J. D. CUSTER.

Watch.

No. 2,939. Patented Feb. 4, 1843.

Fig. 1

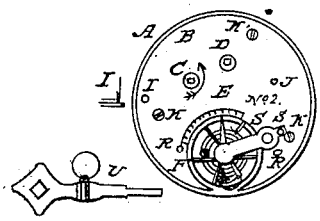


Fig. 2

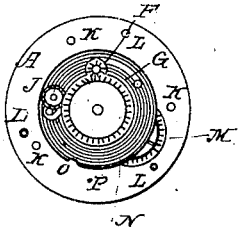


Fig. 3

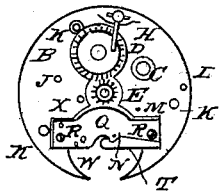


Fig. 4

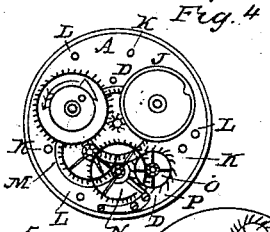


Fig. 5

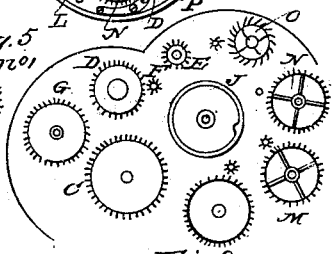


Fig. 6

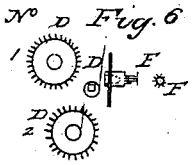


Fig. 7

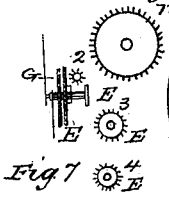
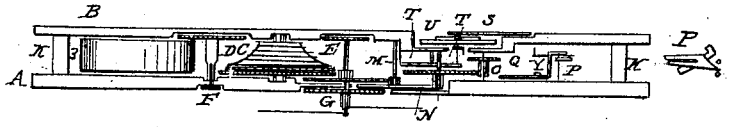


Fig. 8.

Fig. 9



UNITED STATES PATENT OFFICE.

JACOB D. CUSTER, OF NORRISTOWN, PENNSYLVANIA.

WATCH.

Specification of Letters Patent No. 2,939, dated February 4, 1843.

To all whom it may concern:

Be it known that I, JACOB D. CUSTER, of Norristown, in the county of Montgomery and State of Pennsylvania, have invented a new and Improved Mode of Constructing Watches; and I do hereby declare that the following is a full and exact description.

The nature of my invention consists in sinking the escapement in fusee wheel watches, so that the top of the cock is even with the top of the top plate; and in applying pipes, for the purpose of winding and setting, so that the case may fit close on the top of the top plate, so as to make the watch as thin as possible, without diminishing the size of the works.

To enable others skilled in the art, to make, and use my invention, I will proceed to describe its construction, and operation.

Figure 1, in the accompanying drawings, is a top view of the watch, as it would appear without the case.

A is the outer edge of the bottom plate. This plate is sunk as shown at Fig. 2.

B, Fig. 1, is the top plate, which is made flat on the bottom, and a little oval on the top, to suit the case. It has a hole cut in it; the size is shown at S, F, in this figure and at W, Fig. 3. The side view of it, is shown at U, S, Fig. 9. S, Fig. 1, at the end of Norristown, is the cock, which is sunk into the top plate, so that the top plate is even with the top of it; it is fastened to the top of the top plate, by a screw, the head of which, must also be as low as to be even with the top, of the plate; and it extends down through the piece Q as shown at H, Fig. 3. The regulator, is on the end of the cock as shown at Fig. 1, pointing to E. It is made to move spring tight, on the under part, of the end of the cock, by a slit ring, which is slipped on an undercut circle, which is turned on the bottom of the end of the cock, so that the regulator moves from S, to F, between the hairspring, and cock, and takes hold of the hairspring, as usual by two pins, which extend down each side of the outer circle of the hairspring, but not as far as to be in the way of the arms of the fly-wheel, which are close under the hairspring; as shown at U, Fig. 9. The hairspring, is fastened, as usual on the staff of the flywheel, but the outer end of it, is fastened by two pins, as shown at S, Fig. 1. The large pin which points to the S, is fastened pin tight, in the plate under the letter S, and the small pin through the end of it, holds the hairspring, so that when the flywheel, and hairspring, are taken out, the two pins, remain on the outer end of the hairspring.

The piece Q, Fig. 3, is the piece over which the fly wheel vibrates, as it would appear, if the plate were turned bottom up.

R R, are the heads of the screws, which fasten it to the bottom of the top plate; R R, in Fig. 1, are the points of the screws, which appear through the top plate.

The black piece T, Fig. 3, is the potence; and it is fastened to the piece Q, by a screw, and pin. The point of this screw appears at the white spot, in this piece, and the head of it, appears at the foot of F, Fig. 1, below the fly wheel. The piece Q, and T, are shown, as they would appear, fastened to the bottom of the top plate, at Q and T, side view, Fig. 9, with the foot of the fly-wheel staff in the potence, near T, and the top of it, in the cock, S.

The dot N, on the piece Q, Fig. 3, is the upper pivot hole of the fourth wheel pinion, and the lower pivot hole of this wheel, is shown at N, Fig. 2, as it would appear, if the dial were removed. This wheel is shown at N, Fig. 4, and at N, Fig. 9. In the latter figure, the pinion of this wheel, extends through the bottom plate, to receive, and carry, the seconds-hand.

Fig. 4, is a view of the wheels which go between the plates, as they would appear, if the top plate were removed; with the exception, of the wheels D, and E, which are made to appear in their sunken places, in the bottom of the top plate, Fig. 3, to prevent confusion.

The dot, O, in Figs. 2, and 3, are the upper and lower pivot holes of the balance-wheel, and, O, Figs. 4, and 9, is the balance wheel, and pinion.

P, Figs. 4, and 9, is the verge, and lever, with the arbor through them, and the upper pivot of the arbor, is supported by the piece Y, and the lower one, by the bottom plate. At P, Fig. 4, the verge, &c., is shown, in its real position, in relation to the balance wheel, but in Fig. 9, it is moved, and shown out of the real position, in order to prevent confusion. The verge, lever, guard pin, and notch in the end of the lever, are made as usual, in levers, excepting the back end of the lever, and the part of it, at the center of its motion, for at the center, it must be

wide, so as to allow room for riveting it on the verge, which it partly crosses; and at the back end, it must come near to a point, so as to leave room between the end of it, and the back end of the verge, for one of the banking pins; as shown at P, at the right of Fig. 9, which is a top view of the verge, and lever; the two black spots, at the small end of the lever, are the banking pins; which are shown in their real positions, by the two dots at the bottom of P, Fig. 4. The piece Y, of the verge, is also shown, in its real position, in Fig. 4, screwed fast to the outer part, of the bottom plate.

The tumbler, and tumbler pin, as shown on the staff of the flywheel, Fig. 9, are made as usual. The real position of the flywheel staff, &c., in relation to its distance from the pinion, of the fourth wheel, N, could not be shown in this drawing, in its real position; the flywheel staff, is an eighth of an inch from the pinion of the fourth wheel N, and the small dot, at the end of the lever P, in Fig. 4, is nearly its real position. Fig. 9, is not intended to represent, regular distances, sizes, nor proportions; it is only intended to represent the manner in which the parts are placed between the plates, &c.

I arrange the escapement, in this manner below the top plate, and over the fourth wheel, balance wheel, and verge, without diminishing the size of the wheels; which is shown in Fig. 4; for the wheels occupy all the room between the fusee wheel, and main spring barrel, and the balance wheel comes so near the mainspring barrel, as to require a pin, or pillar, to defend it from being struck by the chain, if it should happen to break. The black spot K, Fig. 4, is one of the pillars, and it is placed near the barrel so as to defend the balance wheel from being struck by the chain.

The ring I, Fig. 1, is the center of motion, of the mainspring barrel; it is made as usual, excepting the ratchet, and click, which are sunk into the bottom, of the bottom plate; as shown at J, Fig. 2. C, Fig. 1, is the fusee wheel, and pipe; this wheel with the maintaining ratchet, &c., is made much the same as usual, excepting the pipe, which is applied to it instead of the post. This pipe is shown at Fig. 5, the small dots on it, show the size, and depth of the square, or angled hole; and the flange on, or near, the top of it, is left on it, to prevent it from splitting, it is fastened in the fusee, so that the flange is in a place sunk for it, in the bottom of the top plate, as shown at C, Fig. 9, and the top of it, is even with the top of the top plate.

I, Fig. 1, is the detent, and the detent spring, of the ratchet, of the maintaining power. This detent spring, is a small pin, put through the detent, near the center of its motion, and it extends parallel with the arbor of the detent, through a corresponding hole in the top plate; shown at the little ring, at the bottom of I; the small dot, at the bottom of this ring, is the upper pivot of the detent. E, Fig. 9, is the center wheel, and pinion with the minute wheel, on it, at the top. I call this the minute wheel, because, I never saw any thing like it, and do not know of a more appropriate name for it. This minute wheel, is fastened on an arbor, on the upper end of which, is a small pivot, near the upper side of the wheel, which pivot runs in the center, of the upper plate; as shown at E, Fig. 1; and the lower end of this arbor, extends through the center wheel pinion, as far as to receive, and carry, the minute hand; as shown at E, Fig. 9, and at E, Fig. 7.

The minute wheel, E, stands in a sunken place, in the bottom, of the top plate, as shown at E, Fig. 3, and Fig. 9. The center pinion, must also, extend down through the bottom plate, so as to leave room for nothing, but a small pin, between it, and the minute hand. On this lower part of the center wheel pinion, the hour wheel G, moves in a place sunk in the bottom, of the bottom plate; as shown at G, Fig. 2, and Fig. 9. On the end of the pipe of this wheel, near the minute hand, the hour hand is placed; so as to be near the minute hand, but not touch it.

The sunk, or third wheel, M, Figs. 2, 4, and 9; is made as usual, and needs no description. D, Fig. 1, is the setting pipe. It is placed between the mainspring barrel, and fusee wheel, so as to be near the chain, and teeth of the fusee wheel, but not touch them; as shown at D, Fig. 9, and at D, Fig. 4. The bottom of this pipe, runs in the bottom plate, very near the teeth of the center wheel, and the upper end of it, runs in the upper plate, so that the top of it, is even with the top, of the top plate; as shown at D, Fig. 1, and 9. The pipe part, of this piece, extends half way down, as shown at Fig. 6, and on the upper end of it, is fastened, what I shall call the setting wheel. This wheel, moves in a place sunk for it, in the bottom of the top plate, so as not to interfere with the main spring barrel, and fusee wheel, over which it moves; as shown at D, Fig. 9, and Fig. 3. In the bottom of this pipe D, is a small hole extending up into the pipe part of it, as shown at F, Fig. 6, and 9, in this, the stem of a small pinion, is pressed, as shown at F, Fig. 6, Fig. 9, and Fig. 2; and it must be in tight enough to prevent a touch, of the hour hand, from moving it. This pinion F, is also sunk in the bottom, of the bottom, plate, as shown in these figures. At Fig. 6, this pinion is shown, as it would appear, if the wheel, and pipe D, were out of the watch, and had the pinion F, pressed in the lower end of it.

A face or top view, of wheel, and pipe, D, and the pinion F, is also given, in this figure.

The wheel D, No. 1, is, as the top of it would appear, with the pipe D, riveted into it, and the wheel No. 2, is shown as it would appear, before the pipe is riveted in it.

At Fig. 7, a side view of center wheel, and pinion E, the minute wheel E, the hour wheel G, and the hands, is given, as they would appear, when thus put together, out of the watch, the arbor of the minute wheel E, must fit tight enough, in the center wheel pinion, to carry the minute hand, and loose enough, to turn, when the key is applied to the pipe D, to set the hands: as shown at D, Figs. 1, and 3.

The hour wheel G, Fig. 7, is a trifle smaller than, the center wheel, as shown in this figure, and also at G, Fig. 9. The wheel No. 1, Fig. 7, appears as it would, before it is riveted on its pinion; 2, is a face view of its pinion; the wheel 3, is the minute wheel, E, as it would appear with its arbor riveted in it, and the wheel 4, is the minute wheel E, as it would appear before the arbor is riveted in it. I, use the minute wheel E, instead of the cannon pinion; and the pipe, and wheel D, instead of the minute wheel, as that wheel is called in other watches. I place them under the oval part of the top plate, where they are the least in the way; as shown at Figs. 3, and 9; and for the purpose of dispensing with the setting post; by applying the pipe D, for the purpose of setting the hands from the back of the watch. By thus dispensing with the setting post, by applying the setting pipe, and wheels connected with it, and sinking the escapement, below the top of the top plate, the application of the winding pipe, is made useful; for if the setting post, or cock of the escapement, was left to extend above the top of the top plate, they would prevent the case, from fitting close on the top plate, as much as the winding post would, which shows that the winding pipe, is only made useful, by the above arrangement. In this arrangement, the dial, and hands, are left entirely private; as in Lepine watches, which is indispensable in correct time pieces. The pipes must be well hardened.

In Fig. 3, the winding stop, and its spring, is shown at H, as it would appear if the top plate were turned upside down; it is made as usual, excepting the spring. This spring, is a small pin, put through the stop, near the knob so that one end of the pin, presses up against the plate, at each side of the knob; as shown in this figure. This winding stop and spring, and the detent, and detent spring, of the maintaining power, and the chain, are omitted, in Fig. 9, to prevent confusion.

The letter K, in the first four figures shows the pillars, pillar screws, and their holes.

L, Figs. 2, and 4, are the dial pillar holes.
U Fig. 1, is the square, or angled key.

Fig. 8, represents the faces of all the wheels, and pinion; which is only intended as a reference.

The dial, and false plate, of the dial, are omitted in the drawings. Fig. 2, is sunk between the two outer circles, as low, as the false plate is thick, so that the dial, rests on the false plate, between the two outer circles, and on the part M, N, G, of the bottom, of the bottom, plate, which is left stand, to defend the wheel G, and pinion F, from being pressed by the dial, and so as to give the wheel G, its proper room between the dial, and bottom plate.

Mode of action, and calculation.—The mode of action, is much the same as usual, from the mainspring, to the balance wheel excepting the wheel E, and the parts in connection with it. The mainspring barrel, is an eighth of an inch high, more or less, and it is connected to the fusee wheel, by a chain as usual. The fusee wheel, has 60 teeth, and five laps of chain around it, when the watch is wound up; which takes the wheel around five times, in running down, and produces 30 revolutions, of the center wheel E, the pinion of which has 10 leaves, each revolution of the center wheel being an hour, makes it a 30 hour watch. The center wheel, has 64 teeth, acting in the third wheel pinion M, of 8 leaves, which make it revolve 8 times, in an hour: it has 60 teeth, which act in the pinion of the fourth wheel N, and cause it to make 60 revolutions in an hour, which is the number of revolutions, the second hand makes in an hour. The fourth wheel N, also has 60 teeth, which act in the balance wheel pinion O, of 8 leaves, causing it to revolve seven times, and a half, in a minute. The balance wheel has 20 teeth, and each tooth makes two beats in passing the verge, which make 300 beats a minute; and 5 each second. If the balance wheel, were made to have but 18 teeth, it would make 270 beats a minute: and if it had but 16 teeth, it would make 240 peats a minute, and 4 beats in a second. The teeth of the balance wheel strike the verge, and lock, as usual: and the action of the lever on the tumbler, is as usual: as would appear if the piece Y, and verge P, Fig. 9, were placed in front of the the flywheel, so that the teeth of the balance wheel, would strike the verge and the notch in the end of the lever, would strike the tumbler pin, to give motion to the flywheel.

The wheel E, Fig. 3, has 21 teeth, which act in the wheel D, of 42 teeth, which make the wheel D, revolve once, while the minute wheel E, makes two revolutions, and as the setting pipe is fastened in the wheel D, it revolves, once, in two hours, with the pinion F, in the bottom of it: as shown at F,

Figs. 2, and 9. This pinion F, has 10 leaves, acting in the wheel G, of 60 teeth, which makes the wheel G, revolve once around, in 12 hours; that is the pinion F, revolves 6 times in 12 hours, or 6 times, while the wheel G, makes one revolution; and on the end of the pipe, of this wheel G, the hour hand is placed: as shown at G, Fig. 9.

In setting the hands, to the time the angled key is applied, to the pipe D, as shown at D, Fig. 1, which turns the wheel D, Fig. 3, and it acts in the minute wheel E, moving it, and its arbor (which extends through the pinion of the center wheel,) and the minute hand, twice around, while it is moved only once around, and the pinion F, Fig. 2, being in the bottom of the pipe, acting in the teeth, of the hour wheel G, at the same time, causes it, and the hour hand, to have a corresponding motion, with the minute hand, which may be backward or forward, as may be required. One turn of the key, causes two revolutions of the minute hand, and a corresponding motion of the hour hand. The number of teeth, in the wheel E, the wheel D, the pinion F, and the wheel G, may be made to differ, from the above numbers, without altering the principle: and the arrangements of the escapement, may be reversed, so that the balance wheel, would stand next to the fusee wheel, without altering the principle of the arrangement.

What I claim as my invention, and desire to secure by Letters Patent, is—

The manner of arrangement, of the escapement, over the fourth wheel, balance wheel, and verge, the minute wheel E, and its arbor, the setting wheel and pipe D, and its pinion F, the spring of the detent of the maintaining power, and the winding stop spring, all in combination with the winding pipe and key, as I have arranged them, to reduce the size of fusee wheel watches, without diminishing the size, and strength, of the works; as herein described; using for the purpose, any material, which may be thought best.

JACOB D. CUSTER.

Witnesses:

LEONARD STROEPER,

B. F. HANCOCK.