounted upon one of the posts of said clock, the pin 45 attached to one end of said bell-crank lever and engaging the bevel-face 38 upon the free end of said arm 37, the lug 44 in position parallel with said pin 45, the toothed
 85 wheel 25 mounted upon the shaft of said clock and in position to be engaged by said lug 44, the lug 43 upon the opposite end of said bell-crank lever 42 from the lug 44 and in position to engage the teeth of said wheel 25, and a
 90 leaf-spring 47 having its free end engaging the teeth of the wheel 25, and the leaf-spring 46 engaging said bell-crank lever 42, substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

ROBERT BAUMANN.
 THEODORE H. WURMB.

Witnesses:

S. G. WELLS,
 MAUD GRIFFIN.